

Bridge Inspection Program Manual

NEBRASKA

DEPARTMENT OF TRANSPORTATION

Bridge Division

1500 Hwy 2

Lincoln NE 68509-4759

(402) 479-4701

Revision 8, 2025 July

Introduction

This update, Revision 8, to the Nebraska Bridge Inspection Program manual is a major revision that introduces the Specifications for National Bridge Inventory (SNBI) and updates bridge inspection procedures for Nebraska.

All chapters are affected by this update but none as much as Chapter 3, which provides detailed descriptions of the items included with bridge inspection data collection.

Chapter 3 is composed of three sections to describe the data collected for Element data, SNBI data, and agency data that is specific to Nebraska. The Element data is only minimally affected by changes due to SNBI implementation. The former NBI data items have been removed and replaced with SNBI data items and the Nebraska-specific items have been updated to indicate those that are superseded due to implementation of the SNBI protocols.

Chapter 3 includes some guidance regarding record submittal format that is helpful for NDOT, for the annual FHWA data submittal but can safely be ignored by most users of this manual.

At the time of publication, Chapter 6 is still under review. An update to this manual will be published when Chapter 6 is completed.

Please see the Inspection area of the NDOT Bridge Division web page for the latest updates and FAQs. https://dot.nebraska.gov/business-center/bridge/

DRAFT

Acknowledgements

Thank you to the FHWA for allowing reproduction of the Specifications for National Bridge Inventory, which forms the basis of the SNBI sections of Chapter 3 of this manual.

1.1 GENERAL 5
1.1.1 Applicability 5
1.2 NBIS HISTORY AND FHWA OVERSIGHT 6
1.2.1 History 6
1.2.2 FHWA Oversight 7
1.3 THE LIFE OF A NEBRASKA BRIDGE 7
1.3.1 NDOT Policy for Design, Load-Rating and Inspection of Public Road Bridges, May 24, 2010 8
1.3.1.1 Definitions 8
1.3.1.2 General 8
1.3.1.3 Hydraulic Design 8
1.3.1.4 Geometric and Structural Design 9
1.3.1.5 Load-Rating and Inspection 9
1.3.2 Bridge Information Required by the NDOT Policy on Design, Load-Rating and Inspection 9
1.3.3 Maintenance, Repair or Reconstruction of Bridges 10
1.3.3.1 Nebraska State Statute Definition of Maintenance, Required Records for Bridges 10
1.3.3.2 Bridge Inspection Program Definition of Maintenance, Repair and Reconstruction 11
1.4 RESPONSIBILITIES 12
1.4.1 Nebraska Department of Transportation 12
1.4.2 Bridge Owners 13
1.4.3 Engineering Consultants 13
1.5 NBIS TERMS AND THEIR USE IN THE NE BIP 14
1.6 ABBREVIATIONS AND ACRONYMS 14
1.7 BRIDGE INSPECTION PROGRAM (BIP) ORGANIZATION 14
1.7.1 General 14
1.7.2 Qualifications 14
1.7.2.1 Bridge Inspection Program Manager 14
1.7.2.2 Bridge Inspection Team Leader Qualifications and Certification 15
1.7.2.3 Assistant to the Inspection Team Leader 17
1.7.2.4 Load Rating Engineer 17
1.7.2.5 Underwater Bridge Inspector 17
1.7.2.6 Hydraulic Engineer 18
1.7.2.7 Quality Control and Quality Assurance Personnel 18
1.8 NDOT BRIDGE INSPECTION PROGRAM OPERATION MATRIX, PROGRAM REPORTS AND DATA GENERATED MATRIX 18
1.9 QUALITY CONTROL AND QUALITY ASSURANCE, GENERAL 25
1.9.1 Quality Control (QC) 25
1.9.2 Quality Assurance (QA) 26

DRAFT

1.9.2.1 NDOT QA Responsibilities 27
1.9.2.2 Program Participant QA Responsibilities 27

1.10 NDOT BIP QUALITY ASSURANCE EVALUATION PROGRAM PROCESSES ..27

1.10.1 BIP Operations for QA 27
1.10.2 QA Review Schedule and Reporting 28
1.10.3 General 28

1.10.3.1 Definitions 30

1.10.4 QA Review of Qualifications 32
1.10.5 QA Review of Inspection Intervals 32
1.10.6 QA Review of Inspections 33
1.10.7 QA Review of Load Ratings 33
1.10.8 QA Review of Load Postings 34
1.10.9 QA Review of Bridge Owner Files 34
1.10.10 QA Review of Scour Analysis 35
1.10.11 QA Review of Inventory Data 35
1.10.12 QA Review of Critical Findings 36

1.11 REVISION HISTORY 36

1.12 FORMS 36

DRAFT

1.1 GENERAL

The National Bridge Inspection Standards (NBIS) is a Federal Regulation (23 CFR § 650C published in May of 2022) that sets the national standard for the proper safety inspection and evaluation of highway bridges located on all public roads. The current NBIS is in the Manual Appendix. All participants in the Nebraska Bridge Inspection Program should visit the FHWA Bridge Technology webpage on the NBIS, http://www.fhwa.dot.gov/Bridge/nbis.cfm.

The Specifications for the National Bridge Inventory (SNBI) were developed in coordination with the NBIS regulation (23 CFR 650 Subpart C), the AASHTO Manual for Bridge Evaluation (MBE), the AASHTO Manual for Bridge Element Inspection (MBEI), and the FHWA Bridge Inspector's Reference Manual (BIRM) to provide the specifications for reporting data for highway bridges, open to the public, to the Federal Highway Administration (FHWA), for inclusion in the National Bridge Inventory (NBI).

The Nebraska Bridge Inspection Program has been established to satisfy the NBIS requirements and follows the SNBI guidelines for collecting data and information for each of the bridges in the inventory. This data can be used to aid Bridge Owners in managing their assets, budgeting for preservation and improvements, and to aid in protecting public safety. The primary responsibilities delegated to state transportation agencies in the National Bridge Inspection Standards are for the following:

- Bridge Inspection Organization (23 CFR § 650.307)
- Qualifications of Personnel (23 CFR § 650.309)
- Inspection Interval (23 CFR § 650.311)
- Inspection Procedures (23 CFR § 650.313) (including inspection, load rating, owner's records, scour and follow-up)
- Inventory (23 CFR § 650.315)

Each requirement of the NBIS is summarized in the NDOT Bridge Inspection Program Operation Matrix in this Chapter.

The Nebraska Department of Transportation (NDOT) is responsible for implementation or causing implementation of the NBIS and all requirements of a Bridge Inspection Program (BIP). This Manual provides the procedures adopted by NDOT for meeting these requirements. If there is any conflict between information shown in this Manual and current source document for the information, the source document always governs.

1.1.1 Applicability

The NDOT Bridge Inspection Program, guided by the NBIS regulation, applies to all structures defined as highway bridges that are located on public roads, on and off Federal-

DRAFT

aid highways, and include tribally-owned and federally-owned bridges, private bridges that are connected to a public road on both ends of the bridge, temporary bridges, and bridges under construction with portions open to traffic.

1.2 NBIS HISTORY AND FHWA OVERSIGHT

1.2.1 History

On December 15, 1967, the Silver Bridge over the Ohio River in Point Pleasant, VA collapsed during holiday and rush hour traffic resulting in the deaths of 46 people. This tragic loss of lives focused national attention on the condition of the nation's bridges.

The Silver Bridge was built in 1928 and was a suspension bridge with non-redundant eyebar chains from which the deck was hung. Forensic engineering pointed to failure of a single eye-bar due to a small manufacturing flaw, which over time had grown larger. On the cold December day, with the bridge under heavy live load from the rush hour traffic, the eyebar fractured.

As a result, the U.S. Congress passed legislation establishing the National Bridge Inspection Standards (NBIS), which is today overseen by the US Department of Transportation Federal Highway Administration.

The following chronology summarizes events establishing and refining the NBIS. See the FHWA website https://www.fhwa.dot.gov/bridge/nbi/library.cfm for all policies and related information on the NBIS.

1967 The Silver Bridge over Ohio River

1968 FHWA Memo initiating review and inventory of all existing structures

1971 NBIS published – regular, comprehensive inspection for Federal highways

1978 NBIS extended to all public bridges

1987 Office of Inspector General reviewed the Program

1988 FHWA issued revisions to the NBIS

2001 FHWA issued revision of Coding Guide, Item 113 - Scour Critical Bridges

2005 FHWA issued revisions to the NBIS

2006 Office of Inspector General Audit of Oversight of Load Rating/Posting

2007 FHWA Memo on Oversight of Load Rating/Posting

DRAFT

2011 AASHTO Manual for Bridge Element Inspection

2012 Updates to training course material; Revision to Manual 90; FHWA Bridge Inspector's Reference Manual (BIRM)

2013 AASHTO Manual for Bridge Element Inspection

2015 FHWA Bridge Inspector's Reference Manual (BIRM) revised

2019 AASHTO Manual for Bridge Element Inspection, revised and Specifications for the National Bridge Inventory (SNBI) draft

2020 AASHTO Manual for Bridge Evaluation revised

2022 Specifications for the National Bridge Inventory (SNBI) and NBIS Final Rule

2022 FHWA Bridge Inspector's Reference Manual (BIRM) revised

2023 FHWA Bridge Inspector's Reference Manual (BIRM) update in accordance with SNBI and the NBIS Final Rule

DRAFT

1.2.2 FHWA Oversight

FHWA has the responsibility for overseeing the implementation of the NBIS for all states in the US.

FHWA developed a risk-based, data-driven process to establish uniform oversight. This process is detailed in the NBIS Metrics which were released and first used in 2011. An updated description of the Metrics can be found at https://www.regulations.gov/document/FHWA-2023-0023-0002. FHWA completes their review for each Performance Year that begins after all state transportation agencies submit their inventory data in April of a given calendar year. FHWA completes each state's metric assessment by the end of December, and then a final summary of each state's metric performance and possible plan of corrective action are completed by end of March. A national summary report is completed by the following May. These metrics have also been identified in the NDOT Bridge Inspection Program Operation Matrix in this Chapter for Nebraska program participants' information.

1.3 THE LIFE OF A NEBRASKA BRIDGE

This section briefly describes the overall life of a bridge on the Nebraska road system. It is provided here for the benefit of all program participants. If there is any conflict between information shown in this Manual and current source document for the information, the source document always governs.

1.3.1 NDOT Policy for Design, Load-Rating and Inspection of Public Road Bridges, May 24, 2010

This policy summarizes Bridge Owner responsibilities regarding their bridges. This policy does not apply to bridges located on private property or private roads.

1.3.1.1 Definitions

1.3.1.1.1 Bridge

Bridge shall have the definition set out in 23 CFR § 650.303 and § 650.305.

1.3.1.1.2 Maintenance

Maintenance means the act, operation, continuous process of repair, reconstruction or preservation of the whole or any part of any highway, including surface, shoulders, roadsides, traffic control devices, structures, waterways, and drainage facilities, for the purpose of keeping it at or near or improving upon its original standard of usefulness and safety (Neb. Rev. Stat. § 39-101(6)).

1.3.1.1.3 Public Road

Public road means any road or street under the jurisdiction of and maintained by a public authority and open to public travel (23 USC § 101(a)(21)).

1.3.1.2 General

Any Bridge on a Public Road under the jurisdiction of the state, a municipality, a county, or a village shall be designed, constructed, inspected and maintained in accordance with state and federal law. The public entity with jurisdiction for any Bridge located on a Public Road in Nebraska shall provide NDOT copies of all bridge plans, hydraulic design reports, load-rating reports and inspection reports applicable to each Public Road Bridge.

1.3.1.3 Hydraulic Design

The hydraulic design will satisfy the requirements of Federal-Aid Policy Guide, 23 CFR § 650A (Location and Hydraulic Design of Encroachments on Floodplains) and FHWA-HIF-12-003 (HEC-18 Scour), which is covered in the NDOT Hydraulic Analysis Guidelines. The Nebraska Natural Resources Commission provides minimum standards governing the hydraulic design of improvements in floodplains (See 455 NAC Section 004 and 005, and Chapter 31 of the Nebraska statutes).

DRAFT

A Nebraska licensed professional engineer with training and experience in the hydraulic design of Public Road Bridges shall complete, seal and sign the hydraulic design report. The hydraulic design reports for bridge projects on Federal-aid projects shall be submitted to the NDOT Local Projects Division in accordance with the LPA Manual. For all other bridge projects submit to the NDOT Bridge Division prior to construction a Bridge Data Sheet or a Culvert Data Sheet for bridge-sized culverts.

1.3.1.4 Geometric and Structural Design

All Public Road Bridges shall be designed and constructed to meet the minimum standards of the Nebraska Board of Public Roads Classifications and Standards for the geometric and structural design of bridges (See Minimum Standards created pursuant to Neb. Rev. Stat. § 39-2113). These standards apply to the original construction and any reconstruction, rehabilitation or retrofit of the bridge.

A Nebraska licensed professional engineer with training and experience in geometric and structural design of Public Road Bridges shall complete, seal and sign the bridge design plans. The plans for bridge projects on Federal-aid projects shall be submitted to the NDOT Local Projects Division in accordance with the LPA Manual. The plans for all other bridge projects shall be submitted to the NDOT Bridge Division prior to construction.

1.3.1.5 Load-Rating and Inspection

All Public Road Bridges are subject to the National Bridge Inspection Standards (NBIS). The NBIS requires that all Public Road Bridges be load-rated and inspected. The NDOT Bridge Inspection Program (BIP) Manual sets out the policy covering load-rating and inspection of Public Road Bridges.

All bridges shall be load-rated in accordance with the BIP Manual and the load-rating documents shall be sealed and signed by a Nebraska licensed professional engineer with training and experience in bridge load-rating. The load-rating documents of any bridge constructed as a part of a Federal-aid project shall be submitted to the NDOT Local Projects Division in accordance with the LPA Manual. The load-rating documents for all other bridges shall be submitted to the NDOT Bridge Division in accordance with the BIP Manual. Bridges must be inspected regularly as designated in the BIP Manual, or funding sanctions may be imposed.

1.3.2 Bridge Information Required by the NDOT Policy on Design, Load-Rating and Inspection

This table summarizes required information and their submittal deadlines.

Bridge Records Required for New or Reconstruction/Rehabilitation/Retrofit of Bridges			
Item	**Prepared / done by**	**Submit to NDOT, Federal-aid project**	**Submit to NDOT, for ALL other public road bridges**
Bridge Plans (Geometric and Structural design)	PE	LPA Manual (a deadline prior to construction)	Prior to construction
Hydraulic Design and Analysis Report (for LPA) or Data Sheet (all others)	PE	LPA Manual (a deadline prior to construction)	Prior to construction
Load Rating Report	PE	LPA Manual (a deadline prior to construction)	Prior to construction
Initial Inspection	As designated in the BIP Manual*	As designated in the BIP Manual*	As designated in the BIP Manual*
Inventory updated	As designated in the BIP Manual*	As designated in the BIP Manual*	As designated in the BIP Manual*

* See Chapter 4, Bridge Inspection

1.3.3 Maintenance, Repair or Reconstruction of Bridges

This section provides guidance on these activities and compares the differences and similarities between the state statute and BIP definitions.

1.3.3.1 Nebraska State Statute Definition of Maintenance, Required Records for Bridges

"Maintenance means the act, operation, continuous process of repair, reconstruction or preservation of the whole or any part of any highway, including surface, shoulders, roadsides, traffic control devices, structures, waterways, and drainage facilities, for the purpose of keeping it at near or improving upon its original standard of usefulness and safety" (Neb. Rev. Stat. § 39-101(6)).

"The county highway superintendent or some other qualified person designated by the county board shall keep in his office a road record which shall include a record of the proceedings in regard to the laying out, establishing, changing, or discontinuing of all roads in the county hereafter established, changed or discontinued, and a record of the cost and maintenance of all such roads. Such person shall record in the bridge record, a record of all county bridges and culverts showing number, location and description of each, and a record of the cost of construction and maintenance of all such bridges and culverts….." (Neb. Rev. Stat. § 39-1411).

1.3.3.2 Bridge Inspection Program Definition of Maintenance, Repair and Reconstruction

The BIP uses these definitions when addressing issues on bridges. The state statue definition of "maintenance" includes all of these types of activities.

Bridge Owners often consult NDOT on whether work on structures constitutes repair, maintenance or reconstruction, and which situations require the involvement of a Professional Engineer. Owners should continue to contact NDOT BIPPM with any questions.

1.3.3.2.1 Maintenance

Maintenance is work that preserves the good condition of the bridge by general upkeep or removal of hazards. Examples include:

- Repair damaged guardrail
- Repair or replace signs
- Cleaning roadway expansion devices
- Sweeping decks
- Clearing plugged floor drains
- Removing debris from superstructure and bearings
- Removing debris rafts from bents/piers/abutments
- Clearing trees from a channel
- Filling in erosion (on side slopes or banks, under approach slabs, at culvert ends)
- Removing silt from culvert waterway openings
- Patch bridge deck
- Sealing cracks
- Pressure wash deck, rails, joints and drains

1.3.3.2.2 Repair

Repair, in general, is work to bring the bridge back to its prior condition. There usually is no need for a Professional Engineer (PE) to develop plans for this work, or to complete a hydraulic analysis. Local Owners should contact their consulting engineer or NDOT if they have any questions or need clarification. Examples include:

- Driving a new pile next to an existing that has deteriorated
- Replacing wingwall or backwall within its prior dimensions
- Replacing cracked timber stringers
- Bridge collision damage repair
- Bridge rail repair
- Channel repair erosion or add channel protection
- Repair or replace fencing

DRAFT

- Mechanical and electrical repair
- Repair or replace monitoring equipment
- Encase girder ends
- Clean and paint girder ends
- Patch substructure spalls
- Replacing expansion joints
- Patching a bridge deck

1.3.3.2.3 Reconstruction/Rehabilitation

Reconstruction/Rehabilitation is any work that changes the bridge roadway width, the load carrying capacity (increase or decrease), the hydraulic capacity or the scour resistance. Structural and geometric changes all require a PE to complete design, then seal and sign the plans and specifications. Structural and geometric changes can alter the hydraulic capacity or scour resistance if they change the low superstructure elevation or the bottom elevation of abutments or wingwalls. In this case, a hydraulic analysis report by a PE will be necessary.

Examples of reconstruction/rehabilitation include:

- Two or more substructure pile replaced
- Replacing the substructure
- Replacing the existing stringers with different size or type
- Replacing the superstructure
- Replacing the deck
- Adding new spans
- Bridge widening
- Culvert extension

DRAFT

1.4 RESPONSIBILITIES

1.4.1 Nebraska Department of Transportation

Under the NBIS, state transportation agencies are responsible for the inspection of all highway bridges located on public roadways except for bridges that are federally owned or tribally owned. The state transportation agencies, i.e. NDOT, may, in accordance with the regulation, delegate responsibilities. The responsibilities include:

- Providing a bridge inspection organization
- Provide a Program Manager who will be responsible for the following:
    - Setting statewide bridge inspection policies and procedures
    - Setting statewide quality assurance and quality control
    - Preparing and maintaining a bridge inventory
    - Bridge inspection

- Bridge reporting
- Bridge load rating
- Scour monitoring
- Maintaining a master list of critical findings
- Providing FHWA an updated critical findings master list periodically or as requested by FHWA
- Other requirements.

1.4.2 Bridge Owners

NDOT has delegated these specific tasks as the responsibility of Bridge Owners for bridges under their authority, and this is supported by agreements between NDOT and local Bridge Owners.

- Bridge inspection (Note that as of the date of this revision, NDOT completes Underwater Inspections only.)
- Bridge Load Ratings
- Bridge Hydraulic Assessment
- Monitoring bridges according to their Scour Plans of Action
- Addressing critical and non-critical findings
- Maintaining bridge files and records at their headquarters
- Cooperating with the NDOT in its implementation of the NBIS

Bridge Owners may delegate these responsibilities to other parties, including engineering consultants, but Owners are ultimately responsible for ensuring that all NBIS and NE BIP requirements are met.

For bridges on state and local systems located at borders with neighboring states, NDOT has joint written agreements that define inspection and maintenance responsibilities for each entity.

1.4.3 Engineering Consultants

NDOT or other Nebraska Bridge Owners often use engineering consultants. Consultants assisting Bridge Owners with their NBIS responsibilities are responsible for:

- Educating the members of the firm in NBIS regulations and requirements
- Providing inspection Team Leaders with the training and experience required by NBIS and NDOT
- Completing bridge load ratings under the direct supervision of and the signing of the Load Rating Report by a Nebraska professional engineer in accordance with the Nebraska Engineers and Architects Regulation Act
- Completing bridge scour assessment under the direct supervision of and the signing of the Hydraulic Analysis Report by a Nebraska professional engineer in accordance with the Nebraska Engineers and Architects Regulation Act.

DRAFT

1.5 NBIS TERMS AND THEIR USE IN THE NE BIP

Terms used in the NBIS and in this Bridge Inspection Program Manual are defined in the NBIS. Some terms are included in this Chapter and in other Chapters of this Manual to provide clarification or further instruction to those who will execute the Bridge Inspection Program.

1.6 ABBREVIATIONS AND ACRONYMS

The abbreviations and acronyms for the Bridge Inspection Program Manual are located in the BIP Manual Introduction, Section Intro-6.

1.7 BRIDGE INSPECTION PROGRAM (BIP) ORGANIZATION

1.7.1 General

The Nebraska Bridge Inspection Program Organization includes NDOT staff that performs management and oversight functions for the execution of the NBIS requirements. These key functions include:

- BIP Manager
- BIP Inventory Data Manager
- BIP Load Rating Manager
- BIP Hydraulic Analysis Manager

Each Bridge Owner is responsible for following the policies and procedures of the BIP for bridges under their jurisdictions, which are summarized earlier in this Chapter. The four primary categories of Bridge Owners include:

- Nebraska Department of Transportation
- Nebraska Counties
- Nebraska Municipalities and Cities
- Private Owners operating public bridges

1.7.2 Qualifications

1.7.2.1 Bridge Inspection Program Manager

The NBIS requires that the Program Manager must:

- Be a registered professional engineer; or have a minimum of ten years of bridge inspection experience, **and**

- Have successfully completed an FHWA approved comprehensive bridge inspection training course.

1.7.2.2 Bridge Inspection Team Leader Qualifications and Certification

The NBIS allows five ways to qualify as a Team Leader. NBIS requires that the Team Leader must:

- Have the qualifications of the Program Manager (be a registered professional engineer or have a minimum of ten years of bridge inspection experience, **and** have successfully completed an FHWA approved comprehensive bridge inspection training course); **or**
- Have five years bridge inspection experience and have successfully completed an FHWA approved comprehensive bridge inspection training course, **or**
- Have a bachelor's degree in engineering from a college or university accredited by or determined as substantially equivalent by the Accreditation Broad for Engineer Technology, and have successfully passed the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering examination, and two years of bridge inspection experience, and successfully completed an FHWA approved comprehensive bridge inspection training course; **or**
- Have an associate's degree in engineering or engineering technology from a college or university accredited by or determined as substantially equivalent by the Accreditation Board for Engineering and Technology, and four years of bridge inspection experience, and successfully completed an FHWA approved comprehensive bridge inspection training course.

NDOT issues each Team Leader status to inspectors who meet the NBIS qualifications and NDOT requirements for a Bridge Inspection Team Leader Certification. Certification may be obtained as any of the following:

- NBIS Routine Inspection Team Leader or
- NBIS Routine Inspection and NSTM Inspection Team Leader or
- NBIS Routine Inspection and Underwater Inspection Team Leader or
- NBIS Routine Inspection, NSTM Inspection and Underwater Inspection Team Leader
- The term of certification is a period of five years, and Team Leaders and Program Manager must be recertified every five years, prior to expiration of certification.

The ten-day FHWA NHI Course No. 130055, *Safety Inspection of In-service Bridges,* is an NDOT-approved comprehensive bridge inspection training course. The 3½-day FHWA NHI Course No. 130078S, Bridge Inspection Techniques for Nonredundant Steel Tension Members (NSTM), must be successfully completed to be certified by NDOT as a NSTM Inspection Team Leader. The 4-day FHWA NHI Course No. 130091, Underwater Bridge Inspection, must be successfully completed to be certified by NDOT as an Underwater

DRAFT

Inspection Team Leader. NDOT defines successful completion of all training as achieving a minimum score of 70% on the final exam of the training course.

1.7.2.2.1 Initial Application and Issuance of Inspector ID

An applicant for certification must submit to the NDOT Program Manager the following:

- Completed application, Nebraska Bridge Inspector Information Form NDOT 97, the form can be found at https://dot.nebraska.gov/business-center/bridge and
- Documents that serve as proof of the achievement of the registration, certification, education and training for the single way that the applicant is pursuing certification (of the five listed by the NBIS and shown in the table below).

After acceptance of qualifications by the NDOT Program Manager, an Inspector ID will be issued. The Inspector ID will be the applicants first and last initials followed by four numeric characters.

Certification Application – Accepted Proof of Achievement	
Accomplishment	Document
PE registration	Photocopy of the registration certificate with the PE license number
NICET certificate	Photocopy of certificate
Education	Photocopy of diploma from the institution showing degree attained
FHWA-approved training	Photocopy of the certification of completion from the organization conducting the training
Field experience	Photocopy of inspections, one for each of five separate years for which the applicant served as assistant bridge inspection team leader and verification of experience by current supervisor.

1.7.2.2.2 Certification Revocation

A Team Leader may have their certification revoked if:

- Quality Assurance review for a given yearly inspection cycle finds that the team leader condition evaluations and other coding are not consistent with established national and state inspection procedures or
- Inspection data and reports are not submitted to the Program Manager as prescribed by NDOT or
- The Team Leader is not performing inspection and reporting duties in substantial compliance with the NBIS, as determined by the Program Manager.

1.7.2.2.3 Recertification

A Team Leader who has lost certification either by certification lapse or certification revocation may be recertified. Recertification requires that the Team Leader achieves:

- Successful completion of the three-day FHWA National Highway Institute (NHI) Course No. 130053 Bridge Inspection Refresher Training or
- Successful completion of a minimum of twenty-four (24) hours of other bridge inspection refresher training approved by the NDOT Program Manager.

A Team Leader who fails to successfully complete the refresher training may make a second attempt to pass a refresher training course. Any Team Leader who fails to pass on the second attempt will be required to successfully complete the ten-day FHWA NHI Course No. 130055 *Safety Inspection of In-service Bridges* before being recertified.

1.7.2.3 Assistant to the Inspection Team Leader

Currently, the NBIS does not give minimum requirements for individuals who assist during bridge inspections. NDOT may develop these in the future. NDOT recommends but does not require Assistants obtain an ID from the NDOT Program Manager to be used in the NE BIP. If an Assistant has an ID, the Team Leader should record in the inspection data the Inspector ID of each Assistant participating in the inspection (See Chapter 3.) In this way, Assistants who have an ID will have their experience record documented by NDOT for future certification as a Team Leader.

1.7.2.4 Load Rating Engineer

NDOT requires individuals charged with the overall responsibility for load rating bridges, the Load Rating Engineer (LRE), be registered professional engineers in Nebraska.

1.7.2.5 Underwater Bridge Inspector

The NBIS requires that an underwater bridge inspection diver must:

- Complete an FHWA-approved comprehensive bridge inspection training course **or**

- Complete other FHWA-approved underwater diver bridge inspection training course.

FHWA approved courses include the following will be accepted by NDOT.

- FHWA NHI Course No. 130055, Safety Inspection of In-service Bridges
- FHWA NHI Course No. 130091, Underwater Bridge Inspection.

NDOT further requires that Underwater Bridge Inspectors be NDOT certified Team Leaders and also be a licensed commercial diver certified by OSHA 29 CFR Part 1910, Subpart T, *Commercial Diving Operations*.

1.7.2.6 Hydraulic Engineer

NDOT requires that Hydraulic Engineers (HE) performing hydraulic assessments, scour evaluations and related site visits be registered professional engineers in Nebraska. Hydraulic Engineers need not be certified inspection team leaders, but it is preferred. The HE is assisted by the Interdisciplinary Scour Assessment Team, which includes geotechnical and structural engineers; however, the HE is responsible for the assessments.

1.7.2.7 Quality Control and Quality Assurance Personnel

NDOT requires that an individual completing Quality Control (QC) must have experience that is equal to or better than the individual that originates the program product (inspection report, load rating, etc.) Typically, this is the supervisor of the individual.

Individuals completing Quality Assurance (QA) for the program operations shall meet the qualifications for the particular operation. A party that is independent from the creation of the original program product should complete Quality Assurance.

1.8 NDOT BRIDGE INSPECTION PROGRAM OPERATION MATRIX, PROGRAM REPORTS AND DATA GENERATED MATRIX

The NDOT Bridge Inspection Program Operation Matrix begins on the following page. This Matrix tabulates the NBIS requirements and the parties (program participants) that complete those NBIS requirements for the NDOT Bridge Inspection Program. The participants are the variables in each of the program operations required by the NBIS. The Matrix also shows the FHWA Metric Number related to each of the NBIS requirements.

The Program Reports and Data Generated Matrix is also included in this section after the Operation Matrix. This Matrix tabulates which program participants generate reports, National Bridge Inventory data, and NE Inventory data. The Matrix includes a Manual Chapter number that specifies the processes to be followed in generating the reports and/or data and for maintaining the records for these.

This page is intentionally blank.

DRAFT

NDOT Bridge Inspection Program Operation Matrix

BIP = Bridge Inspection Program
BIPDM = BIP Data Manager
BIPPM = BIP Program Manager
BO = Bridge Owner
CF = Critical Finding
CP = Complex
DR = Department Transportation (DR form prefix)
NSTM = Non-redundant Steel Tension Members
HE = Hydraulic Engineer
LRE = Load Rating Engineer
LPA = Local Public Agency
NDOT = Nebraska Department of Transportation
PE = Professional Engineer
POA = Plan of Action
QA = Quality Assurance
QC = Quality Control
R = Routine
SC = Scour Critical

NBIS References (see end of matrix)	FHWA Metric (see end of matrix)	Operation	Operation completed by	Operation product / result	QC of product § 650.307 (c1) § 650.313 (g) (FHWA Metric 20)	QA of product § 650.307 (c1) § 650.313 (g) (FHWA Metric 20)	Objective – Program data accuracy; Operation verification; Follow-up
§ 650.307 (a), (c), (e) § 650.313 (g)	1, 20	Establish bridge inspection program, Policies & procedures, QC/QA Prepare & maintain bridge inventory	State, BO	Policies & procedures in a Manual Bridge Inventory data	See below.	See below.	See below.
§ 650.309 (a)	2	Maintain minimum BIPPM qualifications	State Bridge Engineer	Certifications & registrations	Set minimum requirements	Process: Review appointed BIPPM qualifications against NBIS	Program participant qualifications
§ 650.307(e)(2) § 650.309 (b), (d),(f), (g) § 650.313(p)	3, 5, New 1	Maintain minimum inspector qualifications	Inspectors	Inspector certification & registration	Set minimum requirements NE registration process	Process: Independent verification of Team Leader qualifications Random sample of active inspectors in the NBIS data submittal	Program participant qualifications
~~§ 650.309 (c)~~	4	~~Maintain minimum engineer qualifications~~	~~Engineers~~	~~Registration~~	~~NE registration process~~	~~Process: Verify engineer registrations. Random sample of LREs and HEs drawn from active engineers for a given NBIS data submittal~~	~~Program participant qualifications~~
§ 650.311	6 – 11, New 2	Maintain specified inspection frequencies (R, UW, NSTM, Damage/In-depth/Special)	BO, BIPPM	Bridge Inventory data	Set requirements if different than NBIS	Process: Review database records for inspections & check Random sample of R, NSTM and UW inspections	Operation verification
§ 650.313 (a), (b), (d), (e1), (e2), (e3), (f) § 650.315 (a)	12, 16 – 19, 22	Inspection – R Inspection – NSTM Inspection – UW Inspection – SC Inspection – CP	TL and Inspectors	BrM record Inspection reports Findings Identification NBIS Condition Ratings	Inspector's organization supervisor review of products	Process: independent inspection. Random sample drawn from population of a given submittal to FHWA; with 2% from each active inspector, minimum of two structures, whichever is greater.	NBIS Condition Rating Items NBIS Inspection dates Accurate and complete reporting
§ 650.313 (f)	19	Identify inspection procedures, TL qualifications for complex bridges	BO, BIPPM	Complex bridge inspection procedures and TL qualifications to complete	BIPPM review of inspection reports	Process: Review of Complex Bridges list, inspection procedures,	Complex bridges addressed in detail
§ 650.313 (c) § 650.315 (a)	13, 22	Load Rating	LRE	NBIS Load ratings from -BrR ratings - Non-BrR rating - NDOT policy	LRE's internal organization supervisor review of products	Process: independent load ratings, review of load ratings Random sample drawn from population with revised ratings of a given submittal to FHWA; with 2% from each active LRE, minimum of two structures, whichever is greater.	NBIS Load Rating Items Accurate load rating and posting
§ 650.313 (c) § 650.315 (a)	14, 22	Load Posting	BO	Load posting signs installed and maintained	Define posting deadline and require notification to BIPPM	Process: independent verification in the field by QA team on sample drawn from the population of all BOs.	Operation verification
§ 650.313 (e3)	18	Scour Assessments	HE	Scour Assessment Report and/or BR385, BR385A, BR385B forms	HE's organization supervisor review of report	Process: independent review of scour assessment reports Random sample of reports completed in the NBIS data submittal	Operation verification

NDOT Bridge Inspection Program Operation Matrix

BIP = Bridge Inspection Program
BIPDM = BIP Data Manager
BIPPM = BIP Program Manager
BO = Bridge Owner
CF = Critical Finding
CP = Complex
DR = Department Transportation (DR form prefix)
NSTM = Non-redundant Steel Tension Members
HE = Hydraulic Engineer
LRE = Load Rating Engineer
LPA = Local Public Agency
NDOT = Nebraska Department of Transportation
PE = Professional Engineer
POA = Plan of Action
QA = Quality Assurance
QC = Quality Control
R = Routine
SC = Scour Critical

NBIS References (see end of matrix)	FHWA Metric (see end of matrix)	Operation	Operation completed by	Operation product / result	QC of product § 650.307 (c1) § 650.313 (g) (FHWA Metric 20)	QA of product § 650.307 (c1) § 650.313 (g) (FHWA Metric 20)	Objective – Program data accuracy; Operation verification; Follow-up
§ 650.313 (e3)	18	Preparation of POA Monitoring of SC bridges	BO	POA and documents on follow-up	BIPPM	Process: independent check of BO's POA log concurrent with BO records review.	Operation verification
§ 650.313 (d)	15	Maintenance of BO's files (Key components)	BO	Quality records, accessible	BO Review	Process: independent check of file contents. Random sample drawn from list of BO in the NE bridge inventory.	
§ 650.313 (d)	15	Address non-critical findings – State	Inspector, BO	Bridge Repair Report, Bridge Maintenance Checklist (state)	BO Review	Process: Review of a random sample of reports.	
§ 650.313 (d)	15	Address non-critical findings – non-state	Inspector, BO	BO maintenance work orders and histories	BO Review	Process: independent check of BO's maintenance histories concurrent with BO records review.	
§ 650.313 (h)	21	Follow-up on Critical findings	Inspector, BO, BIPPM	Critical Findings Report	BIPPM	Process: Review of CFR list; BIPPM send letters to BOs; Independent inspections; Independent check of all a BO's CFs concurrent with BO records check.	Resolution of findings, repairs
§ 650.315	11, 23	Maintenance of Inventory Data	BO, BIPPM, BIPDM	NBIS Data	Checks of NBIS data	Process: on-going checks of the NBI database for apparent inconsistencies and miscoding; run Edit Check	Resolution of findings, repairs

FHWA Metrics PY 2024 Interim

https://www.regulations.gov/document/FHWA-2023-0023-0002

The metrics are used to assess each State's compliance with the NBIS. Each metric is assessed individually and with equal importance. The following is a list of 25 metrics, each related to a specific NBIS regulation, which has been established to provide an assessment of compliance with the NBIS.

• Metric #1: Bridge Inspection Organization (23 CFR 650.307)

• Metric #2: Qualifications of Personnel – Program Manager (23 CFR 650.309v(a); 650.313(p))

• Metric #3: Qualifications of Personnel – Team Leader(s) (23 CFR 650.307(e)(2); 650.309(b),(c); 650.313(p))

• Metric #4: Qualifications of Personnel – Load Rating Engineer (Discontinued)

• Metric #5: Qualifications of Personnel – Underwater Bridge Inspection Diver (23 CFR 650.309(e))

• Metric #New1: Qualifications of Personnel – Damage, Special, and Service Inspection Types (23 CFR 650.309(f),(g)) – Assess in PY25

• Metric #6: Inspection Interval – Routine – Lower Risk Bridges (23 CFR 650.311(a),(e))

• Metric #7: Inspection Interval – Routine – Higher Risk Bridges (23 CFR 650.311(a),(e))

• Metric #8: Inspection Interval – Underwater – Lower Risk Bridges (23 CFR 650.311(b),(e); 650.313(e))

• Metric #9: Inspection Interval – Underwater – Higher Risk Bridges (23 CFR 650.311(b),(e); 650.313(e))

• Metric #10: Inspection Interval – Nonredundant Steel Tension Member (NSTM) (23 CFR 650.311(c),(e); 650.313(f))

• Metric #New2: Inspection Interval – Special, In-Depth, and Service (23 CFR 650.311(d)) – Assess in PY25

• Metric #11: Inspection Interval – Interval Criteria (23 CFR 650.311)

- Metric #12: Inspection Procedures – Quality Inspections (23 CFR 650.313(a) to (j))
- Metric #13: Inspection Procedures – Load Rating (23 CFR 650.313(k))
- Metric #14: Inspection Procedures – Post or Restrict (23 CFR 650.313(l),(m))
- Metric #15: Inspection Procedures – Bridge Files (23 CFR 650.313(n))
- Metric #16: Inspection Procedures – Nonredundant Steel Tension Member (NSTM) (23 CFR 650.313(f), (g))
- Metric #17: Inspection Procedures – Underwater (23 CFR 650.313(e),(g))
- Metric #18: Inspection Procedures – Scour (23 CFR 650.313(o))
- Metric #19: Inspection Procedures – Complex Feature (23 CFR 650.313(g))
- Metric #New3 Inspection Procedures – In-Depth (23 CFR 650.313(g)) – Assess in PY25
- Metric #20: Inspection Procedures – Quality Control (QC) and Quality Assurance (QA) (650.307(e)(6); 650.313(p))
- Metric #21: Inspection Procedures – Critical Findings (23 CFR650.313(q))
- Metric #22: Inventory – Bridge Data Quality (23 CFR 650.303; 650.305; 650.307(e)(7); 650.315(a); 650.317)
- Metric #23: Inventory – Timely Updating of Data (23 CFR 650.315)

Program Participant Reports and Data Generated[1]				
Participant	**Qualification Specified?**	**Operation**	**Program Process Described**	**Generated Program document / product (See Chapter 3 for Database item responsibility.)**
PM	Y			Master list of NSTM Master list of SC Master list of UW
PM	Y			Master list of Critical Findings List of Team Leaders
PM (staff)	N	Inventory	Ch. 3 Coding	Inventory Data
BO	N	Bridge Record Maintenance	Ch. 2 Bridge Records	BO files
BO	N	Posting	Ch. 5 Load Rating	Signage documentation
BO	N	Follow-up	Ch. 4 Inspection	Maintenance/Repair records
BO	N	Prepare POA	Ch. 6 Bridge Scour	POA
BO (TL or HE)	N	Special Inspection - POA	Ch. 4 Inspection, Ch. 6 Bridge Scour	POA Monitoring Log
TL	Y	Inspection	Ch. 3 Coding Ch. 4 Inspection	Inspection Report – R Inspection Report – NSTM Critical Finding Report Maintenance/Repair Report Inventory Data
TL-UW	Y	Inspection – UW	Ch. 3 Coding Ch. 4 Inspection	Inspection Report – UW
LRE	Y	Load Rating	Ch. 3 Coding Ch. 5 Load Rating	Load Rating calculations LRSS Inventory Data
HE	Y	Scour Assessment	Ch. 3 Coding Ch. 6 Bridge Scour	Bridge Scour Assessment & Culvert Scour Assessment (BR385 & 385A) Suggested POA for BO Inventory Data

[1] See Chapter 3 Coding for detailed information on data generation and input into the inventory database.

1.9 QUALITY CONTROL AND QUALITY ASSURANCE, GENERAL

23 CFR § 650.313(g), Quality Control and Quality Assurance, requires each state to assure that systematic Quality Control (QC) and Quality Assurance (QA) procedures are being used to maintain a high degree of accuracy and consistency in the inspection program. Accuracy and consistency of the data is important since the bridge inspection process is the foundation of the entire bridge management operation and bridge management systems. Information obtained during the inspection is used for determining needed maintenance and repairs, for prioritizing rehabilitations and replacements, for allocating resources, and for evaluating and improving design for new bridges. The accuracy and consistency of the inspection and documentation is vital because it not only impacts programming and funding appropriations, but it also affects public safety.

Participants in the NDOT Bridge Inspection Program must understand the difference between Quality Control (QC) and Quality Assurance (QA). QC is a check on every document or product that is prepared by an organization. QA is done to assure that QC is being done and is completed on a small percentage of randomly selected products by an independent party. QC/QA also provides continuous improvement, added value and efficiencies to the program. The findings of the QA program will be documented for future training and improvement to the Bridge Inspection Program. The next sections provide information that is more specific.

1.9.1 Quality Control (QC)

The NBIS defines Quality Control (QC) as "procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level."

Quality Control is defined for NDOT's program as a system of routine technical activities, to measure and control the quality of the bridge inventory data or report as it is being developed.

Products of the BIP that are subject to QC include:

- Bridge inspection reporting in BrM
- Inspection reports, such as NSTM and underwater
- Load ratings and associated calculations, both manual and those from software
- Scour assessments
- Plans of action for scour critical bridges
- Owner bridge files and records
- Follow up on critical findings, scour critical bridge monitoring, needed maintenance, and documentation of the follow up.

Any Quality Control Plan or system should include:

- Standardized procedures for measurement, calculation, recording information and reporting general methods, for the NE BIP Program, the procedures are included in this BIP Manual.
- Standardized procedures for routine and consistent checks for products (data, documents, reports, etc.) for integrity, correctness and completeness. The objective is to identify and address any errors and/or omissions, and to modify processes to prevent the same errors/omissions in the future. Quality checks should be conducted on every product.
- Evidence of the QC activities on products of a BIP operation, typically the documents of any operation should include the identification of the originator of the product and the individual completing the Quality Control step (LRE/HE initials, Team Leader ID, etc.) as well as the date the work was completed.

Quality Control is the responsibility of the party (consultant or agency) preparing the document, data, calculations, or report. When the QC on a program product is complete, it is finished and deliverable to the Bridge Owner for their records. Examples of QC are given for each program operation in the Chapters for that operation.

Consultants providing professional services to Bridge Owners must submit a Quality Control Plan to the Bridge Owner for review and approval. QC must be done on the deliverables prior to submittal to the Bridge Owner.

1.9.2 Quality Assurance (QA)

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

Quality Assurance is defined for NDOT's Program as a planned system of review procedures to check that data quality objectives were met in the QC process so that the inventory represents the best possible assessment of the current state of the structures and confirms the effectiveness of the QC program.

QA Reviews should be performed on completed inventory data and operation reports that have undergone Quality Control procedures.

Personnel not directly involved in the inventory compilation / development process should conduct Quality Assurance. Quality Assurance checks are usually conducted on a random basis so that the sample will be representative of an entire lot. The sampling will be random on the entire lot and augmented for a minimum percentage of each variable, and in some cases for specific attributes.

1.9.2.1 NDOT QA Responsibilities

NDOT conducts a QA review of the Nebraska BIP on an annual basis. Details of the program and the processes are described in this Chapter.

1.9.2.2 Program Participant QA Responsibilities

Each program participant who has been subject of QA review on a BIP operation will receive a report of the QA findings for their work and contributions to the program. These reports are for participants' information. Their employers also receive copies of these reports.

Participants and their employers should review the QA finding reports and use these to improve their internal processes for their work and their QC. These reports should be treated as confidential within each organization that contributes to the BIP. **These reports are NOT to become part of an Owner's Bridge File or any of their Individual Bridge Records**. NDOT recommends that each participant, Owner, and employer keep these QA finding reports in their own BIP QC/QA file for their use in improving their performance on the BIP operations.

1.10 NDOT BIP QUALITY ASSURANCE EVALUATION PROGRAM PROCESSES

Quality Assurance procedures for specific activities are generally defined in this Section. See the BIP Quality Assurance Evaluation Reports for each cycle for specific information related to each operation for each past cycle. Forms used in the QA Evaluation for this NBI cycle are included in the Manual Appendix.

Because of the current changes to SNBI, the Quality Assurance Evaluation Program is expected to change in the coming years. As such, updates will be provided to this Section as those changes are in place.

1.10.1 BIP Operations for QA

This procedure will provide guidelines for selecting sample sizes for conducting QA review of the BIP. QA Evaluation findings in a given cycle guide QA Evaluation procedures and sampling for the next cycle.

Several requirements of the NBIS in the CFR relate to the Program overall and generally do not change from cycle to cycle. These have been established by NDOT and FHWA have been verified as being compliant with the CFR. QA Evaluation by NDOT will not be needed unless there are major changes in the future. These include:

- Establish bridge inspection program, policies and procedures, QC/QA (Metric 1 and 20)
- Maintain minimum BIPPM qualifications (Metric 2)
- Prepare and maintain bridge inventory
- Establish criteria for inspection interval (Metric 11)
- Inspection procedures for NSTM bridges (Metric 16)
- Inspection procedures for Underwater Inspection of bridges (Metric 17)
- Inspection procedures and TL qualifications for complex bridges (Metric 19)

The requirements of the NBIS for which the work can vary from cycle to cycle are the operations listed in the NDOT Bridge Inspection Program Operations Matrix. These operations will undergo QA Evaluations for each inspection cycle and are listed here:

- Qualifications for Inspection Team Leaders and Bridge Inspection Divers (Metric 3 and 5)
- Bridge Inspection Intervals (Metric 6, 7, 8, 9, and 10)
- Bridge inspection and reports (Metric 12 and 22)
- Load ratings, calculations and reports (Metric 13)
- Load posting (Metric 14)
- Owner's bridge files (Metric 15)
- Scour assessment and reports (Metric 18)
- Inventory data maintenance (Metric 20 and 23)
- Critical Findings (Metric 21)

New guidance on the Quality Assurance of MARS Metric New1, New2, and New3 will be issued once they are in effect.

1.10.2 QA Review Schedule and Reporting

Generally, the data set that is submitted to FHWA by April of a given year includes data collected in the prior year. For example, the data collected in 2024 will be submitted to FHWA by April 2025. It is anticipated that QA activities will commence after the April submittal of the data set to FHWA. Findings from the QA program will be documented in the QA Program Report for the cycle, and the target date for the submittal of this report to NDOT is the end of November so that NDOT can submit to FHWA by the end of December, to coincide with the FHWA Metric evaluation process.

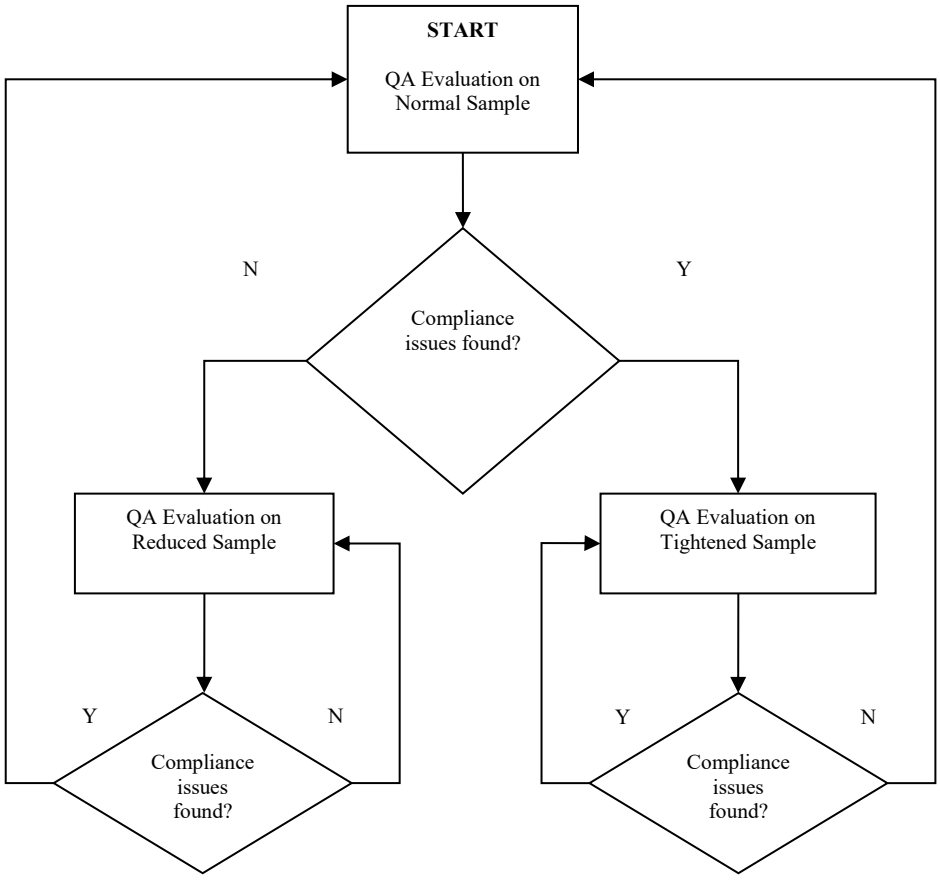
1.10.3 General

The QA Program developed for and implemented by NDOT in 2008 is a data-driven program and evaluates the same NBIS requirements evaluated by FHWA's current metrics. It has been updated to reflect the updated FHWA metrics and the requirements from the MBE.

The QA evaluation is derived from the Standard ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes approach. The ANSI standard and process is applicable to end items, components and raw materials, operations, material in process, supplies in storage, maintenance operations, data or records and administrative procedures. The many different activities included in the bridge inspection program could be classified under several of these groups but for the BIP QA procedures, all items will be addressed as operations.

"Inspection Level" is the standard industry term for the magnitude of a sample taken from a lot of product. For the purposes of the Nebraska Bridge Inspection Program, Evaluation Level (versus Inspection Level) will be used to avoid reuse of the term "inspection" and confusion with the Bridge Inspection Program operation of bridge inventory inspection.

The Levels presented by ANSI are Normal, Reduced and Tightened. The general methodology is to provide for random sampling with tightened sampling when there are findings of concern, and reduced sampling when acceptable quality levels are achieved. The following graphic, adapted from ANSI, illustrates changes in sampling from cycle to cycle of the QA Program.



1.10.3.1 Definitions

The NDOT QA Evaluation Program will use these definitions and are in general conformance to ANSI/ASQ Z1.4.

1.10.3.1.1 Operation

See the BIP Operation Matrix. Samples are drawn for each of the major operation of the Nebraska BIP.

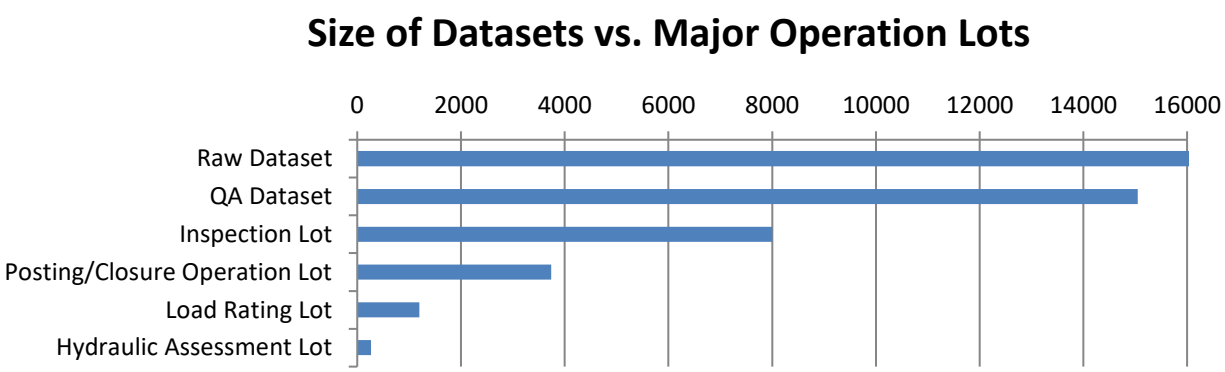
1.10.3.1.2 Operation Variable

The operation variable typically is the party who is completing the operation, because this is the source of variations in following and observing the BIP procedures. This party affects the consistency and quality of the data, reports and product of the operation.

1.10.3.1.3 Population

Population is the set of structures for which products (data, reports, etc.) were prepared and the results included in a dataset submittal to FHWA. Only those structures that are under NDOT's NBIS responsibility need to be included in this set.

The set of structures should encompass those for which work is completed or updated in the period prior to NDOT's submittal of bridge inventory dataset to FHWA. This represents work done in the prior inspection cycle. This is the QA Dataset, a subject of the Raw Dataset. The information for the 2012 NBI Dataset is shown in the following chart.



1.10.3.1.4 Lot

Lot will be a set of structures for an operation from which a sample is to be drawn to evaluate conformance with the acceptability criteria.

Inspection Lot is the largest group of structures, approximately half of the number of structures in the inventory.

1.10.3.1.5 Sample

A sample consists of one or more subjects (structures) randomly drawn from a lot.

1.10.3.1.6 Subject

The subject is an individual structure that undergoes evaluation for a given operation.

1.10.3.1.7 Level

The sample size (quantity of subjects taken from the lot) for an operation that will receive a quality assurance check is based on ANSI/ASQ Z1.4 Table 1. The evaluation levels are:

- Normal, Column II, the default level used if insufficient performance data is available to justify a different level.
- Reduced, Column I, used for in areas that have a good quality trend; and
- Tightened, Column III, used for areas when problems have been identified.

The Program Manager has the authority to adjust which evaluation level will be used and, in addition, attributes of the sample to support a risk-driven approach.

Sample Size for a Given Lot (based on ANSI/ASQ Standard Z1.4-2003, Table 1)

Lot Size			Evaluation Level I	Evaluation Level II	Evaluation Level III
			Reduced	Normal	Tightened
2	to	8	2	2	3
9	to	15	2	3	5
16	to	25	2	5	8
26	to	50	3	8	13
51	to	90	5	13	20
91	to	150	8	20	32
151	to	280	13	32	50
281	to	500	20	50	80
501	to	1200	32	80	125
1201	to	3200	50	125	200
3201	to	10000	80	200	315
10001	to	35000	125	315	500
35001	to	150000	200	500	800

150001	to	500000	315	800	1250
500001	and	over	500	1250	2000

1.10.4 QA Review of Qualifications

Operation	Qualifications Maintain Minimum Qualifications
MARS Metric	3 and 5
Variable	TLs, Underwater Bridge Inspection Diver
Lot	All program participants listed above
Sample	N/A. All program participants for that year are audited.
Method of QA Evaluation	Inspection Team Leaders: Review the BIPPM list of certified qualified inspection Team Leaders to verify the individual is on this list. Review the list for possible errors. Under this review, we will also verify that the Team Leader is approved to conduct the type of inspections that they are qualified for. Underwater Bridge Inspection Diver: Review the BIPPM list of certified Underwater Bridge Inspection Divers to verify the individual is on this list. Review their statement of qualifications for work on the NDOT consultants' contract for the inspections and verify their diver certification is current. Only in years with UW inspections.

Note: Review of qualifications of Personnel for Damage, Special, and Service Inspection types (Mars Metric New1) will be introduced in future years when these inspection types are in effect.

Review of qualifications for Load Rating Engineer is removed as MARS Metric 4 is being deleted. The fact that each load rating was performed by or under the supervision of a Professional Engineer will be verified in Metric 13.

1.10.5 QA Review of Inspection Intervals

Operation	Inspection Intervals - R, NSTM, UW, SC, CP Maintain specified inspection intervals
MARS Metric	6, 7, 8, 9, and 10
Variable	Bridge Owner
Lot	Structures for which inspections are completed, and data are included in a given NBIS dataset. This typically includes structures inspected within a given cycle and is approximately half of the population.
Sample	N/A. The inspection interval for all structures that are part of the lot is verified.
Method of QA Evaluation	The intervals between the subject NBI inspection date and the prior NBI inspection are determined and compared to the specified not-to-exceed frequency. The QA team will determine if any inspections were not completed within their allotted timeframe. The QA team will review the method that is used to notify BO for inspections approaching the deadline.

Note: Review of Inspection Intervals for Damage, Special, and Service Inspection types (Mars Metric New2) will be introduced in future years when these inspection types are in effect.

1.10.6 QA Review of Inspections

Operation	Inspection – R, NSTM, SC, UW,CP
MARS Metric	12 and 22
Variable	Inspection Team Leader
Lot	Structures for which inspections are completed, and data are included in a given NBIS dataset. This typically includes structures inspected within a given cycle and is approximately half of the population.
Sample	Each Team Leader performing inspections in the cycle has QA Evaluation done on 2% of the structures they inspected (with a minimum of 2). For each TL, the size of the base sample is determined from the size of the entire lot, but the samples are chosen from the Structurally Deficient (SD) sub-lot first. The balance of the samples is drawn from the structures that are non-SD.
Method of QA Evaluation	Independent inspection by the QA Evaluation Team of structure after the subject TL has concluded their inspection. The QA Team reviews all the item found in the "Field Inspection Report" from BrM. Differences in NBI condition ratings for items 58, 59, 60, and 61 of more than one is noted. Percent agreement between subject and QA Teams coding for all items is determined. Changes that occur after the subject inspection (e.g. coding procedures, flood events that changed the site conditions) are not included in the evaluation of the TL. Larger variations on all inventory items are recorded and evaluated for program improvements. Other data calculated by the QA Team includes the daily number of inspections performed by each TL. For Underwater Inspections, an in-office review of the inspection reports and pictures is sufficient due to the expense of each UW inspection.

1.10.7 QA Review of Load Ratings

Operation	Load Rating
MARS Metric	13
Variable	Load Rating Engineer
Lot	Structures for which inspections are completed, and data is included in a given NBIS dataset and for which a new load rating is required based on the inspection results.
Sample	Each Load Rating Engineer performing ratings in the cycle has QA Evaluation done on 2% of the structures they rated (with a minimum of 2).
Method of QA Evaluation	The following methods will be utilized: <u>Standard Review</u> • Review of the Load Rating Summary Sheet (LRSS) for each subject. • AASHTOWare BrR software reports: Review report for completeness, input values and that the results are consistent with the bridge inspection report; each report to show evidence of QC check; each report is sealed and signed by a PE. • Non-BrR reports • Reports using spreadsheets, a sample calculation will be conducted for each field to verify that the correct formula has been entered.

Requirements

	• Hand calculations will be reviewed to check that the correct formulas are used and one calculation for each formula will be completed by the QA Engineer to verify the accuracy of the results. Extensive review An extensive review, in addition to a standard review, includes an independent load rating or complete check of the load rating calculations and analysis. Extensive review is completed for the following: • First QA review of a LRE or • First QA review of a specific bridge type or • Non-BrR rating method has been employed.

1.10.8 QA Review of Load Postings

Operation	Posting Closure Post or restrict the bridge
MARS Metric	14
Variable	Bridge Owner
Lot	Structures for which inspections are completed, and data is included in a given NBIS dataset and that meet the following criteria for NBI Item 41: B - Open, posting recommended but not legally implemented (all signs not in place or not correctly implemented) D - Open, would be posted or closed except for temporary shoring, etc. to allow for unrestricted traffic E - Open, temporary structure in place to carry legal loads while original structure is closed and awaiting replacement or Rehabilitation G - New structure not yet open to traffic K - Bridge closed to all traffic P - Posted for load (may include other restrictions such as temporary bridges which are load posted) R - Posted for other load-capacity restriction (speed, number of vehicles on bridge, etc.)
Sample	All BO are audited for the load posting review. The quantity of subjects per BO is based on the ANSI/ASQ Z1.4 Table 1. Subjects are randomly selected from the lot.
Method of QA Evaluation	The QA Team will check each bridge site to verify signs have been posted or that closure barricades are in place.

1.10.9 QA Review of Bridge Owner Files

Operation	Owner Records Maintain key record components in the Bridge File
MARS Metric	15
Variable	Bridge Owner
Lot	All non-state Bridge Owners who have bridges under their jurisdiction, and that have not been audited for Bridge Owner Files in the last 3 years.

Requirements

Sample	BO are selected based on the ANSI/ASQ Z1.4 Table 1. Subjects are randomly selected from the lot. For the number of non-state BO in Nebraska, the number of BO audited each year is 20. For each BO, the size of the base sample is also selected based on ANSI/ASQ Z1.4 Table 1. Subjects are chosen randomly from the lot and determined from the size of the entire lot, but the samples are chosen from the following sub-lots first: NSTM Bridges, Bridges under Scour Plan of Action, and Bridges with Work Candidates. The balance of the samples is drawn from the structures that do not meet these criteria.
Method of QA Evaluation	The QA Team visits Owners' offices and reviews the organization of the Bridge Files and Bridge Records, to meet mandatory components of BIP Manual Chapter 2 for Bridge File requirements. Additional files may be checked at the discretion of the QA reviewer. Each file should be representative of the level of care exhibited by the Bridge Owner since all files should be maintained in the same manner. If the QA reviewer determines that files are being maintained differently for different types of structures, then a sample of each filing system should be checked.

1.10.10 QA Review of Scour Analysis

Operation	Scour Analysis Scour Analysis for Scour Condition
MARS Metric	18
Variable	Hydraulic Engineer
Lot	Structures for which hydraulic analysis reports are completed, and data is included in a given NBIS dataset. This typically includes structures with a Scour code of 3 for Item 113, analyzed within a given cycle, and must be determined from the hydraulic assessment date shown in NDOT's database.
Sample	Each HE performing analysis in the cycle will have QA Evaluation done on 2% of the structures they reviewed (with a minimum of 2).
Method of QA Evaluation	The QA evaluation methods for scour assessments are described in NDOT's Hydraulic Analysis Guidelines.

1.10.11 QA Review of Inventory Data

Operation	Inventory Data
MARS Metric	20 and 23
Lot	Team Leaders and Bridge Owners
Sample	All subjects for the current cycle are checked for data issues. This activity will not be done using a defined sampling plan. NDOT is responsible for maintaining data as defined by the NBIS program. It is important that this data be entered into the bridge inventory database accurately.
Method of QA Evaluation	• The NDOT Data Manager runs the NBIS Edit Check prior to any submittal to FHWA and resolves errors found. • Subjects are reviewed for data inconsistencies or apparent miscoding will be reviewed. • Subjects are reviewed for the timely updating of data.

Requirements

	• Review the system used to notify TL or BO of timely updating of data. • Upon completion of the QA review of reports, the bridge inventory database will be checked to verify that the data for that specific activity has been correctly entered into the database.

1.10.12 QA Review of Critical Findings

Operation	Critical Findings Log
MARS Metric	21
Lot	Bridge Owners
Sample	All bridges that have had Critical Findings during the current cycle.
Method of QA Evaluation	• Evaluate if the CF was resolved within 24 hours • Evaluate the system used to resolve the CF.

1.11 REVISION HISTORY

Rev	Date	Description
0	2010 January 25	Initial Issue of Chapter
1	2011 November 01	Revision 1
2	2013 March 04	Revision 2
3	2015 March 15	Revision 3
4	2016 March 11	Revision 4
5	2017 March 16	Revision 5
6	2018 March	Revision 6
7	2020 March	Revision 7
8	2025 July	Revision 8 – SNBI Compliance

1.12 FORMS

Name	DR Form
Nebraska Bridge Inspector Information Form	DR 97
QA Review of Inspection	N/A
QA Review of Load Posting	N/A
QA Review of Load Rating	N/A
Bridge File Index	N/A
Individual Bridge Record Checklist	N/A
QA Review of Bridge Scour	N/A

This page is intentionally blank.

2.1 GENERAL 39
2.2 REFERENCES 40
2.3 RESPONSIBILITIES 40
2.3.1 Nebraska Department of Transportation 40
2.3.2 Bridge Owners 40
2.3.3 Engineering Consultants 41
2.4 DEFINITIONS 42
2.4.1 AASHTO MBE Definitions 42
2.4.1.1 Bridge File 42
2.4.1.2 Bridge Record 42
2.4.1.3 Base Data 42
2.4.1.4 Inspection Data 42
2.4.1.5 Derived Data 42
2.4.2 NE BIP Implementation and Definitions 43
2.4.2.1 Bridge File 43
2.4.2.2 Individual Bridge Record 43
2.4.2.3 BrM 43
2.4.2.4 PONTIS 43
2.4.2.5 BISON 43
2.4.2.6 BRIN 43
2.4.2.7 Site Photos 44
2.4.2.8 Inspection Photos 44
2.5 COMPONENTS OF EACH INDIVIDUAL BRIDGE RECORD 44
2.5.1 Additional Data Required per NDOT Policy 51
2.5.1.1 Permit Loads 51
2.5.1.2 Traffic Data 51
2.6 QUALITY CONTROL 52
2.7 QUALITY ASSURANCE 52
2.8 REVISION HISTORY 52
2.9 FORMS 52

2.1 GENERAL

Complete Owner Bridge Records are essential for the protection of public safety and for cost-effective management of bridges. Bridges are a significant investment of public funds in capital assets.

The National Bridge Inspection Standards (NBIS) require that records be kept on each bridge. This Chapter documents specific expectations regarding Bridge Records for the Nebraska Bridge Inspection Program.

The NBIS incorporates by reference the AASHTO *Manual for Bridge Evaluation* (MBE) which outlines expectations for Bridge Records. Some of this information is included herein for the convenience of the Bridge Owners, but all Owners should familiarize themselves with the requirements of the MBE. It is recognized that in many cases only a portion of the components recommended in the MBE may be available or needed for managing a specific bridge or types of bridges.

This Chapter describes the NE Bridge Inspection Program expectations for the basic components that Nebraska Bridge Owners should maintain for each Bridge Record in their Bridge File. Some of the components are deemed by NDOT to be mandatory for an Individual Bridge Record; a table of these items is provided herein. Components of Bridge Records should always be dated and include the identification of the individual who prepared the information.

Bridge Owners must keep a Bridge File that includes an Individual Bridge Record with essential components for each bridge under their jurisdiction. The Bridge File must be accessible to the Owner's staff involved with bridge inspection and management, local officials, NDOT and FHWA, and shall be kept in a logical order to allow efficient retrieval, typically by Nebraska Inventory ID.

The Bridge File components may be maintained in individual records or in a group. Components may be in hardcopy or electronic format.

NDOT requires in the *Policy for Design, Load-Rating and Inspection of Public Road Bridges, May 24, 2010* (See Chapter 1 Bridge Inspection Program Requirements) that Owners send hydraulic design reports, bridge design plans, bridge load rating reports and inspection reports for their bridges to the Bridge Division. NDOT requests that these are sent as electronic files. NDOT will place a copy in the Bridge Document Management System folder on the Bridge Division ftp site. Owners may utilize this location as a back-up for the files they must keep on their own servers and computers. NDOT is not responsible for ensuring that Owners' information on this ftp site is up to date and current.

2.2 REFERENCES

The information in this Bridge Inspection Program Manual supplements requirements, and procedures and information in documents by:

- The American Association of State Highway and Transportation Officials (AASHTO)
- The U.S. Department of Transportation, Federal Highway Administration (FHWA)
- The National Cooperative Highway Research Program (NCHRP).

The References list of applicable documents is included in the Manual Appendix. The National Bridge Inspection Standards are also included in the Manual.

Persons involved with the Nebraska Bridge Inspection Program and the bridge inventory must be knowledgeable of the requirements in National Bridge Inspection Standards, the AASHTO *Manual for Bridge Evaluation*, and FHWA publications, technical advisories and publications related to the NBIS.

2.3 RESPONSIBILITIES

2.3.1 Nebraska Department of Transportation

NDOT is responsible for:

- Providing procedures and guidance regarding Bridge Owners' Bridge File.
- Provide access to BrM to all Nebraska Bridge Owners for use and inputting inspection information.
- Maintaining the inventory database for National Bridge Inventory and Nebraska Inventory Items.
- Providing consultants to complete the underwater inspections and reports for each bridge requiring underwater inspection in Nebraska and providing the Owner with a copy of the inspection report.

NDOT holds some Bridge Owner Record information on their ftp site such as bridge plans, load rating information and inspection reports. Owners may use the ftp site as a location for backup and are responsible for ensuring the data held there is current.

2.3.2 Bridge Owners

Bridge Owners are responsible for:

- Maintaining a Bridge File that includes Individual Bridge Records for all of the bridges under the jurisdiction of the Bridge Owner.

- Providing bridge management staff with access to the Bridge File and all Individual Bridge Records, whether they are electronic or hard copy, for their use.
- Accessing Bridge File information at their site or office.
- Keeping back-up of their electronic documents, either at their site or on the NDOT ftp site.
- Storing component documents in either hardcopy or electronic format, organized in a system that is uniform for all their bridges.
- Educating their local officials and their staff of the requirements of the NBIS and the MBE.
- Being familiar with the records and information generated by their engineering consultants.
- Complying with NDOT Bridge Division *Policy for Design, Load-Rating and Inspection of Public Road Bridges, May 24, 2010,* for submittal of bridge plans, hydraulics analyses, load ratings and inspections. (See Chapter 1 Bridge Inspection Program Requirements.)
- Having their bridges load rated when required by this Manual.
- Follow up on and resolution for Critical Findings and report closure to NDOT.

2.3.3 Engineering Consultants

Engineering Consultants are responsible for:

- Being familiar with the requirements of NBIS and the MBE.
- Providing professional services contract deliverables which constitute a component of a Bridge Record (inspection report, SI&A, load rating summary sheet, load rating reports, hydraulic analysis reports, etc.) directly to Bridge Owners.
- Being familiar with NDOT Bridge Division *Policy for Design, Load-Rating and Inspection of Public Road Bridges, May 24, 2010,* for submittal of bridge plans, hydraulics analyses, load ratings and inspections. (See Chapter 1 Bridge Inspection Program Requirements.) This information is not to be transmitted directly to NDOT, except at the request of NDOT.
- Complying with the Bridge File and Bridge Record organization used by the Owner.

Consultants may assist Bridge Owners with their Bridge File and Records assembly and maintenance, but consultants cannot permanently house, possess or store Owners Bridge File and Individual Bridge Records.

2.4 DEFINITIONS

2.4.1 AASHTO MBE Definitions

2.4.1.1 Bridge File

A Bridge File describes all of the bridges under the jurisdiction of the Bridge Owner. It contains one Individual Bridge Record for each bridge. The Bridge File can include group files for information that apply to more than one bridge.

2.4.1.2 Bridge Record

A Bridge Record contains cumulative information about an **individual** bridge. It should provide a full history of the structure, including details of any damage and all strengthening and repairs made to the bridge. The Bridge Record should report data on the capacity of the structure, including the computations substantiating reduced load limits, if applicable, and the hydraulic analysis report or BR385 forms that substantiates a scour critical condition.

2.4.1.3 Base Data

Base data is information for a bridge-specific item that is normally not subject to change. Example of this data would include items such as structure number, year built, location, and dimensions.

2.4.1.4 Inspection Data

Field inspection data is modified with each inspection. Examples of this type of data would include inspection records for any type of inspection performed.

2.4.1.5 Derived Data

Derived data is information that is derived from the base and inspection data. Examples of derived data would be condition ratings, recommendation for maintenance or repair, scour critical code and the calculated load rating for a structure.

2.4.2 NE BIP Implementation and Definitions

2.4.2.1 Bridge File

The Bridge File includes all documents for each Individual Bridge Record, whether hardcopy or electronic format, and whether they are kept in a group or individually. Owners may keep their bridge files in either electronic or hard copy form but should be consistent in storage methods.

2.4.2.2 Individual Bridge Record

The Individual Bridge Record is a file that will contain all components of each Bridge Record, in either hard copy or electronic format. The Individual Bridge Record must be readily retrieved by bridge owners or their representatives. Together, the Individual Bridge Records make up the Owner's Bridge File.

2.4.2.3 BrM

AASHTOWare's Bridge Management (BrM) software is NDOT's current inspection and data management system. BrM replaced Pontis in 2014, and is a web-based system that can be accessed from anywhere a connection to the internet is available using the following link: https://brm.nebraska.gov

2.4.2.4 PONTIS

Pontis was the inspection and data management system used by Nebraska prior to the adoption of BrM in 2014. Pontis was in use from 2008 until 2014.

2.4.2.5 BISON

Bridge Inspection System of Nebraska (BISON) was the inspection and data management system used in Nebraska prior to the adoption Pontis in 2008. This system was used for inspection reporting from 2003 through 2007.

2.4.2.6 BRIN

Bridge Inspection Nebraska (BRIN) was the inspection and data management system used in Nebraska prior to the adoption of BISON. This system was used for inspection reporting from 1997 through 2002.

2.4.2.7 Site Photos

Site photos are those taken once, typically at the inventory inspection and provide a pictorial record of the site. Site photos are only required again when conditions at the site have changed. Guidance on this can be found in Chapter 4, Bridge Inspection. See the guide for taking site photos in Section 4.5.9.2.

2.4.2.8 Inspection Photos

Inspection photos are necessary to document major defects or other conditions. More guidance can be found in Chapter 4, Bridge Inspection.

2.5 COMPONENTS OF EACH INDIVIDUAL BRIDGE RECORD

The following table lists the components of Bridge Records from the MBE, in the order shown in the MBE. NDOT guidance for each component follows the table. Each item is required if it is available. However, NDOT recognizes that some components will be required for all bridges, while others are required if they are applicable to that bridge. Bridge Owners are encouraged to use a Bridge Record Checklist that lists all these components and that indicates if the component applies to that Bridge Record.

The MBE lists Supplemental Documentation in Bridge File in Section 2.3. NDOT encourages Bridge Owners to retain any of this information as it available to them but is not mandatory per the MBE. These are: Construction Plans and Drawings, which may include shop drawings, Construction Documentation (which include Special Provision and Pile Driving Records), Original Design Documentation, Unique Considerations, Utilities and Ancillary Attachments, Maintenance and Repair History, Additional Waterway Information, and Traffic Data.

Component from MBE	All Bridges	If Applicable	Bridge Record Component	NDOT Guidance
General Plans and elevation drawings or a sketch depicting the layout of the bridge (MBE Section 2.2.1)	X		Bridge plans and/or Field Measurements	The record for each bridge must contain the bridge's construction plans with as-built information if they are available, including any repair or rehab work done on the bridge. If plans are not available, detailed measurement sheets shall be included in the Bridge Record, such as for timber and steel stringer structures. For older structures, these sketches were used to complete the load rating of the bridges when plans were not available. If detailed measurements are not possible and plans are not available, such as for concrete structures, a note should be placed in the Bridge Record to this effect.
Clear and understandable layout approach to labeling members and elements (MBE Section 2.2.1)			N/A	NDOT Policy is listed in Chapter 3 NE Item 217 for naming of elements. A direction of increasing milepost is also included in the inspection report to ensure that the direction is consistent. No additional information is required in the bridge file.
Inspection and inventory data as defined by the FHWA (MBE Section 2.2.1)	X		Current SI&A	The SI&A sheet is typically printed and stored with the Bridge Record upon completion of data entry. However, it is acceptable if the SI&A sheet is not printed if the Owner has access to BrM to view the inspection record from the office where the Bridge Record is kept.
General photographs and photographs for major defects, posting, or other features (MBE Section 2.2.1)	X		Photographs	NDOT requires that Owners maintain two sets of photos for each bridge – site photos and inspection photos. Both sets are mandatory components of the Bridge Record. See Chapter 4, Bridge Inspection for procedures related to processing and filing photos. This item is typically met by the inspection photos. The inspection photos are often accessible on BrM.

Component from MBE	All Bridges	If Applicable	Bridge Record Component	NDOT Guidance
History of any structural damage (MBE Section 2.2.1)		X	History of Structural Damage	The Owner may keep maintenance records to show history of structural damages and their repairs. Details of damage from accident or other damage should be included the Bridge Record. Accident information involving bridges is often maintained by and can be obtained from local law enforcement. If an accident resulted in repairs to the bridge, documentation of accident caused-damage to any load bearing element of the superstructure or substructure is a mandatory component of a Bridge Record.
Field Inspection Information (MBE Section 2.2.2)	X		Previous SI&A (all)	This is typically met by having previous inspection reports (SI&A or stand-alone inspection reports) on hand. Old SI&A cannot be accessed on BrM but the inspection data is available on BrM for all previous NBIS inspections.
Critical Findings and Actions Taken (MBE Section 2.2.3)		X	Critical Findings Report	Critical Findings Reports are a mandatory component of a Bridge Record, if this situation is applicable. Records on follow-up on any inspection findings are required by the NBIS.
Waterway information (MBE Section 2.2.4)		X	Scour Assessment Report	This item will be met if Hydraulic assessment and/or BR385 forms for scour documentation. Cross-section records are required as described in Section 4.5.7.3

Component from MBE	All Bridges	If Applicable	Bridge Record Component	NDOT Guidance
Significant Correspondence (MBE Section 2.2.5)		X	Correspondence	The MBE recommends that this component include all correspondence related to the structure from construction to the present. NDOT requires that Bridge Owners keep a copy of all correspondence, including emails, from NDOT pertaining to the bridge. An example would include a copy of the letter NDOT mailed to Bridge Owners regarding excess gravel. Correspondence from NDOT regarding the specifics of this structure is a mandatory component of the Bridge Record. Some correspondence from NDOT might pertain to several individual bridges. It is recommended that a copy of the correspondence should be included in each Bridge Record. Other types of correspondence could be between 2 Owners for Bridges on county lines or state lines. NDOT recognizes that some structures will not have significant correspondence.
Other Inspection Procedures or Requirements (MBE Section 2.2.6)		X	Previous Inspection Reports (all)	This is only applicable to Nonredundant Steel Tension Member (NSTM), Underwater, In-depth or Complex Bridges. Each bridge requiring non-routine inspection techniques should include inspection procedures. These would describe a list of specialized tools and equipment needed to complete the inspection. NSTM bridges must identify all known Nonredundant Steel Tension Members. This documentation is a mandatory component of a Bridge Record for inspections.

Component from MBE	All Bridges	If Applicable	Bridge Record Component	NDOT Guidance
Load Rating Documentation (MBE Section 2.2.7)	X		Load Rating Summary Sheet	Signed LRSS is required for each bridge. The unsigned LRSS can be accessed in BrM. For load ratings completed in BrR, no additional documentation is required as the BrR model contains all necessary information.
		X	Load Rating Calculations	For load ratings that did not use BrR, or that required additional calculations, retain a copy of those calculations, typically in the form of a report completed by the LRE. In rare instances in Nebraska, a bridge may have been load tested and those records should be included.
Posting Documentation		X	Load Posting Record	Each Bridge Record must include the history of all load restrictions and postings for a structure, if this situation is applicable for the individual bridge. A copy of all load rating summaries in the Records is sufficient if they are combined in the file. If all load rating summaries are combined and kept in the file, old summary sheets should have "void" written on them to avoid any confusion about which is the most current. Provide current photographs of the load posting signs and any additional information required. Some Owners have sign inventories that provide a record of load posting at a particular structure.

Component from MBE	All Bridges	If Applicable	Bridge Record Component	NDOT Guidance
Scour Assessment (MBE Section 2.2.9)		X	Scour Assessment	All bridges over waterways are required to be assessed for scour. New bridges should not be designed so that they are scour critical. Scour status of existing bridges may change over time. The Bridge Record should include the complete Hydraulic Analysis Report and/or BR385 forms. The structure may, as a result, have been determined to need a scour Plan of Action (POA), and this is also required to be part of the record. Scour assessments and POAs if required, are mandatory components of a Bridge Record. The Record for bridges with a POA must contain a POA Monitoring Log that documents activities related to the POA, such as installation of countermeasures or monitoring. Scour analysis and/or BR385 forms, POA and the POA Monitoring Log are mandatory components of the Bridge Record for bridges with Item B.AP.03 coded as C, D, E, or U.

Component from MBE	All Bridges	If Applicable	Bridge Record Component	NDOT Guidance
Scour Plan of Action (MBE 2.2.10)		X	Scour Plan of Action	NDOT recommends that Owners prepare POA Monitoring Log in a format that is portable to the field for scour monitoring and reporting. It is the Owners decision how to maintain a POA Monitoring Log, however, the Log must include the date, observations made and the status of the bridge. NDOT also requires the bridge owner to perform field review of the Scour Critical structures annually. If scour monitoring is not required in a calendar year due to lack of events, a note should be placed on the POA Monitoring Log to document this. Examples of POA Monitoring Log used by NE Owners include: - The POA form reproduced on a photocopier and provided to maintenance personnel who complete the monitoring tasks and document the date and their observations. The hardcopy is then filed in the hardcopy Bridge Record at the Owner's office.

Bridge Owners are encouraged to use this Bridge Record Checklist and to keep a copy in their Bridge Record. See NDOT Inspection Forms on Bridge Division Website.

2.5.1 Additional Data Required per NDOT Policy

This section lists the information that is required per NDOT Policy that is not mandatory per the MBE.

2.5.1.1 Permit Loads

NDOT issues permits for oversized loads on the state highway system. The permitting system is capable of issuing permits based on the load capacity of every structure on a hauler-selected route.

Parties needing to haul oversize loads over local roads should contact the Local Public Agency to obtain permission to use the hauler-selected route. It is highly advised by NDOT that Local Public Agency Bridge Owners issue permits for these types of loads. Permit applications typically include documentation of vehicle loads and axle configurations that differ from the Nebraska Legal Truck configuration and the route the vehicle will take. The information should include dates, and any computations completed to issue the permit for the oversized load. Local Public Agencies often can issue a permit based on Load Rating Summary Sheets included in the Bridge Record and/or by consulting their Load Rating Engineer.

2.5.1.2 Traffic Data

Traffic volumes will vary with time and are updated as follows, depending on the Federal Functional Classification.

State System Roadways

The NDOT Planning Section periodically updates state and regional traffic data, Annual Average Daily Traffic (AADT) and Annual Average Daily Truck Traffic (AADTT). Local Owners may have other data in their files.

Local Roads and Streets

The Bridge Owner is responsible for traffic data on local roads and streets, and they should review the data with each routine inspection.

2.6 QUALITY CONTROL

Quality Control (QC) for this program is the responsibility of the consultant or agency conducting the activity. Quality Control checks are conducted on every product of a program operation, and thus at a much higher frequency than quality assurance checks. When the QC on a program product is complete, it is finished and deliverable to the Bridge Owner for their records. The QC expectations are described in more detail in Chapter 1, Bridge Inspection Program Requirements.

2.7 QUALITY ASSURANCE

NDOT or their selected agent will perform Quality Assurance (QA) of all activities of the Bridge Inventory. The QA program activities are described in Chapter 1 of this Manual.

2.8 REVISION HISTORY

Rev	Date	Description
0	2010 January 25	Initial Issue of Chapter
1	2011 November 01	Revision 1 - Add POA Log, Bridge File Index, Individual Bridge Record Checklist; Miscellaneous clarifications
2	2013 March 04	Revision 2
3	2015 March 15	Revision 3
4	2016 March 11	Revision 4
5	2017 March 16	Revision 5
6	2018 March	Revision 6
7	2020 March	Revision 7
8	2025 July	Revision 8 – SNBI Compliance

2.9 FORMS

Forms used in completing activities mentioned in this Chapter are listed below. Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOT Bridge Inspection Program website at https://dot.nebraska.gov/business-center/bridge/ for the current list of applicable forms and the most recent versions of each form.

Name	DR Form
Plan of Action (POA) Monitoring Log	BR385E
Bridge File Review Checklist	BR330

This page intentionally left blank

Chapter 3 SNBI

DRAFT

Notice

This document is current as of errata #1 03/24

TABLE OF CONTENTS CONDENSED

TABLE OF CONTENTS CONDENSED ..... *ii*

TABLE OF CONTENTS EXPANDED ..... *iii*

LIST OF FIGURES ..... *viii*

LIST OF TABLES ..... *xiii*

INTRODUCTION *1*

ABBREVIATIONS, ACRONYMS, AND SYMBOLS *5*

DEFINITIONS *7*

SPECIFICATION FORMAT *17*

BORDER BRIDGES *20*

COMPREHENSIVE EXAMPLE *21*

SECTION 1: BRIDGE IDENTIFICATION *23*

SECTION 2: BRIDGE MATERIAL AND TYPE *57*

SECTION 3: BRIDGE GEOMETRY *102*

SECTION 4: FEATURES *139*

SECTION 5: LOADS, LOAD RATING, AND POSTING *201*

SECTION 6: INSPECTIONS *228*

SECTION 7: BRIDGE CONDITION *252*

QUALITY CONTROL *352*

QUALITY ASSURANCE *352*

REVISION HISTORY *353*

FORMS *353*

ADDITIONAL GUIDANCE *353*

APPENDIX A: COMPREHENSIVE EXAMPLE DATA SETS & DATA ITEMS FOR BRIDGE NUMBER 15558X *354*

APPENDIX B: INDEXES - DATA SETS, SECTIONS, AND ITEMS *360*

APPENDIX C: COMPONENT CONDITION RATING GUIDANCE *372*

APPENDIX D: SNBI-NBI DATA ITEM MAPPING *377*

APPENDIX E: INSPECTION NOTE QUALITY *382*

TABLE OF CONTENTS EXPANDED

TABLE OF CONTENTS CONDENSED ..... *ii*
TABLE OF CONTENTS EXPANDED ..... *iii*
LIST OF FIGURES ..... *viii*
LIST OF TABLES ..... *xiii*
INTRODUCTION *1*
ABBREVIATIONS, ACRONYMS, AND SYMBOLS *5*
DEFINITIONS *7*
SPECIFICATION FORMAT *17*
BORDER BRIDGES *20*
COMPREHENSIVE EXAMPLE *21*
SECTION 1: BRIDGE IDENTIFICATION *23*
SUBSECTION 1.1: IDENTIFICATION **24**
B.ID.01 Bridge Number 25
B.ID.02 Bridge Name 29
B.ID.03 Previous Bridge Number 30
Example Identification Data for Bridge Number 15558X 31
SUBSECTION 1.2: LOCATION **32**
B.L.01 State Code 33
B.L.02 County Code 34
B.L.03 Place Code 35
B.L.04 Highway Agency District 36
B.L.05 Latitude 37
B.L.06 Longitude 38
B.L.07 Border Bridge Number 39
B.L.08 Border Bridge State or Country Code 40
B.L.09 Border Bridge Inspection Responsibility 41
B.L.10 Border Bridge Designated Lead State 42
B.L.11 Bridge Location 43
B.L.12 Metropolitan Planning Organization 44
Example Location Data for Bridge Number 15558X 46
SUBSECTION 1.3: CLASSIFICATION **47**
B.CL.01 Owner 48
B.CL.02 Maintenance Responsibility 50
B.CL.03 Federal or Tribal Land Access 51
B.CL.04 Historic Significance 52
B.CL.05 Toll 54
B.CL.06 Emergency Evacuation Designation 55
Example Classification Data for Bridge Number 15558X 56
SECTION 2: BRIDGE MATERIAL AND TYPE *57*
SUBSECTION 2.1: SPAN MATERIAL AND TYPE **58**
B.SP.01 Span Configuration Designation 59
B.SP.02 Number of Spans 61

DRAFT

B.SP.03 Number of Beam Lines ... 62
B.SP.04 Span Material ... 63
B.SP.05 Span Continuity ... 65
B.SP.06 Span Type ... 67
B.SP.07 Span Protective System ... 69
B.SP.08 Deck Interaction ... 71
B.SP.09 Deck Material and Type ... 72
B.SP.10 Wearing Surface ... 73
B.SP.11 Deck Protective System ... 74
B.SP.12 Deck Reinforcing Protective System ... 76
B.SP.13 Deck Stay-In-Place Forms ... 77
Example Span Material and Type Data for Bridge Number 15558X ... 78

SUBSECTION 2.2: SUBSTRUCTURE MATERIAL AND TYPE ... 80
B.SB.01 Substructure Configuration Designation ... 81
B.SB.02 Number of Substructure Units ... 83
B.SB.03 Substructure Material ... 84
B.SB.04 Substructure Type ... 86
B.SB.05 Substructure Protective System ... 88
B.SB.06 Foundation Type ... 90
B.SB.07 Foundation Protective System ... 92
Example Substructure Material and Type Data for Bridge Number *15558X* ... 94

SUBSECTION 2.3: ROADSIDE HARDWARE ... 95
B.RH.01 Bridge Railings ... 97
B.RH.02 Transitions ... 98
Example Roadside Hardware Data for Bridge Number 15558X ... 101

SECTION 3: BRIDGE GEOMETRY ... 102
B.G.01 NBIS Bridge Length ... 103
B.G.02 Total Bridge Length ... 106
B.G.03 Maximum Span Length ... 110
B.G.04 Minimum Span Length ... 113
B.G.05 Bridge Width Out-to-Out ... 115
B.G.06 Bridge Width Curb-to-Curb ... 119
B.G.07 Left Curb or Sidewalk Width ... 122
B.G.08 Right Curb or Sidewalk Width ... 124
B.G.09 Approach Roadway Width ... 126
B.G.10 Bridge Median ... 128
B.G.11 Skew ... 129
B.G.12 Curved Bridge ... 130
B.G.13 Maximum Bridge Height ... 132
B.G.14 Sidehill Bridge ... 133
B.G.15 Irregular Deck Area ... 134
B.G.16 Calculated Deck Area ... 135
Example Bridge Geometry Data for Bridge Number 15558X ... 136

SECTION 4: FEATURES ... 139

SUBSECTION 4.1: FEATURE IDENTIFICATION ... 141
B.F.01 Feature Type ... 142
B.F.02 Feature Location ... 144
B.F.03 Feature Name ... 145
Example Feature Identification Data for Bridge Number 15558X ... 146

SUBSECTION 4.2: ROUTES ... 147

B.RT.01 Route Designation 148
B.RT.02 Route Number 149
B.RT.03 Route Direction 150
B.RT.04 Route Type 151
B.RT.05 Service Type 152
Example Routes Data for Bridge Number 15558X 153

SUBSECTION 4.3: HIGHWAYS 154
B.H.01 Functional Classification 155
B.H.02 Urban Code 156
B.H.03 NHS Designation 157
B.H.04 National Highway Freight Network 158
B.H.05 STRAHNET Designation 159
B.H.06 LRS Route ID 160
B.H.07 LRS Mile Point 161
B.H.08 Lanes On Highway 162
B.H.09 Annual Average Daily Traffic 163
B.H.10 Annual Average Daily Truck Traffic 164
B.H.11 Year of Annual Average Daily Traffic 165
B.H.12 Highway Maximum Usable Vertical Clearance 166
B.H.13 Highway Minimum Vertical Clearance 168
B.H.14 Highway Minimum Horizontal Clearance, Left 170
B.H.15 Highway Minimum Horizontal Clearance, Right 173
B.H.16 Highway Maximum Usable Surface Width 176
B.H.17 Bypass Detour Length 178
B.H.18 Crossing Bridge Number 180
Example Highway Data for Bridge Number 15558X 181

SUBSECTION 4.4: RAILROADS 182
B.RR.01 Railroad Service Type 183
B.RR.02 Railroad Minimum Vertical Clearance 185
B.RR.03 Railroad Minimum Horizontal Offset 187
Example Railroad Data for Bridge Number 15558X 189

SUBSECTION 4.5: NAVIGABLE WATERWAYS 190
B.N.01 Navigable Waterway 191
B.N.02 Navigation Minimum Vertical Clearance 192
B.N.03 Movable Bridge Maximum Navigation Vertical Clearance 194
B.N.04 Navigation Channel Width 195
B.N.05 Navigation Channel Minimum Horizontal Clearance 197
B.N.06 Substructure Navigation Protection 199
Example Navigable Waterway Data for Bridge Number 15558X 200

SECTION 5: LOADS, LOAD RATING, AND POSTING 201

SUBSECTION 5.1: LOADS AND LOAD RATING 202
B.LR.01 Design Load 203
B.LR.02 Design Method 204
B.LR.03 Load Rating Date 205
B.LR.04 Load Rating Method 206
B.LR.05 Inventory Load Rating Factor 207
B.LR.06 Operating Load Rating Factor 208
B.LR.07 Controlling Legal Load Rating Factor 209
B.LR.08 Routine Permit Loads 211
Example Loads and Load Rating Data for Bridge Number 15558X 213

SUBSECTION 5.2: LOAD POSTING STATUS 214

DRAFT

B.PS.01 Load Posting Status 215
B.PS.02 Posting Status Change Date 217
Example Load Posting Status Data for Bridge Number 15558X 218

SUBSECTION 5.3: LOAD EVALUATION AND POSTING 219
B.EP.01 Legal Load Configuration 220
B.EP.02 Legal Load Rating Factor 221
B.EP.03 Posting Type 223
B.EP.04 Posting Value 224
Example Load Evaluation and Posting Data for Bridge Number 15558X 226

SECTION 6: INSPECTIONS 228

SUBSECTION 6.1: INSPECTION REQUIREMENTS 229
B.IR.01 NSTM Inspection Required 230
B.IR.02 Fatigue Details 231
B.IR.03 Underwater Inspection Required 232
B.IR.04 Complex Feature 233
Example Inspection Requirement Data for Bridge Number 15558X 234

SUBSECTION 6.2: INSPECTION EVENTS 235
B.IE.01 Inspection Type 236
B.IE.02 Inspection Begin Date 237
B.IE.03 Inspection Completion Date 238
B.IE.04 Nationally Certified Bridge Inspector 239
B.IE.05 Inspection Interval 240
B.IE.06 Inspection Due Date 241
B.IE.07 Risk-Based Inspection Interval Method 242
B.IE.08 Inspection Quality Control Date 243
B.IE.09 Inspection Quality Assurance Date 244
B.IE.10 Inspection Data Update Date 245
B.IE.11 Inspection Note 246
B.IE.12 Inspection Equipment 247
Example Inspection Events Data for Bridge Number 15558X 251

SECTION 7: BRIDGE CONDITION 252

SUBSECTION 7.1: COMPONENT CONDITION RATINGS 254
B.C.01 Deck Condition Rating 256
B.C.02 Superstructure Condition Rating 266
B.C.03 Substructure Condition Rating 275
B.C.04 Culvert Condition Rating 284
B.C.05 Bridge Railings Condition Rating 288
B.C.06 Bridge Railing Transitions Condition Rating 289
B.C.07 Bridge Bearings Condition Rating 290
B.C.08 Bridge Joints Condition Rating 293
B.C.09 Channel Condition Rating 296
B.C.10 Channel Protection Condition Rating 298
B.C.11 Scour Condition Rating 300
B.C.12 Bridge Condition Classification 304
B.C.13 Lowest Condition Rating Code 305
B.C.14 NSTM Inspection Condition 306
B.C.15 Underwater Inspection Condition 307
Example Component Condition Ratings Data for Bridge Number 15558X 308

SUBSECTION 7.2: ELEMENT IDENTIFICATION 318
B.E.01 Element Number 320

B.E.02 Element Parent Number 322
B.E.03 Element Total Quantity 323
Example Element Identification Data for Bridge Number 15558X 324

SUBSECTION 7.3: ELEMENT CONDITIONS 327
B.CS.01 Element Quantity Condition State One 328
B.CS.02 Element Quantity Condition State Two 329
B.CS.03 Element Quantity Condition State Three 330
B.CS.04 Element Quantity Condition State Four 331
Example Element Data Set 332
Example Element Conditions Data for Bridge Number 15558X 334

SUBSECTION 7.4: APPRAISAL 336
B.AP.01 Approach Roadway Alignment 337
B.AP.02 Overtopping Likelihood 338
B.AP.03 Scour Vulnerability 339
B.AP.04 Scour Plan of Action 341
B.AP.05 Seismic Vulnerability 342
Example Appraisal Data for Bridge Number 15558X 343

SUBSECTION 7.5: WORK EVENTS 344
B.W.01 Year Built 345
B.W.02 Year Work Performed 346
B.W.03 Work Performed 347
Example Work Events Data for Bridge Number 15558X 351

QUALITY CONTROL 352

QUALITY ASSURANCE 352

REVISION HISTORY 353

FORMS 353

ADDITIONAL GUIDANCE 353

APPENDIX A: COMPREHENSIVE EXAMPLE DATA SETS & DATA ITEMS FOR BRIDGE NUMBER 15558X . 354

APPENDIX B: INDEXES - DATA SETS, SECTIONS, AND ITEMS 360

APPENDIX C: COMPONENT CONDITION RATING GUIDANCE 372

APPENDIX D: SNBI-NBI DATA ITEM MAPPING 377

APPENDIX E – TEMPORARY CODES ..... Error! Bookmark not defined.

APPENDIX F – INSPECTION NOTE QUALITY 382

DRAFT

LIST OF FIGURES

Figure 1. SNBI data relationships. 4
Figure 2. Elevation view of Bridge Number 15558X, looking east. 21
Figure 3. Plan View of Bridge Number 15558X. 21
Figure 4. Approach view to Bridge Number 15558X, looking south. 22
Figure 5. Typical section views for Bridge Number 15558X. 22
Figure 6. Elevation view of the North Hanley Road Bridge, looking east. 31
Figure 7. Location map for Bridge Number 15558X. (Source: Google Earth) 46
Figure 8. Elevation view for Bridge number 15558X, looking west. (Source: Missouri DOT) 78
Figure 9. Cross-section view for Bridge Number 15558X, spans one through four. (Source: Missouri DOT) 78
Figure 10. Cross-section view for Bridge Number 15558X, spans five through seven. (Source: Missouri 78
Figure 11. Metal bridge railing and transition (Source: Alaska DOT) 99
Figure 12. Metal bridge railing and transition for long-span application. (Source: Delaware DOT) 100
Figure 13. Reinforced concrete bridge railing and metal transition railing for Bridge Number 15558X. 101
Figure 14. Profile view of a single span bridge 104
Figure 15. Profile views of various single span bridges. 104
Figure 16. Profile view of a four-sided, multicell culvert under fill. ....**Error! Bookmark not defined.**
Figure 17. Profile view of a multi-pipe culvert under fill. 104
Figure 18. Plan view of a skewed, multi-pipe culvert under fill. 105
Figure 19. Profile views of various single span bridges. 107
Figure 20. Profile views of various spandrel arches. 107
Figure 21. Profile view of a single span bridge with pile bent abutments. 107
Figure 22. Profile view of a four-sided, multicell culvert under fill 108
Figure 23. Profile view of a culvert under fill. 108
Figure 24. Profile view of a multi-pipe culvert under fill. 108
Figure 25. Plan view of a four-span bridge with variable skews. 108
Figure 26. Plan view of a three-span curved bridge. 109
Figure 27. Plan view of a skewed, multi-pipe culvert under fill. 109
Figure 28. Profile views of various bridge types. 111
Figure 29. Plan view of a four-span bridge with variable skews. 112
Figure 30. Plan view of a three-span curved bridge. 112
Figure 31. Profile views of various bridge types. 113
Figure 32. Plan view of a four-span bridge with variable skews. 114
Figure 33. Plan view of a three-span curved bridge. 114
Figure 34. Cross-section view of a through truss bridge. 115
Figure 35. Cross-section view of a sidehill bridge. 116
Figure 36. Cross-section view of a multi-girder bridge. 116
Figure 37. Cross-section view of a filled arch bridge or culvert under fill with headwalls. 116
Figure 38. Cross-section view of a pipe culvert under fill. 117
Figure 39. Cross-section views of various bridge decks with medians. 117
Figure 40. Cross-section views of various bridge decks with medians. 117
Figure 41. Partial cross-section views of various bridge decks with railings. 118
Figure 42. Cross-section view of a sidewalk retrofit. 118
Figure 43. Cross-section view of a sidehill bridge. 120
Figure 44. Cross-section view of a through truss bridge. 120
Figure 45. Cross-section view of a filled arch bridge or culvert under fill with headwalls. 120
Figure 46. Cross-section view of a multi-girder bridge. 120

Figure 47. Cross-section view of a pipe culvert under fill. 120
Figure 48. Partial cross-section views of various bridge decks with railings. 121
Figure 49. Cross-section view of a bridge deck with mountable median. 121
Figure 50. Cross-section view of a bridge deck with non-mountable curb and median barrier. 121
Figure 51. Cross-section view of a bridge deck with multiple median barriers. 121
Figure 52. Cross-section view of a multi-girder bridge. 122
Figure 53. Cross-section view of a through truss bridge. 122
Figure 54. Cross-section view of a slab bridge. 122
Figure 55. Cross-section view of a timber wheel guard. 123
Figure 56. Cross-section view of a sidewalk retrofit. 123
Figure 57. Cross-section view of a sidewalk retrofit. 123
Figure 58. Partial cross-section views of 124
Figure 59. Cross-section view of a 124
Figure 60. Cross-section view of a slab bridge with various medians. 124
Figure 61. Cross-section view of a timber wheel guard. 125
Figure 62. Cross-section view of a sidewalk retrofit. 125
Figure 63. Cross-section view of a sidewalk retrofit. 125
Figure 64. Cross-section view of two approach roadways that are carried across one bridge. 126
Figure 65. Approach roadway cross-section view for a mainline and a ramp that are carried across one bridge. 127
Figure 66. Approach roadway cross-section view for a mainline and a ramp that are carried across separate bridges. 127
Figure 67. Cross-section view of a bridge deck with open median. 128
Figure 68. Cross-section view of a bridge deck with closed median (mountable) 128
Figure 69. Cross-section view of a bridge deck with closed median (non-mountable). 128
Figure 70. Plan view of a bridge deck indicating skew determination. 129
Figure 71. Curved bridge with curved girders. (Source: Alaska DOT) 130
Figure 72. Plan view of a curved bridge with piecewise straight girders. 131
Figure 73. Plan view of a curved bridge with kinked girders. 131
Figure 74. Profile view of a bridge over a creek and trail. 132
Figure 75. Cross-section view of a sidehill bridge. 133
Figure 76. Elevation view of Bridge Number 15558X, looking east. 136
Figure 77. Plan view and dimensions for Bridge Number 15558X. 136
Figure 78. Approach view for Bridge Number 15558X, looking south. 137
Figure 79. Typical cross-sections and dimensions for Bridge Number 15558X. 137
Figure 81. TIGERweb screen shot for the bridge in Delaware. (Source: US Census Bureau) 156
Figure 82. Cross-section view of through truss bridge showing vertical clearances. 167
Figure 82. Elevation view with two separate highway features passing below the bridge. 167
Figure 83. Cross-section view of a through truss bridge showing minimum vertical clearance. 169
Figure 84. Elevation view with two separate highway features passing below the bridge. 169
Figure 85. Bridge elevation view of horizontal clearances for a 2-lane highway with 1-way traffic below the bridge. 170
Figure 86. Bridge elevation view of horizontal clearances for a 2-lane highway with 2-way traffic below the bridge. 171
Figure 87. Bridge elevation view of horizontal clearances for separate southbound and northbound highway features below the bridge, with flexible barriers. 171
Figure 88. Bridge elevation view of horizontal clearances for separate westbound and eastbound highway features below the bridge, with flexible barrier. 171
Figure 89. Bridge elevation view of horizontal clearances for a 2-lane, 1-way highway feature below the bridge, with a rigid barrier. 172

Figure 90. Bridge elevation view of horizontal clearances for a highway feature below the bridge carrying mainline and ramp. 172
Figure 91. Bridge elevation view of horizontal clearances for a 2-lane highway feature with 1way traffic below the bridge. 173
Figure 92. Bridge elevation view of horizontal clearances for a 2-lane highway feature with 2way traffic below the bridge. 174
Figure 93. Bridge elevation view of horizontal clearances for separate southbound and northbound highway features below the bridge, with flexible barriers. 174
Figure 94. Bridge elevation view of horizontal clearances for separate westbound and eastbound highway features below the bridge, with a flexible barrier. 174
Figure 95. Bridge elevation view of horizontal clearances for a 2-lane, 1-way highway feature below the bridge, with a rigid barrier. 175
Figure 96. Bridge elevation view of a 2-lane, 2-way highway feature below the bridge, with a rigid barrier. 175
Figure 97. Bridge elevation view of horizontal clearances for highway feature carrying mainline and ramp traffic below the bridge. 175
Figure 98. Bridge elevation view of two separate highway features below the bridge. 176
Figure 99. Bridge elevation view of two separate highway features below the bridge. 177
Figure 100. Cross-section view of two highway features carried on the bridge with a non-mountable median. 177
Figure 101. Cross-section view of two highway features carried on the pipe culvert under fill with a grass median. 177
Figure 102. Detour map for a highway feature carried on the bridge. 179
Figure 103. Detour map for a highway feature that passes below the bridge. 179
Figure 104. Multi-level interchange with bridges passing above and below other bridges. (Source: Maryland Transportation Authority) 180
Figure 105. Bridge elevation view with two electrified passenger rail tracks carried on the bridge and two freight rail tracks below the bridge. 183
Figure 106. Bridge elevation view with one passenger rail and one freight rail track below the bridge. 184
Figure 107. Bridge elevation view with two freight/passenger rail tracks below the bridge. 184
Figure 108. Bridge elevation view with an electrified passenger rail track and a non-electrified passenger rail track below the bridge. 184
Figure 109. Bridge elevation view with two freight/passenger rail tracks below the bridge. 185
Figure 110. Bridge elevation view with one passenger rail and one freight rail track below the bridge. 186
Figure 111. Bridge elevation view indicating horizontal offset for one railroad track below the bridge. 187
Figure 112. Bridge elevation view indicating horizontal offset for two railroad tracks below the bridge. 188
Figure 113. Bridge elevation view of two railroad tracks below Bridge Number 15558X. 189
Figure 114. Freight train passing below Bridge Number 15558X 189
Figure 115. Bridge elevation view indicating navigation channel and vertical clearance. (Source: Alaska DOT) 192
Figure 116. Bridge elevation view indicating multiple navigation channels and vertical clearances. (Source: Alaska DOT) 193
Figure 117. Bridge elevation view for a vertical lift bridge indicating vertical clearances. (Source: Florida DOT) 193
Figure 118. Bridge elevation view for a vertical lift bridge indicating vertical clearances. 194
Figure 119. Bridge elevation view indicating navigation channel width dimensions. (Source: Alaska DOT) 195
Figure 120. Bridge plan view indicating navigation channel width dimensions. (Source: Alaska DOT) . 196
Figure 121. Bridge elevation view with no substructure units in the waterway. (Source: Alaska DOT) 198

Figure 122. Bridge plan view indicating multiple navigation channel width dimensions to substructure units in the waterway. (Source: Alaska DOT) 198
Figure 123. Bridge elevation view indicating navigation channel clearances to substructure units in the waterway. 198
Figure 124. Berkeley Branch Coldwater Creek below Bridge Number 15558X. 200
Figure 125. Approach view with load posting sign for Bridge Number 15558X. 218
Figure 126. Weight limit sign – gross load. 223
Figure 127. Weight limit sign – truck silhouettes. 223
Figure 128. Weight limit sign – gross load (10T). 225
Figure 129. Weight limit sign – truck silhouettes (8T, 12T, and 16T) for a State that load rates bridges for the AASTHO and FHWA emergency vehicle legal load configurations only. 225
Figure 130. View of MUTCD R12-5 weight limit sign for Bridge Number 15558X. 226
Figure 131. Deck plan view showing defects. 264
Figure 132. Deck spalling along joint. Location 2. 264
Figure 133. Typical deck spall with exposed rebar. Locations 3 and 4. 264
Figure 134. Elevation view of a truss bridge showing superstructure defect locations. 273
Figure 135. Distortion in truss vertical. Location 1. (Source: Colorado DOT) 273
Figure 136. Missing rivets in stringer-to-floor-beam connection. Location 4. (Source: Colorado DOT) 274
Figure 137. Elevation view of two concrete column piers showing substructure defect locations. 283
Figure 138. Crack in Pier 3 column. Location 3 283
Figure 139. Spall in Pier 2 cap beam. Location 1 283
Figure 140. Plan view of pipe culvert showing defects. 286
Figure 141. Corroded pipe culvert inlet. Location 1 and 3. (Source: Alaska DOT) 286
Figure 142. Roadway settlement over pipe culvert. Location 2. (Source: Alaska DOT) 286
Figure 143. Collision-induced distortion of bridge railing. 288
Figure 144. Loss of bearing area for elastomeric bearing. (Source: Oregon DOT) 291
Figure 145. Misaligned rocker bearing. (Source: Alaska DOT) 292
Figure 146. Surface rust on moveable bearing. 292
Figure 147. Joint partially filled with debris. 294
Figure 148. Spall in joint header. (Source: Colorado DOT) 294
Figure 149. Joint seal is torn and partially pulled out. 295
Figure 150. Bridge elevation view of channel condition. (Source: Alaska DOT) 297
Figure 151. Looking downstream from bridge at excavated material. (Source: Alaska DOT) 297
Figure 152. Scour and missing riprap at concrete box culvert outlet. 299
Figure 153. Exposed column footing in stream. 301
Figure 154. Elevation view showing scour elevations and stream cross-section for a bridge. 302
Figure 155. Elevation view showing r scour limits and stream cross-section for a bridge. 302
Figure 156. Elevation view showing current cross-section and previous cross-section for a bridge over water. 303
Figure 157. Elevation view indicating substructure unit numbers for Bridge Number 15558X. (Source: Missouri DOT) 308
Figure 158. Cross-section view of RC voided slab spans one to four for Bridge Number 15558X. (Source: Missouri DOT) 308
Figure 159. Cross-section view, looking north, indicating steel beam numbering in spans five to seven for Bridge Number 15558X. (Source: Missouri DOT) 308
Figure 160. Transverse cracking in top of RC deck for Bridge Number 15558X. 309
Figure 161. Transverse cracking with efflorescence on underside of RC deck for Bridge Number 15558X. 309
Figure 162. Longitudinal cracking in wearing surface for Bridge Number 15558X. 309
Figure 163. Closer view of cracking in wearing surface for Bridge Number 15558X. 310

Figure 164. Spot surface corrosion on steel beams for Bridge Number 15558X. 310
Figure 165. Surface corrosion on cantilever steel beam ends for Bridge Number 15558X. 311
Figure 166. Spalls with exposed rebar on underside of RC voided slab for Bridge Number 15558X. 311
Figure 167. Unsound patched areas and efflorescence on underside of RC voided slab for Bridge Number 15558X. 312
Figure 168. Cracking in south RC abutment for Bridge Number 15558X. 312
Figure 169. Cracking in RC column at Bent 7 for Bridge Number 15558X. 313
Figure 170. Cracking in north RC abutment for Bridge Number 15558X. 313
Figure 171. Typical RC bridge railing condition for Bridge Number 15558X. 314
Figure 172. Typical condition of thrie-beam bridge transition railing for Bridge Number 15558X. 314
Figure 173. Typical rocker bearing with movement restricted by pack rust for Bridge Number 15558X. 315
Figure 174. Typical pot bearings with surface rust for Bridge Number 15558X. 315
Figure 175. Closer view of typical pot bearings with surface rust for Bridge Number 15558X. 315
Figure 176. Strip seal bridge joint for Bridge Number 15558X. 316
Figure 177. Strip seal ripped and punctured completely through for Bridge Number 15558X. 316
Figure 178. RC lined channel with debris and vegetation for Bridge Number 15558X. 317
Figure 179. Bridge elevation view from construction plans for a three-span steel beam bridge. (Source: Alabama DOT) 320
Figure 180. Typical bridge superstructure cross-section view from construction plans for a steel multi-beam bridge. (Source: Alabama DOT) 321
Figure 181. Bridge elements reported to FHWA. 326
Figure 182. Approach roadway for Bridge Number 15558X, looking south. 343
Figure 183. Approach roadway with speed limit sign for Bridge Number 15558X, looking north. 343

LIST OF TABLES

Table 1. Identification data items in the Primary Data Set for Bridge Number 15558X. 31
Table 2. Location data items in the Primary Data Set for Bridge Number 15558X. 46
Table 3. Classification data items in the Primary Data Set for Bridge Number 15558X. 56
Table 4. Span Material and Type data items in the Span Data Sets for Bridge Number 15558X. 79
Table 5. Substructure Material and Type data items in the Substructure Data Set for Bridge Number 15558X. 94
Table 6. Roadside Hardware codes. 96
Table 7. Roadside Hardware. Data items in the Primary Data Set for Bridge Number 15558X. 101
Table 8. Bridge Geometry data items in the Primary Data Set for Bridge Number 15558X. 138
Table 9. Feature Identification data items in the Features Data Set for Bridge Number 15558X. 146
Table 10. Data items in the Routes Data Set for Bridge Number 15558X. 153
Table 11. Highway feature data items in the Features Data Set for Bridge Number 15558X. 181
Table 12. Railroad data items in the Features Data Set for Bridge Number 15558X. 189
Table 13. Navigable Waterway data items in the Features Data Set for Bridge Number 15558X. 200
Table 14. Loads and Load Rating data items in the Primary Data Set for Bridge Number 15558X. 213
Table 15. Load Posting Status Codes. 215
Table 16. Load Posting Status data items in the Posting Status Data Set for Bridge Number 15558X. 218
Table 17. Load Evaluation and Posting data items in the Load Evaluation Data Set for Bridge Number 15558X. 226
Table 18. Inspection Requirement data items in the Primary Data Set for Bridge Number 15558X. 234
Table 19. Inspection Events data items in the Inspections Data Set for Bridge Number 15558X. 251
Table 20. Codes and descriptions for component condition ratings. 255
Table 21. Component Condition Ratings data items in the Primary Data Set for Bridge Number 15558X. 317
Table 22. Bridge elements reported to FHWA. 319
Table 23. Data items in the Elements Data Set for Bridge Number 15558X. 325
Table 24. Element data set for a complete routine inspection performed since the last reporting of data to FHWA. 332
Table 25. Element data collected for a one-time special inspection performed to account for preservation work that occurred after the inspection data shown in Table 24 and prior to reporting data to FHWA. 332
Table 26. Element data set reported to FHWA reflecting all inspections performed since the last reporting of data to FHWA. 333
Table 27. Data items in the Elements Data Set for Bridge Number 15558X. 335
Table 28. Appraisal data items in the Primary Data Set for Bridge Number 15558X. 343
Table 29. Bridge replacement code. 347
Table 30. Bridge improvement codes. 347
Table 31. Rehabilitation codes for deck, superstructure, substructure, and culvert. 347
Table 32. Preservation codes for deck, superstructure, substructure, and culvert. 348
Table 33. Other preservation codes. 348
Table 34. Work Events data items in the Primary Data Set for Bridge Number 15558X. 351
Table 35. Work Events data items in the Work Data Set for Bridge Number 15558X. 351
Table 36. Primary Data Set for Bridge Number 15558X. 354
Table 37. Features Data Sets for Bridge Number 15558X. 356
Table 38. Routes Data Sets for Bridge Number 15558X. 357
Table 39. Span Data Sets for Bridge Number 15558X. 357
Table 40. Substructure Data Sets for Bridge Number 15558X. 357

DRAFT

Table 41. Posting Status Data Sets for Bridge Number 15558X. 357
Table 42. Posting Evaluation Data Sets for Bridge Number 15558X. 358
Table 43. Inspections Data Sets for Bridge Number 15558X. 358
Table 44. Elements Data Sets for Bridge Number 15558X. 359
Table 45. Work Data Sets for Bridge Number 15558X. 359
Table 46. All Materials - defect severity guidance for component condition ratings. 372
Table 47. Concrete - defect severity guidance for component condition ratings. 372
Table 48. Steel - defect severity guidance for component condition ratings. 373
Table 49. Masonry - defect severity guidance for component condition ratings. 373
Table 50. Timber - defect severity guidance for component condition ratings. 373
Table 51. Other Materials - defect severity guidance for component condition ratings. 374
Table 52. Other Materials - defect severity guidance for component condition ratings. 374
Table 53. Bridge Joints - defect severity guidance for component condition ratings. 375
Table 54. Channel - defect severity guidance for component condition ratings. 376

INTRODUCTION

The guidance in this part of Chapter 3 is based on Errata Number 1 Specifications for the National Bridge Inventory (SNBI) with added commentary by NDOT.

The data items in these specifications have been grouped into sections and subsections with like characteristics. The following is a list of sections and subsections in the order that they are presented within these specifications.

- Section 1: Bridge Identification
  - Subsection 1.1: Identification
  - Subsection 1.2: Location
  - Subsection 1.3: Classification
- Section 2: Bridge Material and Type
  - Subsection 2.1: Span Material and Type
  - Subsection 2.2: Substructure Material and Type
  - Subsection 2.3: Roadside Hardware
- Section 3: Bridge Geometry
- Section 4: Features
  - Subsection 4.1: Feature Identification
  - Subsection 4.2: Routes
  - Subsection 4.3: Highways
  - Subsection 4.4: Railroads
  - Subsection 4.5: Navigable Waterways
- Section 5: Loads, Load Rating, and Posting
  - Subsection 5.1: Loads and Load Rating
  - Subsection 5.2: Load Posting Status
  - Subsection 5.3: Load Evaluation and Posting
- Section 6: Inspections
  - Subsection 6.1: Inspection Requirements
  - Subsection 6.2: Inspection Events
- Section 7: Bridge Condition
  - Subsection 7.1: Component Condition Ratings
  - Subsection 7.2: Element Identification
  - Subsection 7.3: Element Conditions
  - Subsection 7.4: Appraisal
  - Subsection 7.5: Work Events

In most subsections, each data item has a single value associated with the reported bridge record. These items are referred to as having a "one-to-one" relationship with the bridge. Even if the value of a data item changes multiple times over a reporting period, only the value that applies at the time of submittal is reported.

In some cases, multiple values may apply but are still reported in a single instance. For these items, shown below, multiple values are delimited by the pipe character (|). No additional spaces should be used in conjunction with the pipe character.

- Item B.ID.02 (*Bridge Name*) – A bridge may be known by several names. This item is part of the Identification subsection.

- Item B.L.12 (*Metropolitan Planning Organization*) – A bridge may be located on a boundary between multiple MPOs. This item is part of the Location subsection.

- Item B.CL.03 (*Federal or Tribal Land Access*) – A bridge may be located on a highway that is owned by a State or local agency and leads to or traverses through multiple Federally managed and/or Tribal government lands. This item is part of the Classification subsection.

- Item B.F.03 (*Feature Name*) – A feature may be known by several names. This item is part of the Feature Identification subsection as described below.

- Item B.EP.03 (*Posting Type*) – Some legal load configurations may have more than one type of posting restricting the configuration. This item is part of the Load Evaluation and Posting subsection as described below.

- Item B.EP.04 (*Posting Value*) – Some legal load configurations may have more than one weight limit value shown on the load posting sign. This item is part of the Load Evaluation and Posting subsection as described below.

- Item B.IE.12 (*Inspection Equipment*) – Some bridges require multiple types of equipment for inspection access and/or specialized inspections. This item is part of the Inspection Events subsection as described below.

- Item B.W.03 (*Work Performed*) – In a given year, multiple types of work may be completed on a bridge. This item is part of the Work Events subsection as described below.

Other subsections contain data items for which there may be multiple values associated with the reported bridge record; however, each value is reported as a separate instance. These items are characterized as having a "many-to-one" relationship with the bridge. These data items fall into two categories, as discussed below.

The first many-to-one category includes data items where multiple events may occur in a reporting period. Each event is reported as a separate sub-record associated with the bridge record. FHWA maintains an historical record of all events that are reported over the life of a bridge. The subsections that contain items in this category are as follows. Sub-records are referred to below as records.

- Subsection 5.2: Load Posting Status – The posting status of a bridge may change multiple times between data submittals and throughout its service life. For each posting status change event, a record is reported that contains a value for Item B.PS.01 (*Load Posting Status*) and Item B.PS.02 (*Posting Status Change Date*).

- Subsection 6.2: Inspection Events – A bridge may undergo several inspection events between data submittals and will undergo many throughout its service life. For each inspection event, a record is reported that contains a value for Item B.IE.01 (*Inspection Type*), Item B.IE.02 (*Inspection Begin Date*), and all other applicable items in this subsection. Multiple values may be reported for Item B.E.12 (*Inspection Equipment*), as described above.

- Subsection 7.5: Work Events – A bridge may have work completed at various times throughout its service life. For each year, a record is reported that contains a value for Item B.W.02 (*Year Work Performed*) and one or multiple values for Item B.W.03 (*Work Performed*), as described above.

The second many-to-one category includes data items where multiple values may apply to a bridge that are not event-related. The first item in the subsection defines a sub-record for each unique value associated with the reported bridge record; all other related items are reported as part of each sub-record. The subsections that contain items in this category are as follows. Sub-records are referred to below as records.

- Subsection 2.1: Span Material and Type – All unique span configurations are identified in Item B.SP.01 (*Span Configuration Designation*). This item has multiple records for a bridge only if there are multiple span configurations. All other items in this subsection are reported for each span configuration record, if they apply to that record.

- Subsection 2.2: Substructure Material and Type - All unique substructure configurations are identified in Item B.SB.01 (*Substructure Configuration Designation*). This item has multiple records for a bridge only if there are multiple substructure configurations. All other items in this subsection are reported for each substructure configuration record, if they apply to that record.

- Subsection 4.1: Feature Identification – Features that are carried on, or pass above or below a bridge, are identified in Item B.F.01 (*Feature Type*). This item always has multiple records for each bridge because there must be at least one feature carried on the bridge and at least one below the bridge. The other items in Section 4 (Features) are reported for each feature record, if they apply to that record. Most items apply only to specific feature types.

- Subsection 4.2: Routes – Each highway feature identified in Item B.F.01 (*Feature Type*) has at least one associated route record. A highway feature has multiple route records only if multiple routes with route numbers share the highway feature. All unique routes are identified in Item B.RT.01 (*Route Designation*). The items in this subsection are reported for each route record.

- Subsection 4.3: Highways – The items in this subsection are reported for each highway feature reported in Item B.F.01 (*Feature Type*).

- Subsection 4.4: Railroads – The items in this subsection are reported for each railroad feature reported in Item B.F.01 (*Feature Type*).

- Subsection 4.5: Navigable Waterways – The items in this subsection are reported for each waterway feature reported in Item B.F.01 (*Feature Type*). If the waterway is not a navigable waterway, only Item B.N.01 (*Navigable Waterway*) is reported.

- Subsection 5.3: Load Evaluation and Posting – When a bridge has undergone a legal load rating evaluation or posting, all legal load configurations that were evaluated or posted are identified in Item B.EP.01 (*Legal Load Configuration*). This item has multiple records for a bridge only if multiple legal load configurations were evaluated or posted. All other items in this subsection are reported for each legal load configuration record, if they apply to that record.

- Subsection 7.2: Element Identification and Subsection 7.3: Element Conditions – All elements that are associated with a bridge are identified in Item B.E.01 (*Element Number*). This item has multiple records for most bridges. All other items in these two subsections are reported for each element record; Item B.E.02 (*Element Parent Number*) is reported only if it applies to that element record.

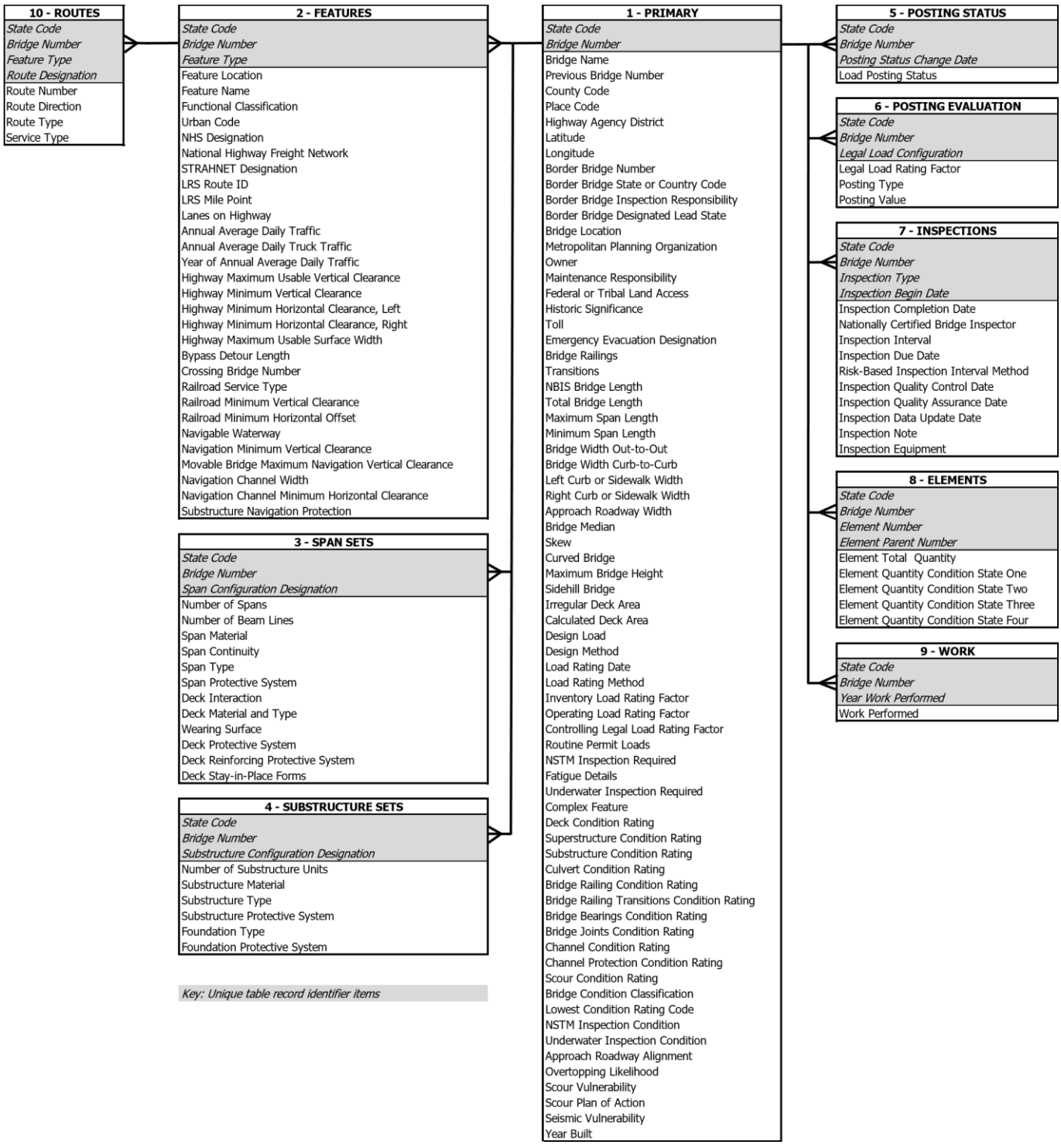


Figure 1. SNBI data relationships.

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

AADT	Annual average daily traffic
AADTT	Annual average daily truck traffic
AASHTO	American Association of State Highway and Transportation Officials
AGC	Associated General Contractors of America
AN	Alpha numeric
ARS	Agricultural Research Service (United States Department of Agriculture)
ARTBA	American Road and Transportation Builders Association
BIRM	Bridge Inspector's Reference Manual
C	Calculated
CFR	Code of Federal Regulations
CIP	Cast-in-place
CL	Center line
CA	Canada
CS	Condition state
D	Date
DC	District of Columbia
DOD	Department of Defense
DOT	Department of Transportation
E	East
EA	Each
EI	Each inspection
EN	Element number
EPN	Element parent number
FHWA	Federal Highway Administration
FIPS	Federal Information Processing Series
FL	Florida
FRP	Fiber reinforced polymer
ft	Foot or feet
ft^2	Square foot or square feet
Glulam	Glued laminated timber
GRS	Geosynthetic reinforced soil
HDPE	High density polyethylene
HEC	Hydraulic Engineering Circular
HPMS	Highway Performance Monitoring System
Hwy	Highway
I	Initial or Interstate
ID	Identification
in	Inch or inches
LF	Linear feet
LRFD	Load and Resistance Factor Design
LRFR	Load and Resistance Factor Rating
LRS	Linear Referencing System
MASH	Manual for Assessing Safety Hardware (AASHTO)
MBE	Manual for Bridge Evaluation (AASHTO)
MBEI	Manual for Bridge Element Inspection (AASHTO)
MHHW	Mean high-high water
MHW	Mean high water

MLW	Mean low water
MoDOT	Missouri Department of Transportation
MPO	Metropolitan Planning Organization
MSE	Mechanically stabilized earth
MUTCD	Manual on Uniform Traffic Control Devices
MX	Mexico
N	Numeric or North
NA	Not applicable
NASA	National Aeronautics and Space Administration
NBI	National Bridge Inventory
NBIS	National Bridge Inspection Standards, 23CFR650C
NCHRP	National Cooperative Highway Research Program
NDE	Non-destructive evaluation
NE	Nebraska
NHFN	National Highway Freight Network
NHS	National Highway System
NSTM	Nonredundant steel tension member
PE	Polyethylene
POA	Plan of action
PSC	Prestressed concrete
PUB	Publication
QA	Quality Assurance
QC	Quality Control
QTY	Quantity
RC	Reinforced concrete
RF	Rating Factor
SCUBA	Self-contained underwater breathing apparatus
SDDC	Military Surface Deployment and Distribution Command
SF	Square foot or square feet
SHPO	State Historic Preservation Office or Officer
S	South
SN	Structure number
SNBI	Specifications for the National Bridge Inventory
SR	State route
STIP	Statewide Transportation Improvement Program
STRAHNET	Strategic highway network
U.S.	United States
U.S.C.	United States Code
W	West

DEFINITIONS

AASHTO Manual: The term "AASHTO Manual" means the American Association of State Highway and Transportation Officials (AASHTO) "Manual for Bridge Evaluation" with Sections 1.4, 2.2, 4.2, 6, and 8, excluding the 3rd paragraph in Article 6B.7.1. (23 CFR 650.317(a)(1))

AASHTO MBEI: AASHTO Manual for Bridge Element Inspection is a reference for standardized element definitions, element quantity calculations, condition state definitions, element feasible actions, and inspection conventions. This manual is used for element descriptions, quantity calculations, and condition state definitions. (23 CFR 650.317(a)(2))

Annual Average Daily Traffic (AADT): The total annual volume of traffic passing a point or segment of a highway in both directions divided by the number of days in a year.

Annual Average Daily Truck Traffic (AADTT): The total annual volume of truck traffic passing a point or segment of a highway in both directions divided by the number of days in a year.

Bridge: A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it includes multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. (23 CFR 650.305)

Bridge Elements: Individual parts of a bridge that are subsets of bridge components, inventoried separately as functional groups. Elements inventoried on the bridge include: the total quantity for each element, and the element quantity that exists in each of four condition states reported to the NBI in accordance with 23 U.S.C. 144(d)(2).

Bridge Inspector's Reference Manual: A comprehensive FHWA manual on procedures and techniques for inspecting and evaluating a variety of in-service highway bridges. This manual is available at: https://www.fhwa.dot.gov/bridge/nbis.cfm. (23 CFR 650.305)

Closed Median: A median in which the area between the two roadways on the structure is bridged over and is capable of supporting traffic.

Complex Feature: 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 movable spans and cable-related members of suspension and cable-stayed superstructures. (23 CFR 650.305)

Culvert:	A structure comprised of one or more barrels, beneath an embankment and designed structurally to account for soil-structure interaction. These structures are hydraulically and structurally designed to convey water, sediment, debris, and, in many cases, aquatic and terrestrial organisms through roadway embankments. Culvert barrels have many sizes and shapes and have inverts that are either integral or open, i.e. supported by spread or pile-supported footings. Many culverts take advantage of headwater submergence of the inlet to increase hydraulic efficiency and economy.
Damage Inspection:	An unscheduled inspection to assess structural damage resulting from environmental factors or human actions. (23 CFR 650.305)
Designated Lead State:	The State responsible for reporting the full bridge record for a border bridge. The Designated Lead State and Neighboring State are determined through agreement between the two border States.
Divided Highway:	A highway with separated roadways for traffic traveling in opposite directions.
Double Deck Bridge:	A bridge consisting of two decks, tiers, or levels. These bridges may incorporate highway lanes on both levels or highway lanes on one level and other transportation modes on the other level.
Driver Expectation:	Relates to the likelihood that a driver will respond to common situations in predictable ways that the driver has found successful in the past. A driver's readiness to respond to situations, events, and information in predictable and successful ways.
Efflorescence:	A deposit on concrete, brick, stone, or mortar caused by crystallization of carbonates brought to the surface by moisture in the masonry or concrete. Efflorescence is a combination of calcium carbonate leached out of the cement paste and other recrystallized carbonate and chloride compounds.
Element Level Bridge Inspection Data:	Quantitative condition assessment data, collected during bridge inspections, that indicates the severity and extent of defects in bridge elements. (23 CFR 650.305)
Engineered Wood:	Products that utilize veneers, plywood, reconstituted wood panel products, or engineered wood assemblies. Some engineered wood products include glued laminated timber, I-joists, and laminated veneer lumber.

Federal Information Processing Series (FIPS):	A system of numeric and/or alphabetic coding issued by the National Institute of Standards and Technology (NIST), an agency of the US Department of Commerce. FIPS codes are assigned for a variety of geographic entities including American Indian and Alaska Native Areas, Hawaiian home lands, congressional districts, counties, county subdivisions, metropolitan areas, places, and states. FIPS codes were discontinued by NIST in 2005, but the Census Bureau continues to maintain and issue codes for the geographic entities covered. (https://www.fhwa.dot.gov/bridge/nbi.cfm)
Federal Lands:	Lands under the jurisdiction of Federal agencies. FHWA's Federal Land Management Agency partners currently include: National Park Service (NPS); USDA Forest Service (Forest Service); U.S. Fish and Wildlife Service (USFWS); Bureau of Indian Affairs (BIA) and Tribal Governments; Bureau of Land Management (BLM); Department of Defense (DOD); U.S. Army Corps of Engineers (USACE); and Bureau of Reclamation (BOR). (https://highways.dot.gov/federal-lands/about)
Ferry Transfer Bridge:	A bridging structure that enables vehicular movement from a dock or approach roadway to a ferry.
Fiber Reinforced Polymer Composite:	Fiber reinforced polymer composite (FRP) is also known as fiberglass reinforced plastic and is a composite made from glass fiber or carbon fiber reinforcement in a plastic (polymer) matrix. With reinforcement of the plastic matrix, a wide variety of physical strengths and properties can be designed into the material. Additionally, the type and configuration of the reinforcement can be selected, along with the type of polymer and additives within the matrix.
Floating Bridge:	A bridge supported by floating on pontoons moored to the lakebed or riverbed; a portion may be removable to facilitate navigation.
Hands-on Inspection:	Inspection within arm's length of the member. Inspection uses visual techniques that may be supplemented by nondestructive evaluation techniques. (23 CFR 650.305)
Highway Performance Monitoring System:	A national level highway information system that includes data on the extent, condition, performance, use, and operating characteristics of the nation's highways. (HPMS Field Manual: https://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/)

Hydraulic review: A review by a person qualified to evaluate the field-observed hydraulic conditions and make a determination of the impacts of the conditions on the performance of the channel, channel protection, or when working with structural staff, determine the scour vulnerability of a bridge member or entire bridge. Hydraulic reviews may include a review of the field inspection notes and photographs, review of as-built plans, scour appraisals, and scour POAs, or performance of a hydraulic analysis as deemed appropriate.

In-Depth Inspection: A close-up, detailed inspection of one or more bridge members located above or below water, using visual or nondestructive evaluation techniques as required to identify any deficiencies not readily detectable using routine inspection procedures. Hands-on inspection may be necessary at some locations. In-depth inspections may occur more or less frequently than routine inspections, as outlined in bridge specific inspection procedures. (23 CFR 650.305)

Initial Inspection: The first inspection of a new, replaced, or rehabilitated bridge. This inspection serves to record required bridge inventory data, establish baseline conditions, and establish the intervals for other inspection types. (23 CFR 650.305)

Inspection Date: The date on which the field portion of the bridge inspection is completed. (23 CFR 650.305)

Inspection Due Date: The last inspection date plus the current inspection interval. (23 CFR 650.305)

Inspection Report: The document which summarizes the bridge inspection findings, recommendations, and identifies the team leader responsible for the inspection and report. (23 CFR 650.305)

Internal Redundancy: A redundancy that exists within a primary member cross-section without load path redundancy, such that fracture of one component will not propagate through the entire member, is discoverable by the applicable inspection procedures, and will not cause a portion of or the entire bridge to collapse. (23 CFR 650.305)

Inventory Data: All data reported to the National Bridge Inventory in accordance with the Specifications for the National Bridge Inventory. (23 CFR 650.317(b)(1)).

Legal Load: The maximum load for each vehicle configuration, including the weight of the vehicle and its payload, permitted by law for the State in which the bridge is located. (23 CFR 650.305)

Legal Load Rating: The maximum permissible legal load to which the structure may be subjected with the unlimited numbers of passages over the duration of a specified bridge evaluation period. Legal load rating is a term used in Load and Resistance Factor Rating method. (23 CFR 650.305)

Legally Enforceable Load Posting:	Posting of a load restriction sign (or signs) at a bridge in accordance with State law that is legally enforceable by law enforcement personnel.
Linear Referencing System:	Provides a geospatial representation of a road network through a set of procedures for determining and retaining a record of specific points along a highway. Typical methods used are mile point, milepost, reference point, or link node. LRS data are required for the annual Highway Performance Monitoring System (HPMS) data submittal from the States to FHWA.
Load Path Redundancy:	A redundancy that exists based on the number of primary load-carrying members between points of support, such that fracture of the cross section at one location of a member will not cause a portion of or the entire bridge to collapse.
Load Posting:	Regulatory signs installed in accordance with the "Manual on Uniform Traffic Control Devices" and State or local law which represent the maximum vehicular live load which the bridge may safely carry. (23 CFR 650.305)
Load Posting:	Regulatory signs installed in accordance with the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD) and State or local law which represent the maximum vehicular live load which the bridge may safely carry. (23 CFR 650.305)
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. (23 CFR 650.305)
Major Rehabilitation:	The major work required to restore the structural integrity or serviceability of a bridge as well as work necessary to correct major safety defects.
Median:	The portion of a highway separating opposing directions of the traveled way.
Minor Rehabilitation:	The minor work required to preserve or restore the structural integrity of a bridge or serviceability as well as the work necessary to correct minor safety defects.
Multi-level Interchange:	A multilevel highway intersection or junction of intersecting roads and bridges arranged so that vehicles may move from one road to another without crossing the streams of traffic.
National Bridge Inspection Standards:	Federal regulations establishing national policy regarding bridge inspection organization, bridge inspection frequency, inspector qualifications, inventory requirements, report formats, and inspection and rating procedures, as described in 23 CFR 650 Subpart C.

National Bridge Inventory: An aggregation of State transportation department, Federal agency and Tribal government bridge and associated highway data maintained by the Federal Highway Administration (FHWA). The NBIS requires each State transportation department, Federal agency, and Tribal government to prepare and maintain a bridge inventory, which must be submitted to FHWA in accordance with these specifications on an annual basis or whenever requested. (23 CFR 650.315)

National Highway Freight Network: A national highway freight network established by FHWA to assist States in strategically directing resources toward improved movement of freight on highways. The National Highway Freight Network consists of a Primary Highway Freight System, the portions of the Interstate System not designated as part of the Primary Highway Freight System, and Critical Rural Freight Corridors and Critical Urban Freight Corridors designated by states. (https://ops.fhwa.dot.gov/Freight/infrastructure/nfn/index.htm)

Nationally Certified Bridge Inspector: An individual meeting the team leader requirements of 23 CFR 650.309(b).

Navigable Waterway: Navigable waterways are determined by the Commandant of the United States Coast Guard. Title 33 of the Code of Federal Regulations, Section 2.36, defines navigable waterways as consisting of:

1. Territorial seas of the United States;
2. Internal waters of the United States that are subject to tidal influence; and
3. Internal waters of the United States not subject to tidal influence that:
   a. Are or have been used, or are or have been susceptible for use, by themselves or in connection with other waters, as highways for substantial interstate or foreign commerce, notwithstanding natural or man-made obstructions that require portage, or
   b. A governmental or non-governmental body, having expertise in waterway improvement, determines to be capable of improvement at a reasonable cost (a favorable balance between cost and need) to provide, by themselves or in connection with other waters, highways for substantial interstate or foreign commerce.

Neighboring State: The State responsible for reporting an abbreviated bridge record for a border bridge. The Designated Lead State and the Neighboring State are determined through agreement between the two border States.

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. (23 CFR 650.305)

Nonredundant Steel Tension Member (NSTM) Inspection: A hands-on inspection of a nonredundant steel tension member. (23 CFR 650.305)

Operating Rating: The maximum permissible live load to which the structure may be subjected for the load configuration used in the load rating. Allowing unlimited numbers of vehicles to use the bridge at operating level may shorten the life of the bridge. Operating rating is a term used in either Allowable Stress or Load Factor Rating method. (23 CFR 650.305)

Orthotropic Deck: An orthotropic deck consists of a flat, thin steel plate stiffened by a series of closely spaced longitudinal ribs at right angles to the floor beams. The deck acts integrally with the steel superstructure.

Private Bridge: A bridge open to public travel and not owned by a public authority as defined in 23 U.S.C. 101. (23 CFR 650.305)

Procedures: Written documentation of policies, methods, considerations, criteria, and other conditions that direct the actions of personnel so that a desired end result is achieved consistently. (23 CFR 650.305)

Probability: Extent to which an event is likely to occur during a given interval. This may be based on the frequency of events, such as in the quantitative probability of failure, or on degree of belief or expectation. Degrees of belief about probability can be chosen using qualitative scales, ranks, or categories such as, remote, low, moderate, or high. (23 CFR 650.305)

Program Manager: The individual in charge of the program, that has been assigned the duties and responsibilities for bridge inspection, reporting, and inventory, and has the overall responsibility to ensure the program conforms with the requirements of the NBIS as provided in 23 CFR 650 Subpart C. The program manager provides overall leadership and is available to inspection team leaders to provide guidance. (23 CFR 650.305)

Public Road: Defined in 23 U.S.C. 101(a) as any road or street under the jurisdiction of and maintained by a public authority and open to public travel. (23 CFR 650.305).

Quality Assurance (QA): The use of sampling and other measures to assure the adequacy of quality control procedures in order to verify or measure the quality level of the entire bridge inspection and load rating program. (23 CFR 650.305)

Quality Control (QC): Procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level. (23 CFR 650.305)

Railroad Flat Car: A salvaged flatbed railroad car used as a bridge superstructure, typically on low-volume roads. This type of bridge often has NSTMs.

Replacement: Total replacement of a bridge with a new facility constructed in the same general traffic corridor.

Risk: The exposure to the possibility of structural safety or serviceability loss during the interval between inspections. It is the combination of the probability of an event and its consequence. (23 CFR 650.305)

Roadway: The portion of a highway, including shoulders, for vehicular use. A divided highway has two or more roadways.

Route: A specific road, highway, or travel way open to public travel.

Routine Inspection: Regularly scheduled comprehensive inspection consisting of observations and measurements needed to determine the physical and functional condition of the bridge and identify changes from previously recorded conditions. (23 CFR 650.305)

Routine Permit Load: A live load, which has a gross weight, axle weight, or distance between axles not conforming with State statutes for legally configured vehicles, authorized for unlimited trips over an extended period of time to move alongside other heavy vehicles on a regular basis. (23 CFR 650.305)

Safe Load Capacity: A live load that can safely utilize a bridge repeatedly over the duration of a specified inspection interval. (23 CFR 650.305)

Scour: Erosion of streambed or bank material due to flowing water; often considered as being localized around piers and abutments of bridges. (23 CFR 650.305)

Scour Appraisal: A risk-based and data-driven determination of a bridge's vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated through a scour evaluation or a scour assessment. (23 CFR 650.305)

Scour Assessment: The determination of an existing bridge's vulnerability to scour which considers stream stability and scour potential as described in HEC 20 and other scour-related data sources. (23 CFR 650.305)

Scour Critical Bridge: A bridge with a foundation member that is unstable, or may become unstable, as determined by the scour appraisal. (23 CFR 650.305)

Scour Evaluation: The application of hydraulic analysis as described in HEC 18 and HEC 20 to estimate scour depths and determine bridge and substructure stability considering potential scour. (23 CFR 650.305)

Scour Monitoring Inspection: An inspection performed during or after a triggering storm event as required by a Scour Plan of Action (POA), by personnel with qualifications required by the agency.

Scour Plan of Action (POA): Procedures for bridge inspectors and engineers in managing each bridge determined to be scour critical or that has unknown foundations. (23 CFR 650.305)

Service Inspection: An inspection to identify major deficiencies and safety issues, performed by personnel with general knowledge of bridge maintenance or bridge inspection. (23 CFR 650.305)

Special Inspection: An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency, or to monitor special details or unusual characteristics of a bridge that does not necessarily have defects. (23 CFR 650.305)

State: Any of the 50 States, the District of Columbia, or Puerto Rico. (23 U.S.C. 101(a))

State Transportation Department: That department, commission, board, or official of any State charged by its laws with the responsibility for highway construction. (23 U.S.C. 101(a))

Strategic Highway Network (STRAHNET) Connectors: Highways which provide access between major military installations and highways which are part of the Strategic Highway Network.

Strategic Highway Network (STRAHNET): A network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity, and emergency capabilities for defense purposes.

Structural Review: A review by a person qualified to evaluate the field-observed conditions and make a determination of the impacts of the conditions on the performance of the bridge member or entire bridge. Structural reviews may include a review of the field inspection notes and photographs, review of as-built plans, or analysis as deemed appropriate.

Supported Bridge: A bridge with temporary shoring, supports, repairs, or supplemental members that are installed to keep the bridge open despite deficiencies in the permanent structure, pending future repairs or replacement.

System Redundancy: A redundancy that exists in a bridge system without load path redundancy, such that fracture of the cross section at one location of a primary member will not cause a portion of or the entire bridge to collapse. (23 CFR 650.305)

Team Leader: The on-site, nationally certified bridge inspector in charge of an inspection team and responsible for planning, preparing, performing, and reporting on bridge field inspections. (23 CFR 650.305)

Temporary Bridge: A bridge which is constructed to carry highway traffic until the permanent facility is built, repaired, rehabilitated, or replaced. (23 CFR 650.305)

Traveled Way: The portion of roadway for the movement of vehicles, exclusive of shoulders.

Underwater Bridge Inspection Diver: The individual performing the inspection of the underwater portion of the bridge. (23 CFR 650.305)

Underwater Inspection: Inspection of the underwater portion of a bridge substructure and the surrounding channel, which cannot be inspected visually at low water or by wading or probing, and generally requiring diving or other appropriate techniques. (23 CFR 650.305)

Unknown Foundations: Foundations of bridges over waterways where complete details are unknown because either the foundation type and depth are unknown, or the foundation type is known, but its depth is unknown, and therefore cannot be appraised for scour vulnerability. (23 CFR 650.305)

SPECIFICATION FORMAT

These specifications provide information in a format modeled in part after the AASHTO design specifications, with the specification separated and presented parallel to the commentary. The format used to present the data items is as shown in the following table.

<table>
<tr><td colspan="3">Data Item Name</td></tr>
<tr><td>Format</td><td>Frequency</td><td>Item ID</td></tr>
<tr><td colspan="2">Specification</td><td>Commentary</td></tr>
<tr><td colspan="2">Requirements for reporting the data item.</td><td>Expanded guidance on the specification.</td></tr>
<tr><td colspan="3">Specification Continued, Commentary Continued, or Examples</td></tr>
<tr><td colspan="3">Additional space for Specification or Commentary, if needed. Examples are presented to further clarify the specification. Each item typically has brief examples. A more comprehensive example can be found at the end of each section or subsection.</td></tr>
</table>

The fields shown in the table above are further described as follows.

Field Name	Description
Format	Designates the format of the data using one of the following: AN (X) – Alphanumeric, where X is the maximum number of characters. Use the pipe character (|) as the text or code delimiter when applicable. Example: Urban Code format is AN (5) – Alphanumeric data, up to 5 characters. Urban Code is 02629. Report 02629. Example: Bridge Name format is AN (300) – Alphanumeric data, up to 300 characters. Bridge Name is Indian River Inlet Bridge. Report Indian River Inlet Bridge. N (X,Y) – Numeric, where X is the maximum number of digits (excludes decimal point), and Y is the number of decimal places. Example: Total Bridge Length format is N (7,1) – Numeric data, up to 7 digits including 1 decimal place. Bridge Length is 251,105.38 ft. Report 251105.4. YYYYMMDD – Date, where leading zeroes are required. Example: July 1, 2016. Report 20160701. This information is provided to assist owners when establishing databases and reporting data to FHWA.

Field Name	Description
Frequency	I (Initial) – Data are recorded initially and updated when necessary, but would not typically change from inspection to inspection. Data are recorded or updated by the inspector or other agency personnel. EI (Each Inspection) – Data are verified and/or updated by the inspector during each inspection. C (Calculated) – Data are automatically calculated and stored by FHWA and are not recorded during inspections or reported to FHWA.
Item ID	This is a unique indicator assigned to each bridge item, following this format: B.X.Y, where B indicates that it is a bridge item, X is an alphabetic designation for the section or subsection of the Specifications in which the item appears, and Y is a unique numerical designation indicating the order of appearance for that item within the section or subsection. Section and Subsection designations are as follows: Section 1: Bridge Identification ID – Identification L – Location CL – Classification Section 2: Bridge Material and Type SP – Span Material and Type SB – Substructure Material and Type RH – Roadside Hardware Section 3: Bridge Geometry G – Bridge Geometry Section 4: Features F – Feature Identification RT – Routes H – Highways RR – Railroads N – Navigable Waterways Section 5: Loads, Load Rating, and Posting LR – Loads and Load Rating PS – Load Posting Status EP – Load Evaluation and Posting

Field Name	Description
Item ID (continued)	Section 6: Inspections IR – Inspection Requirements IE – Inspection Events Section 7: Bridge Condition C – Component Condition Ratings E – Element Identification CS – Element Conditions AP – Appraisal W – Work Events

BORDER BRIDGES

When a bridge crosses a border between two or more states, the Designated Lead State submits a full bridge record, including all features associated with the bridge, regardless of the location of the feature on either side of the border. The Neighboring State reports an abbreviated bridge record that includes feature records for all highway features carried on or passing above the bridge. The Neighboring State does not report non-highway features. Features that pass below the bridge are reported only by the Designated Lead State. The Designated Lead State is determined through agreement between the bordering States.

Concurrence as to the accuracy of the items associated with the border bridge occurs between the bordering States prior to submittal. Submittal of the border bridge data signifies such concurrence. The data reported by the Designated Lead State for a border bridge is incorporated into the Neighboring State's bridge inventory upon acceptance into the NBI, except for the data contained in the abbreviated bridge record submitted by the Neighboring State. The Neighboring State reports only the items listed below, as values for these items may vary between
States. Additional data items reported by the Neighboring State are not processed. It is essential that Item B.F.01 (*Feature Type*) values be assigned to the same features by both States so that the Designated Lead State's submitted feature data are assigned to the correct feature records in the Neighboring State's inventory.

When a border bridge is submitted by a Federal agency or Tribal government, the submitting entity determines which is the Designated Lead State, and which is the Neighboring State. The Federal agency or Tribal government submits both records; Item B.ID.1 (*Bridge Number*) may be the same for both. When a bridge crosses an international border, the bordering State is considered the Designated Lead State and reports a full bridge record.

Item ID	**Data Item**
B.ID.01	Bridge Number
B.ID.03	Previous Bridge Number
B.L.01	State Code
B.L.02	County Code
B.L.03	Place Code
B.L.04	Highway Agency District
B.L.07	Border Bridge Number
B.L.08	Border Bridge State or Country Code
B.L.09	Border Bridge Inspection Responsibility
B.L.10	Border Bridge Designated Lead State
B.L.12	Metropolitan Planning Organization
B.F.01	Feature Type
B.F.02	Feature Location
B.F.03	Feature Name
B.RT.01	Route Designation
B.RT.02	Route Number
B.RT.03	Route Direction
B.RT.04	Route Type
B.RT.05	Service Type
B.H.03	NHS Designation
B.H.06	LRS Route ID
B.H.07	LRS Mile Point
B.H.18	Crossing Bridge Number

COMPREHENSIVE EXAMPLE

These specifications include a comprehensive example to illustrate the proper recording of data items as well as the relationship between data items in each subsection and the full set of data required for a bridge. The bridge in the comprehensive example is Bridge Number 15558X in St. Louis County, Missouri. The characteristics of this bridge serve to illustrate the relational nature of the data collected for many of the subsections; the bridge crosses several features of differing types (waterway, highway, and railroad), is comprised of several material and structure types, and is posted for various vehicle loads. When possible, inventory information for this bridge is taken from existing inventory data for Missouri Bridge Number 15558, but with modifications made as necessary for illustrative purposes.



Figure 2. Elevation view of Bridge Number 15558X, looking east.

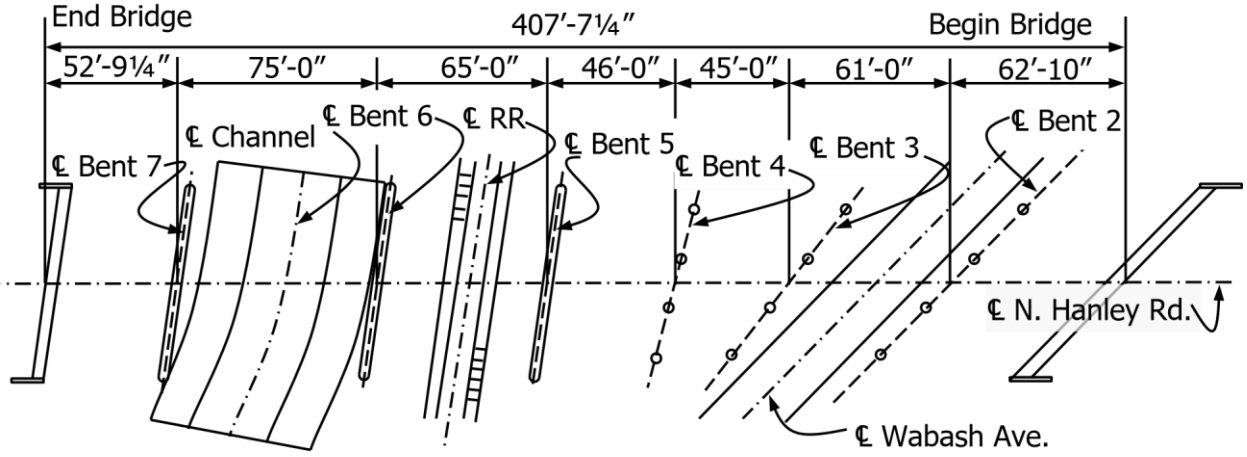


Figure 3. Plan View of Bridge Number 15558X



Figure 4. Approach view to Bridge Number 15558X, looking south.

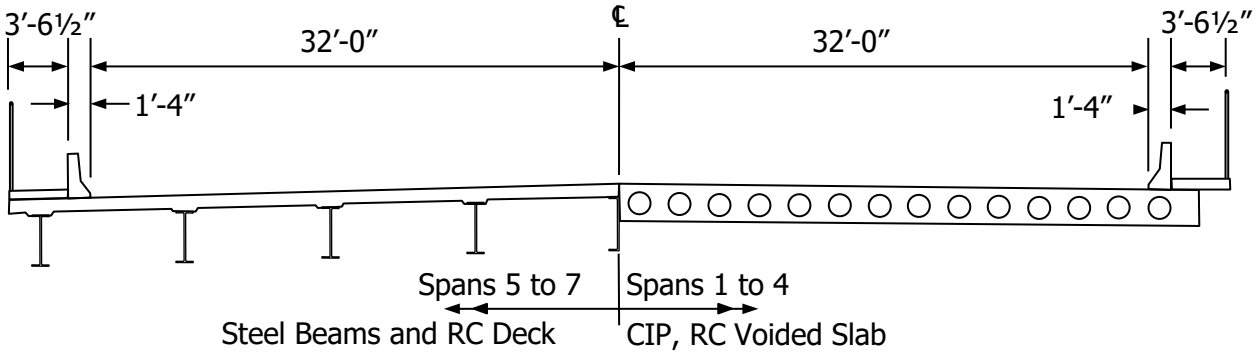


Figure 5. Typical section views for Bridge Number 15558X.

The end of each subsection presents relevant background information and a completed table of the data items in that subsection for Bridge Number 15558X. Appendix A presents the complete data set for the bridge.

SECTION 1: BRIDGE IDENTIFICATION

This section has data items that have been grouped by the following three subsections: Identification, Location, and Classification. The data items in these subsections identify, locate, and classify bridges and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been inventoried.

The following data items are included in this section.

SUBSECTION 1.1: IDENTIFICATION

Item ID	Data Item
B.ID.01	Bridge Number
B.ID.02	Bridge Name
B.ID.03	Previous Bridge Number

SUBSECTION 1.2: LOCATION

Item ID	Data Item
B.L.01	State Code
B.L.02	County Code
B.L.03	Place Code
B.L.04	Highway Agency District
B.L.05	Latitude
B.L.06	Longitude
B.L.07	Border Bridge Number
B.L.08	Border Bridge State or Country Code
B.L.09	Border Bridge Inspection Responsibility
B.L.10	Border Bridge Designated Lead State
B.L.11	Bridge Location
B.L.12	Metropolitan Planning Organization

SUBSECTION 1.3: CLASSIFICATION

Item ID	Data Item
B.CL.01	Owner
B.CL.02	Maintenance Responsibility
B.CL.03	Federal or Tribal Land Access
B.CL.04	Historic Significance
B.CL.05	Toll
B.CL.06	Emergency Evacuation Designation

SUBSECTION 1.1: IDENTIFICATION

The data items in this subsection uniquely identify the bridge and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been inventoried.

The following data items are included in this subsection.

Item ID	Data Item
B.ID.01	Bridge Number
B.ID.02	Bridge Name
B.ID.03	Previous Bridge Number

B.ID.01 Bridge Number

Format	Frequency	Item ID
AN (15)	I	B.ID.01

Specification	Commentary
Report the unique bridge number assigned according to agency policy for each bridge meeting the NBIS bridge definition that is fully or partially located within the State's boundaries, Federal agency's responsibility or jurisdiction, or Tribal government's responsibility or jurisdiction, regardless of inspection or financial responsibility. Do not change the bridge number once it has been assigned and recorded, except for a rare or unusual circumstance that requires a onetime change. When a bridge number is changed, report the previous bridge number under B.ID.03. Report all spans from abutment to abutment as one bridge.	There are no national policies established for assigning unique bridge numbers. Therefore, each State transportation department, Federal agency, or Tribal government develops policy for assigning unique bridge numbers. It is preferable that a new and unique bridge number be assigned when a bridge is replaced. When any portion of the existing bridge is retained for a rehabilitated or partially replaced bridge, it is preferable to retain the existing bridge number. It is expected that all spans of a superstructure spanning from one abutment to another be recorded as one bridge, per the NBIS bridge definition, not as multiple bridges.

Commentary Continued

For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

It is preferable that one bridge number be assigned to a bridge that supports multiple features.

It is preferable that any bridge or bridges with a closed median, where the area between the two roadways on the bridge is bridged over and can support traffic, be reported as one bridge. Closed medians may have either mountable or non-mountable curbs or barriers. It is preferable that separate superstructures with an open median (not meeting the closed median criteria above) sharing a common substructure unit or units be reported as two bridges.

It is preferable that separate bridge numbers be reported for each mainline bridge and the ramp that connects to the mainline bridge, when the ramp has at least one distinct abutment and is greater than 20 feet in length. It is also preferable that separate bridge numbers be reported for a bridge that divides into two or more separate bridges, or two or more bridges that merge into one single bridge. In both cases, the separating point between bridges should be the closest deck joint, or substructure unit to the separating point, or other logical and reasonable location as determined by the bridge owner.

Double deck bridges may be reported as one or two bridges. However, all related data items need to be compatible with the method selected.

Consult with the local FHWA division office contact for questions concerning assigning bridge numbers to unique or complex bridges.

NDOT Commentary – Bridge Number

The Nebraska Department of Transportation structure numbers are 10 or 11 characters and use the general format provided in the table, on the next page. For the purposes of the FHWA data submittal structure numbers are left justified in the required 15-character field with additional spaces remaining empty.

Any structure over an Interstate should be named for the Interstate. Any local structure over a route on the state system should be named for the route under. The identical structure number must appear on the "on" and all "under" records associated with a particular structure.

The following format must be used for Structure Numbers:
County Bridges – Structure No. XXXXXXXXXX Example: C002004305
State System Bridges – Structure No. XXXX XXXXX Example: S077 12668
Municipal/Urban Bridges – Structure No. XXXXXXXXXX Example: M032000P01

State system structure numbers consist of the highway number and reference post number. The first one or two characters will be a letter designating the type of road. ("S" = state, "C" = county, "U" = urban, "M" = municipal, "SS" = state spur, "SL" – state link, "SR" = state recreation). The next three or four characters designate the location by county, city, or highway number. The last five numbers indicate the reference post, which is unique to the bridge, and give its exact location. Except for links and spurs, most reference posts increase from West to East and South to North. The very last character is usually left blank. In the case of twin structures, an "L" or "R" may appear as a letter on the end to designate right or left structure. Other letters may be used to designate ramp structures at interchanges. If a structure number has a reference post with a letter on the end, then the letter must be included with the reference post in the title block. If information on Bridge Plans Sheets applies to both a Left and a Right structure, then add "L & R" to the end of the structure number, (S077 12668L&R).

Twin Structure:
Generally, twin structures have concrete barriers that are separated by a large or small non-mountable distance, regardless of whether the abutments or piers are common to both structures.

Single Structure:
Generally, single structures have a 6 in. median curb or solid median barrier separating lanes of traffic. In other words, the superstructure is one piece. Any structure or structures with a closed median should be considered as one structure, not two. Closed medians may have either mountable or non-mountable curbs or barriers.

Structure Number Changes on the State System:
A plaque with the last 5 or 6 characters of the structure number is displayed at the end of the bridge facing oncoming traffic. Since NDOT uses Highway Number and reference post as part of the Bridge Number new surveys, alignments or route designations can trigger the need to change a Bridge Number. In general, the structure number will only be changed if the route number changes or the reference post changes by more than 0.25 miles. In the case of Bridge Number changes the Bridge Program Manager or their representative will request an update to the plaque by the District Maintenance Engineering staff.

Both City and County owned structure numbers use public agency identification codes as shown in BIPM Appendix NE Local Public Agencies List.

City owned bridges *(structures in municipal boundaries, not owned by the state) will be numbered as follows:*

*A one-character prefix of "**U**", for Urban or "**M**" for Municipal is used depending on the population at the time of the 10-year census. If the population is 5,000 or more the city is considered Urban (and is a city of the first class as per Nebraska Revised Statute 16-101). If the city has a population of less than 5,000 and is incorporated, it is considered Municipal in the Nebraska bridge inventory.*

The one-character prefix for city bridges is followed by a four-character municipal code.

County Owned bridges *will be numbered as follows:*
*A one-character prefix of "**C**", followed by two zeros, the two digit county code, and a five-or six-character structure location number. If the county code is a single digit, then a leading zero is added to maintain a two-digit format.*

*Historically, the structure location number consisted of one letter followed by four digits. However, this format is no longer recommended. The current standard for structure location numbers uses five digits, consistent with the format used for county-owned structures. If a bridge is not located on a section line, a "**P**" is added to the end of the five digits.*

Structure Location Numbers

- *The first three digits correspond to the continuous road segment and the section line number it lies on.*
    - *The first digit is the numbered continuous road segment the bridge lies on along the section line starting at 0.*
    - *The next two digits specify the section line number.*
        - *Even numbers are used for east-west section line roads, typically starting with the northernmost section line in a county.*
        - *Odd numbers are used for north-south section line roads, typically starting with the westernmost section line.*

  Ex. Starting from the west going east on section line 2 (first east-west section line), each road numbered 002,102,202,302 and so forth.
  Ex. Starting from south to north on section line 3 (second north-south section line), each road numbered 003,103,203,303 and so forth.

- *The last two digits indicate where the bridge's relative position between the other bridges on that same numbered continuous road segment. These were historically assigned in increments of five to allow room for adding new bridges between existing ones.*
  *Ex. Adding a bridge between the existing first two bridges (00 and 05) in Lancaster County (55) on the first continuous road segment (0) along section line 2 (02) should be: C005500**03***
  Ex. The first bridge (00) in Lancaster County (55) on the second continuous road segment (1) along section line 2 (02) should be: C005510200
  Ex. The second bridge (05) in Lancaster County (55) on the second continuous road segment (1) along section line 2 (02) should be: C005510205

B.ID.01	Description	Length
A	Bridge Owner	1 character
B	Agency Code	4 digits
C	Unique Identifier	5 to 6 A/N characters

B.ID.01 A – Bridge Owner Type

B.ID.01 A Code	Description (one character)
S	State of Nebraska
C	County Owner
M	Municipality Owner
U	Urban Owner (municipality that is classified as a NE "first-class city")
F	Federal Lands

B.ID.01 B – Bridge Owner Location Code

B.ID.01 A Code	B.ID.01 B Code Description (4 A/N characters)
S	NE highway number followed by underscore or space
C	NDOT Code for the county (this is not the same as FHWA codes for the same county). See list in Manual Appendix NE Local Public Agencies List.
M	NDOT Code for the municipality (this is not the same as FHWA codes for the same municipality) See list in Manual Appendix NE Local Public Agencies List.
U	NDOT Code for the municipality (this is not the same as FHWA codes for the same municipality) See list in Manual Appendix NE Local Public Agencies List.

B.ID.01 C – Bridge Location ID

B.ID.01 A Code	B.ID.01 C Code Description (5 to 6 A/N characters)
S	NE highway number reference post number. The last character may be one of the following letters: "R" or "L" which indicate position of the structure, such as a pair of twin bridges on expressway and interstate routes.
C	five digits that are a unique identifier
M	five digits that are a unique identifier
U	five digits that are a unique identifier

B.ID.02 Bridge Name

Format	Frequency	Item ID
AN (300)	I	B.ID.02

Specification	Commentary
Report the commonly known name(s) for the bridge. For more than one name, report all names with the most common name first. Report multiple names separated by pipe (|) delimiters.	There are no national policies established for assigning unique bridge names. Therefore, each State transportation department, Federal agency, or Tribal government develops their own policy for assigning unique bridge names. If the bridge has no commonly known name, it is optional to report this item, but it is preferable to enter a general description.

Examples

Bridge Number A4231 has a commonly known name of O'Donnell Memorial Bridge. Report O'Donnell Memorial Bridge.

Bridge Number 8675S that carries SR 15 over Goose Creek has a commonly known name of Goose Creek Bridge. Report Goose Creek Bridge.

Bridge Number 3555C that carries Harlem Avenue over I-80 is commonly known by the names Harlem Bridge and State Route 43 Bridge. Report Harlem Bridge|State Route 43 Bridge.

B.ID.03 Previous Bridge Number

Format	Frequency	Item ID
AN (15)	I	B.ID.03

Specification	Commentary
Report the bridge number previously associated with the bridge that has been replaced by the inventoried bridge, or when the inventoried bridge number has changed. Report 0 if no previous bridge number.	The purpose of this item is to retain a link to data for previous bridge numbers associated with this bridge in the NBI. For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

Bridge Number 024657 is constructed adjacent to Bridge Number 000123 as a planned replacement project. When the roadway is connected to the new bridge and it is opened, Bridge Number 000123 is closed and demolished. Report 000123.

Separate parallel bridges with unique bridge numbers (Bridge Number 234 and Bridge Number 567) are reconstructed to form one bridge. The reconstructed bridge is inventoried as Bridge Number 234. Report 567.

Example Identification Data for Bridge Number 15558X



Figure 6. Elevation view of the North Hanley Road Bridge, looking east.

The North Hanley Road Bridge has been assigned Bridge Number 15558X by the State. There was no previous bridge for this crossing.

Table 1. Identification data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.ID.01	*Bridge Number*	15558X
B.ID.02	*Bridge Name*	North Hanley Road Bridge
B.ID.03	*Previous Bridge Number*	0

SUBSECTION 1.2: LOCATION

The data items in this subsection uniquely locate the bridge and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been inventoried.

The following data items are included in this subsection.

Item ID	Data Item
B.L.01	State Code
B.L.02	County Code
B.L.03	Place Code
B.L.04	Highway Agency District
B.L.05	Latitude
B.L.06	Longitude
B.L.07	Border Bridge Number
B.L.08	Border Bridge State or Country Code
B.L.09	Border Bridge Inspection Responsibility
B.L.10	Border Bridge Designated Lead State
B.L.11	Bridge Location
B.L.12	Metropolitan Planning Organization

B.L.01 State Code

Format	Frequency	Item ID
N (2,0)	I	B.L.01

Specification	Commentary
Report the State code where the bridge is located using one of the codes listed below.	State codes are derived from the FIPS, Standard Codes for States (FIPS PUB 5-2). Federal agency or Tribal governments that own bridges which cross State borders need to choose a State code to report here and the bordering State's code in Item B.L.08 (*Border Bridge State or Country Code*). For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Specification Continued

Code	Description	Code	Description	Code	Description
1	Alabama	25	Massachusetts	47	Tennessee
2	Alaska	26	Michigan	48	Texas
4	Arizona	27	Minnesota	49	Utah
5	Arkansas	28	Mississippi	50	Vermont
6	California	29	Missouri	51	Virginia
8	Colorado	30	Montana	53	Washington
9	Connecticut	31	Nebraska	54	West Virginia
10	Delaware	32	Nevada	55	Wisconsin
11	District of Columbia	33	New Hampshire	56	Wyoming
12	Florida	34	New Jersey	60	American Samoa
13	Georgia	35	New Mexico	64	Federated States of Micronesia
15	Hawaii	36	New York	66	Guam
16	Idaho	37	North Carolina	68	Marshall Islands
17	Illinois	38	North Dakota	69	Commonwealth of the Northern Mariana Islands
18	Indiana	39	Ohio	70	Palau
19	Iowa	40	Oklahoma	72	Puerto Rico
20	Kansas	41	Oregon	74	U.S. Minor Outlying Islands
21	Kentucky	42	Pennsylvania	78	U.S. Virgin Islands
22	Louisiana	44	Rhode Island		
23	Maine	45	South Carolina		
24	Maryland	46	South Dakota		

B.L.02 County Code

Format	Frequency	Item ID
N (3,0)	I	B.L.02

Specification	Commentary
Report the FIPS code for the county, parish, or borough in which the bridge is located.	Use the FIPS codes in the current version of the Census of Population and Housing - Geographic Identification Code Scheme to determine the appropriate code. County and county equivalent entity codes can be found through a link at the following web site: https://www.fhwa.dot.gov/bridge/nbi.cfm. For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

Lincoln County, Nebraska, code 111. Report 111.

Queens, New York, code 81. Report 81.

Orleans Parish, Louisiana, code 71. Report 71.

NDOT Commentary – County Code

The FIPS county code is not the same as is the Nebraska county number which is a two-digit numerical code taken from the NE Local Public Agency Codes list that is in the BIP Manual Appendix.

B.L.03 Place Code

Format	Frequency	Item ID
N (5,0)	I	B.L.03

Specification	Commentary
Report the FIPS place code for the city, town, township, village, and other census-designated place where the bridge is located. Report 0 if there is no FIPS place code where the bridge is located.	Use the FIPS codes in the current version of the Census of Population and Housing - Geographic Identification Code Scheme to determine the city, town, township, village, or other census-designated place code, regardless of ownership. FIPS place codes can be found through a link at the following web site: https://www.fhwa.dot.gov/bridge/nbi.cfm. For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

Washington, DC, code 50000. Report 50000.

Tallahassee, FL, code 70600. Report 70600.

North Platte, NE, code 35000. Report 35000.

Unincorporated area with no FIPS code. Report 0.

NDOT Commentary – Place Code

The FIPS place code is not the same as the Nebraska city or municipality number which is a four-digit numerical code taken from the NE Local Public Agency Codes list that is in the BIP Manual Appendix NE Local Public Agency Codes.

B.L.04 Highway Agency District

Format	Frequency	Item ID
AN (2)	I	B.L.04

Specification	Commentary
Report the State transportation department's district or region code where the bridge is located. Where districts or regions are identified by number, report that number. Where districts or regions are identified by name, report a number based on an alphabetical or organizational listing of the districts or regions, or use an abbreviation.	Federal agencies and Tribal governments may report their district or region code where the bridge is located, or use the State transportation department's district or region code. Consult with the local FHWA division office contact for questions concerning State transportation department districts or regions. Current staff listings can be found at: https://www.fhwa.dot.gov/about/field.cfm. For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

District Six. Report 6.

Region Two. Report 2.

Northwest Region. Report NW.

NDOT Commentary – Highway Agency District

The NDOT District in which the bridge is located shall be represented by a two-digit code. Existing district numbers shall be used.

B.L.05 Latitude

Format	Frequency	Item ID
N (9,6)	I	B.L.05

Specification	Commentary
Report the latitude of the bridge in decimal degrees at the location of the bridge following agency procedures. Report a negative sign when the bridge is in the southern hemisphere	Mapping of bridges by FHWA will assume that the reported value is based on World Geodetic System 1984. The format accommodates reporting a negative sign which is counted as a digit. FHWA will adjust the polarity when it is incorrectly reported. The reported value does not need to be at the same location as the LRS mile point reported in Item B.H.07 (*LRS Mile Point*). LRS bridge mile point locations occurring on a chorded shape file created using only roadway mile points do not always correspond with the true latitude of a bridge.

Examples

Latitude is 50º 10’ 00.00” N. Report 50.166667.

Latitude is 53º 52.457' N. Report 53.874285.

Latitude is 14.291368º S. Report -14.291368.

B.L.06 Longitude

Format	Frequency	Item ID
N (10,6)	I	B.L.06

Specification	Commentary
Report the longitude of the bridge in decimal degrees at the location of the bridge following agency procedures. Report a negative sign when the bridge is in the western hemisphere	Mapping of bridges by FHWA will assume that the reported value is based on World Geodetic System 1984. The format accommodates reporting a negative sign which is counted as a digit. FHWA will adjust the polarity when it is incorrectly reported. The reported value does not need to be at the same location as the LRS mile point reported in Item B.H.07 (*LRS Mile Point*). LRS bridge mile point locations occurring on a chorded shape file created using only roadway mile points do not always correspond with the true longitude of a bridge.

Examples

Longitude is 125º 10′ 00.00″ W. Report -125.166667.

Longitude is 166º 32.784333' W. Report -166.546406.

Longitude is 144.677519º E. Report 144.677519.

B.L.07 Border Bridge Number

Format	Frequency	Item ID
AN (15)	I	B.L.07

Specification	Commentary
Report the neighboring State's exact bridge number as used in their Item B.ID.01 (*Bridge Number*). Report N when the bridge does not cross a border with another State or Country. Report 0 when the bordering country does not have a bridge number.	For the purposes of the NBI, only bridges that cross a State or international border are considered border bridges. The Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

I-8 westbound over the Colorado River between California and Arizona. California and Arizona have shared responsibility. California's bridge number is 58 0312L and Arizona's is 000000000001701.

California reports 000000000001701.
Arizona reports 58 0312L.

I-95 northbound over the St. Mary's River between Florida and Georgia. Florida assumes 100% responsibility.

Florida reports Georgia's bridge number.
Georgia reports Florida's bridge number.

B.L.08 Border Bridge State or Country Code

Format	Frequency	Item ID
AN (2)	I	B.L.08

Specification	Commentary
Report the neighboring State code using the codes listed in Item B.L.01 (*State Code*). Report CA for Canada or MX for Mexico when the bridge crosses those borders. Do not report this item when the bridge does not cross a border with another State or Country.	Use this item to indicate bridges crossing borders of States or countries. The Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

A bridge crosses the border between California and Arizona.
California reports 4.
Arizona reports 6.

A bridge crosses the border between California and Mexico. California reports MX.

The National Park Service (Federal agency) is the bridge owner for a bridge that crosses the borders of Virginia and the District of Columbia. The National Park Service reports 51 when Item B.L.01 (*State Code*) is 11, and reports 11 when Item B.L.01 (*State Code*) is 51.

B.L.09 Border Bridge Inspection Responsibility

Format	Frequency	Item ID
AN (1)	I	B.L.09

Specification

Report the border bridge inspection responsibility for any entity within the State geographical boundaries, regardless of ownership, using one of the following codes.

Code	Description
0	No responsibility
1	Shared responsibility with bordering State or country
2	Full responsibility

Do not report this item when the bridge does not cross a border with another State or Country.

Commentary

The intent of this item is to capture the border bridge inspection responsibility for any entity within the State geographical boundaries, for all inspection types, regardless of ownership (Federal, State, city, county, toll authority etc.).

Agency inspection responsibility should be documented in interagency agreements or memorandums of understanding and included as part of the bridge file or record.

The Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

Border bridge between California and Arizona with shared inspection responsibility. California is responsible for underwater inspection and Arizona is responsible for routine inspection.
Arizona reports 1.
California reports 1.

Border bridge between Florida and Georgia. Florida is responsible for inspections and has 100% responsibility.
Florida reports 2.
Georgia reports 0.

Border bridge between Illinois and Missouri with shared maintenance responsibility. Missouri has responsibility for inspection.
Missouri reports 2.
Illinois reports 0.

B.L.10 Border Bridge Designated Lead State

Format	Frequency	Item ID
N (2,0)	I	B.L.10

Specification	Commentary
Report the State code for the State that has been determined to be the Designated Lead State for reporting the border bridge full record using one of the State codes listed in Item B.L.01 (*State Code*). Do not report this item when the bridge does not cross a border with another State or Country.	The intent of this item is to capture the State which has been designated by agreement between the two bordering states to report a full bridge record for the border bridge. For more information, see the Border Bridges section of this document. The Neighboring State reports this item as part of their abbreviated bridge record.

Examples

Border bridge between California and Arizona with shared inspection responsibility. Through agreement, California is determined to be the Designated Lead State. California and Arizona report 6.

Border bridge between Florida and Georgia. Florida is responsible for inspections and has 100% responsibility. Through agreement, Florida is determined to be the Designated Lead State. Florida and Georgia report 12.

Border bridge between Illinois and Missouri with shared maintenance responsibility. Missouri has responsibility for inspection. Through agreement, Missouri is determined to be the Designated Lead State. Illinois and Missouri report 29.

B.L.11 Bridge Location

Format	Frequency	Item ID
AN (300)	I	B.L.11

Specification	Commentary
Report a narrative description of the bridge location.	It is preferred that the narrative describe the location and distance of the bridge from a distinguishable feature along the same route the bridge carries. Include additional information as needed to locate the bridge. Distinguishable features should be on official highway department, State, local, or Federal agency maps.

Examples

Report 3.2 mi. south of the junction of SR 35.

Report 0.2 miles south of I-80 middle-tier of 3 ramps ramp to southbound State Route 15.

Report 5.7 miles north of State Route 10 on State Route 15, then 1.8 miles east on Buckingham Road. Bear right at the unmarked fork at the 1.1-mile point of Buckingham Road.

Report At the entrance to the Veterans Affairs facility in Bath, NY.

B.L.12 Metropolitan Planning Organization

Format	Frequency	Item ID
AN (300)	I	B.L.12

Specification	Commentary
Report the name(s) of the Metropolitan Planning Organization(s) in which the bridge is located, regardless of bridge owner or maintenance responsibility. Report each MPO when the bridge is located on a boundary between MPOs. Report multiple MPOs separated by pipe (|) delimiters. Report N if Bridge is not located in an MPO.	This item only needs to be reported if a highway carried by the bridge is on the National Highway System, as indicated in Item B.H.03 (*NHS Designation*). If the State transportation department and its MPOs have established a numeric or alphanumeric identification system for MPOs, that identifier can be used to report this item if it is used consistently. This item can be used to assist in calculating MPO performance measures and targets required by the National Performance Management Measures regulation. The names of Regional Planning Organizations (RPOs) or single county planning organizations do not need to be reported for this item. The National Performance Management Measures regulation only applies to MPOs and not RPOs. For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

NDOT Commentary – Metropolitan Planning Organization

Nebraska has two MPOs: the City of Lincoln and the Metropolitan Area Planning Agency (MAPA), which includes the Cities of Bellevue, La Vista and Omaha and Douglas County and Sarpy County.

Examples
Bridge is located within the boundary of the Des Moines Area MPO. Report Des Moines Area MPO. Bridge is located on the boundary of two MPOs, the Delaware Valley Regional Planning Commission and North Jersey Transportation Planning Authority. Report Delaware Valley Regional Planning Commission|North Jersey Transportation Planning Authority or report: DVRPC|NJTPA. Bridge is partially located within the boundary of the Southeast Texas Regional Planning Commission MPO. Report Southeast Texas Regional Planning Commission MPO or report SETRPC MPO. Bridge is not located within the boundary of an MPO. Report N.

Example Location Data for Bridge Number 15558X

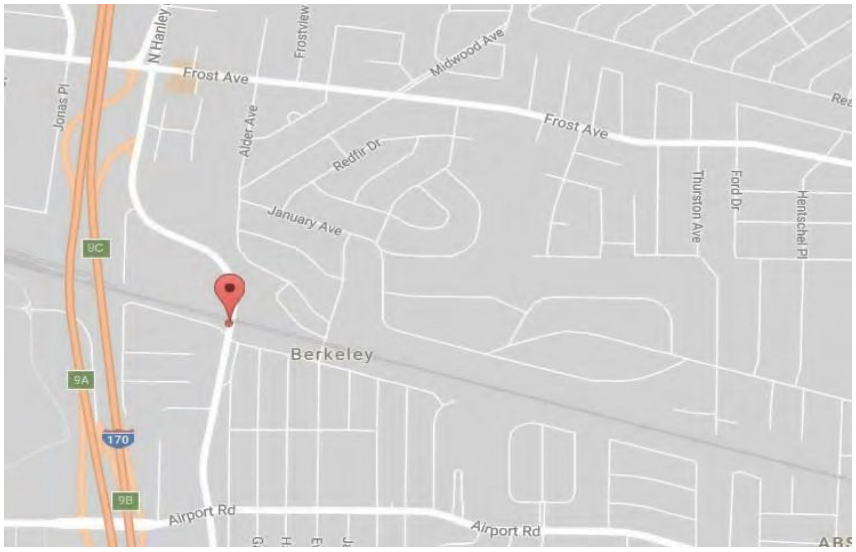


Figure 7. Location map for Bridge Number 15558X. (Source: Google Earth)

The bridge is in the city of Berkeley, Missouri, an inner-ring suburb of St. Louis, located in St. Louis County and within the boundaries of the East-West Gateway Council of Governments MPO. It does not cross a border with another State or country. It is located at 38 degrees, 45 minutes, 19.28 seconds north, and 90 degrees, 20 minutes, 4.15 seconds west. It is located within the boundaries of MoDOT District 5. It carries North Hanley Road and is located 0.4 miles north from the intersection with Airport Road.

Data are not reported for Items B.L.08 (*Border Bridge State or Country Code*), B.L.09 (*Border Bridge Inspection Responsibility*) and B.L.10 (*Border Bridge Inspection Responsibility*) since the bridge does not cross a border with another State or country.

Table 2. Location data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.L.01	*State Code*	29
B.L.02	*County Code*	189
B.L.03	*Place Code*	4906
B.L.04	*Highway Agency District*	5
B.L.05	*Latitude*	38.755356
B.L.06	*Longitude*	-90.334486
B.L.07	*Border Bridge Number*	N
B.L.08	*Border Bridge State or Country Code*	
B.L.09	*Border Bridge Inspection Responsibility*	
B.L.10	*Border Bridge Designated Lead State*	
B.L.11	*Bridge Location*	0.4 miles north on N Hanley Rd from intersection with Airport Rd
B.L.12	*Metropolitan Planning Organization*	East-West Gateway Council of Governments

SUBSECTION 1.3: CLASSIFICATION

The data items in this subsection provide classification data for the bridge and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been inventoried.

The following data items are included in this subsection.

Item ID	Data Item
B.CL.01	Owner
B.CL.02	Maintenance Responsibility
B.CL.03	Federal or Tribal Land Access
B.CL.04	Historic Significance
B.CL.05	Toll
B.CL.06	Emergency Evacuation Designation

B.CL.01 Owner

Format	Frequency	Item ID
AN (4)	I	B.CL.01

Specification	Commentary
Report the agency that has ownership of the bridge using one of the following codes. Code Description S01 State transportation department S02 State park, forest, or reservation agency S03 State toll authority SX Other State agency L01 County highway agency L02 Town or township highway agency L03 City or municipal highway agency L04 Local park, forest, or reservation agency L05 Local toll authority LX Other local agency F01 Agriculture Research Service (ARS) F02 Department of Energy (DOE) F03 General Services Administration (GSA) F04 National Aeronautics and Space Administration (NASA) F05 Smithsonian – National Zoo F06 Tennessee Valley Authority (TVA) F07 U.S. Department of Veterans Affairs F08 Federal Emergency Management Agency (FEMA) F09 International Boundary and Water Commission, United States Section (USIBWC) FX Other Federal agency Codes continued next page.	Use the hierarchy of State, Federal, county, city, railroad, and other private entity for multiple owners of a bridge. Use code S01 for District of Columbia, Puerto Rico, and U.S. Territories (Guam, American Samoa, Northern Mariana Islands, and Virgin Islands) Use codes FL01 through FLX for Federal Lands Management agencies identified at the following FHWA website https://flh.fhwa.dot.gov/programs/fltp/. Use codes D01 through DX for bridges owned by the Department of Defense. Use code T for transit agency or authority for air, bus, light rail, and port regardless of whether the entity is considered State, local, or private. Use code P for private owners other than railroad or transit. Use code R for highway bridges owned by railroad entities that are not considered a transit agency or authority. *NDOT Commentary – Owner* *Nebraska also maintains a field named Administrative Owner, which treats the county as the primary source of contact for municipalities with populations smaller than 5,000 at the most recent census. The Nebraska Item is not the same as the SNBI Item for Owner.* *Bridges over the Interstate that carry local traffic are owned and maintained by NDOT as per Statute 39-1372.*

Specification Continued – Owner

Code	Description
FL01	Bureau of Indian Affairs (BIA)
FL02	Bureau of Land Management (BLM)
FL03	Bureau of Reclamation (USBR)
FL04	U.S. Fish and Wildlife Service (FWS)
FL05	National Park Service (NPS)
FL06	U.S. Army Corps of Engineers (USACE)
FL07	U.S. Forest Service (USFS)
FL0X	Other Federal Lands Management Agency
I	Indian Tribal Government
D01	Air Force
D02	Army
D03	Navy/Marines
D04	Pentagon
D05	National Security Agency (NSA)
DX	Other Department of Defense
T	Transit agency/authority
P	Private
R	Railroad
U	Unknown
X	Other

B.CL.02 Maintenance Responsibility

Format	Frequency	Item ID
AN (4)	I	B.CL.02

Specification	Commentary
Report the agency that has primary maintenance responsibility for the bridge using one of the codes listed in Item B.CL.01 (*Owner*).	Use the hierarchy of State, Federal, county, city, railroad, and other private entity for determining primary responsibility for maintenance of a bridge. Use code S01 for District of Columbia, Puerto Rico, and U.S. Territories (Guam, American Samoa, Northern Mariana Islands, and Virgin Islands). Use codes FL01 through FLX for Federal Lands Management agencies identified at the following FHWA website https://flh.fhwa.dot.gov/programs/fltp/. Use codes D01 through DX for bridges maintained by the Department of Defense. Use code T for transit agency or authority for air, bus, light rail, and port regardless of whether the entity is considered State, local, or private. Use code P for private entities other than railroad or transit. Use code R for highway bridges maintained by railroad entities that are not considered a transit agency or authority. *NDOT Commentary – Maintenance Responsibility* *Bridges over the Interstate that carry local traffic are owned and maintained by NDOT as per Statute 39-1372.*

B.CL.03 Federal or Tribal Land Access

Format	Frequency	Item ID
AN (30)	I	B.CL.03

Specification

Report the Federally managed and/or Indian Tribal Government lands using one or more of the following codes, for the bridge owned by a State or local agency and carrying a highway that leads to or traverses through the Federal or Tribal lands.

Report multiple codes separated by pipe (|) delimiters.

Code	Description
N	Not applicable
BIA	Indian Tribal Government or Bureau of Indian Affairs
BLM	Bureau of Land Management
NPS	National Park Service
USACE	U.S. Army Corps of Engineers
USBR	Bureau of Reclamation
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
X	Other

Report N when the highway carried by the bridge is not owned by a State or local agency and/or does not lead to or traverse through Federal or Tribal lands.

Commentary

This item is used to identify bridges owned by State or local agencies on highways that lead to and/or traverse through any Federally managed land or Tribal government property. These bridges may be eligible to receive funding from the Federal Lands Access Program under 23 U.S.C. 204.

Consider those bridges that are located on the identified highway to the nearest intersecting highway owned by a State or local agency.

For assistance in locating Federal properties, contact Federal Lands Highway at: https://highways.dot.gov/federal-lands/about/contacts.

NDOT Commentary – Federal or Tribal Land Access

NDOT notifies US Bureau of Reclamation about upcoming projects on USBR lands.

B.CL.04 Historic Significance

Format	Frequency	Item ID
AN (1)	I	B.CL.04

Specification	Commentary
Report the historic significance of the bridge using one of the following codes. Code – Description 1 – Bridge is on the National Register 2 – Bridge is eligible for the National Register 3 – Bridge is in a historic district that is on or eligible for the National Register, and contributes to the eligibility of the district 4 – Bridge is in a historic district that is on or eligible for the National Register, but does not contribute to the eligibility of the district 5 – Bridge is potentially eligible for the National Register, or potentially contributes to a historic district, but has not been evaluated according to the criteria for listing 6 – Bridge is on a State or local historic register, but is not eligible for the National Register 7 – Historic significance of the bridge has not been determined N – Bridge is not eligible for the National Register, and is not in a historic district eligible for the National Register	This item is used to report the historic significance of bridges. Bridges that are historically significant are subject to Section 106 of the National Historic Preservation Act of 1966, and 36 CFR 800 (Protection of Historic Properties). 36 CFR 800 governs the Section 106 process, and outlines how agencies are to consult with various parties, identify historic properties, and assess the effects of undertakings to properties. Undertakings to historically significant bridges or their surroundings are also subject to Section 4(f) of the Department of Transportation Act of 1966, and 23 CFR Part 774 (Parks, Recreation Areas, Wildlife and Waterfowl Refuges, and Historic Sites). 23 CFR Part 774 governs the Section 4(f) process, considers how the property is used as a resource, and outlines the project approval process when undertakings are proposed. 36 CFR Part 70 (National Register of Historic Places) identifies the attributes that may make a property historically significant, and prescribes the evaluation criteria and procedures for listing properties on the National Register. Determinations of eligibility are generally not made with the purpose of eventual listing on the National Register of Historic Places. Rather, the evaluation criteria for listing is used to assess historical significance with the purpose of assessing the effects of undertakings, and to fulfill the goals of 23 USC 144(g) Historic Bridges. Determinations of eligibility are normally made by the relevant federal agency, typically FHWA for highway bridges, and can change when circumstances or conditions change, such as age or bridge integrity. As such, the eligibility status and reported code can change with time.

Commentary Continued – Historic Significance
Use code 2 when the bridge has been determined to be eligible for listing on the National Register even though the nomination and listing process have not concluded or are not being pursued. Use code 5 when the bridge has attributes that may make it historically significant as indicated by the National Register criteria for evaluation and listing. This code may also apply when a bridge was previously evaluated but requires reevaluation because its current attributes, such as age, may make it historically significant. Use code 6 when a bridge has local historic value, but has been determined to be not eligible for the National Register. Undertakings may be subject to the Section 4(f) process, but without the same level of consultation as prescribed by Section 106. Use code N when the other codes do not apply. *NDOT Commentary – Historic Significance* *This Item is maintained by NDOT.*

B.CL.05 Toll

Format	Frequency	Item ID
AN (1)	I	B.CL.05

Specification	Commentary
Report the toll status of the bridge using one of the following codes. Code Description 1 Toll bridge not under FHWA Toll Agreement 2 Toll bridge under FHWA Toll Agreement 3 Bridge carries a toll road not under FHWA Toll Agreement 4 Bridge carries a toll road under FHWA Toll Agreement N Bridge does not carry a toll road and is not a toll bridge Report this item if only a portion of the bridge is tolled such as if an HOV Toll lane is on the same bridge as a freeway.	Use code 1 when tolls on a toll bridge are paid specifically to use the bridge and not part of a facility which requires an FHWA Toll Agreement (23 U.S.C. 129). Use code 2 when an interstate highway toll bridge is under a FHWA Toll Agreement (23 U.S.C. 129). Bridge has a separate agreement from the highway segment. Use code 3 when the tolls on a toll road are paid to use the facility, which includes the roadway and the bridge. No FHWA Toll Agreement or unknown whether a toll agreement exists. Use code 4 when the bridge is on an Interstate toll highway segment under a FHWA Toll Agreement (23 U.S.C. 129). Bridge is a part of the toll segment. More tolling program information related to 23 U.S.C. 129 can be found at: https://www.fhwa.dot.gov/ipd/tolling_and_pricing/ and in the FHWA Informational Memorandum - Federal Tolling Programs under the Moving Ahead for Progress in the 21st Century Act. *NDOT Commentary – Toll* *This Item is maintained by NDOT.*

B.CL.06 Emergency Evacuation Designation

Format	Frequency	Item ID
AN (1)	I	B.CL.06

Specification	Commentary
Report whether the route carried on the bridge is an emergency evacuation route using one of the following codes. Code – Description N – Not an Emergency evacuation route. Y – Emergency evacuation route.	This item is used by FHWA with other items, as per 23 U.S.C. 144(b), to classify bridges according to serviceability, safety, and essentiality for public use and considers the potential impacts to emergency evacuation routes and to regional and national freight and passenger mobility if the serviceability of the bridge is restricted or diminished. Emergency evacuation routes may be designated for various events such as hurricanes, earthquakes, tsunami, dam failure, and other hazardous events. Refer to the State Emergency Management Agency for designated emergency evacuation routes. *NDOT Commentary – Emergency Evacuation Destination* *Evacuation routes are not currently part of the State or Local transportation system in Nebraska.*

Example Classification Data for Bridge Number 15558X

The bridge is owned and maintained by St. Louis County and is not eligible for the National Register for Historic Places. It is not on a Federal or Tribal land access road; is not on a toll road; and is not on an emergency evacuation route.

Table 3. Classification data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.CL.01	*Owner*	L01
B.CL.02	*Maintenance Responsibility*	L01
B.CL.03	*Federal or Tribal Land Access*	N
B.CL.04	*Historic Significance*	N
B.CL.05	*Toll*	N
B.CL.06	*Emergency Evacuation Designation*	N

SECTION 2: BRIDGE MATERIAL AND TYPE

This section has data items that have been grouped by the following three subsections: Span Material and Type, Substructure Material and Type, and Roadside Hardware. The data items in these subsections identify the structural, types, and configurations that make up a bridge.

The data items in Span Material and Type subsection identify the bridge configuration based on material(s), type(s), and continuity. These items are considered part of the Span Data Set and have a many-to-one relationship with a bridge when applicable.

The data items in the Substructure Material and Type subsection identify the bridge substructure and foundation material(s) and type(s). These items are considered part of the Substructure Data Set and have a many-to-one relationship with a bridge when applicable.

The data items in the Roadside Hardware subsection identify crash-tested roadside hardware. These data items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge.

The data for items in this section typically remain static once a bridge has been inventoried. The following data items are included in this section.

SUBSECTION 2.1: SPAN MATERIAL AND TYPE

Item ID	Data Item
B.SP.01	Span Configuration Designation
B.SP.02	Number of Spans
B.SP.03	Number of Beam Lines
B.SP.04	Span Material
B.SP.05	Span Continuity
B.SP.06	Span Type
B.SP.07	Span Protective System
B.SP.08	Deck Interaction
B.SP.09	Deck Material and Type
B.SP.10	Wearing Surface
B.SP.11	Deck Protective System
B.SP.12	Deck Reinforcing Protective System
B.SP.13	Deck Stay-In-Place Forms

SUBSECTION 2.2: SUBSTRUCTURE MATERIAL AND TYPE

Item ID	Data Item
B.SB.01	Substructure Configuration Designation
B.SB.02	Number of Substructure Units
B.SB.03	Substructure Material
B.SB.04	Substructure Type
B.SB.05	Substructure Protective System
B.SB.06	Foundation Type
B.SB.07	Foundation Protective System

SUBSECTION 2.3: ROADSIDE HARDWARE

Item ID	Data Item
B.RH.01	Bridge Railings
B.RH.02	Transitions

SUBSECTION 2.1: SPAN MATERIAL AND TYPE

The data items in this subsection identify the span and deck configurations based on material(s), type(s), and continuity for the bridge, and are considered part of the Span Data Set. These data items have a many-to-one relationship with a bridge when applicable.

Data items in this subsection are reported for each span configuration present in the bridge. A span configuration characterizes all spans of similar material, type, and continuity. Spans of similar configuration do not need to be contiguous to be reported in the same data set.

All bridges have at least one span configuration; therefore at least one data set must be reported for each bridge. Additional data sets are reported when applicable.

Do not report these data items for bridges and culverts that were originally designed and constructed under fill: B.SP.08 (*Deck Interaction*), B.SP.10 (*Wearing Surface*), B.SP.11 (*Deck Protective System*), B.SP.12 (*Deck Reinforcing Protective System*), and B.SP.13 (*Deck Stay-In-Place Forms*).

The data for items in this subsection typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.SP.01	Span Configuration Designation
B.SP.02	Number of Spans
B.SP.03	Number of Beam Lines
B.SP.04	Span Material
B.SP.05	Span Continuity
B.SP.06	Span Type
B.SP.07	Span Protective System
B.SP.08	Deck Interaction
B.SP.09	Deck Material and Type
B.SP.10	Wearing Surface
B.SP.11	Deck Protective System
B.SP.12	Deck Reinforcing Protective System
B.SP.13	Deck Stay-In-Place Forms

B.SP.01 Span Configuration Designation

Format	Frequency	Item ID
AN (3)	I	B.SP.01

Specification	Commentary
Report the assigned span configuration designation using one of the following codes. Code Description M## Main A## Approach C## Culvert V## Culvert extension W## Widening Replace the ## characters in the above codes with sequential numbers, with leading zeros, assigned to each span configuration.	This item captures how spans of the reported bridge configuration are classified and designated. Except for culverts, each bridge has at least one main span. Main spans include all spans of most bridges or the major span(s) of a sizable bridge. Replacing the "##" characters in the codes with a sequential number (e.g., M01, A01, A02, etc.) identifies each unique span configuration present on the bridge.

Commentary Continued

A bridge may or may not have approach spans. Approach spans are typically those of a different material, type, or design than the main span and are typically at one or both ends of the main span.

Consider the span(s) of vaulted abutments as an approach span.

Use code C for spans that convey water through or under a roadway embankment and are designed hydraulically to take advantage of submergence to increase water carrying capacity.

Use code V when a culvert is extended using dissimilar construction.

Use code W for widened portions of main or approach spans with dissimilar construction. Widening data sets do not contribute to the calculation of the total number of spans for the bridge.

Examples – Span Configuration Designation
Four-span steel plate girder bridge. This bridge has one span data set. Report M01. Double-leaf bascule bridge with four steel box girder approach spans. This bridge has two span data sets. • Report M01 for the bascule data set. • Report A01 for the steel box girder data set. Six-span bridge with two continuous steel plate girder main spans and four simply supported steel plate girder approach spans. This bridge has two span data sets. • Report M01 for the continuous steel plate girder data set. • Report code A01 for the simply supported steel plate girder data set. Four-barrel corrugated steel pipe culvert, modified by adding four additional HDPE round pipes along the roadway centerline to increase hydraulic capacity. This bridge has two span data sets. • Report C01 for the steel pipes data set. • Report C02 for the HDPE pipes data set. Steel truss main span bridge with three prestressed concrete multi-beam approach spans at the north end, and two steel multi-beam approach spans at the south end. This bridge has three span data sets. • Report M01 for the steel truss data set. • Report A01 for the north approach data set. • Report A02 for the south approach data set. Single span reinforced concrete tee-beam bridge widened with prestressed concrete box beams. This bridge has two span data sets. • Report M01 for the reinforced concrete tee-beam data set. • Report W01 for the prestressed concrete box beams data set. Three-sided frame culvert, lengthened by adding a four-sided box culvert to the end of the barrel. This bridge has two span data sets. • Report C01 for the three-sided frame culvert data set. • Report V01 for the four-sided box culvert data set. Single span steel beam bridge widened using the same superstructure/deck construction. This bridge has one span data set. Report M01. IT girder main span bridge with two steel plate girder approach spans at the north end, and two steel rolled beam approach spans at the south end. The main span was widened with prestressed concrete box beams and the approach spans were widened with NU girders. This bridge has 5 span data sets. • Report M01 for the IT girder data set. • Report A01 for the north approach data set. • Report A02 for the south approach data set. • Report W01 for the prestressed concrete box beams data set. • Report W02 for the NU girder data set.

B.SP.02 Number of Spans

Format	Frequency	Item ID
N (4,0)	I	B.SP.02

Specification	Commentary
Report the number of spans.	This item captures the number of spans of the configuration(s) designated in item B.SP.01 (*Span Configuration Designation*). If the number of barrels or spans varies, report the maximum number.

Examples

Four-span steel plate girder bridge. This bridge has one span data set. Report 4.

Six-span bridge with two continuous steel plate girder main spans and four simply supported steel plate girder approach spans. This bridge has two span data sets.
- Report 2 for the main span data set.
- Report 4 for the approach span data set.

Four-barrel corrugated steel pipe culvert, modified by adding four additional HDPE round pipes along the roadway centerline to increase hydraulic capacity. This bridge has two span data sets.
- Report 4 for the steel pipes data set.
- Report 4 for the HDPE pipes data set.

Three steel girder spans with concrete vaulted/cellular abutments that enclose a reinforced concrete slab span at each end of the bridge. This bridge has two span data sets.
- Report 3 for the steel girder main span data set.
- Report 2 for the reinforced concrete approach span data set.

Four-sided concrete box culvert that collects runoff at a single-barrel inlet at the northeast corner of an intersection, and at a three-barrel inlet at the northwest corner. The barrels merge beneath the intersection, and all four barrels outlet to the southeast corner. This bridge has one span data set. Report 4.

Three-sided frame culvert, lengthened by adding a four-sided box culvert to the end of the barrel. This bridge has two span data sets.
- Report 1 for the three-sided frame culvert data set.
- Report 1 for the four-sided box culvert data set.

Twin concrete box girder bridge that has eastbound and westbound lanes separated by a 1” median gap. Eastbound portion of superstructure is supported by two piers, and westbound portion is supported by three piers due to unusual terrain restrictions. This bridge has one span data set. Report 4.

B.SP.03 Number of Beam Lines

Format	Frequency	Item ID
N (3,0)	I	B.SP.03

Specification	Commentary
Report the number of principal beam lines. Report 1 for bridges where Item B.SP.06 (*Span Type*) is F01, F02, S01, or S02. Report 0 for bridges where Item B.SP.06 (*Span Type*) is P01 or P02.	Principal beam lines include the main longitudinal load-carrying members of the superstructure such as beams, girders, trusses, and arches or arch ribs, but do not include stringers of a floor beam system or spandrel walls of an arch. Use the average number of beam lines for bridges with variable number of beam lines within a span configuration, rounded down.

Examples

Timber multi-beam bridge with 12 beams. Report 12.

Steel through truss bridge with two trusses and ten stringers. Report 2.

Flared three-span tee-beam bridge with 12 beams at the south end and 17 beams at the north end. Report 14.

Steel arch bridge with three arch ribs. Report 3.

Concrete arch bridge with masonry spandrel walls. Report 1.

Four-barrel corrugated steel pipe culvert, modified by adding four additional HDPE round pipes along the roadway centerline to increase hydraulic capacity. This bridge has two span data sets.

- Report 0 for the steel pipes data set.
- Report 0 for the HDPE pipes data set.

Three-sided frame culvert, lengthened by adding a four-sided box culvert to the end of the barrel. This bridge has two span data sets.

- Report 1 for the three-sided frame data set.
- Report 1 for the four-sided frame data set.

B.SP.04 Span Material

Format	Frequency	Item ID
AN (3)	I	B.SP.04

Specification	Commentary
Report the principal span material type using one of the following codes. Code Description A01 Aluminum C01 Reinforced concrete – cast-in-place C02 Reinforced concrete – precast C03 Prestressed concrete – pre-tensioned C04 Prestressed concrete – cast-in-place post-tensioned C05 Prestressed concrete – precast post-tensioned CX Concrete – other F01 FRP composite – aramid fiber F02 FRP composite – carbon fiber F03 FRP composite – glass fiber FX FRP composite – other I01 Iron – cast I02 Iron – wrought M01 Masonry – block M02 Masonry – stone P01 Plastic – Polyethylene PX Plastic - other S01 Steel – rolled shapes S02 Steel – welded shapes S03 Steel – bolted shapes S04 Steel – riveted shapes S05 Steel – bolted and riveted shapes SX Steel – other Codes continued next page.	A principal span member includes the main longitudinal load-carrying members of the span such as beams, girders, trusses, arches, or pipes, but does not include the floor system. Use code C04 or C05, as applicable, for prestressed concrete superstructures that utilize both pre-tensioning and posttensioning. Use code M01 for masonry made from bricks or concrete blocks. Use code M02 for natural stone. Use code P01 for plastics that include HDPE and PE materials typically used for pipes.

Specification Continued – Span Material

Code	Description
T01	Timber – glue laminated
T02	Timber – nail laminated
T03	Timber – solid sawn
T04	Timber – stress laminated
TX	Timber - other
X	Other

Examples – Span Material

Spliced concrete girder: post-tensioned, precast, pre-tensioned bulb-T. Report C05.

Stress laminated timber slab. Report T04.

Concrete encased steel rolled beam. Report S01.

Bolted steel truss with timber stringers. Report S03.

Cast-in-place reinforced concrete tee-beams strengthened with carbon fiber FRP. Report C01.

Corrugated steel pipes with bolted seams. Report S03.

Corrugated steel pipe culvert with welded seams, modified by adding additional HDPE round pipes to lengthen the culvert along the roadway centerline. This bridge has two span data sets.

- Report S02 for the steel pipes data set.
- Report P01 for the HDPE pipes data set.

Three-sided, cast-in-place reinforced concrete frame culvert, lengthened by adding a four-sided precast reinforced concrete frame culvert to the end of the barrel. This bridge has two span data sets.

- Report C01 for the three-sided frame data set.
- Report C02 for the four-sided frame data set.

Terra cotta pipes. Report X.

B.SP.05 Span Continuity

Format	Frequency	Item ID
AN (1)	I	B.SP.05

Specification	Commentary
Report the span continuity using one of the following codes. Code Description 1 Simple or single span 2 Continuous 3 Continuous for live loads only 4 Cantilever 5 Cantilever with pin and hanger 6 Frame 7 Buried	This item captures the continuity of the span(s) in the configuration. Use code 2 for bridges designed continuous for permanent (dead) loads and live loads. Also, use code 2 for cable stayed and suspension bridges, and for multi-span arches. Use code 3 for bridges designed as simple spans for permanent (dead) loads and continuous for live loads. When it is unknown if the superstructure was designed as continuous for live loads, code this item consistent with the assumption used in the load rating calculations. Use code 6 for three-sided and four-sided frames that are not buried. Use code 7 for pipe culverts and other structures that rely on soil-structure interaction to support vertical loads.

Examples – Span Continuity
Two prestressed concrete girder simple spans that have one span data set. Report 1. Three-span bridge with cantilevered end spans that are unsupported at the extreme ends. There are two span data sets, one for the center span and one for the end spans. Report 2 for the center spans. Report 4 for the end spans. Steel rigid K-frame that has one span dataset. Report 6. Two prestressed concrete girder simple spans with continuous deck designed to provide continuity for live load over the pier and have one span data set. Report 3. Three-span concrete girder bridge with cantilever and suspended center span. There are two span data sets, one for the center span and one for the end spans. Report 4 for the center span. Report 2 for the end spans. Three-span steel girder bridge with cantilever and suspended pin and hanger center span. There are two span data sets, one for the center span and one for the end spans. Report 5 for the center span. Report 2 for the end spans. Three-barrel monolithic concrete frame bridge that is not buried and has one span data set. Report 6. Four-barrel corrugated steel pipe culvert. Report 7.

B.SP.06 Span Type

Format	Frequency	Item ID
AN (3)	I	B.SP.06

Specification

Report the span type using one of the following codes.

Code	Description
A01	Arch – under fill without spandrel
A02	Arch – open spandrel
A03	Arch – closed spandrel
A04	Arch – through
A05	Arch – tied
B01	Box girder/beam – single
B02	Box girder/beam – multiple adjacent
B03	Box girder/beam – multiple spread
B04	Box girder/beam – segmental
F01	Frame – three-sided
F02	Frame – four-sided
F03	Frame – K-shaped
F04	Frame – delta-shaped
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
G09	Girder/beam – girder & floor beam
G10	Girder/beam – through girder
GX	Girder/beam – other

Codes continued next page.

Commentary

Adjacent girders/beams are those sections that are placed directly next to each other and are touching or nearly touching.

Spread girders/beams are those sections that are spaced so that the deck spans the space between the sections.

Box girder/beams include boxes, tubs, and cellular structures where interior surfaces may or may not be accessible. Use code B04 for segmental construction and irrespective if the span type meets the description for B01, B02, or B03.

Use code F01 for three-sided rigid frames.

Use code F02 for rigid four-sided concrete box bridges.

Use code G01 or G02, as applicable, for bulb-tee and deck bulb-tee girders/beams.

Use code G09 for superstructures with girder and floor beam systems regardless of the girder shape.

Use code G10 for through girder type superstructures regardless of the girder shape.

Use code P02 for pipes that rely on the stability of surrounding soils to maintain their structural shape.

Specification Continued – Span Type

Code	Description
L01	Cable – suspension
L02	Cable – cable-stayed
L03	Cable – extradosed
LX	Cable – other
M01	Movable – vertical lift
M02	Movable – bascule
M03	Movable – swing
MX	Movable – other
P01	Pipe - Rigid
P02	Pipe - Flexible
S01	Slab – solid
S02	Slab – voided
T01	Truss – deck
T02	Truss – through
T03	Truss – pony
X01	Other – railroad flat car
X02	Other – ferry transfer
X03	Other – floating
X	Other

B.SP.07 Span Protective System

Format	Frequency	Item ID
AN (3)	I	B.SP.07

Specification	Commentary
Report the span protective system using one of the following codes. Code – Description 0 – None A01 – Admixture – internally sealed A02 – Admixture – low permeability A03 – Admixture – polymer impregnated A04 – Admixture – corrosion inhibitor A05 – Admixture – ASR inhibitor AX – Admixture – other C01 – Coating – paint C02 – Coating – sealer C03 – Coating – methacrylate C04 – Coating – hot dip galvanizing C04 – Coating – metalizing/thermal spray CX – Coating – other E01 – Encasement - concrete EX – Encasement – other M01 – Membrane – built-up M02 – Membrane – sheet M03 – Membrane – liquid applied MU – Membrane – unknown MX – Membrane – other P01 – Patina – uncoated weathering steel Codes continued next page.	Code this item consistent with the material reported for Item B.SP.04 (*Span Material*). In cases where the span configuration may have a combination of protective systems, use the code for the predominant protective system based on protected area. In cases where multiple systems protect the same area, use the code for the outermost protective layer. Use code 0 when the span is unprotected. Use code 0 when unprotected steels either never were coated or currently have no signs of coating systems and have no protective systems such as cathodic protection or weathering chemistry. Non-protective anti-graffiti and aesthetic coatings are not considered when coding this item. Use code C01 for weathering steel that has been painted. Use code C02 for sealers such as silanes, siloxanes, linseed oils, etc. Use code P01 only for weathering grades of steel. For timber, use code T01 for oil-based or water-borne timber preservatives. Use code C01 for paints and stains. Use the appropriate code for span members under fill that have a protective system.

Specification Continued – Span Protective System

Code	Description
S01	Sacrificial – cathodic, passive
S02	Sacrificial – cathodic, active
SX	Sacrificial – other
T01	Treated – timber preservative
U	Unknown
X	Other

NDOT Commentary – Span Protective System

For slab bridges and concrete girder bridges with asphalt overlays and waterproofing membrane use the following codes.

M01 Membrane – built-up. AKA cold liquid applied membrane
M02 Membrane – sheet. AKA preformed fabric membrane.
M03 Membrane – liquid applied. AKA hot liquid applied membrane.

Examples – Span Protective System

Low permeability concrete slab bridge with waterproofing sheet membrane. Report M02.

Weathering steel multi-beam bridge that has the beam ends painted to protect from leakage through the joints. Report P01.

B.SP.08 Deck Interaction

Format	Frequency	Item ID
AN (2)	I	B.SP.08

Specification

Report the type of interaction between the superstructure and deck for the span configuration using one of the following codes.

Code	Description
CS	Composite – shored construction
CU	Composite – unshored construction
IM	Integral or monolithic
NC	Non-composite

Do not report this item when Item B.SP.09 (*Deck Material and Type*) is 0.

Commentary

This item captures the type of structural interaction that occurs between the bridge deck and superstructure, which may indicate the importance of the deck to the overall stability and capacity of the bridge.

Use code NC to indicate that the deck and the superstructure act independently.

Use code CU to indicate that the deck acts composite with the superstructure, and that the superstructure can carry its own self-weight, plus that of the deck concrete prior to curing.

Commentary Continued

Use code CS to indicate that the deck acts composite with the superstructure, but without the deck the superstructure requires shoring to carry its own self weight, the weight of the deck concrete prior to curing, or both.

Use code IM to indicate that the deck was cast or fabricated of the same material and at the same time as the superstructure and the two can be expected to act as a unit. Use code IM for slabs and orthotropic steel decks.

When the type of interaction is unknown, code this item consistent with the assumption used in the load rating calculations.

Examples

Steel rolled shape beams with cast-in-place deck. No shear connectors. Report NC.

Precast concrete bulb-tee with cast-in-place deck. Shear connectors extend into the deck. Deck was cast without shoring. Report CU.

Precast concrete double-tee beam bridge with an additional structural deck cast on top. Report CU.

Steel plate girder with cast-in-place deck. Shear connectors extend into the deck. Girders were shored during deck construction to maintain stability. Report CS.

Cast-in-place tee-beam bridge. Report IM.

Adjacent beam bridge. Traffic rides on the top flange of the box. Report IM

B.SP.09 Deck Material and Type

Format	Frequency	Item ID
AN (3)	I	B.SP.09

Specification	Commentary
Report the deck material and type for the span configuration using one of the following codes. Code Description 0 None A01 Aluminum C01 Reinforced concrete – cast-in-place C02 Reinforced concrete – precast C03 Prestressed concrete – pre-tensioned C04 Prestressed concrete – cast-in-place post-tensioned C05 Prestressed concrete – precast post-tensioned CX Concrete – other F01 FRP composite – aramid fiber F02 FRP composite – carbon fiber F03 FRP composite – glass fiber FX FRP composite – other S01 Steel – open grid S02 Steel – filled or partially filled grid S03 Steel – plate S04 Steel – orthotropic S05 Steel – corrugated SX Steel – other T01 Timber – glue laminated T02 Timber – nail laminated T03 Timber – solid sawn T04 Timber – stress laminated TX Timber – other X Other	In cases where the superstructure configuration may have a combination of deck materials and/or types, code the predominant deck material and type based on the deck area. Use the applicable code for superstructure types with integral top flanges that serve as the deck, such as concrete tee-beams and box beams/girders. For slabs, and for the slab portion of three-sided and four-sided concrete rigid frame bridges and culverts not under fill, use the same applicable material code as used in Item B.SP.04 (*Span Material*). Use code 0 for the following bridge and culvert types when under fill, as these do not have a deck component: slabs, arches without spandrels, closed spandrel arches, pipes, and three-sided or four-sided rigid frames. Use code C02, C03, or C05, as applicable, for full depth precast panels only. Use code C01 or C04, as applicable, for cast-in-place concrete on partial depth structural panels that are not just considered stay-in-place forms.

B.SP.10 Wearing Surface

Format	Frequency	Item ID
AN (3)	I	B.SP.10

Specification	Commentary
Report the predominant wearing surface material type protecting the deck or slab for the span configuration using one of the following codes. Code Description 0 None B01 Bituminous (asphalt) C01 Concrete – monolithic C02 Concrete – unmodified C03 Concrete – latex modified C04 Concrete – low slump C05 Concrete – fiber reinforced C06 Concrete – microsilica C07 Concrete – polyester CX Concrete – other CU Concrete – unknown E01 Earth – gravel or soil P01 Polymer – epoxy P02 Polymer – polyester PX Polymer – other S01 Steel T01 Timber – running planks X Other Do not report this item when Item B.SP.09 (*Deck Material and Type*) is 0.	When a span configuration has a combination of wearing surface types, code the predominant wearing surface type based on the deck or slab area. Do not consider patching materials when coding this item. Use code 0 when no additional sacrificial concrete thickness or wearing surface is included on the deck or slab. Use codes C01 through CU for overlays that contain portland cement. Use code C01 when there is an additional sacrificial thickness cast concurrently with the structural deck or slab. Use code C02 when an additional placement of concrete of the same concrete material as the deck or slab is placed after the deck or slab has cured. Use code CU when a concrete wearing surface exists, but the specific material composition is unknown. Use code S01 when a steel grid deck is fabricated with an additional sacrificial thickness. Code S01 is not intended for temporary steel plates. Use code T01 where running planks are added on timber decks or slabs.

Examples

Bridge with 2” asphalt wearing surface over a sheet waterproofing membrane. Report B01.

Bridge with latex modified concrete overlay topped with an epoxy polymer overlay. Report P01.

B.SP.11 Deck Protective System

Format	Frequency	Item ID
AN (3)	I	B.SP.11

Specification	Commentary
Report the deck protective system for the span configuration using one of the following codes. Code Description 0 None A01 Admixture – internally sealed A02 Admixture – low permeability A03 Admixture – polymer impregnated A04 Admixture – corrosion inhibitor A05 Admixture – ASR inhibitor AX Admixture – other C01 Coating – paint C02 Coating – sealer C03 Coating – methacrylate C04 Coating – hot dip galvanizing C05 Coating – metalizing/thermal spray CX Coating – other M01 Membrane – built up M02 Membrane – sheet M03 Membrane – liquid applied MU Membrane – unknown MX Membrane – other P01 Patina – uncoated weathering steel T01 Treated – timber preservative U Unknown X Other Do not report this item when Item B.SP.09 (*Deck Material and Type*) is 0.	Code this item consistent with the predominant material reported in Item B.SP.09 (*Deck Material and Type*). In cases where the deck may have a combination of protective systems, use the code for the predominant protective system based on protected area. In cases where multiple systems protect the same area, use the code for the outermost protective layer. Use code 0 when the deck is unprotected Use code A01 for internally sealed concrete systems that use wax beads in the concrete. After the concrete cures, it is heated to melt the wax and seal the concrete. Use code A02 when low permeability concrete is used with admixtures such as flyash, microsilica, or slag. Use code A05 when admixtures are used to inhibit alkali-silica reactivity (ASR). Use code C02 for sealers such as silanes, siloxanes, linseed oils, etc. Do not use codes C02 and C03 when the material is applied for localized crack repair. Use code M01 when the membrane is built up using combined layers of liquid and preformed/sheet membranes. Use code MX when a membrane type is known, but does not match the types specified for codes M01, M02, or M03.

Examples – Deck Protective System
Bridge with 2" asphalt wearing surface over a sheet waterproofing membrane. Report M02. Bridge deck constructed with polymer impregnated concrete and sealed with a flood coat of methacrylate. Report C03. *NDOT Commentary – Deck Protective System* *M01 Membrane – built-up. AKA cold liquid applied membrane* *M02 Membrane – sheet. AKA preformed fabric membrane.* *M03 Membrane – liquid applied. AKA hot liquid applied membrane.*

B.SP.12 Deck Reinforcing Protective System

Format	Frequency	Item ID
AN (3)	I	B.SP.12

Specification

Report the type of deck reinforcing protective system for the span configuration using one of the following codes for concrete decks and slabs.

Code	Description
0	None
C01	Coating – epoxy coated
C02	Coating – galvanized
C03	Coating – metalized
CX	Coating – other
R01	Reinforcing – stainless, clad
R02	Reinforcing – stainless, solid
R03	Reinforcing – high chromium
R04	Reinforcing – FRP, aramid fiber
R05	Reinforcing – FRP, carbon fiber
R06	Reinforcing – FRP, glass fiber
R07	Reinforcing – FRP, other
RX	Reinforcing – other
S01	Sacrificial – cathodic, passive
S02	Sacrificial – cathodic, active SX
	Sacrificial – other
U	Unknown
X	Other

Report this item only if Item B.SP.09 (*Deck Material and Type*) is concrete (i.e. codes C01 to CX).

Commentary

In cases where the span(s) may have a combination of protective systems, use the code for the predominant protective system based on protected area. In cases where multiple systems protect the same area, use the code for the outermost protective layer. If the top and bottom mat have different protective systems, report the protective system for the top mat.

Do not consider bar chairs or other reinforcing steel supports when coding this item.

Use code 0 when steel reinforcement is unprotected, such as with black steel.

Use codes C01 to CX and R01 to RX when any (e.g., top mat only) or all the reinforcing steel in the deck is protected by the selected steel type.

Use code S02 when impressed currents are used as the cathodic protection system.

Example

Bridge deck constructed with black reinforcing bars, later widened with a top mat of epoxy coated bars and bottom mat of black bars. This bridge has two span data sets.

- Report 0 for the original deck data set.
- Report C01 for the widened deck data set.

B.SP.13 Deck Stay-In-Place Forms

Format	Frequency	Item ID
AN (3)	I	B.SP.13

Specification	Commentary
Report the type of deck stay-in-place form for the span configuration using one of the following codes. Code Description 0 None C01 Concrete – reinforced C02 Concrete – prestressed F01 FRP composite M01 Metal T01 Timber X Other Do not report this item when Item B.SP.09 (*Deck Material and Type*) is 0.	Use this item to identify forms used in construction that remain in place by design or owner preference. When a span configuration has a combination of stay-in-place form types, code the predominant type based on the deck area. Use code C01 when a precast reinforced concrete panel (partial depth) is used with a cast-in-place reinforced concrete placement on top. Use code C02 when a precast prestressed concrete panel (partial depth) is used with a cast-in-place reinforced concrete placement on top. This item is not intended to be used for materials installed only for debris shielding, or when Item B.SP.09 (*Deck Material and Type*) is S05 (Steel – corrugated).

Examples

Bridge constructed using 3” thick prestressed concrete form panels. Completed deck is 8” thick. Report C02.

Bridge with reinforced concrete deck placed originally with removable forms, subsequently widened with reinforced concrete deck placed on metal stay-in-place forms. This bridge has two span data sets.

- Report 0 for the original data set.
- Report M01 for the widened data set.

Example Span Material and Type Data for Bridge Number 15558X

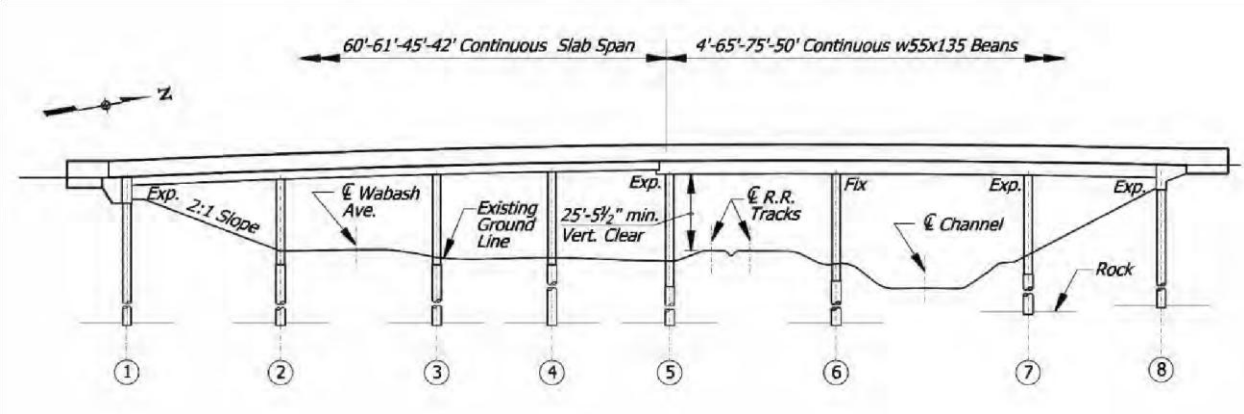


Figure 8. Elevation view for Bridge number 15558X, looking west. (Source: Missouri DOT)

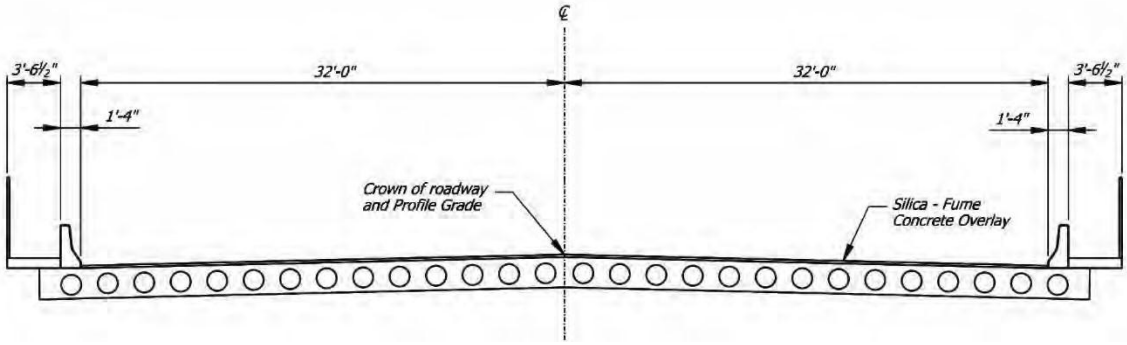


Figure 9. Cross-section view for Bridge Number 15558X, spans one through four. (Source: Missouri DOT)

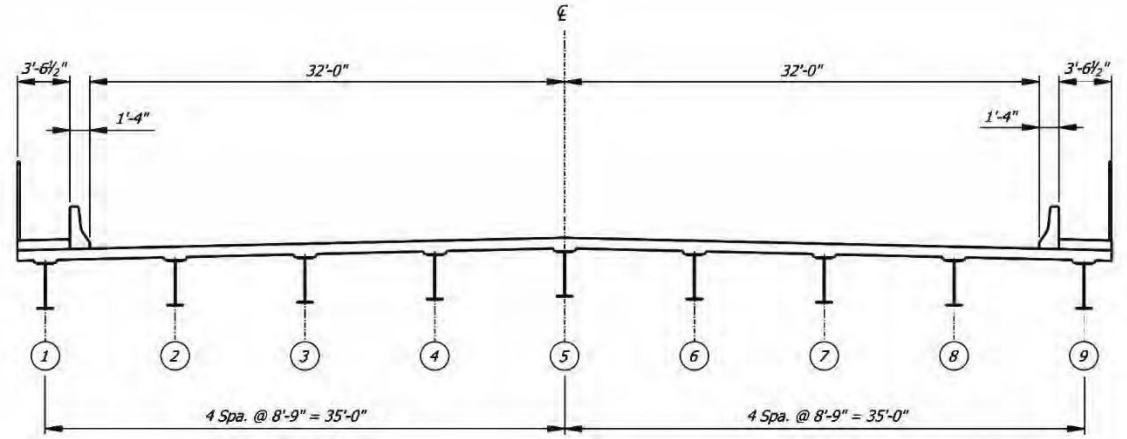


Figure 10. Cross-section view for Bridge Number 15558X, spans five through seven. (Source: Missouri DOT)

The bridge has seven spans with an intermediate hinge in span four.

Main spans one through three are continuous, cast-in-place reinforced concrete voided slabs. Slabs are reinforced with uncoated bars (black bars) and protected with an active cathodic protection system. Slabs have a microsilica modified concrete overlay with a surface penetrating sealer. (Value 1)

Main span four is a cast-in-place reinforced concrete voided slab supported on one end by cantilever portions of the steel beams extending from span five. Slabs are reinforced with uncoated bars (black bars) and protected with an active cathodic protection system. Slabs have a microsilica modified concrete overlay with a surface penetrating sealer. (Value 2)

Main spans five through seven are continuous, rolled steel beams (W35x135) that are painted. There are nine beam lines in each span. The beams support a cast-in-place, reinforced concrete deck that is reinforced with epoxy coated reinforcing steel. The beams are composite with the deck. The deck has a monolithic, sacrificial concrete wearing surface with a surface penetrating sealer. The deck has no stay-in-place forms. (Value 3)

This bridge has three span data sets.

Table 4. Span Material and Type data items in the Span Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)
B.SP.01	*Span Configuration Designation*	M01	M02	M03
B.SP.02	*Number of Spans*	3	1	3
B.SP.03	*Number of Beam Lines*	1	1	9
B.SP.04	*Span Material*	C01	C01	S01
B.SP.05	*Span Continuity*	2	4	2
B.SP.06	*Span Type*	S02	S02	G01
B.SP.07	*Span Protective System*	S02	S02	C01
B.SP.08	*Deck Interaction*	IM	IM	CU
B.SP.09	*Deck Material and Type*	C01	C01	C01
B.SP.10	*Wearing Surface*	C06	C06	C01
B.SP.11	*Deck Protective System*	C02	C02	C02
B.SP.12	*Deck Reinforcing Protective System*	S02	S02	C01
B.SP.13	*Deck Stay-In-Place Forms*	0	0	0

SUBSECTION 2.2: SUBSTRUCTURE MATERIAL AND TYPE

The data items in this subsection identify the substructure and foundation material(s) and type(s) for the bridge and are considered part of the Substructure Data Set. These data items have a many-to-one relationship with a bridge when applicable.

Data items for this subsection are reported for each substructure configuration present in the bridge. A substructure configuration characterizes all substructure units that have the same material, type, and foundation type. One or more substructure sets are reported for a bridge when applicable. Substructures of similar configuration do not need to be adjacent to be reported in the same data set.

These data items are not reported when Item B.SP.06 (*Span Type*) is a pipe (i.e. code P01 or P02). Deck and superstructure are not otherwise considered in the determination of a substructure set.

The data for items in this subsection typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.SB.01	Substructure Configuration Designation
B.SB.02	Number of Substructure Units
B.SB.03	Substructure Material
B.SB.04	Substructure Type
B.SB.05	Substructure Protective System
B.SB.06	Foundation Type
B.SB.07	Foundation Protective System

B.SB.01 Substructure Configuration Designation

Format	Frequency	Item ID
AN (3)	I	B.SB.01

Specification

Report the substructure set designation using one of the following codes.

Code	Description
A##	Abutment
P##	Pier or Bent
W##	Widening

Replace the ## characters in the above codes with sequential numbers, with leading zeros, assigned to each substructure configuration.

Do not report this item when B.SP.06 (*Span Type*) is a pipe (i.e. code P01 or P02).

Commentary

This item captures how the reported substructure configuration is designated.

The substructure is the portion of a bridge below the bearings or below the springline of an arch, which transfers loads to the foundation. This includes the walls and footings, caps, or floor slabs of three-sided and four-sided rigid frame bridges and culverts.

Replacing the "##" characters in the codes with a sequential number (e.g., A01, A02, P01, etc.) identifies each unique substructure configuration present on the bridge.

Commentary Continued

An abutment is a substructure unit located at the end of a bridge that transfers loads from the superstructure to the foundation while providing lateral support for the approach roadway embankment. Typically, a bridge has two abutments, but there may be cases (such as bifurcated structures assigned two bridge numbers) where one end of the bridge does not mate up with the approach roadway.

A multiple span bridge with cantilevered end spans that are unsupported at the extreme ends does not have abutments.

Piers and bents are substructure units that support the spans of a multi-span superstructure at intermediate location(s) between abutments.

Use code W for widened portions of abutments or piers/bents with dissimilar substructure construction.

Examples

Single-span concrete rigid frame bridge. This bridge has one designated substructure data set. Report A01.

Two-span concrete, three-sided, rigid frame culvert. This bridge has two designated substructure data sets.

- Report A01 for the end support frame legs data set.
- Report P01 for the intermediate support frame leg data set.

Four-span multi-beam bridge with integral concrete abutments and concrete column piers. This bridge has two designated substructure data sets.

- Report A01 for the abutment data set.
- Report P01 for the pier data set.

Examples Continued – Substructure Configuration Designation

Three-span bridge with intermediate concrete pier walls and cantilevered end spans that are unsupported at the extreme ends. This bridge has one designated substructure data set. Report P01.

Three-span suspension bridge with concrete tower piers, concrete pier walls supporting the ends of the suspension spans, eight timber bents supporting the approach spans, and concrete stub abutments at each end of the bridge. The north abutment has a spread footing on rock foundation and the south abutment has a steel H-pile foundation. This bridge has five designated substructure data sets.

- Report A01 for the north abutment data set.
- Report A02 for the south abutment data set.
- Report P01 for the towers data set.
- Report P02 for the concrete pier walls data set.
- Report P03 for the timber bents data set.

Five-span girder bridge with concrete stub abutments and concrete wall piers. Bridge is widened with concrete stub abutments and concrete column piers. This bridge has three designated substructure data sets.

- Report A01 for the stub abutments (including the widening) data set.
- Report P01 for the concrete wall piers data set.
- Report W01 for the concrete columns data set.

B.SB.02 Number of Substructure Units

Format	Frequency	Item ID
N (3,0)	I	B.SB.02

Specification	Commentary
Report the number of substructure units.	This item captures the number of substructure units of similar material, design, and foundation type that are being reported.

Examples

Four-span multi-beam bridge with integral concrete abutments and concrete column piers. This bridge has two substructure data sets.

- Report 2 for the abutment data set.
- Report 3 for the pier data set.

Three-span bridge with intermediate concrete pier walls and cantilevered end spans that are unsupported at the extreme ends. This bridge has one substructure data set. Report 2.

Three-span suspension bridge with concrete tower piers, concrete pier walls supporting the ends of the suspension spans, eight timber bents supporting the approach spans, and concrete stub abutments at each end of the bridge. The north abutment has a spread footing on rock foundation and the south abutment has a steel H-pile foundation. This bridge has five substructure data sets.

- Report 1 for the north abutment data set.
- Report 1 for the south abutment data set.
- Report 2 for the towers data set.
- Report 2 for the concrete pier walls data set.
- Report 8 for the timber bents data set.

Five-span girder bridge with concrete stub abutments and concrete wall piers. Bridge is widened with concrete stub abutments and concrete column piers. This bridge has three substructure data sets.

- Report 2 for the stub abutments (including the widening) data set.
- Report 4 for the concrete wall piers data set.
- Report 4 for the concrete columns data set.

B.SB.03 Substructure Material

Format	Frequency	Item ID
AN (3)	I	B.SB.03

Specification	Commentary
Report the principal substructure material type using one of the following codes. Do not report this item when B.SP.06 (*Span Type*) is a pipe (i.e. code P01 or P02). Code – Description 0 – None A01 – Aluminum C01 – Reinforced concrete – cast-in-place C02 – Reinforced concrete – precast C03 – Prestressed concrete – pre-tensioned C04 – Prestressed concrete – cast-in-place post-tensioned C05 – Prestressed concrete – precast post-tensioned CX – Concrete – other E01 – Earth – reinforced soil mass F01 – FRP composite – aramid fiber F02 – FRP composite – carbon fiber F03 – FRP composite – glass fiber FX – FRP composite – other I01 – Iron – cast I02 – Iron – wrought M01 – Masonry – block M02 – Masonry – stone P01 – Plastic – Polyethylene PX – Plastic – other Codes continued next page.	This item reflects the material which provides the support for the transfer of the superstructure load to the foundation. In cases where the substructure unit(s) may have a combination of materials, use the code for the predominant material that transfers load to the foundation. Use code 0 when the superstructure rests directly on the foundation (i.e. on unreinforced soil or bedding material, reinforced soil or bedding material, or rock). Use code C04 or C05, as applicable, for prestressed concrete substructure unit(s) that utilize both pre-tensioning and posttensioning. Use code E01 when the superstructure rests directly on the reinforced soil mass. Code E01 is not intended to be used for MSE walls when the superstructure does not rest directly on the reinforced soil mass. Use code M01 for masonry made from bricks or concrete blocks. Use code M02 for natural stone. Use code S06 for filled or unfilled steel pipe piles. Use code C01 for cased and uncased cast-in-place concrete piles, and for driven corrugated, fluted, or spiral-welded shell-cased concrete piles.

Specification Continued – Substructure Material

Code	Description
S01	Steel – rolled shapes
S02	Steel – welded shapes
S03	Steel – bolted shapes
S04	Steel – riveted shapes
S05	Steel – bolted and riveted shapes
S06	Steel – pipe
SX	Steel – other
T01	Timber – glue laminated
T02	Timber – nail laminated
T03	Timber – solid sawn
T04	Timber – stress laminated
TX	Timber – other
X	Other

Examples – Substructure Material

Closed spandrel arch founded on cast-in-place concrete spread footings on rock. Report C01.

Reinforced concrete full height cantilever abutment. Report C01.

Pile bent abutment with timber piles, timber lagging, and concrete cap. Report C01.

Pile bent abutment with steel H-piles, timber lagging, and rolled steel cap. Report S01.

Reinforced concrete stub abutment on steel piles with a MSE wall. Report C01.

GRS abutment with precast, prestressed concrete box beams placed directly on the reinforced soil mass. Report E01.

B.SB.04 Substructure Type

Format	Frequency	Item ID
AN (3)	I	B.SB.04

Specification

Report the abutment, pier, or bent design type using one of the following codes.

Do not report this item when B.SP.06 (*Span Type*) is a pipe (i.e. code P01 or P02).

Code	Description
0	None
A01	Abutment – cantilever/wall
A02	Abutment – stub
A03	Abutment – open/spill through
A04	Abutment – integral
A05	Abutment – semi-integral
A06	Abutment – gravity
A07	Abutment – counterfort or buttressed
A08	Abutment – pile bent with lagging
A09	Abutment – crib
A10	Abutment – cellular/vaulted
A11	Abutment – reinforced soil mass
A12	Abutment – footing or cap only
AX	Abutment – other
B01	Bent – column or open
B02	Bent – column with web wall
B03	Bent – pile
B04	Bent – straddle or c-shaped
BX	Bent – other
P01	Pier – wall
P02	Pier – single column
P03	Pier – multiple column
P04	Pier – multiple column with web wall
P05	Pier – straddle or c-shaped
P06	Pier – movable bridge
P07	Pier – tower
P08	Pier – footing or cap only
PX	Pier – other

Codes continued next page.

Commentary

In cases where the substructure may have a combination of designs due to retrofitting actions, use the code for the predominant design.

Both piers and bents provide the same function; however, a pier has only one footing at each substructure unit (the footing may serve as a pile cap) while a bent has several footings or no footing, as is the case with a pile bent.

Use code 0 when the superstructure rests directly on the foundation (i.e. on unreinforced soil or bedding material, reinforced soil or bedding material, or rock).

Use codes A01 to A10, as appropriate, if the superstructure load is supported by a substructure unit, which is in turn supported by piles or the reinforced soil mass. Use code A11 when the superstructure rests directly on the reinforced soil mass.

Use code A02 for partial height abutments that do not extend to near the bottom of the embankment fill. Use code A02 for abutments that are larger height than a pile cap or have features such as a backwall that exceed the purpose of a pile cap.

Use code A10 when the space between wingwalls, abutment stem, approach slab, and footings is hollow.

Use code A12 or P08 when the superstructure rests only on a footing, grade beam, thrust block, or pile or shaft cap with embedded piles or shafts that are not part of a bent.

Use code B04 when a highway or railroad passes directly beneath or through the bent.

Commentary continued next page

Specification Continued – Substructure Type	Commentary Continued – Substructure Type
Code Description U Unknown X Other	Use code P06 for piers that support movable bridges and the equipment needed to open and close the bridge. Use code P07 for towers of complex bridges such as cable-stayed and suspension bridges.

Examples – Substructure Type

Reinforced concrete full-height cantilever abutment. Report A01.

Reinforced concrete stub abutment on steel piles with a MSE wall. Report A02.

Pile bent type abutment with painted steel piles, timber lagging, and steel cap. Report A08.

Single-span closed spandrel arch that bears directly on a thrust block founded on rock. Report A12.

Single-span timber beams resting on concrete grade beam. Report A12.

Single-span railroad flat car with ends resting on unreinforced soil. Report 0.

Intermediate bent supported on concrete-filled steel pipe piles connected with a concrete cap beam. Report B03.

Reinforced concrete pier wall widened with a single reinforced concrete column. This bridge has two substructure data sets.

- Report P01 for the pier data set.
- Report P02 for the widening data set.

Reinforced concrete pier with three concrete columns on concrete footing/pile cap. Report P03.

NDOT Commentary – Substructure Type

See the NDOT Substructure & Foundation Identification Guide on NDOT's Bridge Division Webpage.

B.SB.05 Substructure Protective System

Format	Frequency	Item ID
AN (3)	I	B.SB.05

Specification	Commentary
Report the substructure protective system using one of the following codes. Do not report this item when B.SP.06 (*Span Type*) is a pipe (i.e. code P01 or P02). Code – Description 0 – None A01 – Admixture – internally sealed A02 – Admixture – low permeability A03 – Admixture – polymer impregnated A04 – Admixture – corrosion inhibitor A05 – Admixture – ASR inhibitor AX – Admixture – other C01 – Coating – paint C02 – Coating – sealer C03 – Coating – methacrylate C04 – Coating – hot dip galvanizing C05 – Coating – metalizing/thermal spray CX – Coating – other E01 – Encasement – concrete EX – Encasement – other P01 – Patina – uncoated weathering steel S01 – Sacrificial – cathodic, passive S02 – Sacrificial – cathodic, active SX – Sacrificial – other T01 – Treated – timber preservative U – Unknown X – Other Do not report this item when Item B.SB.04 (*Substructure Type*) is 0.	Code this item consistent with the predominant material reported in Item B.SB.03 (*Substructure Material*). In cases where the substructure may have a combination of protective systems, use the code for the predominant protective system based on protected area. In cases where multiple systems protect the same area, use the code for the outermost protective layer. Use code 0 when the substructure is unprotected. Use code 0 when unprotected steels either never were coated or currently have no signs of coating systems and have no protective systems, such as, cathodic protection or weathering chemistry. Anti-graffiti coatings are not considered when coding this item. Use code C01 for weathering steel that has been painted. Use code C02 for sealers such as silanes, siloxanes, linseed oils, etc. Use code E01 for steel piles of pile bents that are encased in concrete. Use code P01 only for weathering grades of steel. For timber, use code T01 for oil-based or water-borne timber preservatives. Use code C01 for paints and stains.

Examples – Substructure Protective System
Painted weathering steel pier cap. Report C01. Pile bent with preservative treated timber piles and concrete cap sealed with siloxane. Report C02. Pile bent type abutment with painted steel H-pile foundation, timber lagging, and reinforced concrete cap with active cathodic protection. Report S02.

B.SB.06 Foundation Type

Format	Frequency	Item ID
AN (3)	I	B.SB.06

Specification

Report the foundation type using one of the following codes.

Do not report this item when B.SP.06 (*Span Type*) is a pipe (i.e. code P01 or P02).

Code	Description
E01	Earth – reinforced soil
E02	Earth – unreinforced soil
E03	Earth – Rock
F01	Footing – not on rock
F02	Footing – on rock
F03	Footing – on reinforced soil
P01	Pile – steel H-shape
P02	Pile – steel pipe
P03	Pile – concrete, cast-in-place
P04	Pile – prestressed concrete
P05	Pile – timber
P06	Pile – auger cast
P07	Pile – micropile
P08	Pile – composite
P09	Pile – FRP composite
PX	Pile – other
S01	Drilled shaft – single
S02	Drilled shafts – multiple
S03	Caisson
U	Unknown
X	Other

Commentary

In cases where the substructure has a combination of foundations due to retrofitting actions, use the code for the predominant foundation.

Do not consider localized repairs to original foundation types when reporting this item.

Use code E01 when the superstructure bears directly on reinforced soil, reinforced bedding material, or the reinforced soil mass. Use code E02 when the superstructure bears directly on unreinforced soil or unreinforced bedding material. Use code E03 when the superstructure bears entirely on rock

Use codes F01 to F03 for footings or when the substructure bears directly on ground at grade or below grade, e.g. grade beams, floor slabs, gravity walls, crib walls, etc.

Use code F02 only if the design plans, or subsequent subsurface investigation, indicate that the entire foundation is supported by rock.

Use code F03 if the superstructure load is supported by a substructure unit, which is in turn supported by the reinforced soil mass.

Use code P02 for filled or unfilled steel pipe piles.
Use code P03 for cased and uncased cast-in-place concrete piles, and for driven corrugated, fluted, or spiral-welded shell-cased concrete piles.

Use code P04 for solid or hollow-core square, octagonal, or cylindrical piles.

Use code P06 for piles that have concrete or grout placed by pumping through the stem of the auger pipe as the auger is withdrawn.

Commentary Continued – Foundation Type

Use code P07 for small diameter piles, typically less than 12 inches, that are drilled, then grouted.

Use code P08 for piles in which the length is composed of two or more pile types or materials, excluding pile tips.

Use code P09 when FRP composite piles are used for construction but not as repairs to existing piles of a different type.

Use codes S01 and S02 for cased or uncased drilled shafts.

Use code S03 for footings sunk into position by excavation through or beneath the caisson structure.

NDOT Commentary – Foundation Type

See the NDOT Substructure & Foundation Identification Guide on NDOT's Bridge Division Webpage.

Examples – Foundation Type

Three-sided concrete frame culvert with a spread footing keyed into bedrock, modified by adding a four-sided box culvert placed on crushed stone bedding to the end of the barrel to widen the culvert. This culvert has two substructure data sets.

- Report F02 for the three-sided concrete frame culvert data set.
- Report F01 for the four-sided box culvert data set.

Three-sided concrete frame culvert with steel H-pile foundation, modified by adding a four-sided box culvert with steel H-pile foundation to the end of the barrel to widen the culvert. This culvert has two substructure data sets.

- Report P01 for the three-sided concrete frame culvert data set (B.SB.01=A01).
- Report P01 for the four-sided box culvert data set (B.SB.01=W01).

Closed spandrel arch founded on spread footings on bedrock. Report F02.

Pile bent abutment with steel H-piles, timber lagging, and rolled steel cap. Report P01.

Reinforced concrete stub abutment on steel H-piles with an MSE wall. Report P01.

Precast, reinforced concrete arch structure constructed on cast-in-place concrete footing with steel H-pile foundation. Report P01.

Pile bent abutment with timber piles, timber lagging, and concrete cap. Report P05.

GRS abutment with precast, prestressed concrete box beams placed directly on the reinforced soil mass. Report E01.

Four corrugated steel circular pipes placed on crushed stone bedding. Do not report this item.

B.SB.07 Foundation Protective System

Format	Frequency	Item ID
AN (3)	I	B.SB.07

Specification

Report the foundation protective system using one of the following codes.

Do not report this item when B.SP.06 (*Span Type*) is a pipe (i.e. code P01 or P02).

Code	Description
0	None
A01	Admixture – internally sealed
A02	Admixture – low permeability
A03	Admixture – polymer impregnated
A04	Admixture – corrosion inhibitor
A05	Admixture – ASR inhibitor
AX	Admixture – other
C01	Coating – paint
C02	Coating – sealer
C03	Coating – methacrylate
C04	Coating – hot dip galvanizing
C05	Coating – metalizing/thermal spray
CX	Coating – other
E01	Encasement – concrete
EX	Encasement – other
P01	Patina – uncoated weathering steel
S01	Sacrificial – cathodic, passive
S02	Sacrificial – cathodic, active
SX	Sacrificial – other
T01	Treated – timber preservative
U	Unknown
X	Other

Commentary

Code this item consistent with the predominant material reported in Item B.SB.06 (*Foundation Type*).

In cases where the foundation may have a combination of protective systems, use the code for the predominant protective system based on protected area. In cases where multiple systems protect the same area, use the code for the outermost protective layer.

Use code 0 when the foundation is unprotected.

Use code 0 when unprotected steels either never were coated or currently have no signs of coating systems and have no protective systems, such as cathodic protection or weathering chemistry.

Anti-graffiti coatings are not considered when coding this item.

Use code C02 for sealers such as silanes, siloxanes, linseed oils, etc.

Use code E01 for steel piles of pile bents that are encased in concrete.

Use code P01 only for weathering grades of steel.

For timber, use code T01 for oil-based or water-borne timber preservatives. Use code C01 for paints and stains.

Examples – Foundation Protective System
Closed spandrel arch founded on spread footings on bedrock. Report 0. Pile bent abutment with timber piles treated with creosote, timber lagging, and concrete cap. Report T01. Pile bent with painted steel H-piles and rolled steel cap. Report C01. GRS abutment with precast, prestressed concrete box beams placed directly on the reinforced soil mass. Report 0. Three-sided concrete frame culvert with a spread footing keyed into bedrock, modified by adding a four-sided box culvert placed on crushed stone bedding to the end of the barrel to widen the bridge. The four-sided box was constructed with high performance concrete that provides for low permeability. • Report 0 for the three-sided concrete frame culvert data set. • Report A02 for the four-sided box culvert data set. Precast, reinforced concrete arch bridge constructed on cast-in-place concrete footing with unpainted steel H-pile foundation. Report 0.

Example Substructure Material and Type Data for Bridge Number *15558X*

The bridge has eight substructure units; two abutments and six piers. All substructure units and their foundations do not have protective systems.

The south abutment is a reinforced concrete stub abutment. The foundation consists of four reinforced concrete drilled shafts. (Value 1)

The north abutment is a semi-integral, reinforced concrete abutment. The foundation consists of three reinforced concrete drilled shafts. (Value 2)

Piers two through four are reinforced concrete column bents. There are four columns per bent. Each column is an extension of a single reinforced concrete drilled shaft. The bent caps are integral with the reinforced concrete voided slab superstructure. (Value 3)

Piers five and six, near the railroad tracks, are reinforced concrete column bents that have reinforced concrete web walls (crash walls). There are three columns per bent. Each column is an extension of a single reinforced concrete drilled shaft. The reinforced concrete bent caps are not integral with the steel beam superstructure. (Value 4)

Pier seven is a reinforced concrete column bent. There are three columns. Each column is an extension of a single reinforced concrete drilled shafts. The reinforced concrete bent caps are not integral with the steel beam superstructure. (Value 5)

Table 5. Substructure Material and Type data items in the Substructure Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)	Value (5)
B.SB.01	*Substructure Configuration Designation*	A01	A02	P01	P02	P03
B.SB.02	*Number of Substructure Units*	1	1	3	2	1
B.SB.03	*Substructure Material*	C01	C01	C01	C01	C01
B.SB.04	*Substructure Type*	A02	A05	B01	B02	B01
B.SB.05	*Substructure Protective System*	0	0	0	0	0
B.SB.06	*Foundation Type*	S02	S02	S02	S02	S02
B.SB.07	*Foundation Protective System*	0	0	0	0	0

SUBSECTION 2.3: ROADSIDE HARDWARE

The data items in this subsection identify crash tested roadside hardware on the bridge. These data items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge.

The data for these items typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.RH.01	Bridge Railings
B.RH.02	Transitions

Roadside hardware is commonly associated with bridges and serves as a traffic safety feature to redirect errant vehicles and reduce crash severity. The items in this subsection are inventoried to indicate if hardware at the bridge is required, present, or has been crash tested. Do not consider the condition of the hardware when reporting these items.

Table 6 contains the applicable crash testing codes used for all the roadside hardware items in this subsection. The applicable code may be based on an approved analytical equivalency evaluation.

Refer to the FHWA Office of Highway Safety website for policy and guidance on roadside hardware (https://highways.dot.gov/safety/ rwd/reduce-crash-severity). Also, refer to the Task Force 13 – Hardware Guide website for roadside hardware, systems specifications, and individual component details.

The AASHTO LRFD Bridge Design Specifications are currently used to design bridge railings. The AASHTO Manual for Assessing Safety Hardware (MASH), which replaces NCHRP Report 350, is currently used for testing and evaluating the safety performance of roadside hardware.

The AASHTO Roadside Design Guide addresses appropriate bridge railings, roadside barriers, barrier end treatments, and crash cushions.

Table 6. Roadside Hardware codes.

Code	Test Level Code						Description
	1	2	3	4	5	6	
N							Not applicable – roadside hardware is not required.
	MYY1	MYY2	MYY3	MYY4	MYY5	MYY6	Roadside hardware successfully crash-tested for AASHTO MASH.
	3501	3502	3503	3504	3505	3506	Roadside hardware successfully crash-tested for NCHRP Report 350.
	2301	2302	2303				Roadside hardware successfully crash-tested for NCHRP Report 230.
	2391	2392	2393				Roadside hardware successfully crash-tested for NCHRP Report 239.
	891	892	893				Roadside hardware successfully crash-tested for 1989 AASHTO Guide Specifications for Bridge Railings.
X							Roadside hardware successfully crash-tested for other criteria.
AYY							Roadside hardware has not been crash-tested but meets AASHTO Standard Specifications for Highway Bridges.
SYY							Roadside hardware has not been crash-tested but meets approved agency standards.
I							Roadside hardware has not been crash-tested and does not meet approved agency standards.
0 (zero)							None - roadside hardware is required, but required roadside hardware is not present.

Note that YY, for codes in Table 6, represents the last two digits of the year for the crash testing publication, AASHTO Specifications, or agency approved standards.

B.RH.01 Bridge Railings

Format	Frequency	Item ID
AN (4)	I	B.RH.01

Specification	Commentary
Report the crash-test level for the bridge railings using one of the codes in Table 6.	This roadside hardware includes all types and shapes of bridge railings (parapets, median barriers, or structure mounted) located on the bridge or that cross over culverts. Use the code that first applies going from the bottom (Code 0) of Table 6 to the top (MYY), if there are more than one type of bridge railing on the bridge.

Commentary Continued

A list of crash-tested bridge railings may be obtained from the FHWA Office of Highway Safety website at: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/.

Prior to 1993, bridge railings were tested according to the AASHTO Guide Specifications for Bridge Railings, NCHRP Report 230, or NCHRP Report 239.

Since 1993, bridge railings were crash-tested and classified according to the guidelines shown in NCHRP Report 350.

In 2009 the AASHTO Manual for Assessing Safety Hardware (MASH) replaced NCHRP 350.

Refer to State, Federal agency, or Tribal government policies for bridge railing standards.

Use code I when no information is known about the crash test level or an agency approved standard. Also, use code I when an overlay is applied to the deck/slab and the height no longer meets the original geometry requirements of the crash-tested rail.

NDOT Commentary – Bridge Railings
See the NDOT Bridge Rail Identification Guide on the NDOT Bridge Division website.

B.RH.02 Transitions

Format	Frequency	Item ID
AN (4)	I	B.RH.02

Specification	Commentary
Report the crash-test level for transition railings using one of the codes in Table 6.	This roadside hardware serves as the transition from the roadside approach railing to the bridge railing and is firmly attached and anchored to the bridge railing to provide sufficient tension in the transition rail upon impact. Use the code that first applies going from the bottom (Code 0) of Table 6 to the top (MYY), if there are more than one type of transition.

Commentary Continued

A list of crash-tested transitions may be obtained from the FHWA Office of Highway Safety website at: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/.

Since 1993, transitions to bridge railings have been crash tested and classified according to the guidelines shown in NCHRP Report 350.

In 2009 the AASHTO Manual for Assessing Safety Hardware (MASH) replaced NCHRP 350.

Refer to State, Federal agency, or Tribal government policies for transition railing standards.

Use code I when no information is known about the crash test level or an agency approved standard. Also, use code I when an overlay is applied to the deck/slab and the height no longer meets the original geometry requirements of the crash-tested transition.

For bridges with one-way traffic, and which a transition on the departure end of the bridge is not warranted (i.e. only a connection to develop the departure rail strength is warranted), the crash-test level of the departure end does not need to be reported when it is lower crash test level than the approach end.

Examples – Bridge Railings/Transitions



Figure 11. Metal bridge railing and transition (Source: Alaska DOT)

Bridge carries an NHS route with the following roadside hardware.

Alaska Multi-State Bridge Rail successfully crash-tested for NCHRP 350 Test Level 4.

- Report 3504 for Item B.RH.01 (*Bridge Railings*).

Alaska Multi-State Bridge Rail Thrie-Beam Transition successfully crash tested for NCHRP 350 Test Level 4.

- Report 3504 for Item B.RH.02 (*Transitions*).

Examples Continued – Bridge Railings/Transitions

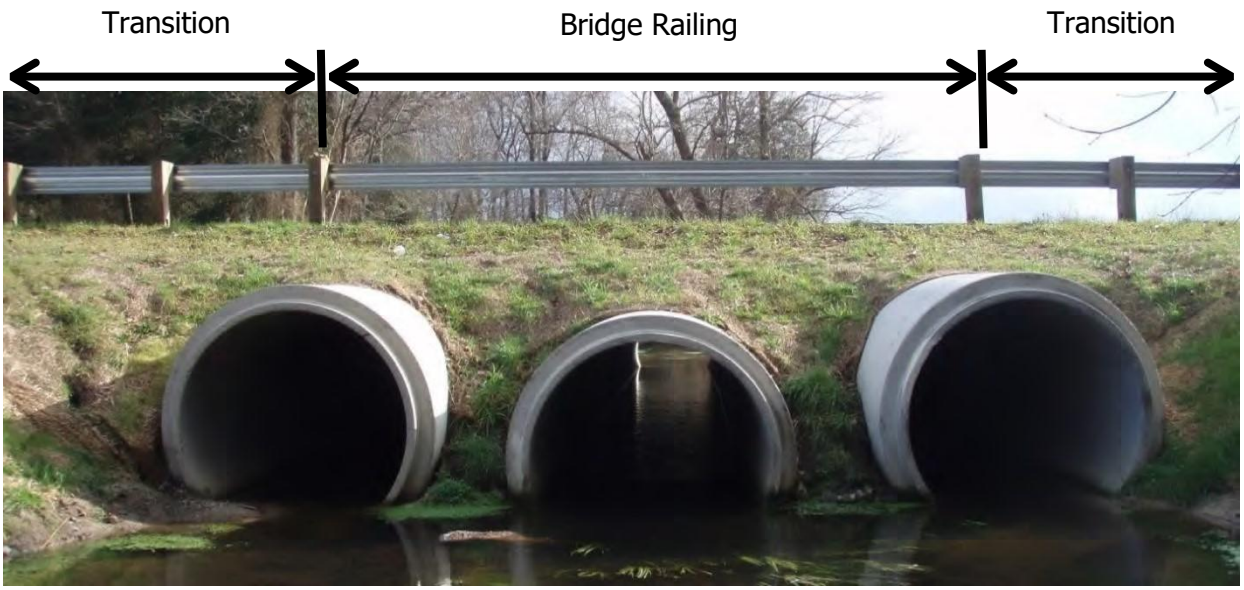


Figure 12. Metal bridge railing and transition for long-span application. (Source: Delaware DOT)

Concrete pipe bridge that carries a non-NHS route with the following roadside hardware.

Steel W-beam bridge rail with wood posts (long-span application) successfully crash tested to MASH 2009 Test Level 3.

- Report M093 for Item B.RH.01 (*Bridge Railings*).

Steel W-beam transition with wood posts (long-span application) successfully crash tested to MASH 2009 Test Level 3.

- Report M093 for Item B.RH.02 (*Transitions*).

Example Roadside Hardware Data for Bridge Number 15558X



Figure 13. Reinforced concrete bridge railing and metal transition railing for Bridge Number 15558X.

The bridge has a 32" tall New Jersey Concrete Safety Shape bridge railing system with details equivalent to the system that was crash-tested using the 1989 AASHTO Guide Specifications for Bridge Railings that resulted in a PL-2 performance level. This bridge railing system was determined to have an NCHRP 350 TL-4 equivalency. Report 3504 for Item B.RH.01 (*Bridge Railings*).

The bridge has a Thrie-Beam transition system for which there is no known information about crash-testing. However, the transition system was built using approved agency standards from 1992. Report S92 for Item B.RH.02 (*Transitions*).

Table 7. Roadside Hardware. Data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.RH.01	*Bridge Railings*	3504
B.RH.02	*Transitions*	S92

SECTION 3: BRIDGE GEOMETRY

The data items in this section provide geometric data for bridges and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge.

The data for these items typically remain static once a bridge has been inventoried. The following data items are included in this section.

Item ID	Data Item
B.G.01	NBIS Bridge Length
B.G.02	Total Bridge Length
B.G.03	Maximum Span Length
B.G.04	Minimum Span Length
B.G.05	Bridge Width Out-to-Out
B.G.06	Bridge Width Curb-to-Curb
B.G.07	Left Curb or Sidewalk Width
B.G.08	Right Curb or Sidewalk Width
B.G.09	Approach Roadway Width
B.G.10	Bridge Median
B.G.11	Skew
B.G.12	Curved Bridge
B.G.13	Maximum Bridge Height
B.G.14	Sidehill Bridge
B.G.15	Irregular Deck Area
B.G.16	Calculated Deck Area

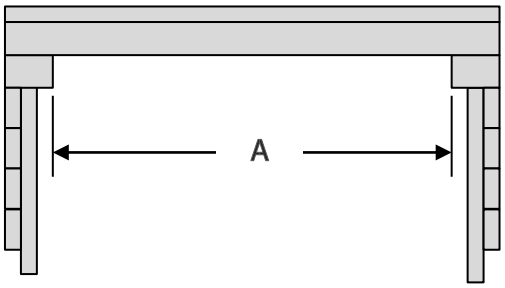
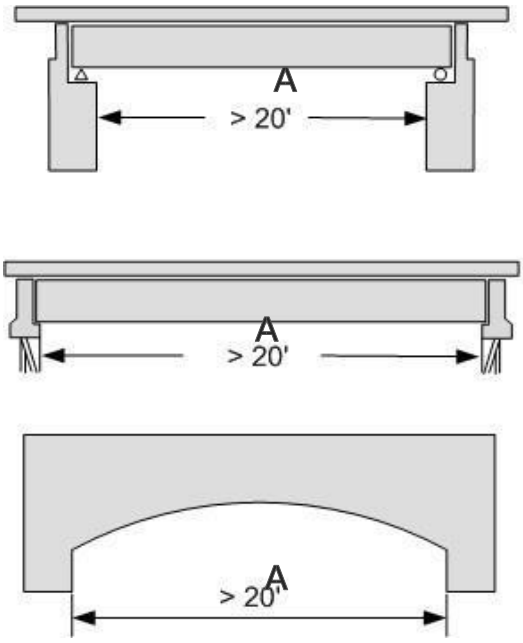
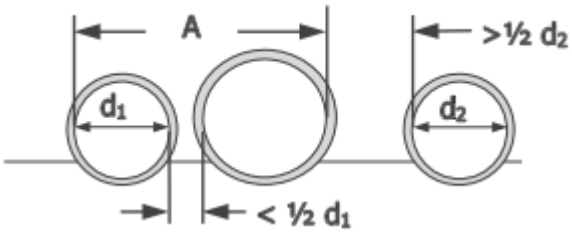
Item B.G.16 (*Calculated Deck Area*) is calculated by FHWA using data from other items in the SNBI. This item is not reported to FHWA. The item specification that explains how the item is calculated is presented for reference only. Therefore, the wording of the specification and commentary is different (passive voice) than for other items (active voice) in this section.

The reported dimensional values for the items in this section can be obtained from either plans or field measurement, excluding B.G.01 (*NBIS Bridge Length*), which is field measured when required by the item specification.

B.G.01 NBIS Bridge Length

Format	Frequency	Item ID
N (7,1)	I	B.G.01

Specification	Commentary
Report the NBIS bridge length to the nearest tenth of a foot measured along the roadway centerline. Measure along the roadway centerline between undercopings of abutments or spring lines of arches. For filled or closed spandrel arches, measure along the roadway centerline from inside faces of exterior spring lines. For other bridges under fill, measure along the roadway centerline from inside faces of exterior walls; this includes multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. Vaulted abutments and enclosed spans or sections are included in the NBIS bridge length. Report the field measured NBIS bridge length when Item B.G.02 (*Total Bridge Length*) is less than 30 ft.	NBIS bridge definition: A structure, including supports, erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it includes multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. (23 CFR 650.305) Structures that meet the NBIS bridge definition, and NBIS applicability in 23 CFR 650.303, are reported to FHWA. The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The length for curved structures would be measured along the curved centerline. When item B.G.02 (*Total Bridge Length*) is greater than 30.0 feet the value for this item may be estimated from plans or drawings, or estimated using the observed difference between items B.G.02 (*Total Bridge Length*) or B.G.03 (*Maximum Span Length*) and the NBIS bridge definition.

Examples – NBIS Bridge Length	
Report measurement A.  *Figure 14. Profile view of a single span bridge*	Report measurement A.  *Figure 15. Profile views of various single span bridges.*
	Report measurement A.  *Figure 16. Profile view of a multi-pipe culvert under fill.*

Examples Continued – NBIS Bridge Length

Skewed multi-pipe bridge under highway has an opening of 20.85 ft measured along the center of the roadway. Report 20.9.

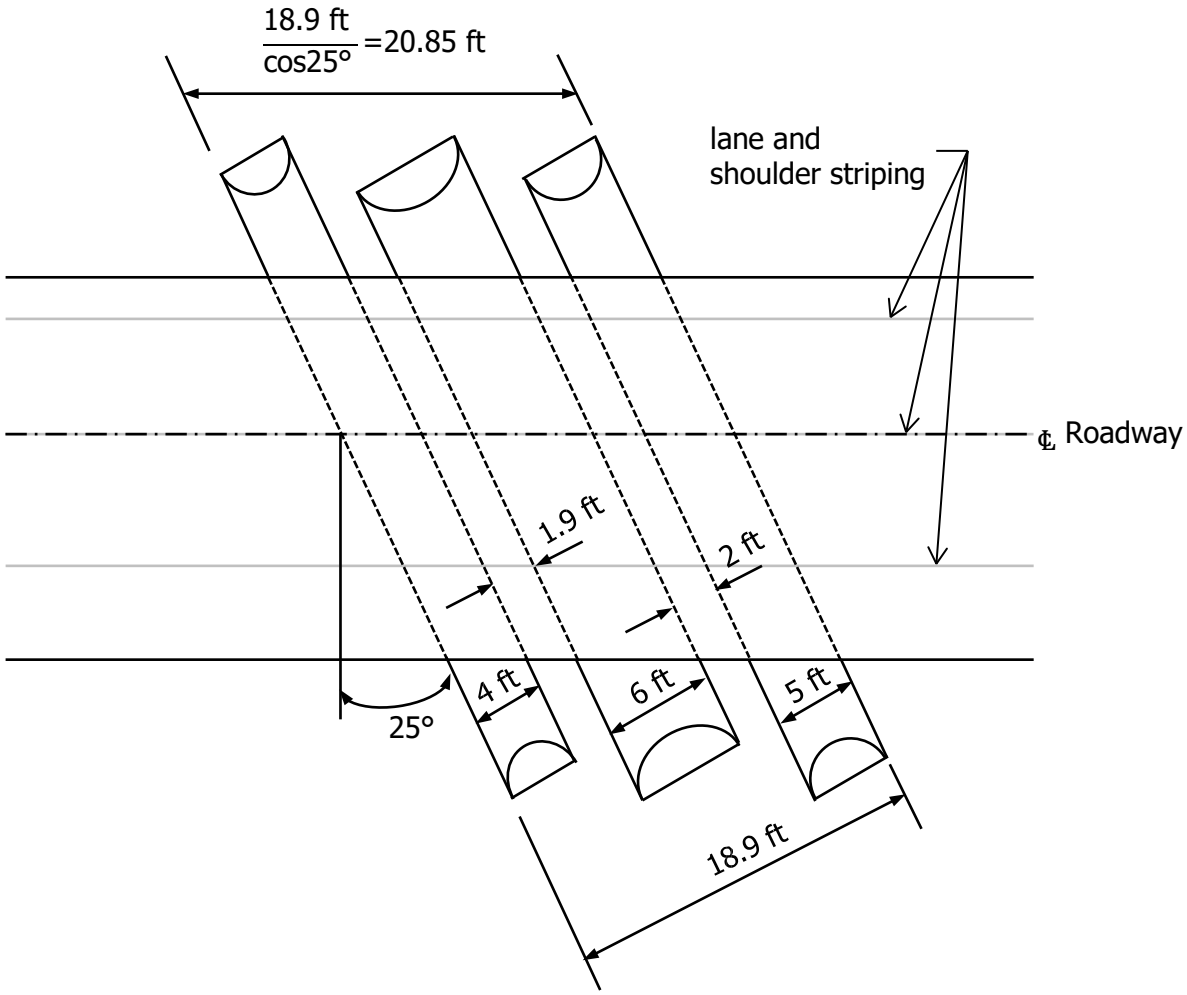


Figure 17. Plan view of a skewed, multi-pipe culvert under fill.

B.G.02 Total Bridge Length

Format	Frequency	Item ID
N (7,1)	I	B.G.02

Specification	Commentary
Report the total length of the bridge to the nearest tenth of a foot measured along the roadway centerline. Measure along the roadway centerline from back-to-back of backwalls or from paving notch to paving notch at abutments. For filled or closed spandrel arches, measure along the roadway centerline from inside faces of exterior spring lines when well-defined backwalls or paving notches do not exist. For other bridges under fill, measure along the roadway centerline from inside faces of exterior walls For bridges with vaulted abutments and enclosed spans or sections, measure from back-to-back of backwalls or from paving notch to paving notch inclusive of the vaulted abutments and enclosed spans.	The total bridge length measurement can be used with the bridge width out-to-out to calculate an estimated deck area. The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The total bridge length for curved bridges is measured along the curved centerline.

Examples – Total Bridge Length

Report measurement A.

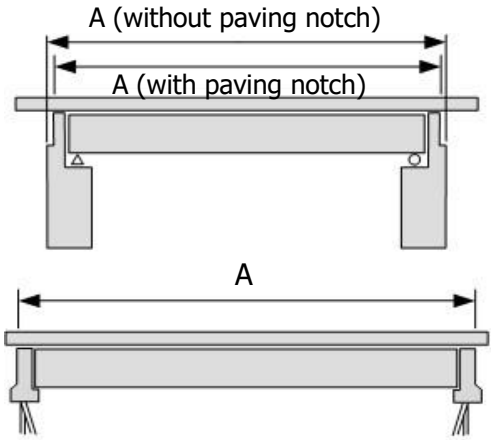


Figure 18. Profile views of various single span bridges.

Report measurement A.

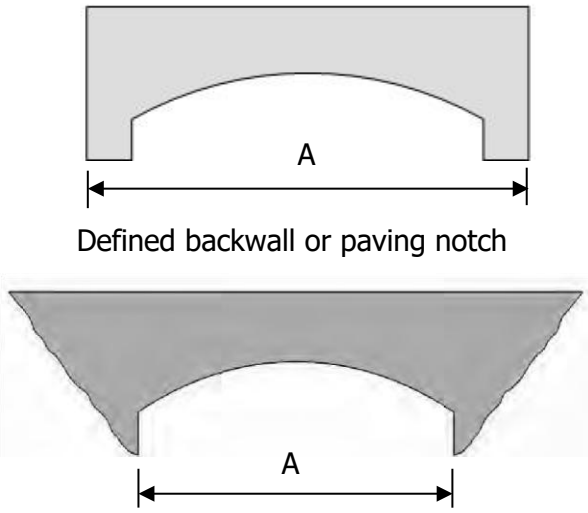


Figure 19. Profile views of various spandrel arches.

Report measurement A.

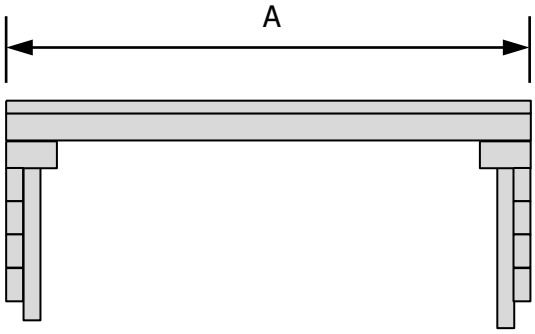


Figure 20. Profile view of a single span bridge with pile bent abutments.

Examples Continued – Total Bridge Length

Report measurement A.

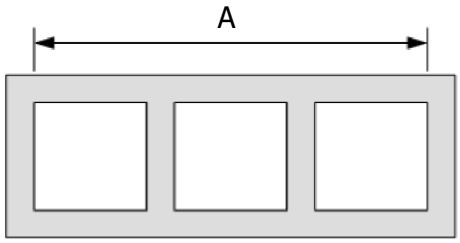


Figure 21. Profile view of a four-sided, multicell culvert under fill

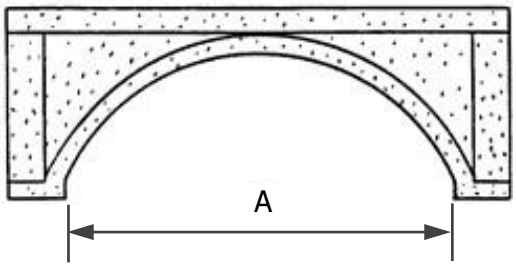


Figure 22. Profile view of a culvert under fill.

Report measurement A.

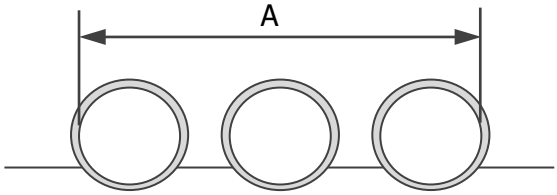


Figure 23. Profile view of a multi-pipe culvert under fill.

Four span bridge with variable skews. Total bridge length is measured along the roadway centerline from back-to-back of backwalls at abutments. Report 477.6.

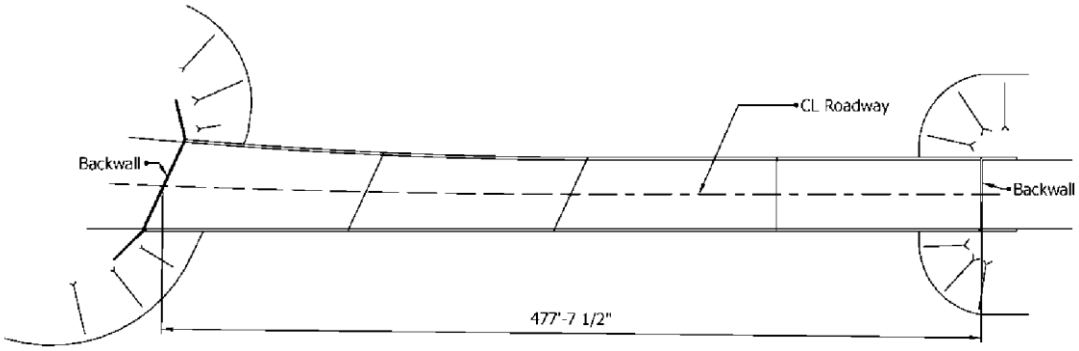


Figure 24. Plan view of a four-span bridge with variable skews.

Examples Continued – Total Bridge Length

Three span curved bridge. Total bridge length is measured along the roadway centerline from back-to-back of backwalls at abutments. Report 504.0.

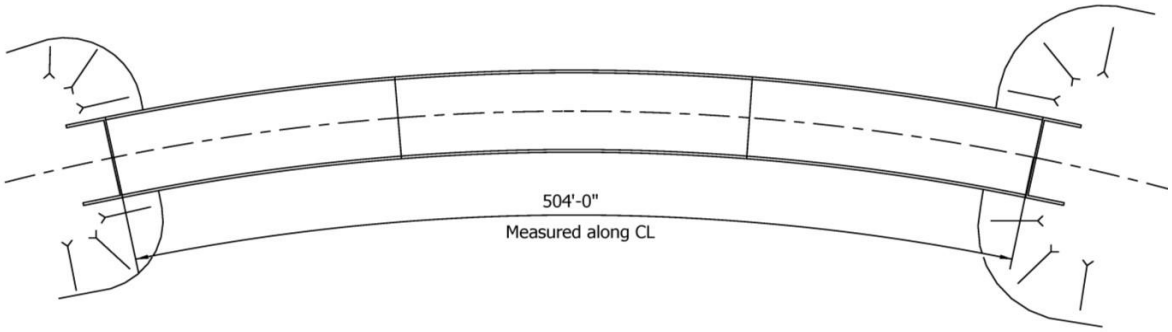


Figure 25. Plan view of a three-span curved bridge.

Skewed pipe bridge under a highway has an opening of 20.85 ft measured along the roadway centerline. Report 20.9.

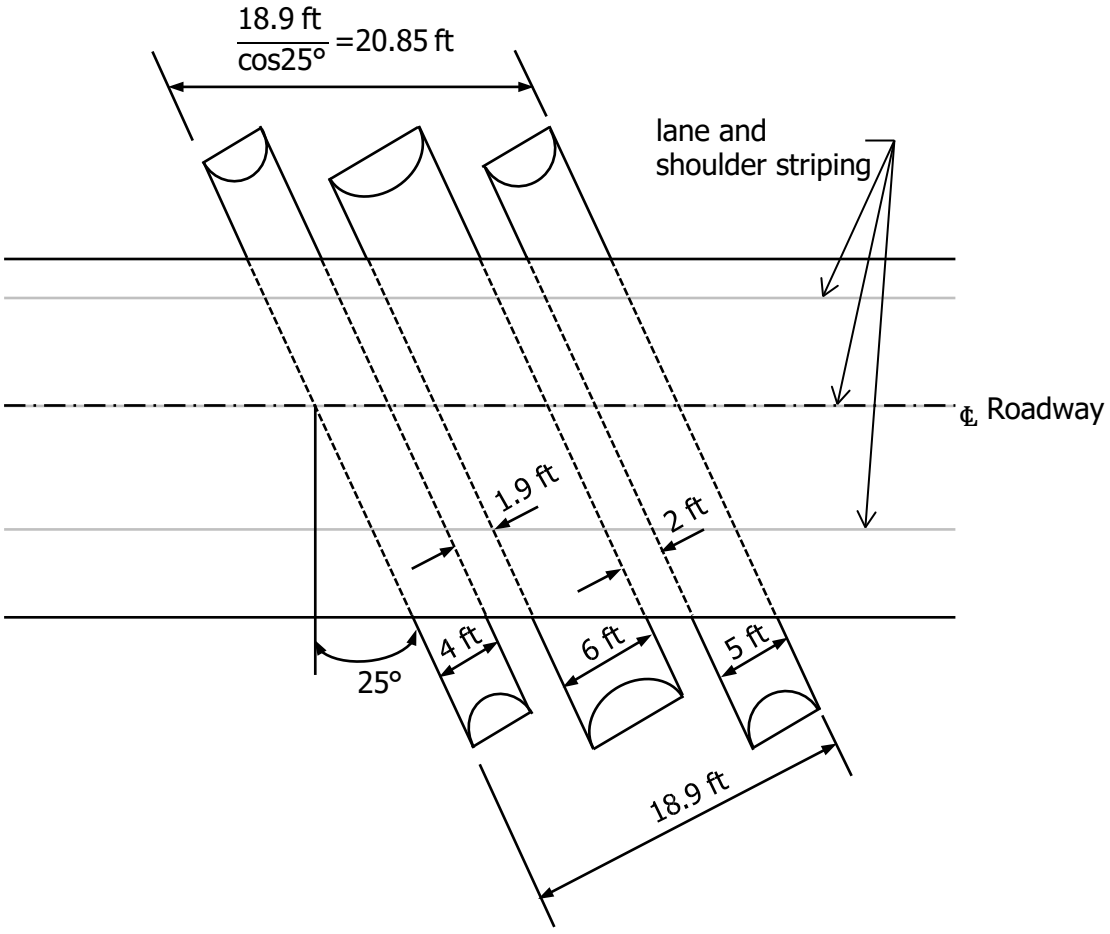


Figure 26. Plan view of a skewed, multi-pipe culvert under fill.

B.G.03 Maximum Span Length

Format	Frequency	Item ID
N (5,1)	I	B.G.03

Specification	Commentary
Report the length of the maximum span to the nearest tenth of foot, measured from centerline of bearing to centerline of bearing, along the roadway centerline.	For rigid frames, arches, pipes, integral abutments, or similar type bridges where there is not a clear centerline of bearing, use the clear open distance between piers, bents, walls, or abutments. The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The length for curved bridges would be measured along the curved centerline. For bridges with in-span hinges or bearings, measure from centerline of substructure bearing to centerline of substructure bearing, or clear open distance between substructure units when there is not a clear centerline of bearing. For bridges with single spans this item has the same value as B.G.04 (*Minimum Span Length*).

Examples – Maximum Span Length

Report measurement A.

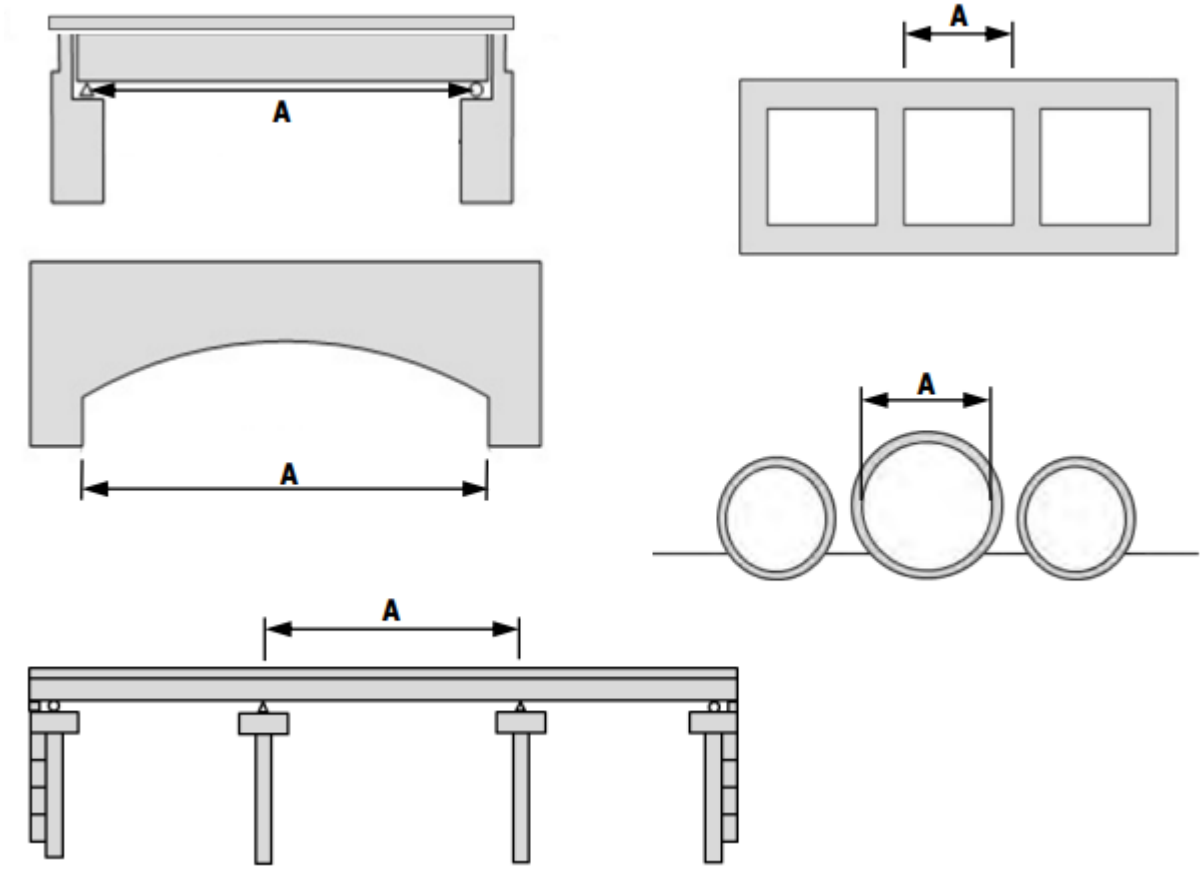


Figure 27. Profile views of various bridge types.

Examples Continued – Maximum Span Length

Four span bridge with variable skews. Span lengths are measured from centerline of bearing to centerline of bearing along the roadway centerline. Report 120.1.

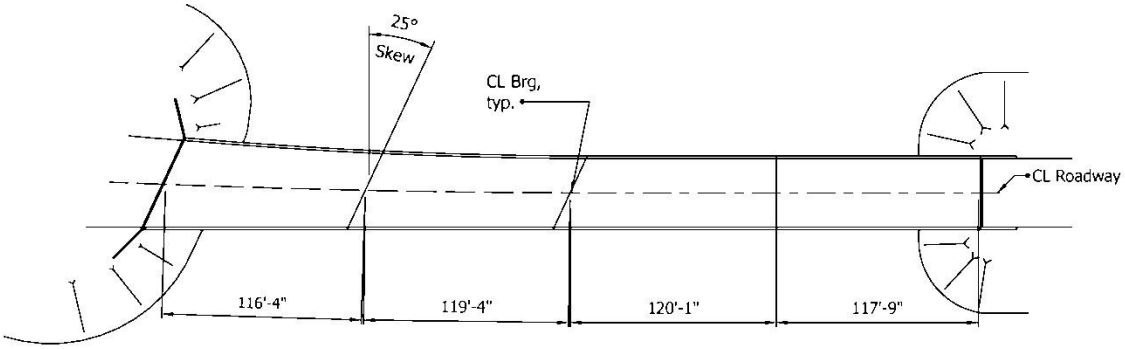


Figure 28. Plan view of a four-span bridge with variable skews.

Three span curved bridge. Span lengths are measured from centerline of bearing to centerline of bearing along the curved roadway centerline. Report 190.0.

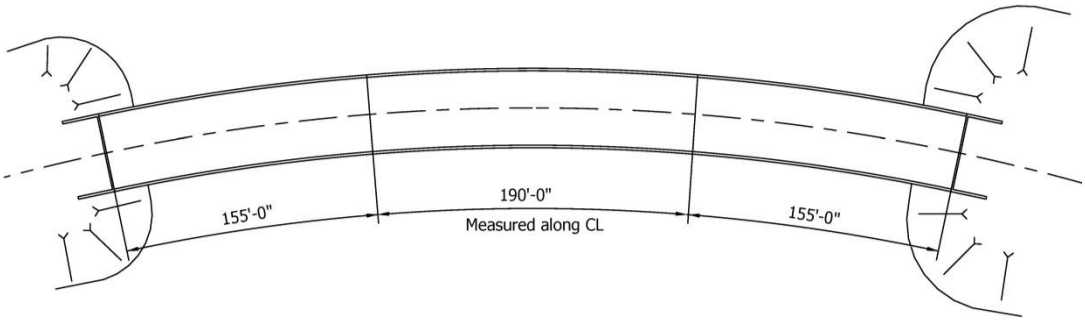


Figure 29. Plan view of a three-span curved bridge.

B.G.04 Minimum Span Length

Format	Frequency	Item ID
N (5,1)	I	B.G.04

Specification	Commentary
Report the length of the minimum span to the nearest tenth of foot, measured from centerline of bearing to centerline of bearing, along the roadway centerline.	For rigid frames, arches, pipes, integral abutments, or similar type bridges where there is not a clear centerline of bearing, use the clear open distance between piers, bents, or abutments.

Commentary Continued

The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The length for curved bridges is measured along the curved centerline.

For bridges with in-span hinges or bearings, measure from centerline of substructure bearing to centerline of substructure bearing, or clear open distance between substructure units when there is not a clear centerline of bearing.

For bridges with single spans this item has the same value as B.G.03 (*Maximum Span Length*).

Examples – Minimum Span Length

Report measurement A.

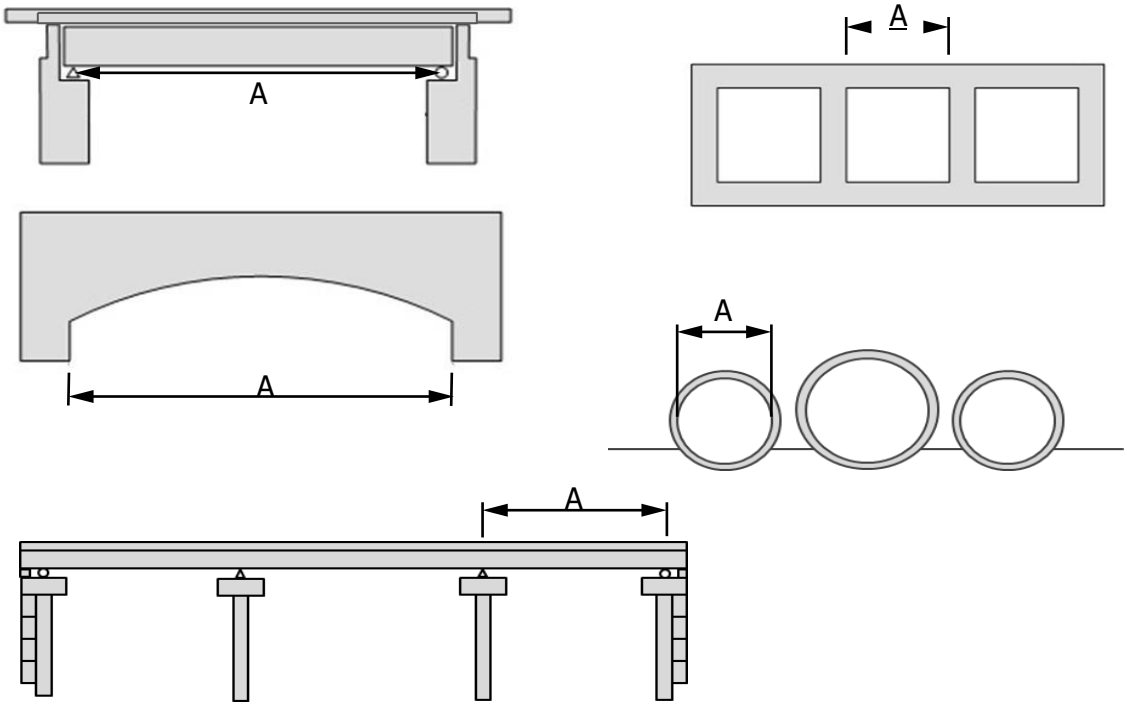


Figure 30. Profile views of various bridge types.

Examples Continued – Minimum Span Length

Four span bridge with variable skews. Span lengths are measured from centerline of bearing to centerline of bearing along the roadway centerline. Report 116.3.

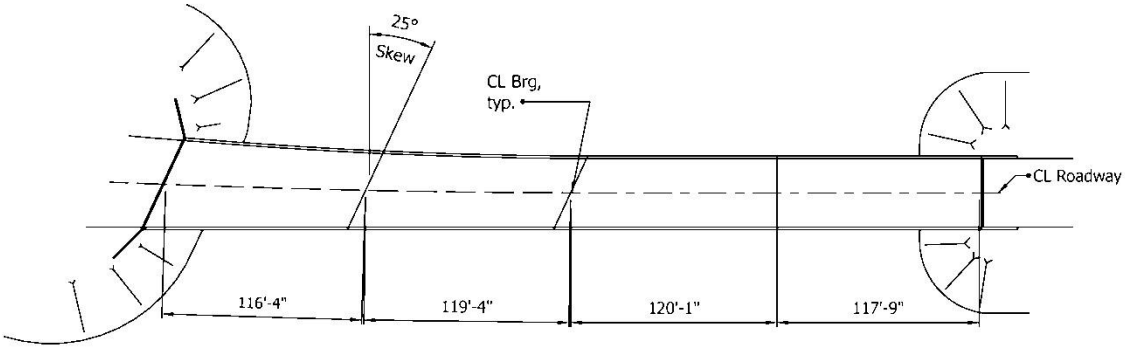


Figure 31. Plan view of a four-span bridge with variable skews.

Three span curved bridge. Span lengths are measured from centerline of bearing to centerline of bearing along the curved roadway centerline. Report 155.0.

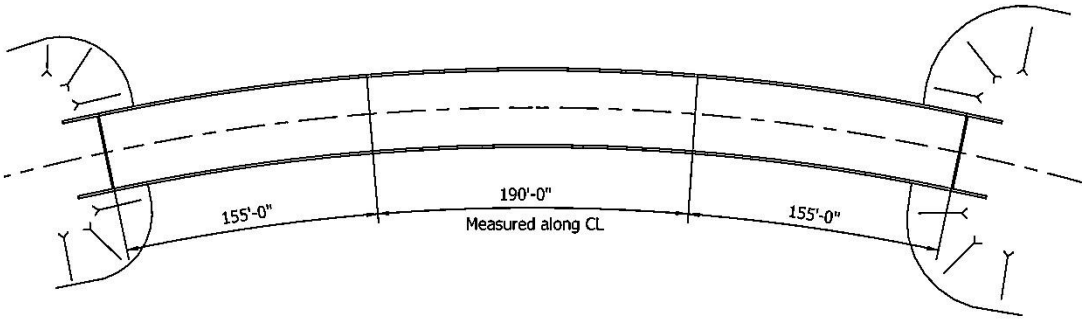


Figure 32. Plan view of a three-span curved bridge.

B.G.05 Bridge Width Out-to-Out

Format	Frequency	Item ID
N (4,1)	I	B.G.05

Specification	Commentary
Report the minimum out-to-out width measured perpendicular to the centerline of the roadway to the nearest tenth of a foot. For multiple (double) deck bridges that are inventoried as one bridge, measure all levels, and report the sum of the measurements to account for the total width carried on the bridge. For bridges under fill, measure the width from out-to-out of the headwalls or barrel ends. For sidehill bridges, measure the out-to-out structure width. For bridges that carry multiple types of service, for example highway, pedestrian, and railroad, measure the out-to-out width that encompasses all service types.	For bridges under fill, the reported value can be limited to the width of the roadway section over the bridge for unusual situations where the bridge continues far beyond the roadway cross-section, and a lesser width would likely be constructed for a replacement project. For bridges under fill, in which the features that define the out-to-out width are not parallel, report the minimum out-to-out width.

Examples

Report measurement A.

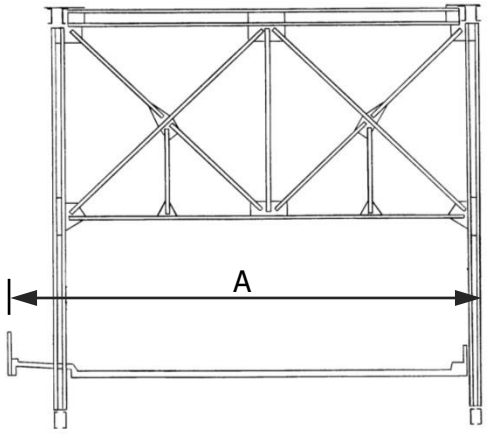


Figure 33. Cross-section view of a through truss bridge.

Examples Continued – Bridge Width Out-to-Out

Report measurement A.

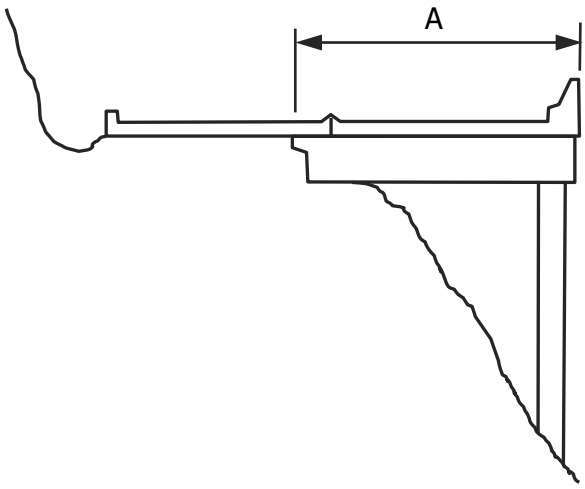


Figure 34. Cross-section view of a sidehill bridge.

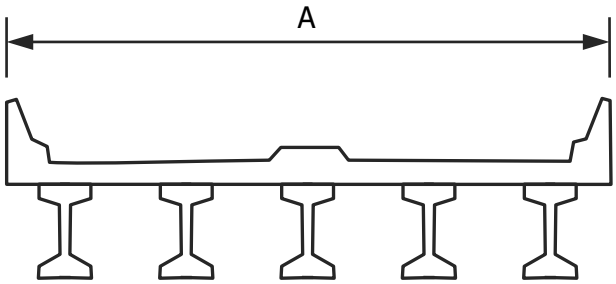


Figure 35. Cross-section view of a multi-girder bridge.

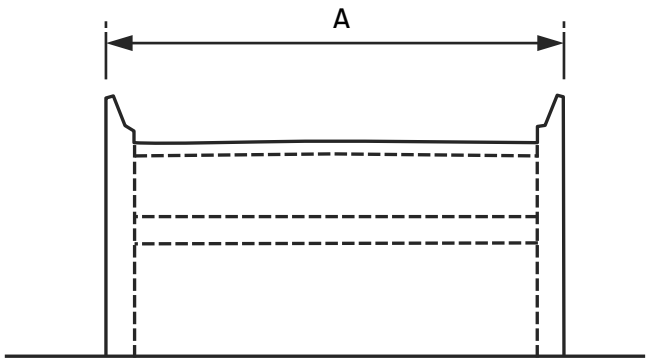


Figure 36. Cross-section view of a filled arch bridge or culvert under fill with headwalls.

Examples Continued – Bridge Width Out-to-Out

Report measurement A.

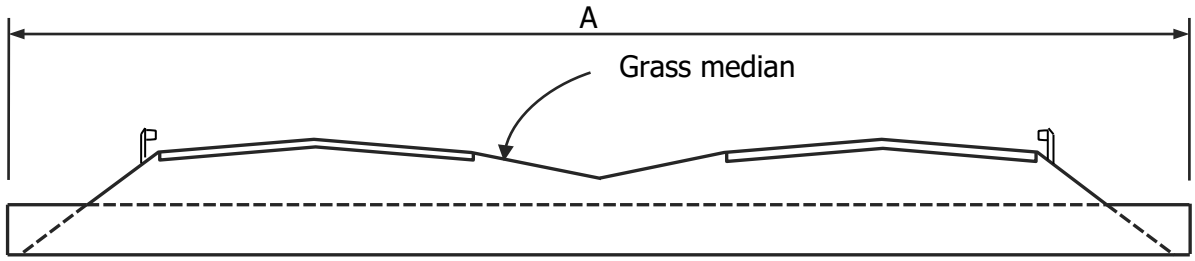


Figure 37. Cross-section view of a pipe culvert under fill.

Report measurement A.

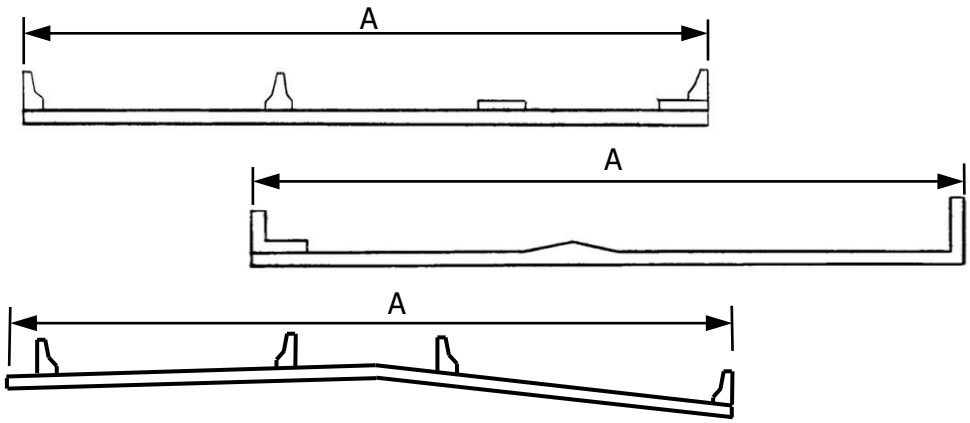


Figure 38. Cross-section views of various bridge decks with medians.

Report measurement A.

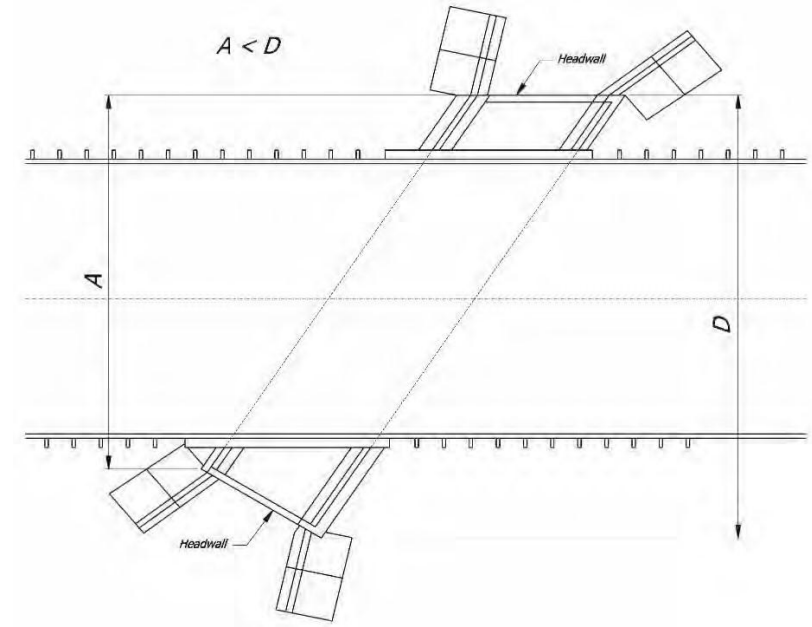


Figure 39. Cross-section views of various bridge decks with medians.

Examples Continued – Bridge Width Out-to-Out

Report measurement A.

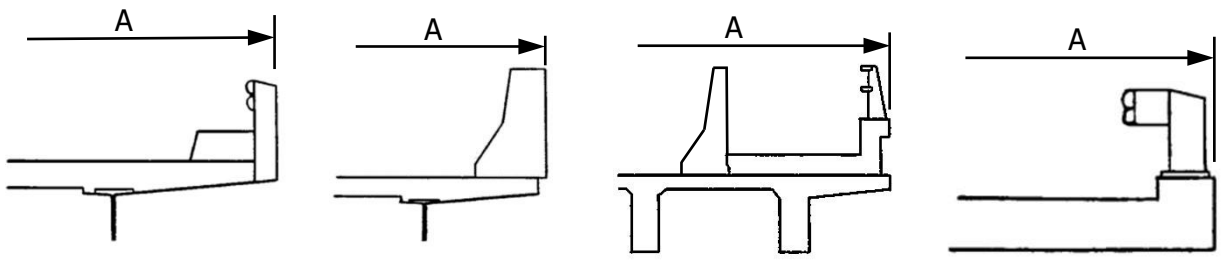


Figure 40. Partial cross-section views of various bridge decks with railings.

Report measurement A.

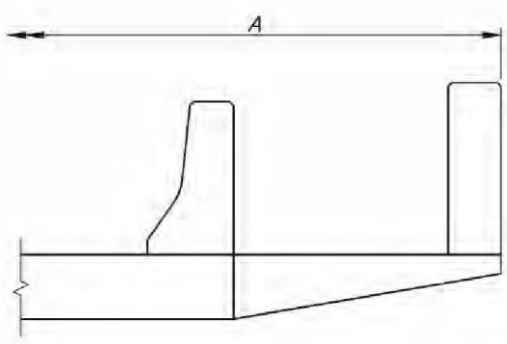


Figure 41. Cross-section view of a sidewalk retrofit.

B.G.06 Bridge Width Curb-to-Curb

Format	Frequency	Item ID
N (4,1)	I	B.G.06

Specification	Commentary
Report the sum of the most restrictive minimum usable distances for all roadways carried by the bridge. Measure the distance on the bridge perpendicular to the centerline of the roadway between curbs or rails to the nearest tenth of a foot. Exclude from the usable distance measurement medians, sidewalks, structurally inadequate shoulders, and other non-mountable areas. The measurement for this item shall be compatible with the measurements used for Item B.H.08 (*Lanes On Highway*), Item B.G.09 (*Approach Roadway Width*), and Item B.H.09 (*Annual Average Daily Traffic*). For multiple (double) deck bridges that are inventoried as one bridge, measure all levels, and report the sum of the most restrictive minimum usable distances carried by the bridge. For sidehill bridges measure the actual full curb-to-curb roadway width. For bridges that carry multiple types of service, for example highway, pedestrian, and railroad, report the usable distance that serves the highway service as denoted by curb or barrier separation, or other delineation that separates the service types.	Usable roadway width includes the width of traffic lanes and the widths of shoulders. Shoulders must be contiguous with the traveled way and must be structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not to be considered a shoulder for this item. Refer to agency policy for when and where stabilized shoulders are used. When it is not readily known if stabilized construction details were used, the presence of rutting, heaving, water retention, or other distress may be used as indicators that the shoulder is not stabilized. For bridges under fill, the usable roadway width crossing the bridge is commonly the same value reported for Item B.G.09 (*Approach Roadway Width*). A barrier or curb greater than 6 inches high may be considered non-mountable for these specifications.

Examples – Bridge Width Curb-to-Curb

Report measurement A.

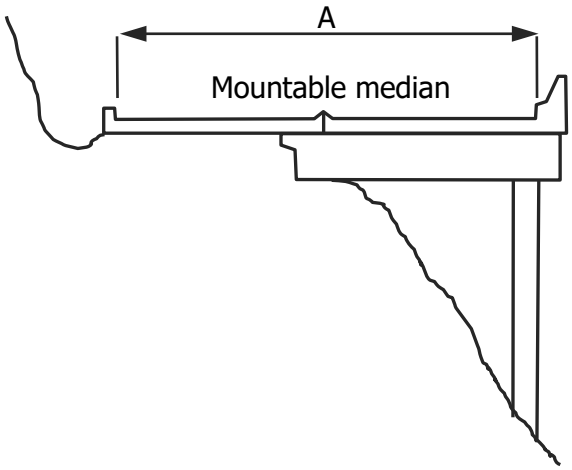


Figure 42. Cross-section view of a sidehill bridge.

Report measurement A.

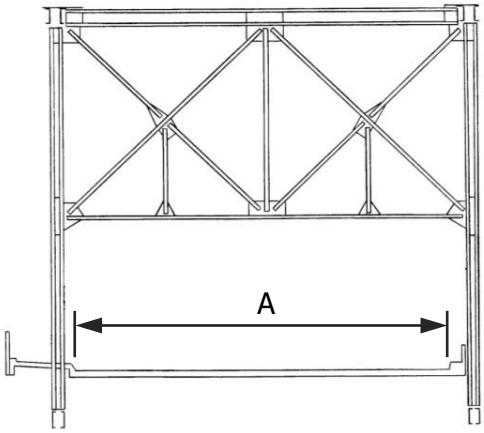


Figure 43. Cross-section view of a through truss bridge.

Report measurement A.

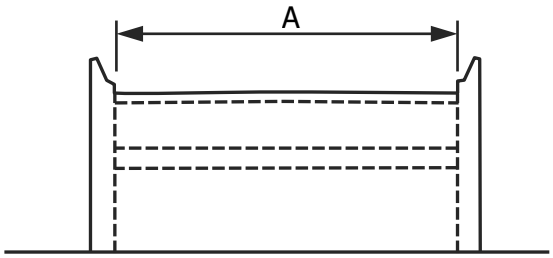


Figure 44. Cross-section view of a filled arch bridge or culvert under fill with headwalls.

Report measurement A.

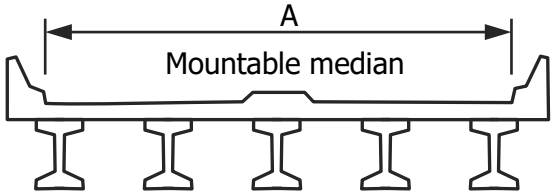


Figure 45. Cross-section view of a multi-girder bridge.

Report the sum of A+B.

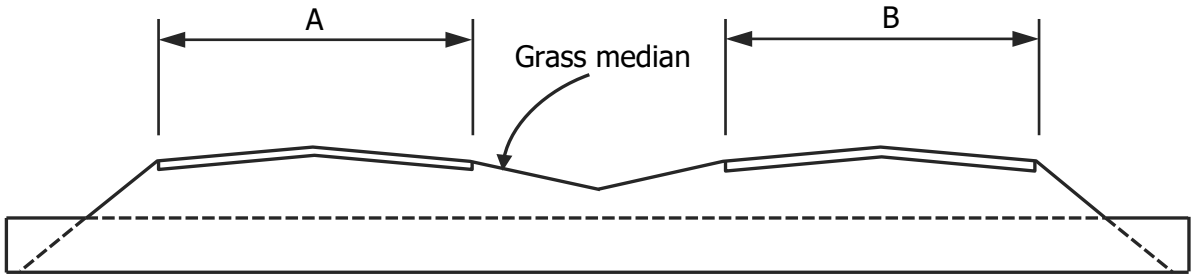


Figure 46. Cross-section view of a pipe culvert under fill.

Examples Continued – Bridge Width Curb-to-Curb

Report measurement A.

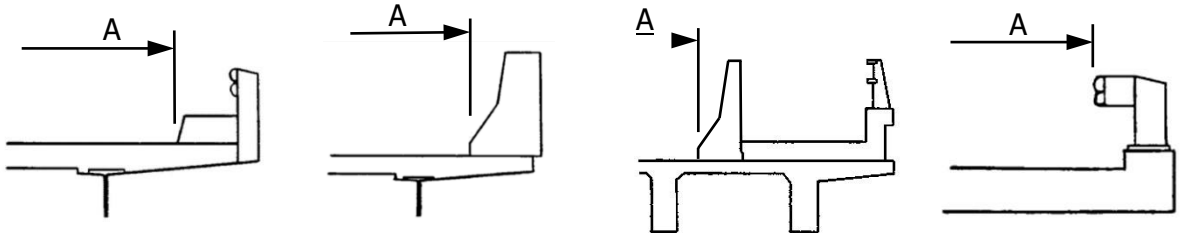


Figure 47. Partial cross-section views of various bridge decks with railings.

Report measurement A.

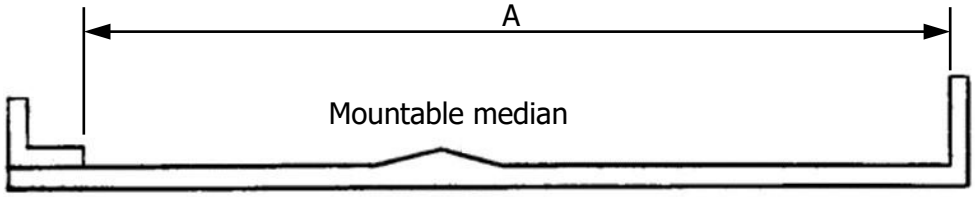


Figure 48. Cross-section view of a bridge deck with mountable median.

Report the sum of A+B+C.

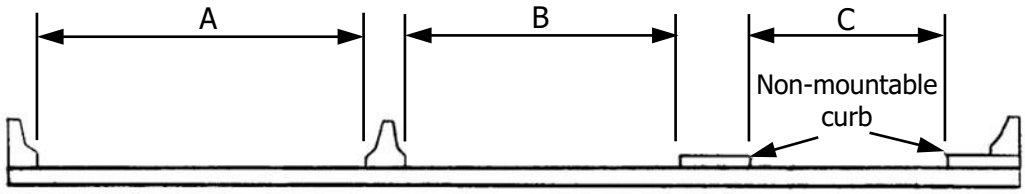


Figure 49. Cross-section view of a bridge deck with non-mountable curb and median barrier.

Report the sum of A+B.

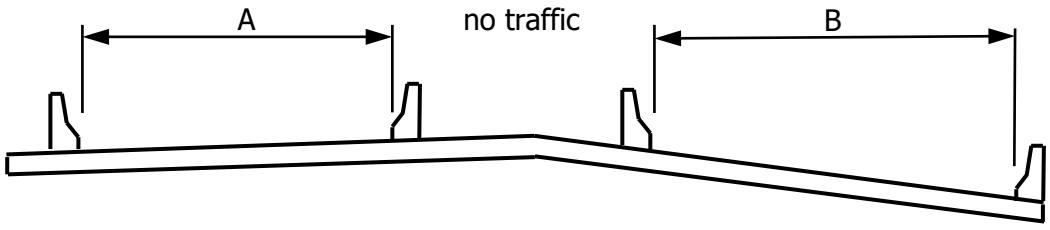


Figure 50. Cross-section view of a bridge deck with multiple median barriers.

B.G.07 Left Curb or Sidewalk Width

Format	Frequency	Item ID
N (3,1)	I	B.G.07

Specification	Commentary
Report the minimum width of the left curb or sidewalk to the nearest tenth of a foot from the face of bridge rail to the face of curb. Measure the width perpendicular to the centerline of the roadway. Report 0.0 when the face of the curb does not extend beyond the face of the bridge rail. Report 0.0 when there is no left curb or sidewalk.	Left and right are determined based on the direction of the inventoried route carried by the bridge, commonly west to east or south to north. When a defined longitudinal joint exists between the curb and the sidewalk, such as a granite curb and concrete sidewalk, measure the width from the face of bridge rail to the face of the granite curb.

Examples

Report measurement C.

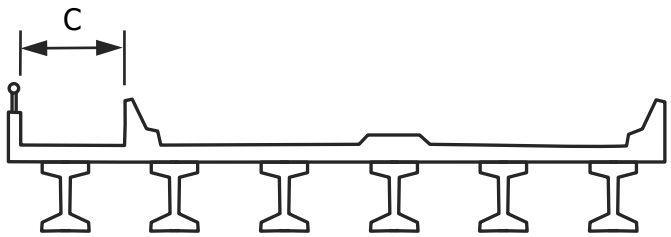


Figure 51. Cross-section view of a multi-girder bridge.

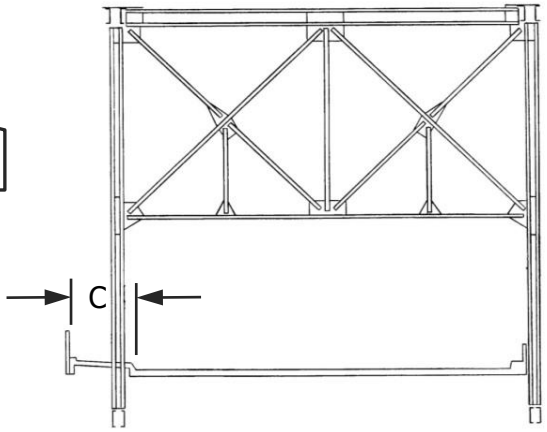


Figure 52. Cross-section view of a through truss bridge.

Report measurement C.

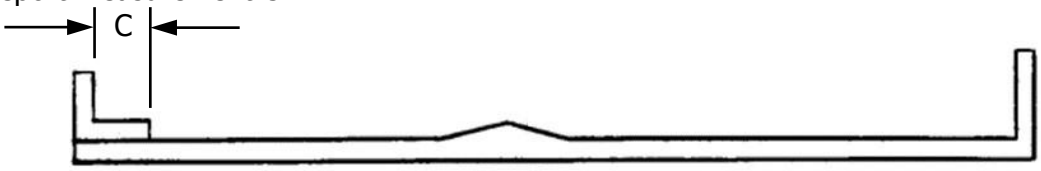
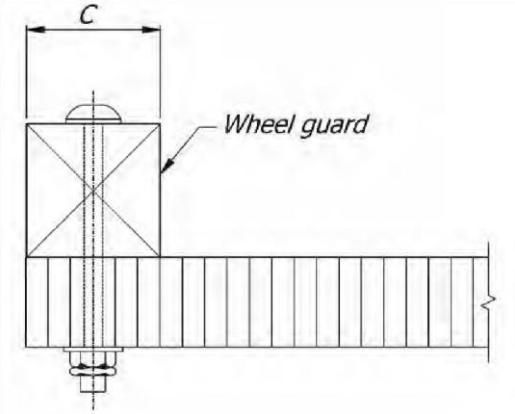
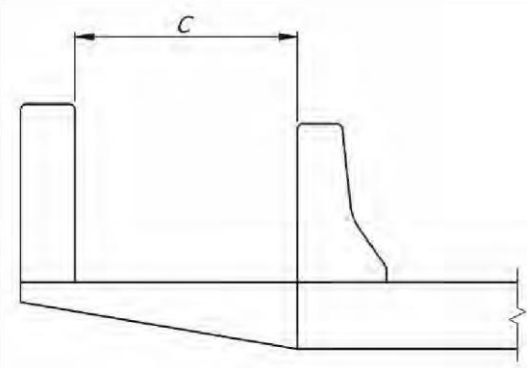
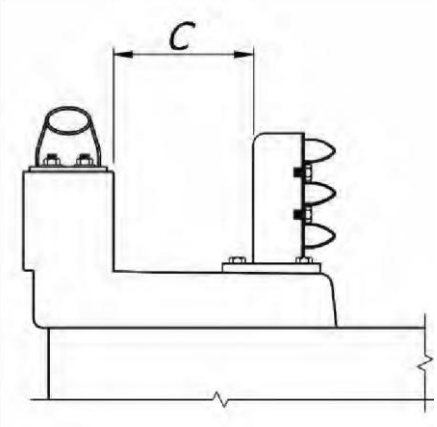


Figure 53. Cross-section view of a slab bridge.

Examples Continued – Left Curb or Sidewalk Width
Report measurement C.    *Figure 54. Cross-section view of a timber wheel guard.*
Report measurement C.    *Figure 55. Cross-section view of a sidewalk retrofit.*
Report measurement C.    *Figure 56. Cross-section view of a sidewalk retrofit.*

B.G.08 Right Curb or Sidewalk Width

Format	Frequency	Item ID
N (3,1)	I	B.G.08

Specification	Commentary
Report the minimum width of the right curb or sidewalk to the nearest tenth of a foot from the face of bridge rail to the face of curb. Measure the width perpendicular to the centerline of the roadway. Report 0.0 when the face of the curb does not extend beyond the face of the bridge rail. Report 0.0 when there is no right curb or sidewalk.	Right and left is determined based on the direction of the inventoried route carried by the bridge, commonly west to east or south to north. When a defined longitudinal joint exists between the curb and the sidewalk, such as a granite curb and concrete sidewalk, measure the width from the face of bridge rail to the face of the granite curb.

Examples

Report measurement C.

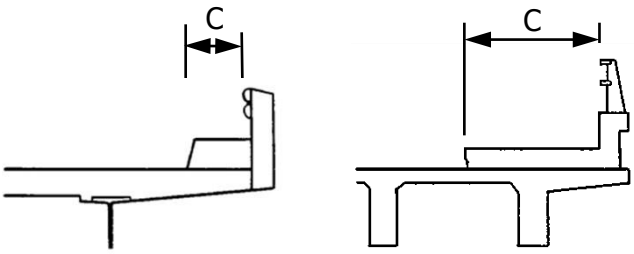


Figure 57. Partial cross-section views of various bridge decks with railings.

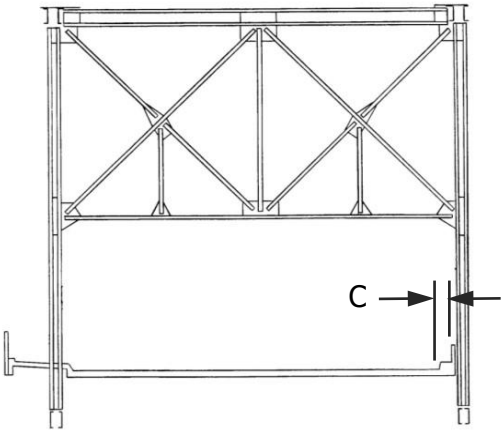


Figure 58. Cross-section view of a through truss bridge.

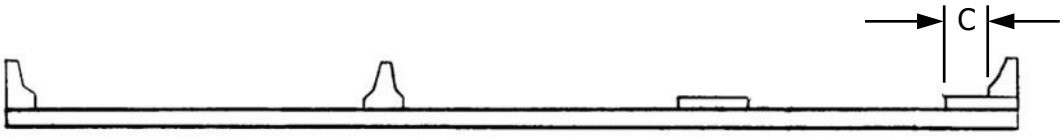
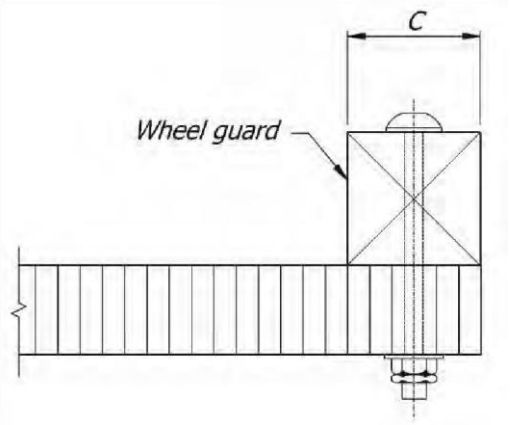
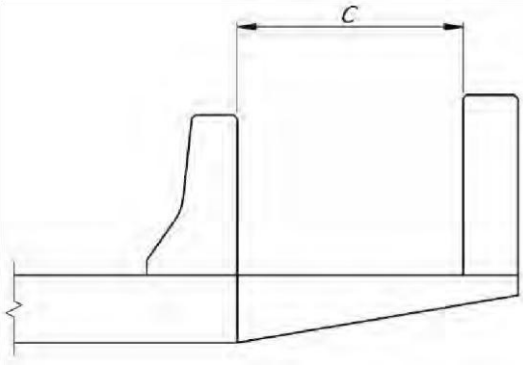
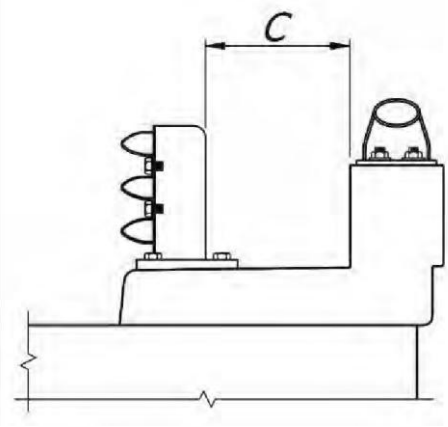


Figure 59. Cross-section view of a slab bridge with various medians.

Examples Continued – Right Curb or Sidewalk Width
Report measurement C.    *Figure 60. Cross-section view of a timber wheel guard.*
Report measurement C.    *Figure 61. Cross-section view of a sidewalk retrofit.*
Report measurement C.    *Figure 62. Cross-section view of a sidewalk retrofit.*

B.G.09 Approach Roadway Width

Format	Frequency	Item ID
N (4,1)	I	B.G.09

Specification	Commentary
Report the minimum usable approach roadway width measured to the nearest tenth of a foot. Measure the distance perpendicular to the centerline of the roadway between curbs or rails that is representative of the approach roadway within 100 feet of the bridge. Exclude from the usable distance measurement: medians, sidewalks, and other protected areas with non-mountable curbs or barriers. Report the lesser of the two approach roadway widths for bridges that carry two-way traffic. Report the width at the approach end for bridges that carry one-way traffic.	Usable roadway width includes the width of traffic lanes and the width of shoulders. Shoulders must be contiguous with the traveled way and must be structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not to be considered a shoulder for this item. Refer to agency policy for when and where stabilized shoulders are used. When it is not readily known if stabilized construction details were used, the presence of rutting, heaving, water retention, or other distress may be used as indicators that the shoulder is not stabilized. A curb greater than 6 inches high may be considered non-mountable for these specifications.

Examples

Both roadways are carried on one bridge. Report the sum of measurements A and B.

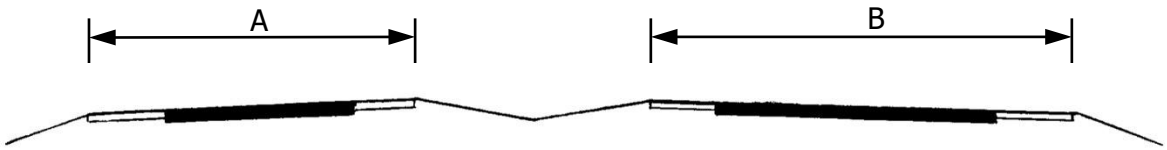


Figure 63. Cross-section view of two approach roadways that are carried across one bridge.

Examples Continued – Approach Roadway Width

Mainline and Ramp are both carried on one bridge. Report the sum of measurements A and B.

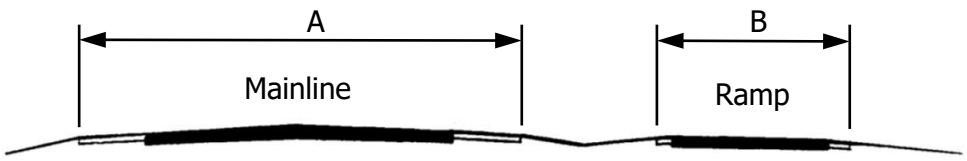


Figure 64. Approach roadway cross-section view for a mainline and a ramp that are carried across one bridge.

Mainline and Ramp are carried on separate bridges.

- Report measurement A for the Mainline bridge.
- Report measurement B for the Ramp bridge.

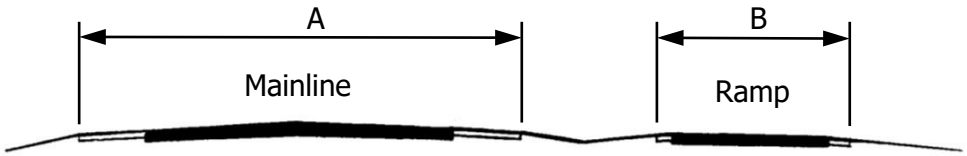


Figure 65. Approach roadway cross-section view for a mainline and a ramp that are carried across separate bridges.

B.G.10 Bridge Median

Format	Frequency	Item ID
AN (1)	I	B.G.10

Specification	Commentary
Report the type of bridge median using one of the following codes. Code Description 0 No median 1 Open median 2 Closed median (mountable) 3 Closed median (non-mountable)	A barrier or curb greater than 6 inches high may be considered non-mountable for these specifications. For bridges with a longitudinal joint, use code 1 when traffic cannot safely traverse the joint width. If the joint width is safely traversable, use one of the remaining codes. Joint condition does not affect the coding of this item.

Commentary Continued

Use code 0 for bridges that do not have a median, including bridges that carry adjacent traffic lanes separated only by centerline, edge line, or channelization striping, with or without a traversable longitudinal joint.

Use code 2 for bridges with medians that are either flush or mountable, with or without a traversable longitudinal joint, including areas that are striped to designate a median.

Examples

Each example represents a single bridge.

Report 1.

Open median



Figure 66. Cross-section view of a bridge deck with open median.

Report 2.

Closed median (mountable)

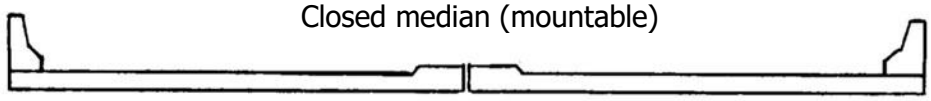


Figure 67. Cross-section view of a bridge deck with closed median (mountable)

Report 3.

Closed Median (non-mountable)

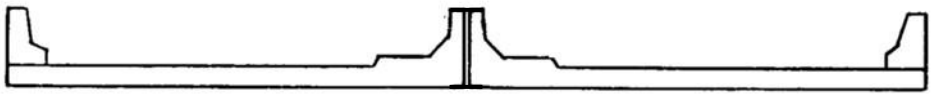


Figure 68. Cross-section view of a bridge deck with closed median (non-mountable).

B.G.11 Skew

Format	Frequency	Item ID
N (2,0)	I	B.G.11

Specification	Commentary
Report the skew angle to the nearest degree. Measure the skew angle between the centerline of a substructure unit and a line perpendicular to the roadway centerline. Report the maximum skew when skews vary amongst substructure units. Report 0 if there is no skew.	The skew angle can be taken directly from the plans, if available, or measured in the field.

Example

Report the skew as the result of $Sin^{-1}(A/C)$, $Cos^{-1}(B/C)$ or Tan^{-1} (A/B).

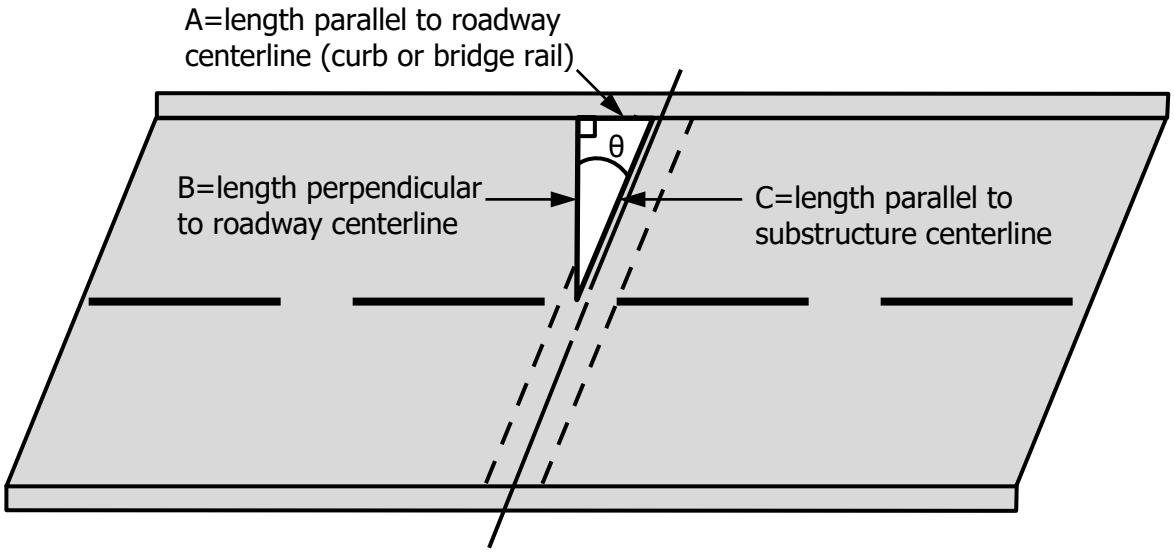


Figure 69. Plan view of a bridge deck indicating skew determination.

B.G.12 Curved Bridge

Format	Frequency	Item ID
AN (2)	I	B.G.12

Specification	Commentary
Report whether the bridge is horizontally curved using one of the following codes. Code — Description CU — Curved girder(s) CP — Piecewise straight girders CK — Kinked girder(s) N — Not curved	A bridge is considered horizontally curved when at least one partial or full length girder line forms a curve using either a curved girder(s), piecewise straight girders forming a segmented/chorded curve, or a kinked girder(s). For this specification, a piecewise straight girder line is comprised of girders with a longitudinal axis that changes orientation at one or more supports. The girder line may be simply supported or continuous at supports. A kinked girder is a girder with a longitudinal axis that changes orientation at a location(s) along the girder length excluding at the supports. Use code N for bridges that have curved deck geometry, or may be striped as curved, but the girders do not form a curve.

Example

Report CU.



Figure 70. Curved bridge with curved girders. (Source: Alaska DOT)

Examples Continued – Curved Bridge

Report CP.

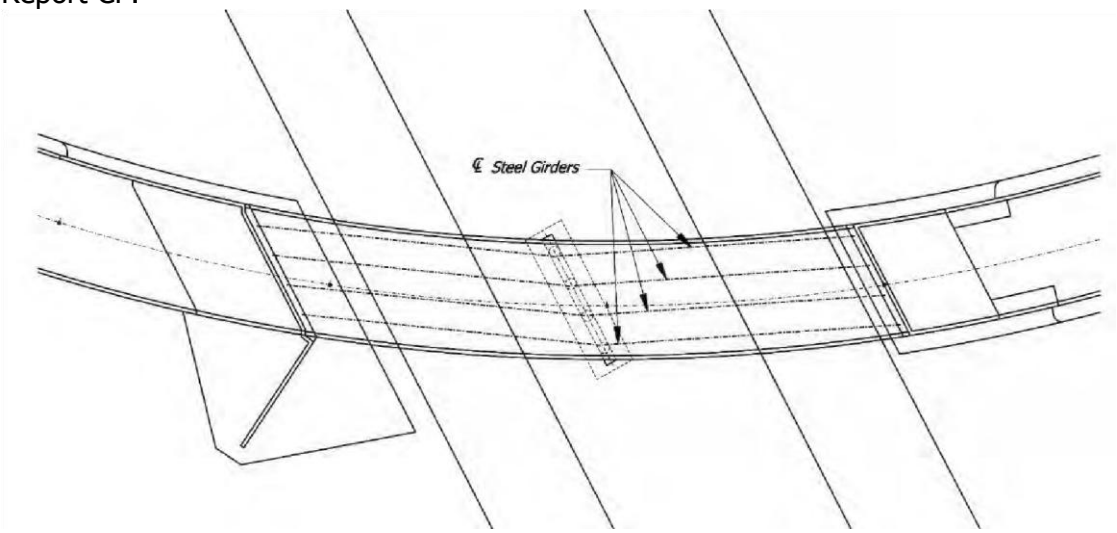


Figure 71. Plan view of a curved bridge with piecewise straight girders.

Report CK.

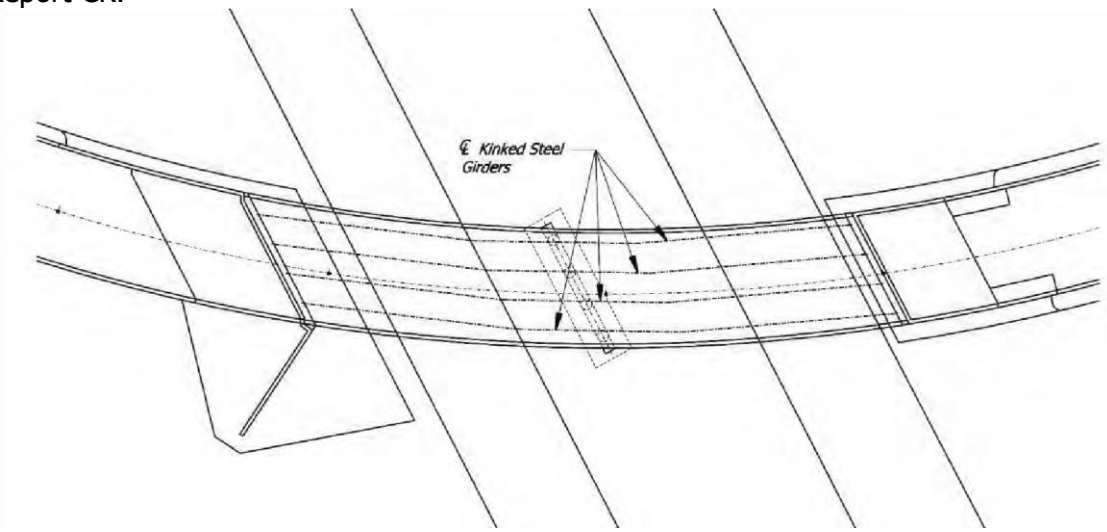


Figure 72. Plan view of a curved bridge with kinked girders.

B.G.13 Maximum Bridge Height

Format	Frequency	Item ID
N (4,0)	I	B.G.13

Specification	Commentary
Record the maximum height from top of deck to ground line or water surface elevation, whichever yield the largest value, rounded to the nearest foot.	For double-deck bridges inventoried as one bridge, measure from top of deck of the lower deck. For double-deck bridges inventoried as two bridges, measure from the top of deck of the inventoried bridge. For bridges under fill, excluding closed spandrel arches, measure from top of slab, or top of pipe, to water surface elevation. When there is no waterway feature, measure to inside bottom of pipe, inside of floor slab, or ground line when the bottom is unexposed or the bridge is bottomless. For closed spandrel arches measure from top of roadway surface. Ground line represents dry terrain or pavement. Use the water surface elevation at the time the value for this item is established. This item may be estimated by field observation or from plans when it is not practical or is infeasible to measure, or height is more than 30 ft. This item does not need to be updated due to fluctuations in water surface elevation.

Example

Bridge carries SR170 over Felix Creek and County Trail. Report 27.

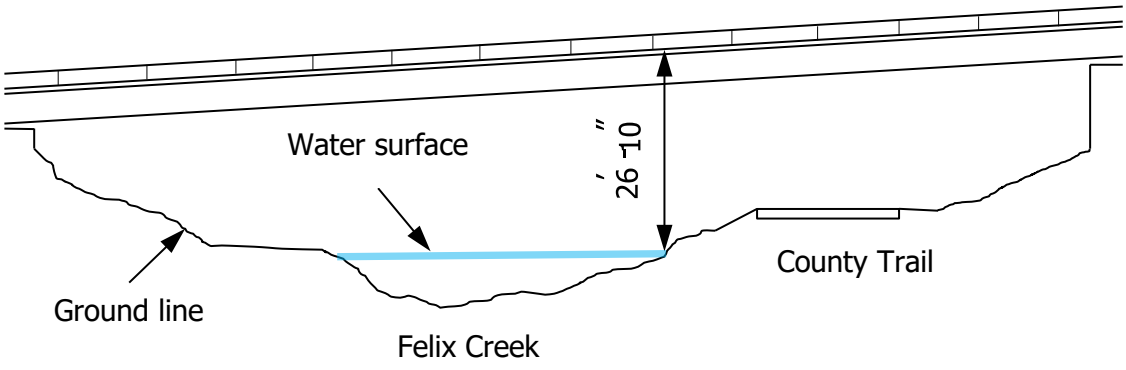


Figure 73. Profile view of a bridge over a creek and trail.

B.G.14 Sidehill Bridge

Format	Frequency	Item ID
AN (1)	I	B.G.14

Specification	Commentary
Report whether any portion of the bridge is a sidehill structure. Code Description N Not a sidehill bridge Y Is a sidehill bridge	A sidehill bridge is a structure built onto the side of terrain or earth material with the roadway centerline running nearly parallel to the face of the terrain or material. The roadway is carried partially on structure and partially on terrain that has been modified by cutting or filling to form the required roadway subgrade elevation. For sidehill bridges, Item B.G.06 (*Bridge Width Curb-to-Curb*) is typically larger than Item B.G.05 (*Bridge Width Out-to-Out*). For sidehill bridges with irregular geometry, reporting the actual deck area in Item B.G.15 (*Irregular Deck Area*) provides a more accurate value than using the default calculation described for that item. Use code N when no portion of the bridge is a sidehill structure.

Example

A bridge is built onto the side of a hill with the roadway partially on ground and partially on structure. Report Y.

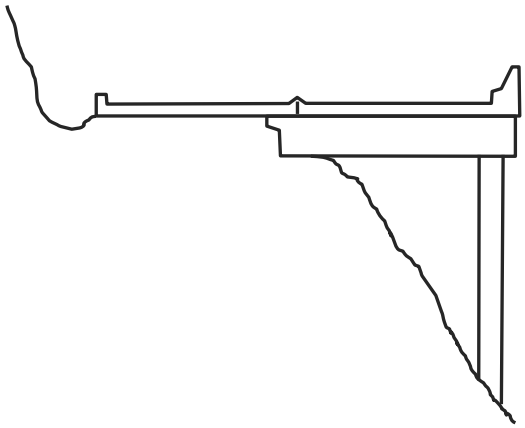


Figure 74. Cross-section view of a sidehill bridge.

B.G.15 Irregular Deck Area

Format	Frequency	Item ID
N (10,1)	I	B.G.15

Specification	Commentary
Report the total deck area rounded to the nearest tenth of a square foot. Only report this item when the actual area is obtained from plans or measurement of bridges with irregular geometry. The limits of measurement shall be in accordance with Items B.G.05 (*Bridge Width Out-to-Out*) and B.G.02 (*Total Bridge Length*). For bridges that carry multiple types of service, for example highway and railroad, report the deck area that encompasses all service types.	Reporting the deck area calculated from plans may more accurately reflect the deck area for bridges with unusual geometry (e.g. flared, sidehill, or bifurcated structures), or through structures with cantilevered sidewalks. This item can improve the accuracy of national performance measure computations, estimating cost, etc.

B.G.16 Calculated Deck Area

Format	Frequency	Item ID
N (10,1)	C	B.G.16

Specification	Commentary
Do not report this item as it is calculated by FHWA. The default calculation for bridges is the value reported in Item B.G.05 (*Bridge Width Out-to-Out*) multiplied by the value reported in Item B.G.02 (*Total Bridge Length*) rounded to the nearest tenth of a square foot.	

Example Bridge Geometry Data for Bridge Number 15558X



Figure 75. Elevation view of Bridge Number 15558X, looking east.

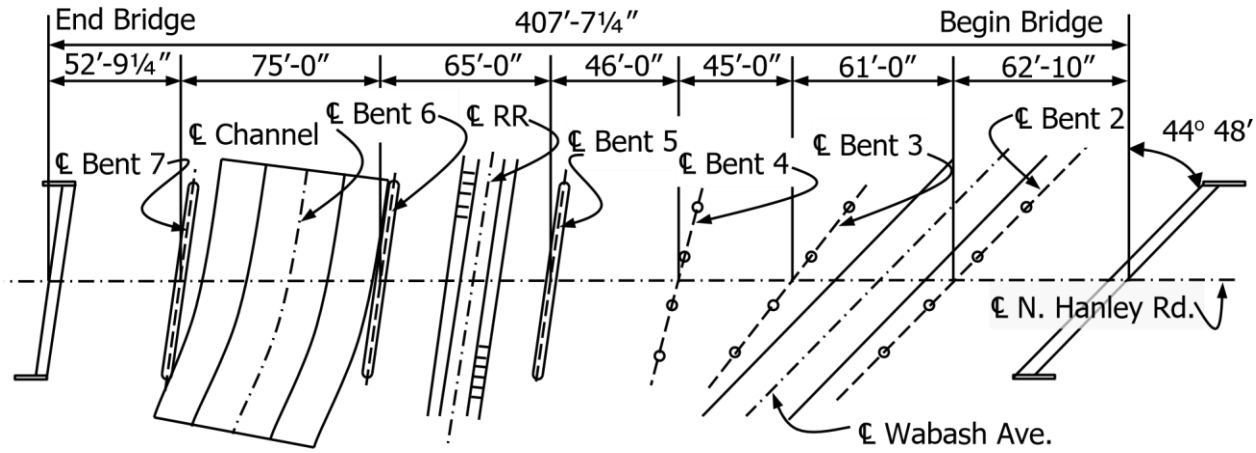


Figure 76. Plan view and dimensions for Bridge Number 15558X.



Figure 77. Approach view for Bridge Number 15558X, looking south.

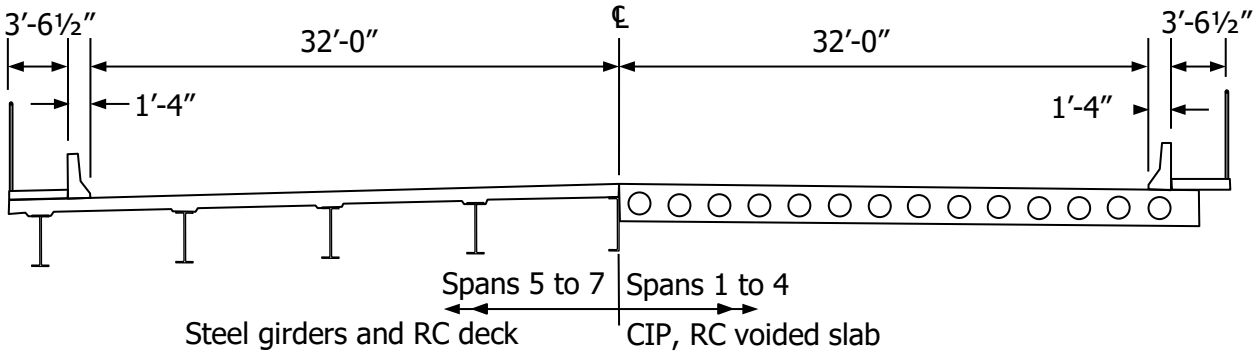


Figure 78. Typical cross-sections and dimensions for Bridge Number 15558X.

This bridge has an NBIS bridge length of 400′-7 1/4″ measured along the centerline of North Hanley Road from front face-to-face of the abutments. The total bridge length is 407′-7 1/4″ measured along the centerline of North Hanley Road from paving notch to paving notch (back face of abutments). The maximum span length is 75′-0″ (span six) and the minimum span length is 45′-0″ (span three). The bridge width out-to-out is 73′-9″ and the bridge width curb-to-curb is 64′-0″. There is a 3′-6 1/2″ sidewalk on the left and right sides of the bridge. The approach roadway width is 66′-8″. The substructure units have varying skews with abutment one (south end) having a maximum skew of 44 degrees 48 minutes. The maximum bridge height is 37′-6″ at the centerline of the paved channel measured from the top of deck to the water surface. The calculated deck area is 30,080.9 ft^2 as determined by the FHWA by multiplying the value in Item B.G.02 (*Total Bridge Length*) by the value in Item B.G.05 (*Bridge Width Out-to-Out*).

The bridge does not have medians, does not have curved or chorded girders, is not a sidehill bridge, and does not have an irregular deck area.

Table 8. Bridge Geometry data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.G.01	*NBIS Bridge Length*	400.6
B.G.02	*Total Bridge Length*	407.6
B.G.03	*Maximum Span Length*	75.0
B.G.04	*Minimum Span Length*	45.0
B.G.05	*Bridge Width Out-to-Out*	73.8
B.G.06	*Bridge Width Curb-to-Curb*	64.0
B.G.07	*Left Curb or Sidewalk Width*	3.5
B.G.08	*Right Curb or Sidewalk Width*	3.5
B.G.09	*Approach Roadway Width*	66.7
B.G.10	*Bridge Median*	0
B.G.11	*Skew*	45
B.G.12	*Curved Bridge*	N
B.G.13	*Maximum Bridge Height*	38
B.G.14	*Sidehill Bridge*	N
B.G.15	*Irregular Deck Area*	
B.G.16	*Calculated Deck Area (Determined by FHWA*)*	30080.9*

SECTION 4: FEATURES

This section has data items that have been grouped by the following five subsections: Feature Identification, Routes, Highways, Railroads, and Navigable Waterways. The data items in these subsections identify and describe the features that are above, below, and carried on bridges.

The data items in the Feature Identification subsection identify and locate features that are above, below, and carried on the bridge. These items are considered part of the Features Data Set and have a many-to-one relationship with a bridge.

The data items in the Routes and Highways subsections are reported when the feature type reported in Item B.F.01 (*Feature Type*) is a highway (e.g. code H01, H02, etc.).

The data items in the Routes subsection identify the routes that are carried on each highway feature reported in Item B.F.01 (*Feature Type*). These items are considered part of the Routes Data Set and have a many-to-one relationship with a highway feature.

The data items in the Highways subsection provide information about the highways that are carried on, and that pass above or below the bridge. These items are considered part of the Features Data Set and have a many-to-one relationship with a bridge.

The data items in the Railroads subsection are reported when the feature type reported in Item B.F.01 (*Feature Type*) is a railroad (e.g. code R01, R02, etc.). The items in this subsection provide information about railroads that are carried on or pass below the bridge. These data items are considered part of the Features Data Set and have a many-to-one relationship with a bridge.

The data items in the Navigable Waterways subsection are reported when the feature type reported in Item B.F.01 (*Feature Type*) is a waterway (e.g. code W01, W02, etc.). The items in this subsection provide information on navigable waterways that pass below the bridge. These data items are considered part of the Features Data Set and have a many-to-one relationship with a bridge. The data for items in this section typically remain static once a bridge has been inventoried. The following data items are included in this section.

SUBSECTION 4.1: FEATURE IDENTIFICATION

Item ID	Data Item
B.F.01	Feature Type
B.F.02	Feature Location
B.F.03	Feature Name

SUBSECTION 4.2: ROUTES

Item ID	Data Item
B.RT.01	Route Designation
B.RT.02	Route Number
B.RT.03	Route Direction
B.RT.04	Route Type
B.RT.05	Service Type

SUBSECTION 4.3: HIGHWAYS

Item ID	Data Item
B.H.01	Functional Classification
B.H.02	Urban Code
B.H.03	NHS Designation
B.H.04	National Highway Freight Network
B.H.05	STRAHNET Designation
B.H.06	LRS Route ID
B.H.07	LRS Mile Point
B.H.08	Lanes on Highway
B.H.09	Annual Average Daily Traffic
B.H.10	Annual Average Daily Truck Traffic
B.H.11	Year of Annual Average Daily Traffic
B.H.12	Highway Maximum Usable Vertical Clearance
B.H.13	Highway Minimum Vertical Clearance
B.H.14	Highway Minimum Horizontal Clearance, Left
B.H.15	Highway Minimum Horizontal Clearance, Right
B.H.16	Highway Maximum Usable Surface Width
B.H.17	Bypass Detour Length
B.H.18	Crossing Bridge Number

SUBSECTION 4.4: RAILROADS

Item ID	Data Item
B.RR.01	Railroad Service Type
B.RR.02	Railroad Minimum Vertical Clearance
B.RR.03	Railroad Minimum Horizontal Offset

SUBSECTION 4.5: NAVIGABLE WATERWAYS

Item ID	Data Item
B.N.01	Navigable Waterway
B.N.02	Navigation Minimum Vertical Clearance
B.N.03	Movable Bridge Maximum Navigation Vertical Clearance
B.N.04	Navigation Channel Width
B.N.05	Navigation Channel Minimum Horizontal Clearance
B.N.06	Substructure Navigation Protection

SUBSECTION 4.1: FEATURE IDENTIFICATION

The items in this subsection identify and locate features that are above, below, and carried on the bridge. These items are reported for each feature.

These data items are considered part of the Features Data Set and have a many-to-one relationship with a bridge. Therefore, each feature has a unique Feature data set, and there are typically multiple Feature data sets associated with a bridge.

The data for the items in this subsection typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.F.01	Feature Type
B.F.02	Feature Location
B.F.03	Feature Name

B.F.01 Feature Type

Format	Frequency	Item ID
AN (3)	I	B.F.01

Specification

Report the feature that is above, below, or carried on the bridge using one of the following codes.

Code	Description
H##	Highway
R##	Railroad
P##	Pathway
W##	Waterway
F##	Relief for waterway
B##	Urban feature
D##	Dry terrain or side slope
X##	Other

Replace the ## characters in the above codes with sequential numbers, with leading zeros, assigned to each feature type.

For a double deck bridge that is inventoried with one unique bridge number, report a feature for each deck level.

Report a railroad feature for each separate railroad service type, as identified in Item B.RR.01 (*Railroad Service Type*), that is carried on or passes below the bridge. When a track carries multiple railroad service types, report only one feature. When multiple tracks carry the same railroad service type(s), report only one feature.

Report one highway feature for a highway that is designated with two or more route numbers.

Report multiple highway features when the highway is divided at the bridge.

Commentary

All bridges have at least one feature carried on the bridge and one feature below the bridge. Some bridges have several features that are above, below, or carried on the bridge.

Each feature type is numbered sequentially, starting with one (H01, R01, etc.). Highway features should be numbered beginning with the features carried on the bridge, followed by those below and above (H01, H02, H03, etc.).

This item does not include ancillary structures and utilities.

Reporting more than one Urban feature or Other feature is optional.

For multi-level interchanges, report highway features directly above and below the bridge.

The presence of a flush or mountable median does not in itself indicate that the highway is divided.

Use code R for each railroad service type listed in Item B.RR.01 (*Railroad Service Type*).

Use code P for separated pathways dedicated for pedestrian, bicycle, equestrian, or other non-highway modes of human transportation not covered in other codes.

Use code W for each unique waterway. Do not use for roadside ditches or pipes that typically only carry roadway runoff from rain events.

Use code F for bridges where one or more spans provide waterway openings for flow only during flood stages to provide additional hydraulic capacity, such as relief channels.

Commentary Continued – Feature Type

Use code B for urban features such as buildings, parking lots, etc.

Use code D for features such as a natural depression or sidehill slope when there is no discernable waterway channel and none of the other feature codes apply.

Use code X when no other code applies for features that exist below the bridge.

For border bridges, the Neighboring State reports this item for all highway features carried on or passing above the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples – Feature Type

A bridge carries I-66 eastbound and I-66 westbound over County Route 601 and Passage Creek. I-66 eastbound and westbound are divided at the bridge by an opening between two superstructure units supported by abutments common to both superstructures.

- Report H01 for I-66 eastbound.
- Report H02 for I-66 westbound.
- Report H03 for County Route 601.
- Report W01 for Passage Creek.

A bridge carries I-68 eastbound and State Route 17 northbound over County Route 603, the Appalachian Trail, and Postage Creek. I-68 eastbound and State Route 17 northbound share a common highway that is not divided at the bridge. Above the bridge is a ramp connecting I-68 westbound to County Route 603 southbound.

- Report H01 for I-68/SR17.
- Report H02 for County Route 603.
- Report H03 for the ramp.
- Report P01 for the Appalachian Trail.
- Report W01 for Postage Creek.

A bridge carries Brookside Glen Drive over Union Creek. The bridge carries sidewalks on the north and south sides.

- Report H01 for Brookside Glen Drive.
- Report P01 for the sidewalks.
- Report W01 for Union Creek.

B.F.02 Feature Location

Format	Frequency	Item ID
AN (1)	I	B.F.02

Specification	Commentary
Report the location for the feature reported in Item B.F.01 (*Feature Type*) that is above, below, or carried on the bridge using one of the following codes. Code – Description C – Carried on bridge A – Above bridge B – Below bridge T – Top level L – Lower level	This item has a corresponding code for each feature reported for Item B.F.01 (*Feature Type*). Use code T for the top level of a double deck bridge that is inventoried using one unique bridge number. Use code L for the lower level of a double deck bridge that is inventoried using one unique bridge number. For border bridges, the Neighboring State reports this item for all highway features carried on or passing above the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

A bridge carries I-66 eastbound and I-66 westbound over County Route 601 and Passage Creek. I-66 eastbound and westbound are divided at the bridge by an opening between two superstructure units supported by abutments common to both superstructures.

- Report C for I-66 eastbound.
- Report C For I-66 westbound.
- Report B for County Route 601.
- Report B for Passage Creek.

A bridge carries I-68 eastbound and State Route 17 northbound over County Route 603, the Appalachian Trail, and Postage Creek. I-68 eastbound and State Route 17 northbound share a common highway that is not divided at the bridge. Above the bridge is a ramp connecting I-68 westbound to County Route 603 southbound.

- Report C for I-68/SR17.
- Report B for County Route 603.
- Report A for the ramp.
- Report B for the Appalachian Trail.
- Report B for Postage Creek.

A bridge carries Brookside Glen Drive over Union Creek. The bridge carries sidewalks on the north and south sides.

- Report C for Brookside Glen Drive.
- Report C for the sidewalks.
- Report B for Union Creek.

B.F.03 Feature Name

Format	Frequency	Item ID
AN (300)	I	B.F.03

Specification	Commentary
Report the commonly known name(s) for the feature reported in Item B.F.01 (*Feature Type*). If the feature has no commonly known name, provide a general description. For more than one name, report all names with the most common name first. When applicable, report the route number first followed by other names. Report multiple names separated by pipe (|) delimiters.	This item has correlating data for each feature reported for Item B.F.01 (*Feature Type*). The owner may include directional or other descriptive information in this field. Official names and local names may be included. For border bridges, the Neighboring State reports this item for all highway features carried on or passing above the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

I-90, commonly named Massachusetts Turnpike. Report I-90|Massachusetts Turnpike.

I-64, with no commonly known name. Report I-64.

US 50 & US 301 carried on one highway commonly named John Hanson Highway. Report US 50|US 301|John Hanson Highway.

I-95S carried on the lower deck of the George Washington Bridge. Report I95S|George Washington Bridge - Lower Deck.

I-495 northbound. Report I-495 NB.

A bridge carries I-68 eastbound (commonly named Harry Byrd Expressway), and State Route 17 northbound (commonly named Paris Pike) over County Route 603 (commonly named Blue Ridge Mountain Road), the Appalachian Trail, and Postage Creek. I-68 eastbound and State Route 17 northbound share a common highway that is not divided at the bridge. Above the bridge is a ramp connecting I-68 westbound to County Route 603 southbound.

- Report I-68|Harry Byrd Expressway|SR17|Paris Pike for I-68/SR17.
- Report County Route 603|Blue Ridge Mountain Road for County Route 603.
- Report I-68 WB to County Route 603 SB for the ramp.
- Report Appalachian Trail for the pathway.
- Report Postage Creek for the waterway.

A bridge carries Brookside Glen Drive over Union Creek. The bridge carries sidewalks on the north and south sides.

- Report Brookside Glen Drive for the highway.
- Report Sidewalks for the pathways.
- Report Union Creek for the waterway.

Example Feature Identification Data for Bridge Number 15558X

The example below shows the many-to-one relationship of the Feature Identification data, where there are typically multiple features associated with a bridge.

The bridge carries North Hanley Road (Value 1) over Wabash Avenue (Value 2), Burlington Northern/Santa Fe (BNSF) Railroad (Value 3), and Berkeley Branch Coldwater Creek (Value 4). There is a sidewalk on the east and west sides of the bridge (Value 5) and no sidewalk below the bridge.

Table 9. Feature Identification data items in the Features Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)	Value (5)
B.F.01	*Feature Type*	H01	H02	R01	W01	P01
B.F.02	*Feature Location*	C	B	B	B	C
B.F.03	*Feature Name*	North Hanley Road	Wabash Avenue	BNSF RR	Berkeley Branch Coldwater Creek	Sidewalk east and west sides

SUBSECTION 4.2: ROUTES

The data items in this subsection identify the routes that are carried on each highway feature reported in Item B.F.01 (*Feature Type*). These data items are considered part of the Routes Data Set and have a many-to-one relationship with a highway feature. Therefore, each route reported in Item B.RT.01 (*Route Designation*) has a unique route data set, and there may be multiple route data sets associated with a highway feature.

For each highway feature that is carried on the bridge, report all route items.

For each highway feature that passes below the bridge and is not carried by another bridge, report all route items.

Do not report route items for highway features that pass above or below the bridge and are carried by another bridge. When needed, FHWA obtains the data for these highway feature(s) using the data reported for the crossing bridge, per Item B.H.18 (*Crossing Bridge Number*).

The data for the items in this subsection typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.RT.01	Route Designation
B.RT.02	Route Number
B.RT.03	Route Direction
B.RT.04	Route Type
B.RT.05	Service Type

B.RT.01 Route Designation

Format	Frequency	Item ID
AN (3)	I	B.RT.01

Specification	Commentary
Report the assigned route designation for the highway reported in Item B.F.01 (*Feature Type*) using the following code. Code Description R## Unique Route Designation Replace the ## characters in the above code with sequential numbers, with leading zeros, assigned to each unique route designation carried on the highway feature (e.g., R01, R02, etc.). If a highway carries multiple routes, report only those routes that have a route number. If a highway carries only routes without route numbers, report one route designation.	This item captures how routes that share the reported highway feature are designated. Each highway feature has at least one route designation. Typically, the route with the highest-class route type is listed first, using the hierarchy shown in Item B.RT.04 (*Route Type*). An interstate is considered the highest-class route. If the highway feature is carried on a ramp bridge, report all applicable routes for the highways that are being connected. For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

I-35 southbound. Report R01.

Local road with no known route number. Report R01.

I-66 and State Route 17 northbound share one highway that is not divided at the bridge.
- Report R01 for I-66.
- Report R02 for State Route 17.

A ramp bridge departs from I-66 westbound and enters I-81 southbound.
- Report R01 for I-66. • Report R02 for I-81.

One highway feature is signed for both State Highway 43 and Harlem Avenue.
- Report R01 for State Highway 43.
- Do not report a route record for Harlem Avenue.

B.RT.02 Route Number

Format	Frequency	Item ID
AN (15)	I	B.RT.02

Specification	Commentary
Report the route number for the route reported in Item B.RT.01 (*Route Designation*). Include letters that are used as part of the route numbers. Report 0 for routes without route numbers.	For divided highways, do not report the route direction. Identify that information in Item B.RT.03 (*Route Direction*). For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

I-35 southbound. Report 35.

I-35W southbound. Report 35W.

State Highway 9A is not divided at the bridge. Report 9A.

Local road with no known route number. Report 0.

I-66 and State Route 17 northbound share one highway that is not divided at the bridge.
- Report 66 for the route designated as I-66.
- Report 17 for the route designated as State Route 17.

A ramp bridge departs from I-66 westbound and enters I-81 southbound.
- Report 66 for the route designated as I-66.
- Report 81 for the route designated as I-81.

B.RT.03 Route Direction

Format	Frequency	Item ID
AN (2)	I	B.RT.03

Specification	Commentary
Report the designated route direction for the route reported in Item B.RT.01 (*Route Designation*) using one of the following codes. Code – Description NB – Northbound EB – Eastbound SB – Southbound WB – Westbound NS – Northbound and Southbound EW – Eastbound and Westbound	Use code NS when the route is not divided at the bridge and carries traffic in both north and south directions. Use code EW when the route is not divided at the bridge and carries traffic in both east and west directions. Use the designated route direction for the departure or entrance route when a bridge only carries a ramp; i.e. Item B.RT.05 (*Service Type*) is 7. Use the most applicable code when a route does not have a designated route direction. For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

I-35 southbound. Report SB.

I-35W southbound. Report SB.

State Highway 9W is not divided at the bridge and carries traffic in north and south directions. Report NS.

A ramp bridge departs from I-66 westbound and enters I-81 southbound.
- Report WB for the route designated as I-66.
- Report SB for the route designated as I-81.

Bridge carries I-81 northbound and I-64 eastbound.
- Report NB for the route designated as I-81.
- Report EB for the route designated as I-64.

B.RT.04 Route Type

Format	Frequency	Item ID
AN (1)	I	B.RT.04

Specification	Commentary
Report the route type for the route reported in Item B.RT.01 (*Route Designation*) using one of the following codes. Code – Description 1 – Interstate route 2 – U.S. route 3 – State route 4 – County route 5 – City street 6 – Federal lands road 7 – State lands road X – Other	Use code 4 for parish routes or other county route equivalents. Use code 5 for city or other municipal streets. Use code 6 when a public highway passes through Federal lands such as national parks, national forests, or DOD facilities and does not meet the description of codes 1 through 5. Use code 7 when a public highway passes through State lands such as State parks or State forests and does not meet the description of codes 1 through 5. Use code X when a public highway is not designated as one of the defined route type codes. For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

Highway feature is signed for both I-35 and US-77.
- Report 1 for the route designated as I-35.
- Report 2 for the route designated as US-77.

Route is signed I-35 southbound. Report 1.

Route is signed State Highway 9W. Report 3.

A ramp bridge departs from VA-7 westbound and enters I-81 southbound.
- Report 3 for the route designated as VA-7.
- Report 1 for the route designated as I-81.

B.RT.05 Service Type

Format	Frequency	Item ID
AN (1)	I	B.RT.05

Specification

Report the designated service type for the route reported in Item B.RT.01 (*Route Designation*), using one of the following codes.

Code	Description
1	Mainline
2	Alternate
3	Bypass
4	Spur
5	Business
6	Ramp, connector, etc.
7	Service or frontage road
X	Other

Commentary

The service type designation is determined by the agency and typically included as part of the signage for the route.

Use code 7 for all types, arrangements, and sizes of turning roadways that connect two or more highways at an interchange.

Use code 8 for frontage roads. These are typically parallel to the traveled way, may be provided on one or both sides of the mainline, and may or may not be continuous. A frontage road may include a U-turn lane.

For Federal agency roads, report the most logical description of the service type compared to other routes within the facility.

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Examples

A ramp bridge connects I-66 westbound to I-81 southbound. Report 7.

I-35W southbound. Report 1.

Example Routes Data for Bridge Number 15558X

The bridge carries North Hanley Road over Wabash Ave., BNSF Railroad, and the Berkeley Branch of Coldwater Creek.

North Hanley Road (no route number) is a 4-lane, 2-way city street traveling north and south, which is not divided at the bridge. (Value 1)

Wabash Ave. (no route number) is a 2-lane, 2-way city street traveling east and west, which is not divided at the bridge, and is not carried on another bridge. (Value 2)

Items in the Routes subsection are only reported for highway features identified in Item B.F.01 (*Feature Type*) with code H. Therefore, the Routes subsection items are not reported for the railroad or the creek.

Table 10. Data items in the Routes Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)
B.RT.01	*Route Designation*	R01	R02
B.RT.02	*Route Number*	0	0
B.RT.03	*Route Direction*	NS	EW
B.RT.04	*Route Type*	5	5
B.RT.05	*Service Type*	1	1

SUBSECTION 4.3: HIGHWAYS

The data items in this subsection provide information about the highways that are carried on, and that pass above or below the bridge. These data items are considered part of the Features Data Set and have a many-to-one relationship with a bridge. Therefore, each highway feature reported in Item B.F.01 (*Feature Type*) has a unique highway feature data set, and there are typically multiple highway feature data sets associated with a bridge.

For each highway feature that is carried on the bridge, report all applicable items.

For each highway feature that passes below the bridge and is not carried by another bridge, report all applicable items. Items B.H.12 (*Highway Maximum Usable Vertical Clearance*) and B.H.16 (*Highway Maximum Usable Surface Width)* apply to highway features below a bridge only when the highway feature carries an NHS route.

For each highway feature that passes above or below the bridge and is carried by another bridge, report only Item B.H.18 (*Crossing Bridge Number*). When needed, FHWA obtains the data for these highway feature(s) using the data reported for the crossing bridge.

The data for the items in this subsection typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.H.01	Functional Classification
B.H.02	Urban Code
B.H.03	NHS Designation
B.H.04	National Highway Freight Network
B.H.05	STRAHNET Designation
B.H.06	LRS Route ID
B.H.07	LRS Mile Point
B.H.08	Lanes on Highway
B.H.09	Annual Average Daily Traffic
B.H.10	Annual Average Daily Truck Traffic
B.H.11	Year of Annual Average Daily Traffic
B.H.12	Highway Maximum Usable Vertical Clearance
B.H.13	Highway Minimum Vertical Clearance
B.H.14	Highway Minimum Horizontal Clearance, Left
B.H.15	Highway Minimum Horizontal Clearance, Right
B.H.16	Highway Maximum Usable Surface Width
B.H.17	Bypass Detour Length
B.H.18	Crossing Bridge Number

B.H.01 Functional Classification

Format	Frequency	Item ID
AN (1)	I	B.H.01

Specification	Commentary
Report the functional classification for the highway feature reported in Item B.F.01 (*Feature Type*) using one of the following codes. Code – Description 1 – Interstate 2 – Principal Arterial – Other Freeways and Expressways 3 – Principal Arterial – Other 4 – Minor Arterial 5 – Major Collector 6 – Minor Collector 7 – Local	Functional classifications result from the grouping of highways by the character of service they provide. Ensure that the functional classification designated in this item is consistent with the HPMS. When one highway feature carries multiple route types, report the code for the highest-class route following the hierarchy in the code descriptions; Interstate being the highest class. Use code 7 for State or Federal parkways and other park roads unless there is a through highway designated at a higher classification. FHWA Highway Functional Classification Concepts, Criteria, and Procedures website: https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/.

B.H.02 Urban Code

Format	Frequency	Item ID
AN (5)	I	B.H.02

Specification	Commentary
Report the urbanized area code consistent with the State's HPMS urban boundaries for the highway feature reported in Item B.F.01 (*Feature Type*) at the bridge.	Urban codes can be found at: https://www.census.gov/programshttps://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.htmlsurveys/geography/guidance/geoareas/urban-rural.html. For bridges outside urbanized areas, use code 99999 for rural areas with population less than 5,000 and use code 99998 for small urban areas with population 5,000 to 49,999 in accordance with the HPMS Field Manual. FHWA approves adjusted urban boundaries submitted by State DOT planning offices. State's HPMS urban boundaries are based on the FHWA-approved adjusted urban boundaries. State maps of the unadjusted U.S. Census urban boundaries with highways (map layers: Labels, Transportation, and Urban Areas checked) can be found at: https://tigerweb.geo.census.gov.

Example

U.S. 13/113A over Saint Jones River. Report 24580.

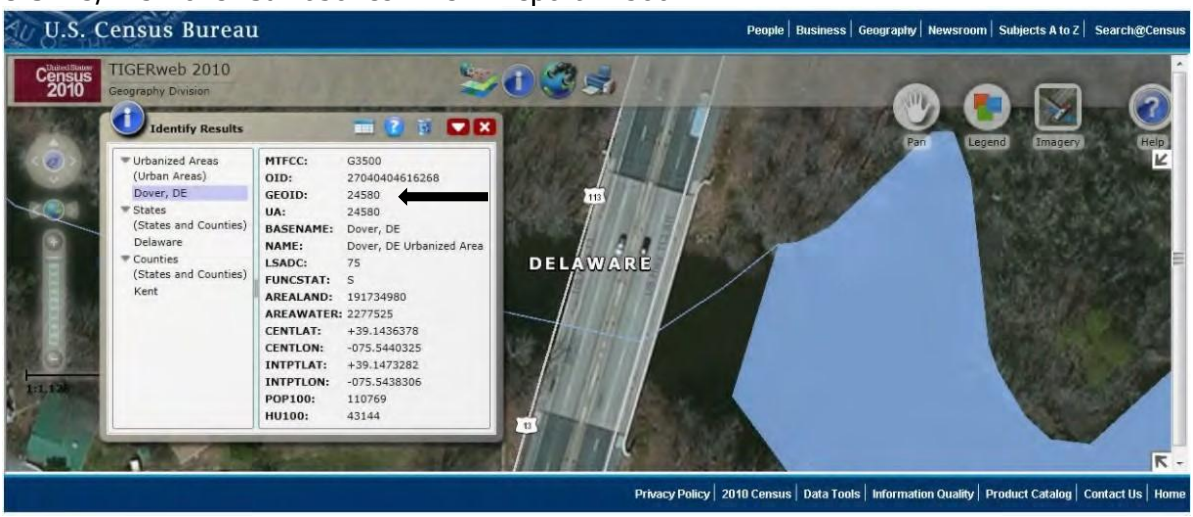


Figure 79. TIGERweb screen shot for the bridge in Delaware. (Source: US Census Bureau)

B.H.03 NHS Designation

Format	Frequency	Item ID
AN (1)	I	B.H.03

Specification	Commentary
Report the NHS designation for the highway feature reported in Item B.F.01 (*Feature Type*), using one of the following codes. Code Description N Non-NHS Y NHS	The National Highway System (NHS) includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The NHS was developed by the U.S. Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs). The NHS includes the following subsystems of highways: Interstate, other principal arterials, STRAHNET, major STRAHNET connectors, and intermodal connectors. NHS routes and connectors are identified in the HPMS. State maps of the NHS can be found at: https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/. For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

B.H.04 National Highway Freight Network

Format	Frequency	Item ID
AN (1)	I	B.H.04

Specification	Commentary
Report the National Highway Freight Network (NHFN) designation for the highway feature reported in Item B.F.01 (*Feature Type*), using one of the following codes. Code — Description 1 — Primary Highway Freight System 2 — Interstate portions not on the Primary Highway Freight System 3 — Critical Rural Freight Corridor 4 — Critical Urban Freight Corridor N — Not on the NHFN	This item is used to identify the National Highway Freight Network and to report to Congress on the conditions and performance of the network. This item is also used with other items to classify bridges according to serviceability, safety, and essentiality for public use and considers the potential impacts to emergency evacuation routes and to regional and national freight and passenger mobility if the serviceability of the bridge is restricted or diminished. More information can be found at: https://ops.fhwa.dot.gov/Freight/infrastructure/nfn/index.htm.

B.H.05 STRAHNET Designation

Format	Frequency	Item ID
AN (1)	I	B.H.05

Specification	Commentary
Report the Strategic Highway Network (STRAHNET) designation for the highway feature reported in Item B.F.01 (*Feature Type*), using one of the following codes. Code — Description 1 — STRAHNET route 2 — STRAHNET Connector route N — Not a STRAHNET route	The STRAHNET is a system of Interstate and primary highways and connectors that provide access to major US military installations and strategic ports, and provides continuity and emergency capabilities for defense purposes. The STRAHNET is determined by the Surface Deployment and Distribution Command (SDDC) in coordination with FHWA. STRAHNET routes and STRAHNET Connector routes can be found on NHS State maps at: https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/.

B.H.06 LRS Route ID

Format	Frequency	Item ID
AN (120)	I	B.H.06

Specification	Commentary
Report the LRS Route ID defined by the State that is reported to the HPMS for the highway feature reported in Item B.F.01 (*Feature Type*). The LRS Route ID must match the HPMS data exactly. Report N if an LRS Route ID has not been assigned.	The LRS Route ID is not necessarily the same as the route number posted along the highway, but is a number used to uniquely identify a route within a county or a State for GIS analysis and mapping purposes. Refer to the FHWA HPMS Field Manual at https://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/. For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

B.H.07 LRS Mile Point

Format	Frequency	Item ID
N (8,3)	I	B.H.07

Specification	Commentary
Report the LRS mile point for the highway feature reported in Item B.F.01 (*Feature Type*) to the nearest thousandth of a mile. The mile point must be consistent with the LRS route and mile point system for the HPMS. For highway features that carry an LRS route, report the mile point at the beginning of the bridge. When the LRS route passes below the bridge, report the mile point on the LRS route where the bridge is first encountered.	The LRS mile point is used to establish the location of the bridge along the LRS route. *If the highway does not carry an LRS route, report the most appropriate mile point. Refer to the FHWA HPMS Field Manual at https://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/. For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document. *NDOT Commentary – LRS Mile Point* **If the highway does not carry an LRS route, the milepoint shall reference the beginning (or other point the State uses) of the structure in the direction of increasing mileage of the highway feature identified in Item B.F.01 (*Feature Type*).* *Code zero if a milepoint location cannot be determined or is not appropriate. If the milepoint location of the structure is at the beginning of the route mileage, code with a nominal value of 0.001 rather than 0.000.*

Examples

LRS Mile Point from HPMS is 130.344. Report 130.344.

LRS Mile Point from HPMS is 9.600. Report 9.600.

The highway does not carry an LRS route code as 0.000.

B.H.08 Lanes On Highway

Format	Frequency	Item ID
N (2,0)	I	B.H.08

Specification	Commentary
Report the number of highway traffic lanes for the highway feature reported in Item B.F.01 (*Feature Type*). Report 1 when a highway is signed or striped for one-lane, but carries two-way traffic. Report 1 for a highway feature carried on the bridge when Item B.G.06 (*Bridge Width Curb-to-Curb*) is less than 16 feet and the bridge is not striped for full width traffic lanes.	For highway features carried on the bridge, include all lanes that are striped or otherwise operated as full width highway traffic lanes, auxiliary lanes (e.g. merge lanes, ramp lanes, turn lanes), and special use lanes that run the entire length of the bridge For highway features below the bridge that are not carried on another bridge, include all lanes that are striped or otherwise operated as full width highway traffic lanes, auxiliary lanes (e.g. merge lanes, ramp lanes, turn lanes), and special use lanes that pass below the entire width of the bridge

Commentary Continued

Do not include pedestrian sidewalks, bike paths, or railroad tracks as lanes, unless the railroad tracks are concurrent with the highway lanes.

For double deck bridges and parallel bridges, report the number of lanes consistent with the highway feature reported in Item B.F.01 (*Feature Type*).

For sidehill bridges, report the total number of lanes for the highway feature regardless if carried on the bridge or terrain/earth material.

Examples

Highway feature carried on the bridge has one lane. Report 1.

Highway feature carries two-way traffic on unstriped lanes and has a curb-to-curb width of 18 ft. Report 2.

Double deck bridge inventoried as one unique bridge number. Highway feature on top level carries five lanes. Highway feature on lower level carries five lanes.

- Report 5 for the highway feature on the top level.
- Report 5 for the highway feature on the lower level.

B.H.09 Annual Average Daily Traffic

Format	Frequency	Item ID
N (8,0)	I	B.H.09

Specification	Commentary
Report the annual average daily traffic (AADT) from the most recent count for the highway feature reported in Item B.F.01 (*Feature Type*). The AADT must be compatible with the other items reported for the highway feature. Report the design AADT for a newly inventoried highway feature when actual AADT information is not yet available. Report the last open AADT for a highway feature that is temporarily closed until repair or replacement can be completed.	The AADT should be updated at intervals in accordance with the standards for the HPMS and standards/policies within the State. All traffic, including trucks, is counted in the AADT. The number of trucks counted in the AADT is reported in Item B.H.10 (*Annual Average Daily Truck Traffic*). When HPMS or other planning data are not available, use a best estimate based on site familiarity or functional classification in accordance with State standards and policies.

NDOT Commentary – Annual Average Daily Traffic

The AADT is the total for both directions, unless a structure is one of a set of twins, such as on a divided highway.

Traffic volumes will vary with time and are updated as follows, depending on the Federal Functional Classification.

Federal Functional Classification	***Data Provider***
Arterials or Collectors	• *NDOT Planning Section provides state and regional traffic data, Annual Average Daily Traffic (AADT) and Average Annual Daily Truck Traffic (AADTT).* • *BIP Data Manager uploads this data periodically.* • *Data should be reviewed at each routine inspection. Bridge Owner may have traffic data from counts taken. In this case, the mark revisions on a copy of SI&A and sent to the BIP Data Manager*
Local	• *Bridge Owner provides traffic data on Local roads and streets.* • *Data should be reviewed at each routine inspection. Mark revisions on a copy of SI&A and sent to the BIP Data Manager*

B.H.10 Annual Average Daily Truck Traffic

Format	Frequency	Item ID
N (8,0)	I	B.H.10

Specification	Commentary
Report the Average Annual Daily Truck Traffic (AADTT) from the most recent count for the highway feature reported in Item B.F.01 (*Feature Type*). The AADTT must be compatible with the other items reported for the highway feature. Report the design AADTT for a newly inventoried highway feature when actual AADTT information is not yet available. Report the last open AADTT for a highway feature that is temporarily closed until repair or replacement can be completed.	The AADTT should be updated at intervals in accordance with the standards for the HPMS and standards/policies within the State. When HPMS or other planning data are not available, use a best estimate based on site familiarity or functional classification in accordance with State standards and policies. Do not include vans, pickup trucks, and other light delivery trucks in the AADTT. The AADTT represents vehicle classes 4-13 as described in FHWA's Traffic Monitoring Guide at: https://www.fhwa.dot.gov/policyinformation/tmguide/.

B.H.11 Year of Annual Average Daily Traffic

Format	Frequency	Item ID
N (4,0)	I	B.H.11

Specification	Commentary
Report the year associated with the data reported in Item B.H.09 (*Annual Average Daily Traffic*) for the highway feature reported in Item B.F.01 (*Feature Type*).	The traffic data should be updated at intervals in accordance with the standards for the HPMS and standards/policies within the State.

B.H.12 Highway Maximum Usable Vertical Clearance

Format	Frequency	Item ID
N (3,1)	EI	B.H.12

Specification	Commentary
Report the minimum vertical clearance for the highway feature reported in Item B.F.01 (*Feature Type*), measured over the 10-footwide envelope of the traveled part of the highway, that provides for the maximum usable clearance envelope, rounded down to the nearest tenth of a foot. Measure the vertical clearance plumb from the deck or highway surface to the lowest bridge member restriction, appurtenance (signs, utilities, etc.) attached to the bridge, or other structure. Report 99.9 when the clearance is 100 feet or greater or no restriction exists above the highway.	This item identifies the maximum height of a notional 10-foot-wide vehicle that can pass on the highway feature(s) reported in Item B.F.01 (*Feature Type*). This information is sometimes used for preliminary military routing. The data may not represent the absolute minimum clearance over the highway feature. Refer to Item B.H.13 (*Highway Minimum Vertical Clearance*) for the absolute minimum clearance. The traveled part of the highway feature does not include shoulders. These data may be different than the posted vertical clearance due to agency vertical clearance posting policies and procedures. These data are not sufficient for permit routing as the location of the 10-foot-wide envelope that provides for the maximum usable clearance is not reported. For a double decked bridge inventoried as one bridge, report this information for each highway feature on each level of the bridge. Update field measurements when alterations are made to the bridge or highway that affect the previously measured clearance. Reporting this item is optional for highway features below the bridge that do not carry NHS routes as identified in Item B.H.03 *(NHS Designation*). Clearances greater than 30 feet may be estimated.

Example – Highway Maximum Usable Vertical Clearance

The bridge has a 13′-9″ maximum usable vertical clearance. Report 13.7.

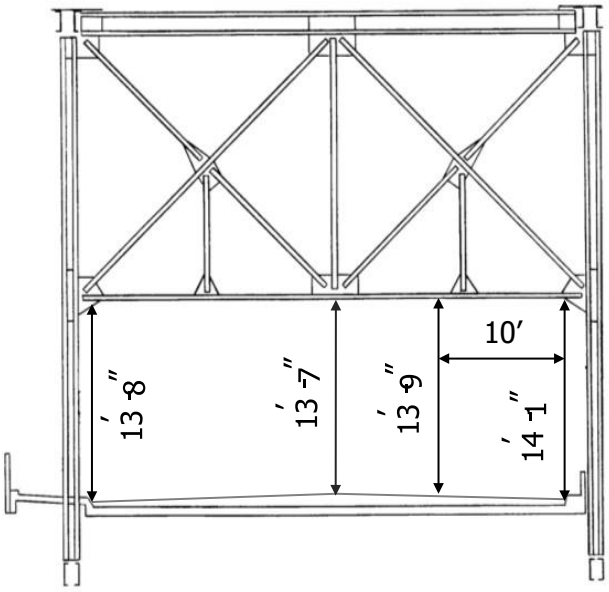


Figure 80. Cross-section view of through truss bridge showing vertical clearances.

The bridge carries a highway with no vertical clearance restrictions. Report 99.9.

Arthur Road passes below the bridge and has an 18′-5″ maximum usable vertical clearance. SR70 also passes below the bridge and has a 19′-11″ maximum usable vertical clearance.

- Report 18.4 for the Arthur Road highway feature.
- Report 19.9 for the SR70 highway feature.

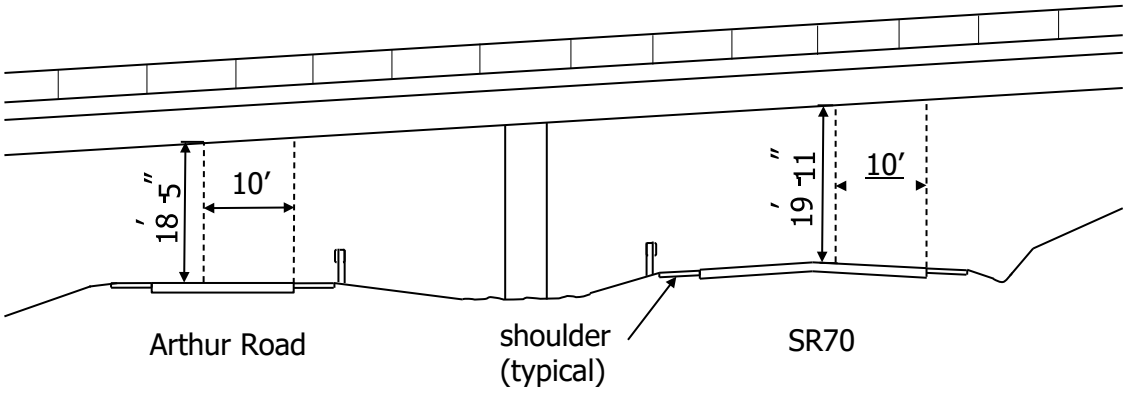


Figure 81. Elevation view with two separate highway features passing below the bridge.

B.H.13 Highway Minimum Vertical Clearance

Format	Frequency	Item ID
N (3,1)	EI	B.H.13

Specification	Commentary
Report the minimum vertical clearance measured over the highway feature reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. Measure the vertical clearance plumb from the deck or highway surface (including paved or stabilized shoulders) to the lowest bridge member restriction, appurtenance (signs, utilities, etc.) attached to the bridge, or other structure. Report 99.9 when the clearance is 100 feet or greater or no restriction exists above the highway.	Several measurements may need to be made to determine the minimum vertical clearance. However, only the minimum measurement is reported. Shoulders must be contiguous with the traveled way and must be structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not to be considered a shoulder for this item. Refer to agency policy for when and where stabilized shoulders are used. When it is not readily known if stabilized construction details were used, the presence of rutting, heaving, water retention, or other distress may be used as indicators that the shoulder is not stabilized. These data may be different than the posted vertical clearance due to agency vertical clearance posting policies and procedures. Update field measurements when alterations are made to the bridge or highway that affect the previously measured clearance. Clearances greater than 30 feet may be estimated.

Examples – Highway Minimum Vertical Clearance
The bridge has a 13′-7″ minimum vertical clearance. Report 13.5.

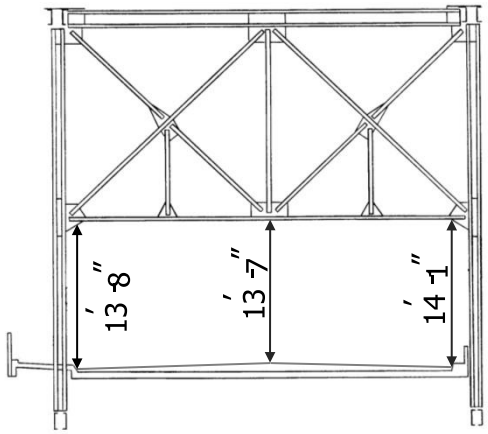


Figure 82. Cross-section view of a through truss bridge showing minimum vertical clearance.

The bridge carries a highway with no vertical clearance restrictions. Report 99.9.

Two highway features below the bridge. Arthur Road passes below the bridge and has an 18′3″ minimum vertical clearance. SR70 also passes below the bridge and has a 19′-9″ minimum vertical clearance.

- Report 18.2 for the Arthur Road highway feature.
- Report 19.7 for the SR70 highway feature.

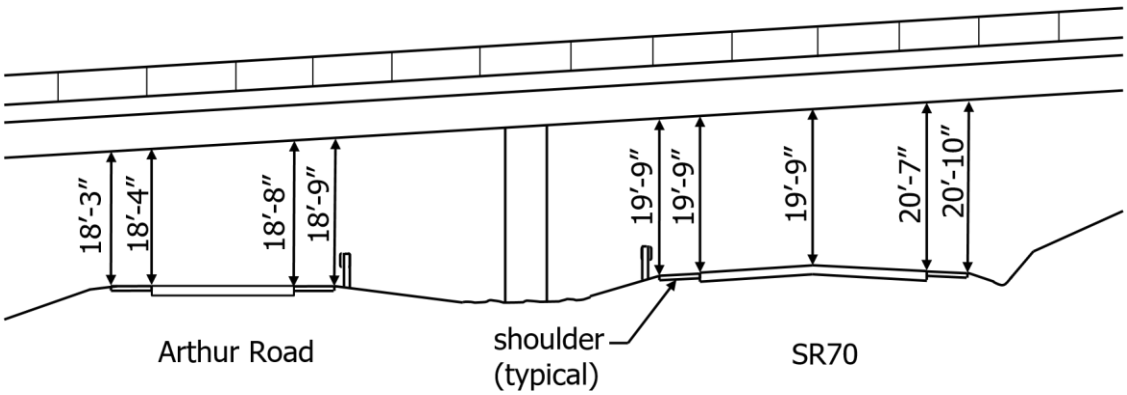


Figure 83. Elevation view with two separate highway features passing below the bridge.

B.H.14 Highway Minimum Horizontal Clearance, Left

Format	Frequency	Item ID
N (3,1)	I	B.H.14

Specification	Commentary
Report the minimum horizontal clearance on the left, for the highway feature below the bridge reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. Measure from the left edge line of the highway (excluding shoulders, turn lanes, acceleration, or deceleration lanes) in the direction of travel to the nearest substructure unit, rigid barrier, oncoming traffic lane, or toe of slope that is steeper than 1 to 3 (vertical to horizontal). Report 99.9 when the clearance is 100 feet or greater. Report 0 when the highway is a two-way highway that is not divided at the bridge. Do not report this item for highway feature(s) carried on the bridge.	This item provides data for the highway feature(s) reported in Item B.F.01 (*Feature Type*) that pass below the bridge. Highways undivided at the bridge are reported as 0 due to the adjacent oncoming traffic lane which provides no horizontal clearance to the left. Reinforced concrete and masonry traffic safety features are considered rigid barriers; metal and timber railings are not considered rigid barriers. Clearances greater than 30 feet may be estimated. *NDOT Commentary – Highway Minimum Horizontal Clearance, Left* *Code only for divided highways, one-way streets, and ramps; not applicable to railroads.*

Examples

Highway feature below the bridge carries 1-way traffic, looking in the direction of travel. Report 20.0.

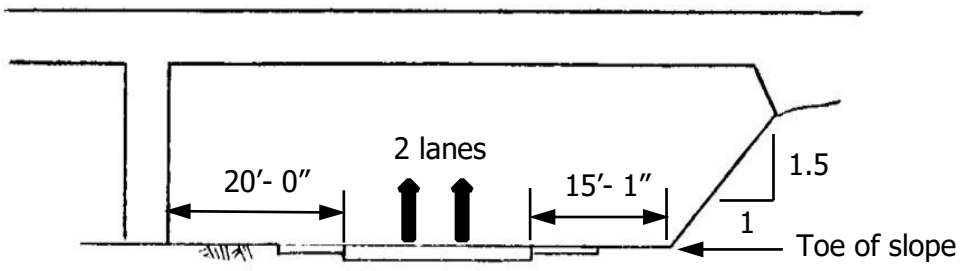


Figure 84. Bridge elevation view of horizontal clearances for a 2-lane highway with 1-way traffic below the bridge.

Examples Continued – Highway Minimum Horizontal Clearance, Left

Highway feature below the bridge carries two-way traffic. Report 0.

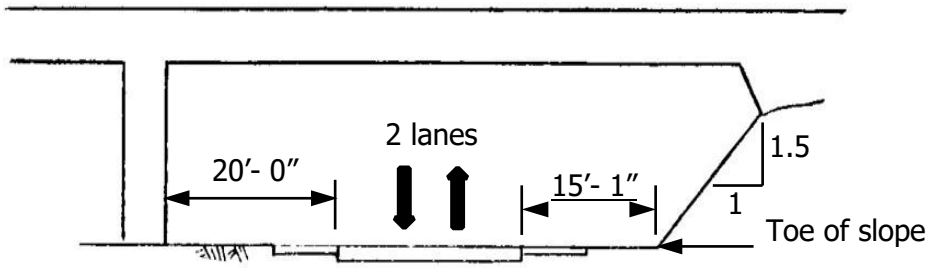


Figure 85. Bridge elevation view of horizontal clearances for a 2-lane highway with 2-way traffic below the bridge.

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic southbound and one carries 1-way traffic northbound.

- Report 18.0 for the southbound highway feature.
- Report 19.0 for the northbound highway feature.

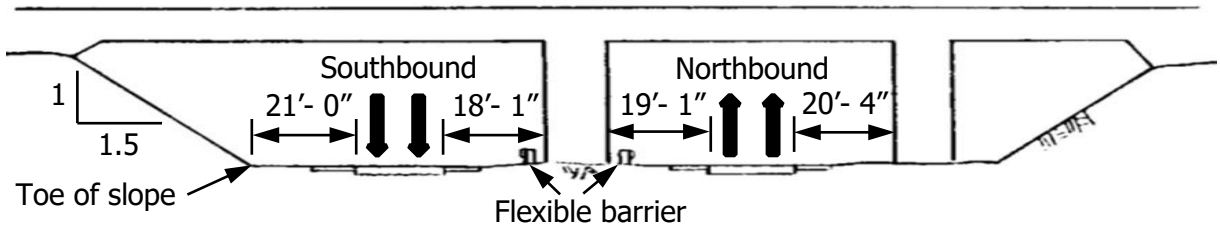


Figure 86. Bridge elevation view of horizontal clearances for separate southbound and northbound highway features below the bridge, with flexible barriers.

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic eastbound and one carries 1-way traffic westbound.

- Report 35.5 for the eastbound highway feature.
- Report 35.5 for the westbound highway feature.

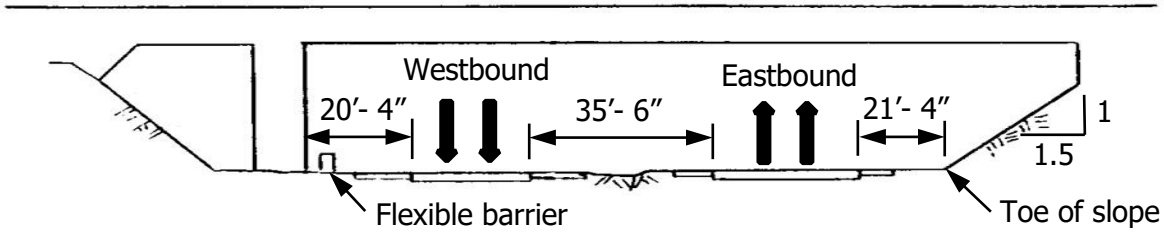


Figure 87. Bridge elevation view of horizontal clearances for separate westbound and eastbound highway features below the bridge, with flexible barrier.

Examples Continued – Highway Minimum Horizontal Clearance, Left
Highway feature below the bridge carries 1-way ramp traffic, looking in the direction of travel. Report 14.5.

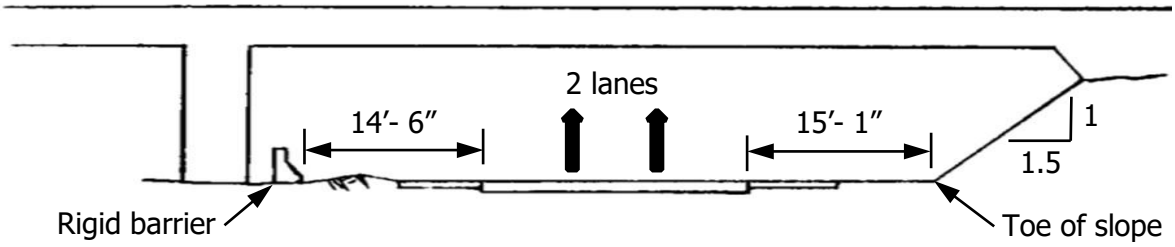


Figure 88. Bridge elevation view of horizontal clearances for a 2-lane, 1-way highway feature below the bridge, with a rigid barrier.

Highway feature below the bridge carries 1-way mainline traffic and 1-way ramp traffic, looking in the direction of travel. Report 20.0.

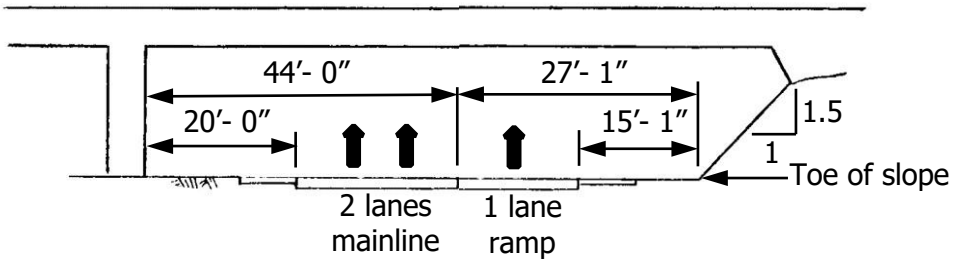


Figure 89. Bridge elevation view of horizontal clearances for a highway feature below the bridge carrying mainline and ramp.

B.H.15 Highway Minimum Horizontal Clearance, Right

Format	Frequency	Item ID
N (3,1)	I	B.H.15

Specification	Commentary
Report the minimum horizontal clearance on the right, for the highway feature below the bridge reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. Measure from the right edge line of the highway (excluding shoulders, turn lanes, acceleration, or deceleration lanes) in the direction of travel to the nearest substructure unit, rigid barrier, oncoming traffic lane or toe of slope that is steeper than 1 to 3 (vertical to horizontal). Report 99.9 when the clearances are 100 feet or greater. Do not report this item for highway feature(s) carried on the bridge.	This item provides data for the highway feature(s) reported in Item B.F.01 (*Feature Type*) that pass below the bridge. Reinforced concrete and masonry traffic safety features are considered rigid barriers; metal and timber railings are not considered rigid barriers. Clearances greater than 30 feet may be estimated.

Examples

Highway feature below the bridge carries 1-way traffic, looking in the direction of travel. Report 15.0.

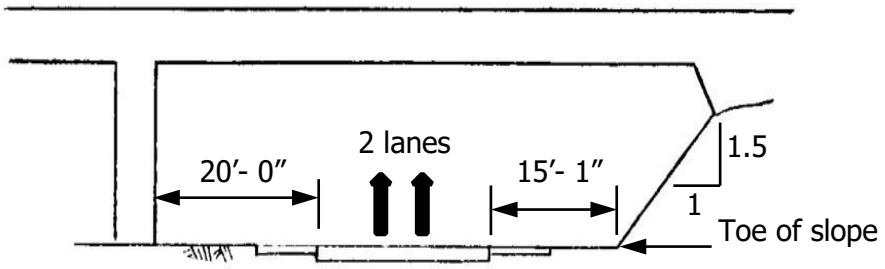


Figure 90. Bridge elevation view of horizontal clearances for a 2-lane highway feature with 1way traffic below the bridge.

Examples Continued – Highway Minimum Horizontal Clearance, Right

Highway feature below the bridge carries two-way traffic. Report 15.0.

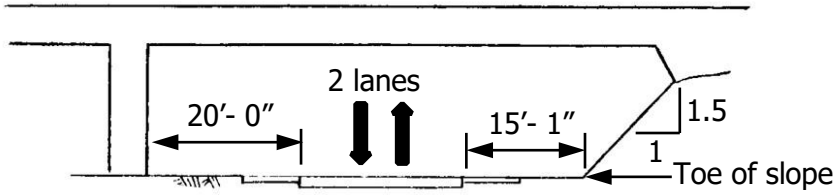


Figure 91. Bridge elevation view of horizontal clearances for a 2-lane highway feature with 2way traffic below the bridge.

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic southbound and one carries 1-way traffic northbound.

- Report 21.0 for the southbound highway feature.
- Report 20.3 for the northbound highway feature.

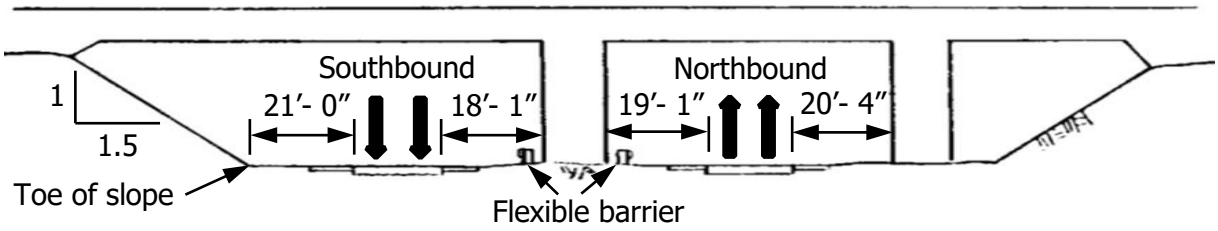


Figure 92. Bridge elevation view of horizontal clearances for separate southbound and northbound highway features below the bridge, with flexible barriers.

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic eastbound and one carries 1-way traffic westbound.

- Report 21.3 for the eastbound highway feature.
- Report 20.3 for the westbound highway feature.

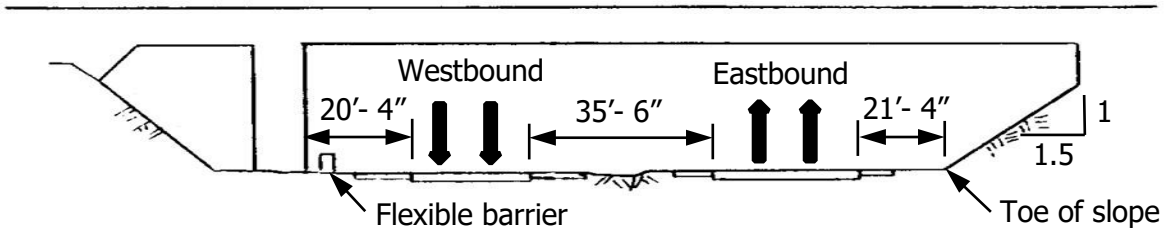


Figure 93. Bridge elevation view of horizontal clearances for separate westbound and eastbound highway features below the bridge, with a flexible barrier.

Examples Continued – Highway Minimum Horizontal Clearance, Right
Highway feature below the bridge carries 1-way ramp traffic, looking in the direction of travel. Report 15.0.

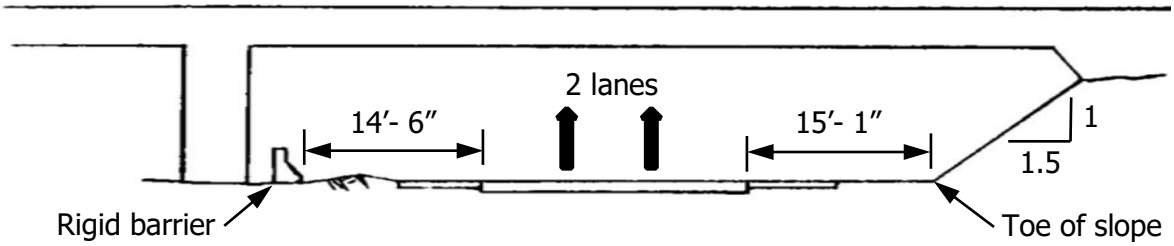


Figure 94. Bridge elevation view of horizontal clearances for a 2-lane, 1-way highway feature below the bridge, with a rigid barrier.

Highway feature below the bridge carries 2-way traffic. Report 14.5.

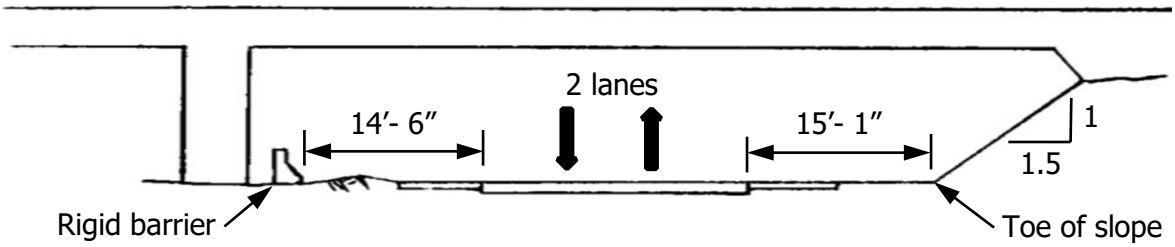


Figure 95. Bridge elevation view of a 2-lane, 2-way highway feature below the bridge, with a rigid barrier.

Highway feature below the bridge carries 1-way mainline traffic and 1-way ramp traffic, looking in the direction of travel. Report 15.0.

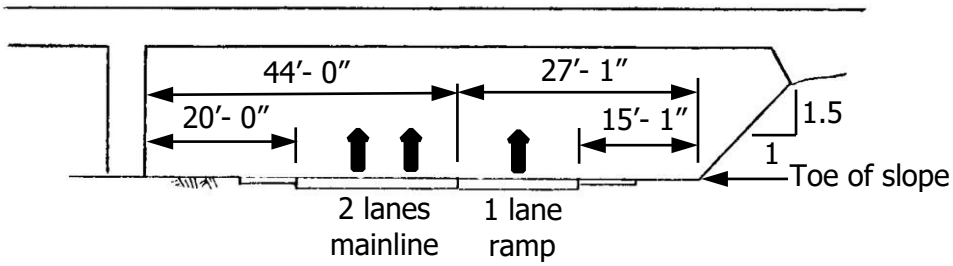


Figure 96. Bridge elevation view of horizontal clearances for highway feature carrying mainline and ramp traffic below the bridge.

B.H.16 Highway Maximum Usable Surface Width

Format	Frequency	Item ID
N (3,1)	I	B.H.16

Specification	Commentary
Report the maximum usable surface width for the highway feature reported in Item B.F.01 (*Feature Type*) that passes below or is carried on the bridge, rounded down to the nearest tenth of a foot. Measure the width perpendicular to the centerline of the highway (including paved or stabilized shoulders). Report 99.9 when the surface width is 100 feet or greater.	Shoulders are included when they are contiguous with the traveled way and structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not considered a shoulder for this item. Refer to agency policy for when and where stabilized shoulders are used. When it is not readily known if stabilized construction details were used, the presence of rutting, heaving, water retention, or other distress may be used as indicators that the shoulder is not stabilized.

Commentary Continued

Flush (striped) and mountable medians are not considered restrictions.

A curb greater than 6 inches high may be considered non-mountable for these specifications.

Use the least restrictive configuration when movable rigid barriers are used to accommodate reversible lanes for non-construction-related applications.

Reporting this item is optional for highway features below the bridge that do not carry NHS routes as identified in Item B.H.03 (*NHS Designation*).

Examples

Two highway features below the bridge. One highway feature carries eastbound traffic and one carries westbound traffic.

- Report 34.6 for the eastbound highway feature.
- Report 42.4 for the westbound highway feature.

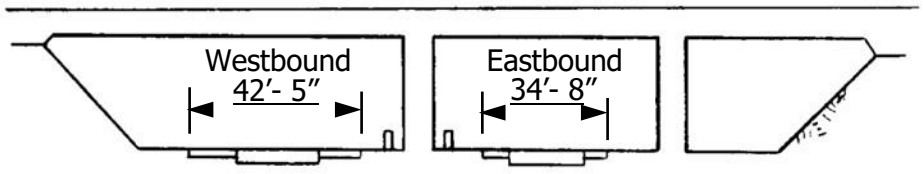


Figure 97. Bridge elevation view of two separate highway features below the bridge.

Examples Continued – Highway Maximum Usable Surface Width

One highway feature carried on the bridge. Highway feature carries 2-way traffic that is not divided at the bridge. Report measurement A.

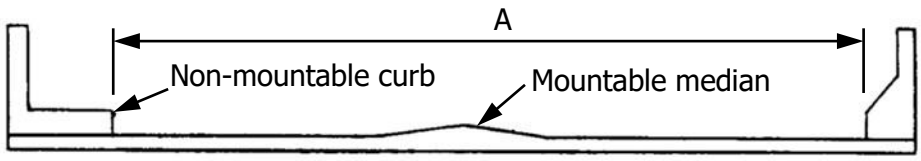


Figure 98. Bridge elevation view of two separate highway features below the bridge.

Two highway features carried on the bridge. Highway 1 (H01) and Highway 2 (H02) are divided at the bridge by the non-mountable median.

- Report measurement A for H01.
- Report measurement B for H02.

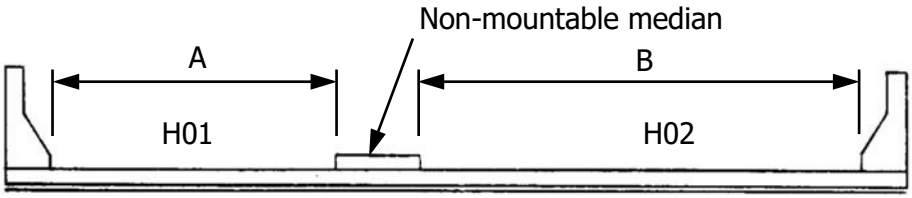


Figure 99. Cross-section view of two highway features carried on the bridge with a non-mountable median.

Two highway features carried on the pipe culvert under fill. Highway 1 (H01) and Highway 2 (H02) are divided at the bridge.

- Report measurement A for H01. •
  Report measurement B for H02.

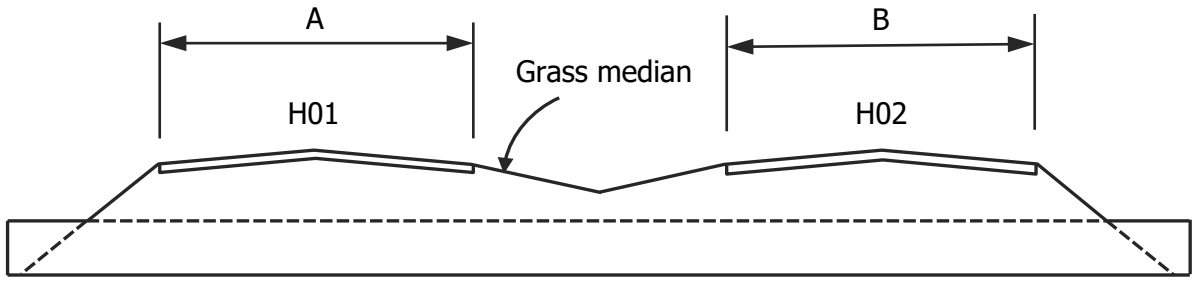
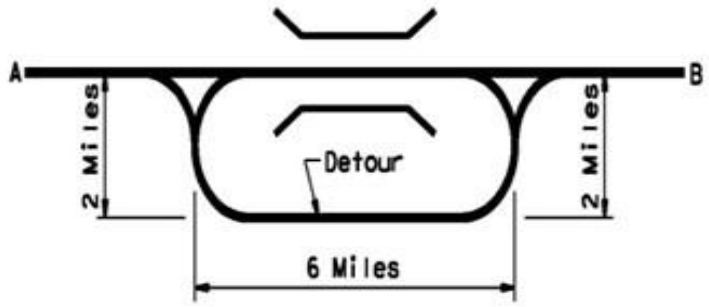
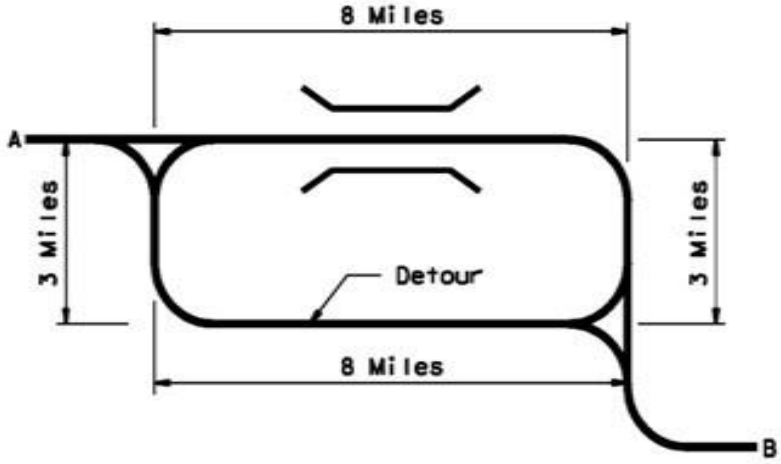


Figure 100. Cross-section view of two highway features carried on the pipe culvert under fill with a grass median.

B.H.17 Bypass Detour Length

Format	Frequency	Item ID
N (3,0)	I	B.H.17

Specification	Commentary
Report the length to the nearest mile of the total additional travel for a vehicle to bypass the bridge for the highway feature reported in Item B.F.01 (*Feature Type*), that passes below or is carried on the bridge. Report 999 where a detour does not exist. Report 0 for available ground level bypass. Report 1 when the highway feature is carried by a bridge, is not at an interchange, and a parallel bridge can be used as a temporary bypass with a reasonable amount of crossover grading.	Determine bypass detour length by evaluating the potential to move traffic, including military vehicles and trucks, around bridges. • Avoid detour routes that have load, height, or capacity limitations unacceptable for the additional traffic detoured onto them. • Consider using the parallel bridge of dual bridges or temporary culverts if emergency detours can be constructed with a reasonable amount of grading within the existing right-of-way. • Consider using ramps and/or frontage roads in interchanges. • Review plans for strategic bridge detour routes. *NDOT Commentary – Bypass Detour Length* *Additional travel due to a detour route should be established using roads and bridges of similar type and quality. For example, a detour route for a State highway should utilize on-system roads with equivalent roadway, bridges and shoulders. If the route to be detoured is an off-system gravel road, an equivalent roadway of approximately equal width and quality shall be chosen. If the road being detoured contains no posted bridges the detour route selected should also contain no posted bridges, if possible. Minimum maintenance roadways should not be used as detour routes.* *Detour lengths should be calculated for through vehicles using a route, not local vehicles. For example, a homeowner living immediately east of Bridge 22260 in the second example below may have a detour length of over 3 miles, however the actual detour length for the route is 2 miles for through traffic.*

Examples – Bypass Detour Length
Diamond interchange. Bridge can be bypassed. Report 0. Cloverleaf. Bridge cannot be bypassed; 18-mile detour. Report 18. Highway feature carried on the bridge with a 4-mile detour (Figure 102). Report 4.      *Figure 101. Detour map for a highway feature carried on the bridge.* Highway feature passes below the bridge with a 0-mile detour (Figure 103). Report 0.      *Figure 102. Detour map for a highway feature that passes below the bridge.*

B.H.18 Crossing Bridge Number

Format	Frequency	Item ID
AN (15)	I	B.H.18

Specification	Commentary
Report the exact bridge number(s) as assigned in Item B.ID.01 (*Bridge Number*) for the bridge carrying a highway feature that is located directly above or below the inventoried highway bridge. Do not report this item when the highway bridge does not pass above or below another bridge, or passes above or below a bridge that is not reportable to the NBI.	The intent of this item is to capture the bridge number for bridges of a multi-level interchange, where bridges pass directly above or below other bridges. For border bridges, the Neighboring State reports this item for all highway features that pass above the bridge, as part of their abbreviated bridge record. For more information, see the Border Bridges section of this document.

Example

The inventoried bridge number 300000B-X636010 passes above bridge number 300000BX638012 and passes below 300000B-X635010 and 30000B-X634010.

- Report 300000B-X638012 for the bridge below.
- Report 300000B-X635010 for the bridge above.
- Report 300000B-X634010 for the other bridge above.
-

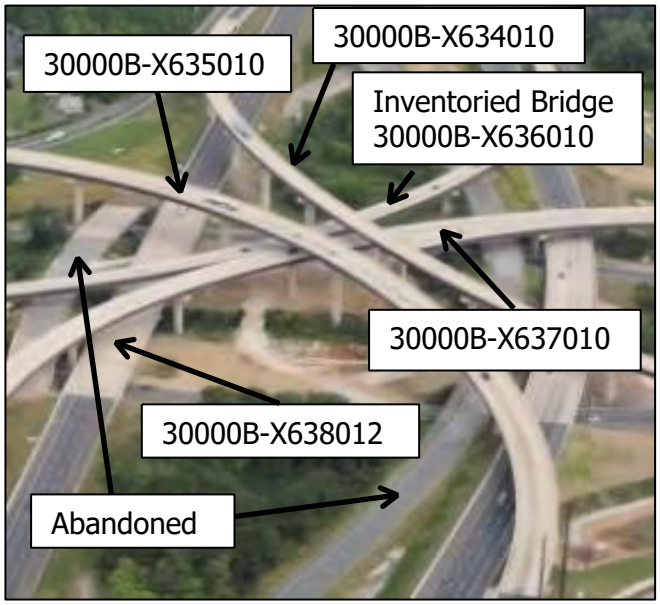


Figure 103. Multi-level interchange with bridges passing above and below other bridges. (Source: Maryland Transportation Authority)

Example Highway Data for Bridge Number 15558X

The bridge carries North Hanley Road over Wabash Ave., BNSF Railroad, and the Berkeley Branch of Coldwater Creek. The bridge is in the St. Louis Urban Area (code: 77770).

North Hanley Road (no route number) is a 4-lane, 2-way city street traveling north and south, which is not divided at the bridge. The functional class is other principle arterial. It is an NHS route. The 2014 Annual Average Daily Traffic is 8,376 with a truck percentage of 10% (838 by count). The bridge carries a highway with no vertical clearance restrictions. The maximum usable surface width of the highway carried on the bridge is 64'-0". The bypass detour length is 1 mile. (Value 1)

Wabash Ave. (no route number) is a 2-lane, 2-way city street traveling east and west, which is not divided at the bridge, and is not carried on another bridge. It is not on the NHS. The Annual Average Daily Traffic is not available but estimated at 300 with a truck percentage of 15% (45 by count) due to the industrial nature of the area. Wabash Ave. passes below the bridge and has a 22'-5" maximum usable vertical clearance (reporting optional because this is not an NHS route), a 21'-9" minimum vertical clearance, a minimum horizontal clearance to the right of 7'-8", and a maximum usable surface width of 22'-0" (reporting optional because this is not an NHS route). Wabash Ave. is a dead-end road. Therefore, there is no bypass detour. (Value 2)

Neither highway is on the National Freight Network nor the STRAHNET, and no LRS data has been assigned to either highway. No highways are carried on bridges passing above or below the bridge.

Items in the Highways subsection are only reported for highway features identified in Item B.F.01 (*Feature Type*) with code H. Therefore, the Highways subsection items are not reported for the railroad or the creek.

Table 11. Highway feature data items in the Features Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)
B.H.01	*Functional Classification*	3	7
B.H.02	*Urban Code*	77770	77770
B.H.03	*NHS Designation*	Y	N
B.H.04	*National Highway Freight Network*	N	N
B.H.05	*STRAHNET Designation*	N	N
B.H.06	*LRS Route ID*	N	N
B.H.07	*LRS Mile Point*		
B.H.08	*Lanes On Highway*	4	2
B.H.09	*Annual Average Daily Traffic*	8376	300
B.H.10	*Annual Average Daily Truck Traffic*	838	45
B.H.11	*Year of Annual Average Daily Traffic*	2014	2014
B.H.12	*Highway Maximum Usable Vertical Clearance*	99.9	22.4
B.H.13	*Highway Minimum Vertical Clearance*	99.9	21.7
B.H.14	*Highway Minimum Horizontal Clearance, Left*		0
B.H.15	*Highway Minimum Horizontal Clearance, Right*		7.6
B.H.16	*Highway Maximum Usable Surface Width*	64	22
B.H.17	*Bypass Detour Length*	1	999
B.H.18	*Crossing Bridge Number*		

SUBSECTION 4.4: RAILROADS

The data items in this subsection provide information about railroads that are carried on or pass below the bridge. These data items are considered part of the Features Data Set and have a many-to-one relationship with a bridge. Therefore, each railroad feature reported in Item B.F.01 (*Feature Type*) has a unique railroad feature data set, and there may be multiple railroad feature data sets associated with a bridge.

Item B.RR.01 (*Railroad Service Type*) is reported for all railroads, and the remaining items are reported only for railroads below the bridge, i.e. when Item B.F.02 (*Feature Location*) is B.

The dimensional values for the items in this subsection can be obtained from either plans or field measurement.

The data for the items in this subsection typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.RR.01	Railroad Service Type
B.RR.02	Railroad Minimum Vertical Clearance
B.RR.03	Railroad Minimum Horizontal Offset

B.RR.01 Railroad Service Type

Format	Frequency	Item ID
AN (2)	I	B.RR.01

Specification	Commentary
Report the designated railroad service type for the railroad feature reported in Item B.F.01 (*Feature Type*) using one of the following codes. Code – Description F – Freight FE – Freight - electrified P – Passenger PE – Passenger - electrified M – Multiple services - not electrified ME – Multiple services – electrified I – Inactive	Electrified is intended for electricity-powered rail lines and third-rails, but not for battery or fuel cell powered lines. Use code M when multiple rail services (such as freight and passenger rail) use the same tracks and both services are not electrified. Use code ME when multiple rail services (such as freight and passenger rail) use the same tracks, and at least one is electrified.

Examples

The bridge carries two highway features separated by two electrified passenger rail tracks (i.e. one railroad feature). Two railroad tracks pass below the bridge that both carry freight (i.e. one railroad feature).

- Report PE for the railroad feature carried on the bridge.
- Report F for the railroad feature below the bridge.

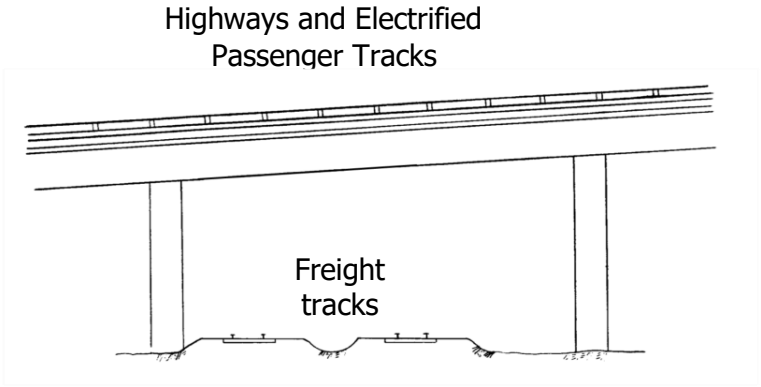
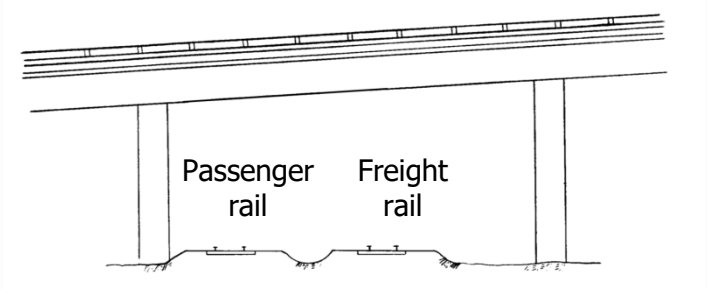
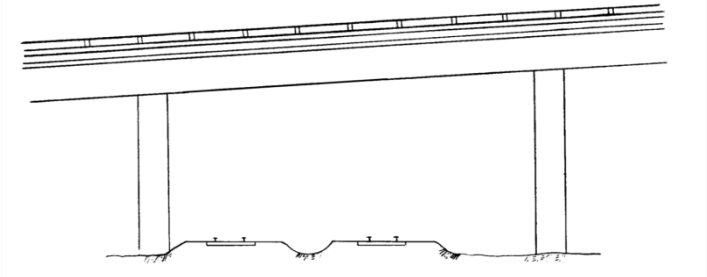
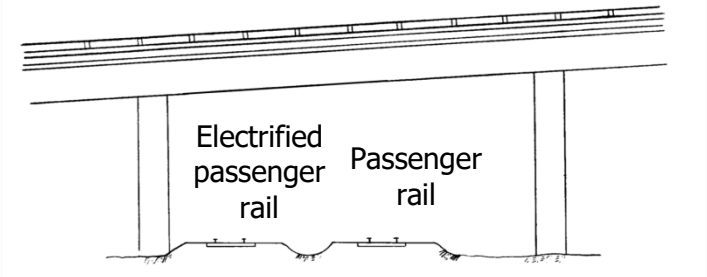


Figure 104. Bridge elevation view with two electrified passenger rail tracks carried on the bridge and two freight rail tracks below the bridge.

Examples Continued – Railroad Service Type
Two railroad tracks below the bridge. One carries passenger rail service and one carries freight (i.e. two railroad features). • Report P for the passenger rail feature. • Report F for the freight rail feature.    *Figure 105. Bridge elevation view with one passenger rail and one freight rail track below the bridge.*
Two railroad tracks below the bridge that both carry freight and passenger service (i.e. one railroad feature). Report M.  *Figure 106. Bridge elevation view with two freight/passenger rail tracks below the bridge.*
Two railroad tracks below the bridge. One carries electrified passenger service and one carries non-electrified passenger service (i.e. two railroad features). • Report PE for the electrified passenger rail feature. • Report P for the non-electrified passenger rail feature.    *Figure 107. Bridge elevation view with an electrified passenger rail track and a non-electrified passenger rail track below the bridge.*

B.RR.02 Railroad Minimum Vertical Clearance

Format	Frequency	Item ID
N (3,1)	EI	B.RR.02

Specification	Commentary
Report the minimum vertical clearance for the railroad feature reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. Measure plumb from the top of rails to the lowest bridge restriction or appurtenance (signs, utilities, etc.) attached to the bridge. Appurtenances attached to the bridge that serve only a railroad purpose, such as catenary systems, are excluded from the measurement and do not reduce the vertical clearance measurement. Report 99.9 when the clearance is 100 feet or greater. Report this item only when Item B.F.02 (*Feature Location*) is B.	Several measurements may need to be made to determine the minimum vertical clearance for each railroad feature when one or more railroad tracks pass below the bridge. However, only the minimum measurement is reported. Update measurements when alterations are made to the bridge or railroad tracks that affect the previously measured clearance. Clearances greater than 30 feet may be estimated.

Examples

Two railroad tracks below the bridge that both carry freight and passenger service (i.e. one railroad feature). Report 31.2.

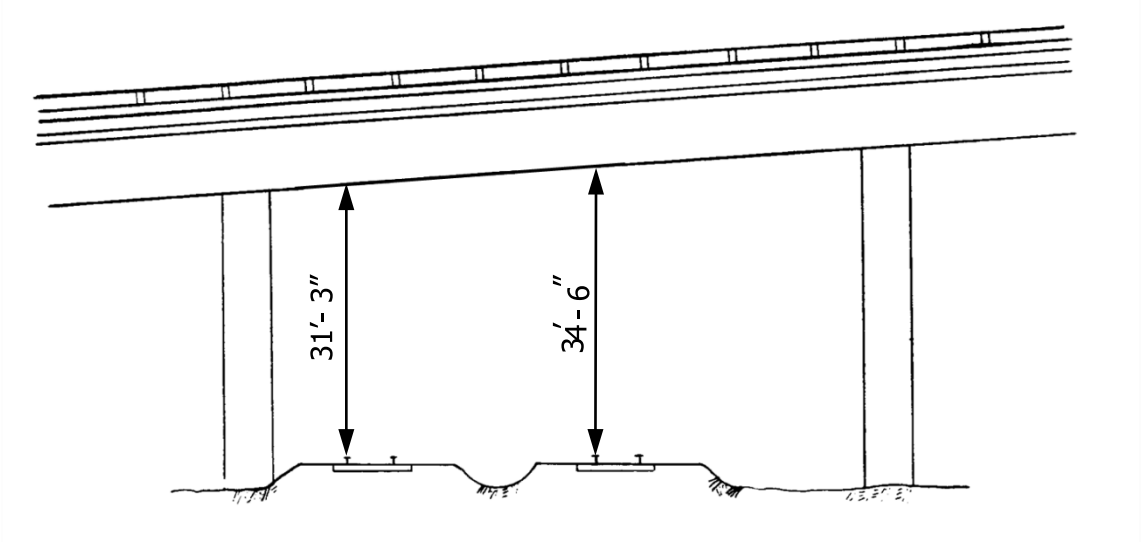


Figure 108. Bridge elevation view with two freight/passenger rail tracks below the bridge.

Examples Continued – Railroad Minimum Vertical Clearance

Two railroad tracks below the bridge. One carries passenger rail service, and one carries freight (i.e. two railroad features).

- Report 20.2 for the passenger rail feature.
- Report 21.2 for the freight rail feature.

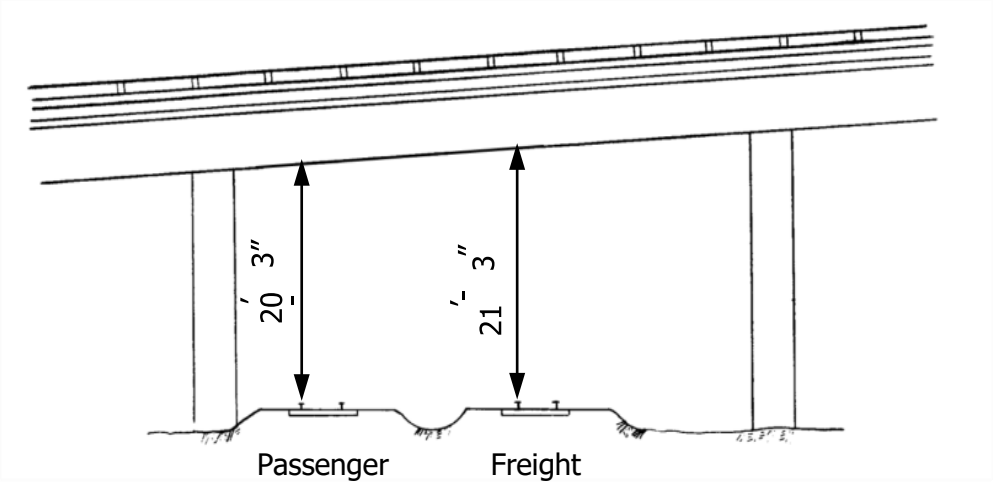


Figure 109. Bridge elevation view with one passenger rail and one freight rail track below the bridge.

B.RR.03 Railroad Minimum Horizontal Offset

Format	Frequency	Item ID
N (3,1)	I	B.RR.03

Specification	Commentary
Report the minimum horizontal offset for the railroad feature reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. Measure perpendicular from the centerline of the tracks to the nearest substructure unit or toe of slope that is steeper than 1 to 3 (vertical to horizontal). For multiple tracks with the same railroad service type, report the minimum distance after measuring the offsets in both directions from all tracks. Report 99.9 when the minimum horizontal offset is 100 feet or greater. Report this item only when Item B.F.02 (*Feature Location*) is B.	The intent of this item is to collect the minimum distance from the centerline of the railroad track to a bridge related obstruction. Offsets greater than 30 feet may be estimated.

Examples

One railroad track below the bridge. Report 20.3.

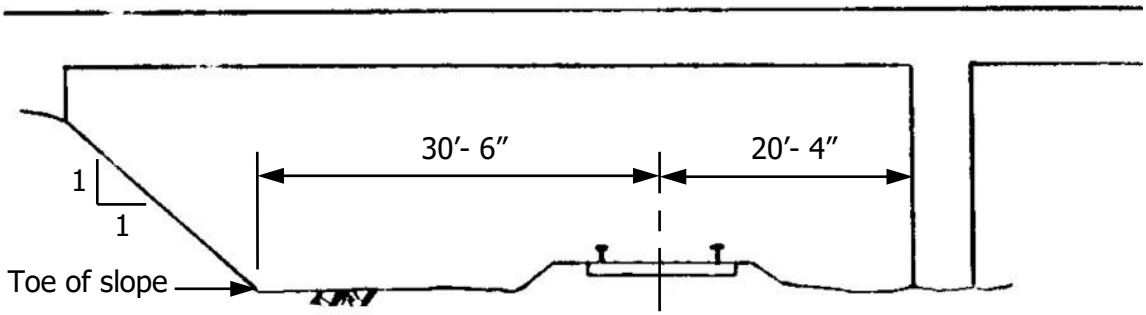


Figure 110. Bridge elevation view indicating horizontal offset for one railroad track below the bridge.

Examples Continued – Railroad Minimum Horizontal Offset

Two railroad tracks that both carry freight (i.e. one railroad feature). Report 18.5.

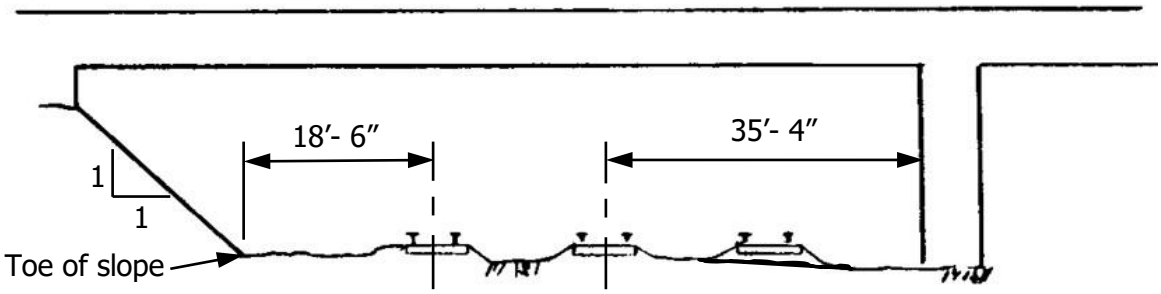


Figure 111. Bridge elevation view indicating horizontal offset for two railroad tracks below the bridge.

Example Railroad Data for Bridge Number 15558X

The bridge carries North Hanley Road over Wabash Avenue, BNSF Railroad (two tracks, both carrying freight rail service), and the Berkeley Branch of Coldwater Creek. The minimum vertical underclearance to the railroad tracks is 23’-0” and the minimum horizontal offset is 14’-0”.



Figure 112. Bridge elevation view of two railroad tracks below Bridge Number 15558X.



Figure 113. Freight train passing below Bridge Number 15558X

Table 12. Railroad data items in the Features Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.RR.01	*Railroad Service Type*	F
B.RR.02	*Railroad Minimum Vertical Clearance*	23.0
B.RR.03	*Railroad Minimum Horizontal Offset*	14.0

SUBSECTION 4.5: NAVIGABLE WATERWAYS

The data items in this subsection provide information about the waterways that pass below the bridge. These data items are considered part of the Features Data Set and have a many-to-one relationship with a bridge. Therefore, each waterway feature reported in Item B.F.01 (*Feature Type*) has a unique waterway feature data set, and there may be multiple waterway feature data sets associated with a bridge.

Item B.N.01 (*Navigable Waterway*) is reported for all waterways, and the remaining items are reported only for navigable waterways, i.e. when Item B.N.01 (*Navigable Waterway*) is Y.

The dimensional values for the items in this subsection can be obtained from either plans or field measurement.

The data for the items in this subsection typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

Item ID	Data Item
B.N.01	Navigable Waterway
B.N.02	Navigation Minimum Vertical Clearance
B.N.03	Movable Bridge Maximum Navigation Vertical Clearance
B.N.04	Navigation Channel Width
B.N.05	Navigation Channel Minimum Horizontal Clearance
B.N.06	Substructure Navigation Protection

B.N.01 Navigable Waterway

Format	Frequency	Item ID
AN (1)	I	B.N.01

Specification	Commentary
Report whether the waterway feature reported in Item B.F.01 (*Feature Type*) is considered navigable waters of the United States using one of the following codes. Code — Description N — Not navigable waters Y — Navigable waters U — Navigable waters designation is undetermined	This item identifies bridges over navigable waters where the United States Coast Guard may exercise jurisdiction, as defined in 33 CFR, Part 2. This information helps identify bridges at risk from vessel collision and bridges where a Coast Guard permit may be required for modifications to the structure. Information helpful in coding this item may be found in design and construction documentation or prior correspondence with the Coast Guard. Navigable waterways are determined by the Commandant of the United States Coast Guard per Title 33 of the Code of Federal Regulations, Section 2.36.

B.N.02 Navigation Minimum Vertical Clearance

Format	Frequency	Item ID
N (4,1)	I	B.N.02

Specification

Report the minimum vertical clearance over the waterway feature reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot.

The reported clearance is from the highest datum plane referenced in the approved permit plans to the lowest superstructure restriction or other appurtenances attached to the bridge over the designated navigation channel.

For all movable bridges, the vertical clearance reported for this item is for the bridge in the closed position (i.e., open to vehicular traffic).

Report the most restrictive clearance when there are multiple designated navigation channels.

Report this item only when Item B.N.01 (*Navigable Waterway*) is Y.

Commentary

Reference datum, designated navigation channels, and vertical clearances can be found on permit plans approved by the United States Coast Guard.

When permit plans are not available, values can be established from field measurements obtained for known navigation channels and the most restrictive clearance recorded. Reference field measurements to the following datum:

Crossing Type	Datum
Tidal waters	Mean High Water
Non-tidal waters	Extreme High Water
River	Q50 Surface Elevation

Examples

Permit plans for a bridge over tidal waters with the navigation channel designated by crosshatched area. Permit plans set the datum at mean higher-high water (M.H.H.W.) instead of mean high water. Report 50.0.

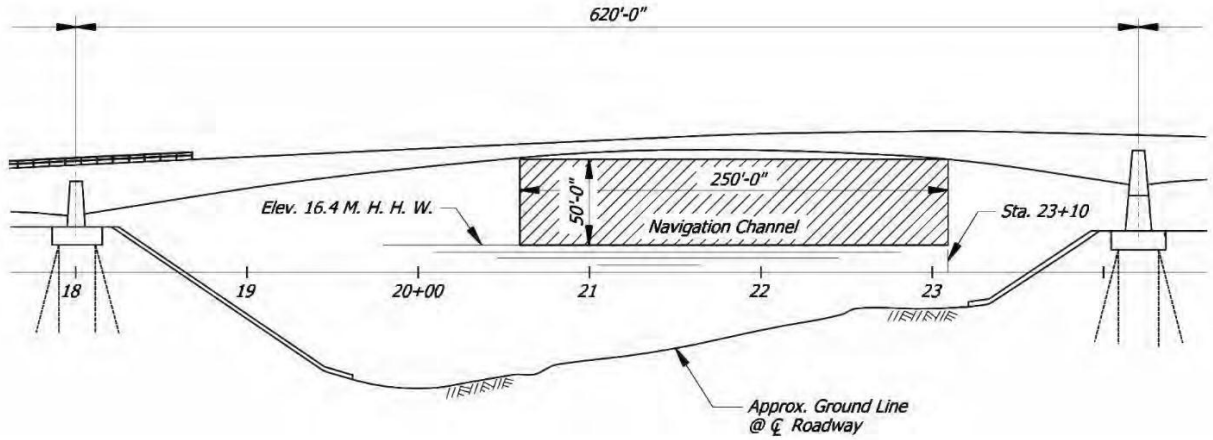


Figure 114. Bridge elevation view indicating navigation channel and vertical clearance. (Source: Alaska DOT)

Examples Continued - Navigation Minimum Vertical Clearance

Permit plans for a bridge over tidal waters with multiple designated navigation channels. Permit plans set the datum at mean higher-high water (M.H.H.W.) instead of mean high water. Report 23.1

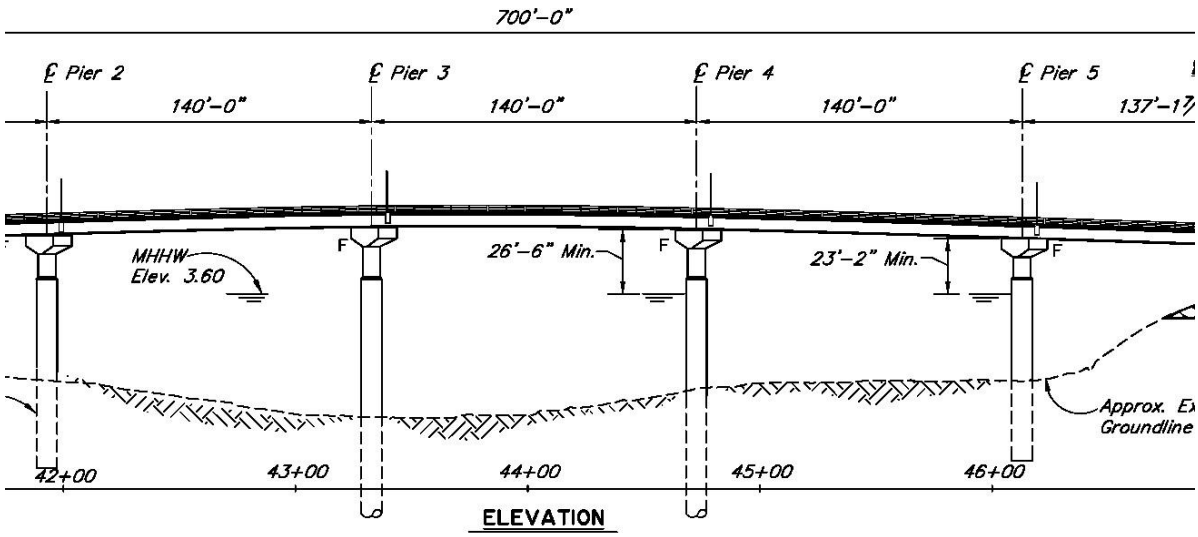


Figure 115. Bridge elevation view indicating multiple navigation channels and vertical clearances. (Source: Alaska DOT)

Vertical lift bridge. Information taken from "As-Built" plans as no permit plans are available. Mean High Water elevation is 3.2 ft. Minimum vertical underclearance is 12 ft – 3.2 ft = 8.8 ft. Report 8.8.

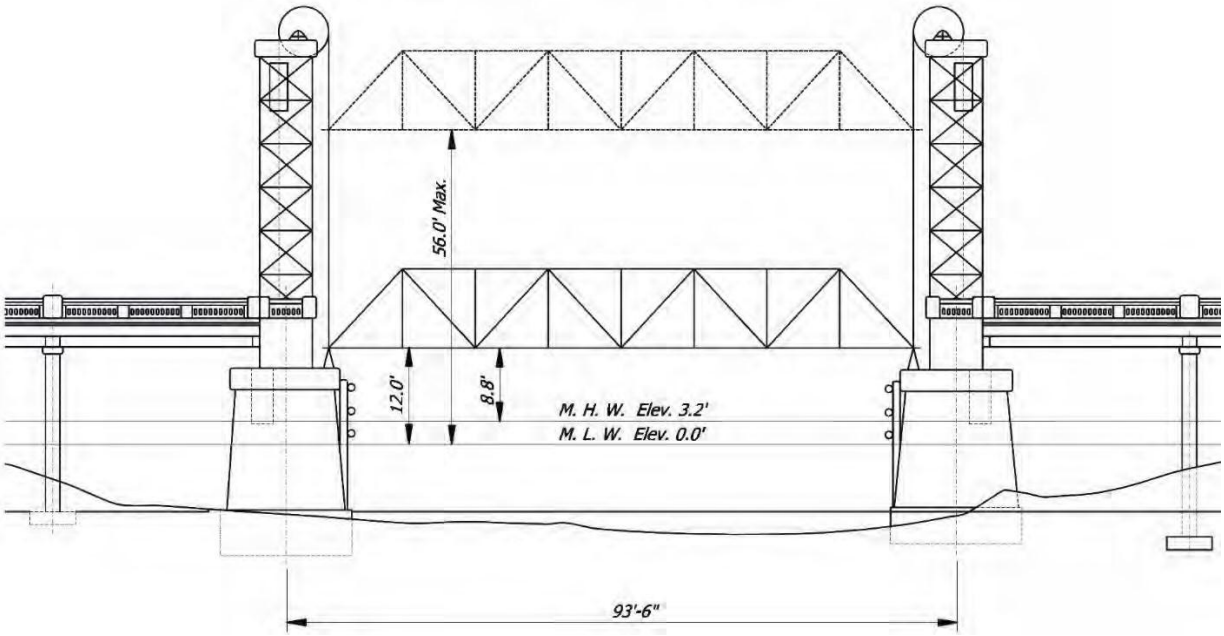


Figure 116. Bridge elevation view for a vertical lift bridge indicating vertical clearances. (Source: Florida DOT)

B.N.03 Movable Bridge Maximum Navigation Vertical Clearance

Format	Frequency	Item ID
N (4,1)	I	B.N.03

Specification	Commentary
Report the maximum vertical clearance over the waterway feature reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. The reported clearance is from the highest datum plane referenced in the approved permit plans to the lowest superstructure restriction or other appurtenances attached to the bridge over the designated navigation channel when the movable bridge is in the open position. Report 999.9 when the bridge provides unlimited vertical clearance over the navigation channel in the open position. Report this item only when Item B.N.01 (*Navigable Waterway*) is Y and Item B.SP.06 (*Span Type*) begins with M, indicating that the span type is movable.	The value reported for this item is particularly useful for vertical lift bridges and for bascule bridges where the leaf (or leaves) does not provide unlimited vertical clearance over the designated navigation channel in the open position. When permit plans are not available, values can be obtained from field measurements. Reference field measurements to the following datum: Crossing Type — Datum Tidal waters — Mean High Water Non-tidal waters — Extreme High Water River — Q50 Surface Elevation

Example

Vertical lift bridge. Information taken from "As-Built" plans as no permit plans are available. Mean High Water elevation is 3.2 ft. Maximum vertical underclearance is 56 ft – 3.2 ft = 52.8 ft. Report 52.8.

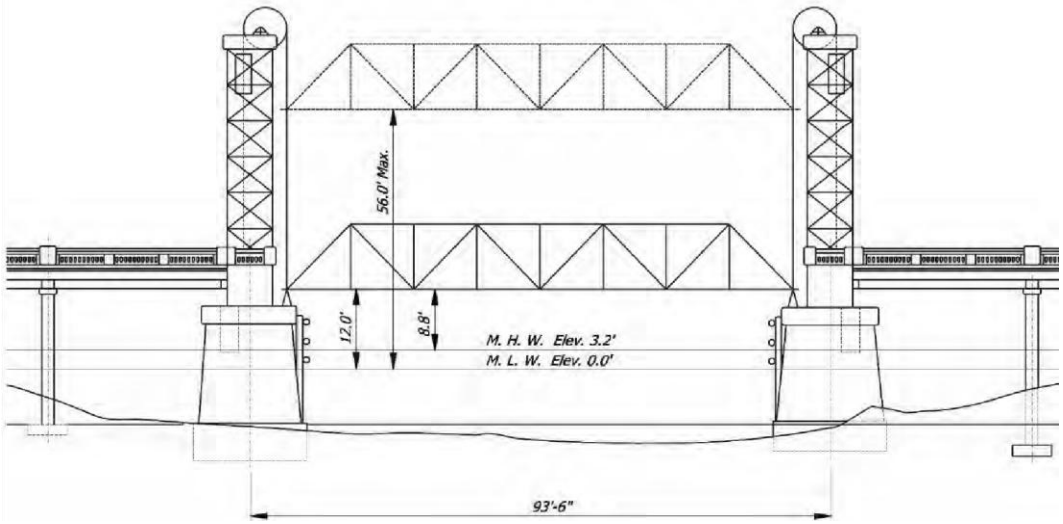


Figure 117. Bridge elevation view for a vertical lift bridge indicating vertical clearances.

B.N.04 Navigation Channel Width

Format	Frequency	Item ID
N (5,1)	I	B.N.04

Specification	Commentary
Report the navigation channel width for the waterway feature reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. The width is as shown on the approved permit plans, or field measured when the navigation channel changes or is unmarked. For field measurements, measure the horizontal distance perpendicular to the centerline of the navigation channel. For marked channels measure between the markers designating the limits of the channel at the bridge. For unmarked channels, measure the minimum clear distance between fenders or piers. If multiple channels exist, report the most restrictive. Report this item only when Item B.N.01 (*Navigable Waterway*) is Y.	The width provided here should be consistent with the navigation channel used in the navigation vertical clearance items. The designated navigation channel width may be less than the distance between substructure units.

Examples

Permit plans for a bridge over tidal waters with the navigation channel designated by crosshatched area. Report 250.0.

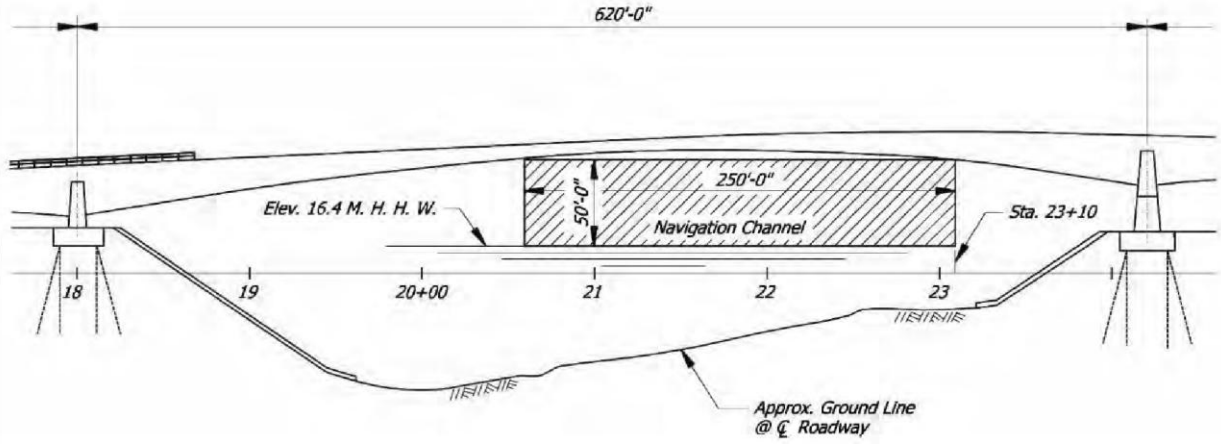


Figure 118. Bridge elevation view indicating navigation channel width dimensions. (Source: Alaska DOT)

Examples Continued - Navigation Channel Width

Bridge with multiple designated navigation channels bounded by piers. Report 126.5.

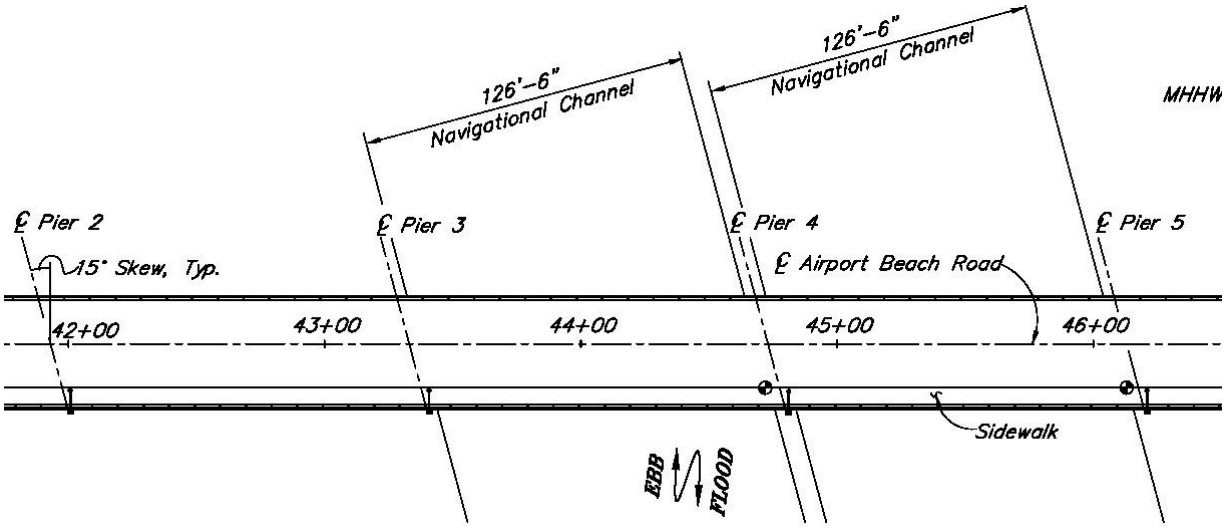


Figure 119. Bridge plan view indicating navigation channel width dimensions. (Source: Alaska DOT)

B.N.05 Navigation Channel Minimum Horizontal Clearance

Format	Frequency	Item ID
N (5,1)	I	B.N.05

Specification	Commentary
Report the minimum horizontal clearance for the waterway feature reported in Item B.F.01 (*Feature Type*), rounded down to the nearest tenth of a foot. The clearance is the minimum distance from either edge of the navigation channel shown on the approved permit plans, to the face of the nearest bridge substructure unit located within the waterway. The clearance may be field measured when the placement of navigation markers at the bridge is inconsistent with the permit plans, or if the presence of navigation markers indicates a navigation channel and no permit plans are available. For field measurements, measure the horizontal distance perpendicular to the centerline of the navigation channel from the markers designating the limits of the channel at the bridge, to the face of the nearest bridge substructure unit located within the waterway. Report 0 when substructure units in the waterway are the boundaries for the navigation channel. Report 9999.9 when no substructure unit is within the waterway. Report this item only when Item B.N.01 (*Navigable Waterway*) is Y.	The intent of this item is to collect the most restrictive distance from the edge of the navigational channel to a bridge substructure to assess risk for vessel collision. The clearance provided here should be consistent with the navigation channel used in Item B.N.04 (*Navigation Channel Width*).

Examples

Permit plans for a bridge over tidal waters with the navigation channel designated by crosshatched area. No substructure units within the waterway. Report 9999.9.

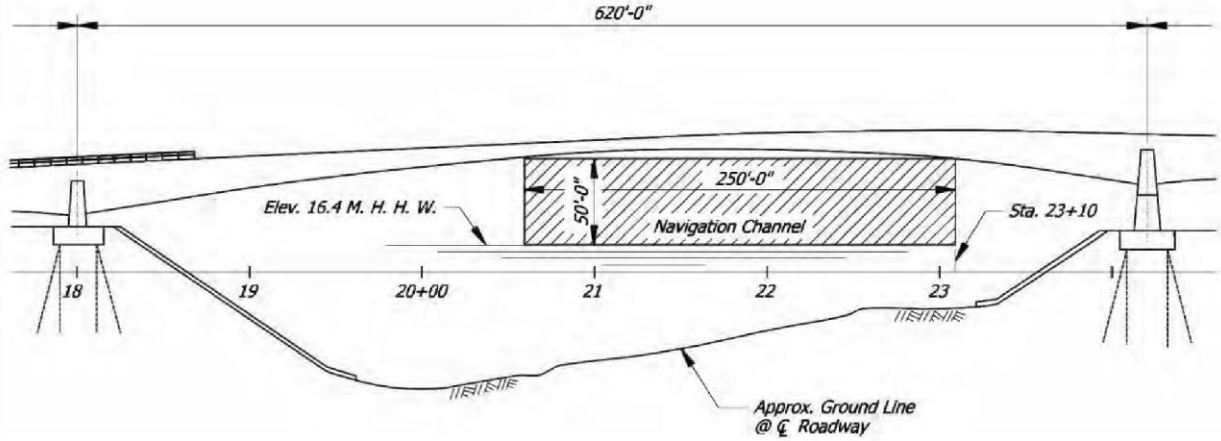


Figure 120. Bridge elevation view with no substructure units in the waterway. (Source: Alaska DOT)

Bridge with multiple designated navigation channels bounded by piers. Report 0.

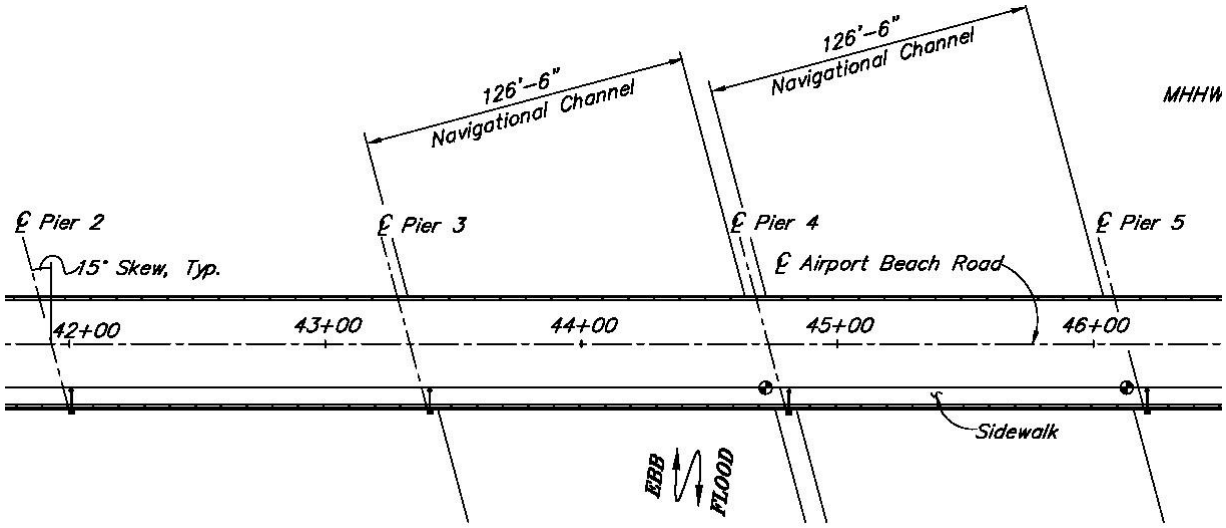


Figure 121. Bridge plan view indicating multiple navigation channel width dimensions to substructure units in the waterway. (Source: Alaska DOT)

Bridge with navigation channel designated by cross-hatched area. Substructure units within the waterway. Report 135.6.

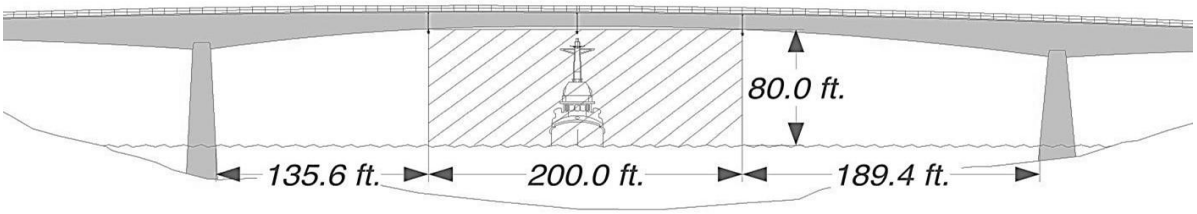


Figure 122. Bridge elevation view indicating navigation channel clearances to substructure units in the waterway.

B.N.06 Substructure Navigation Protection

Format	Frequency	Item ID
AN (1)	EI	B.N.06

Specification	Commentary
Report the presence and adequacy of substructure navigation protection for the waterway feature reported in Item B.F.01 (*Feature Type*), using one of the following codes. Code — Description 0 — Navigation protection not required; bridge has been designed or assessed to have adequate capacity to resist anticipated impact loads without collapse. 1 — Navigation protection not required; assessment of navigation opening and vessel traffic has determined that there is a low probability that an errant vessel could impact the bridge. 2 — Protective system in place and functioning. 3 — Protective system in place, but damage or deterioration impacts ability to protect. 4 — Protective system in place, but reevaluation of design suggested. 5 — No protective system in place, but reevaluation of the need for a protective system is recommended. Report this item only when Item B.N.01 (*Navigable Waterway*) is Y.	Substructure navigation protection systems can be fender systems, dolphins, or other systems that either prevent the substructure from being impacted or adequately reduce the impact load that is transferred into the substructure. Use codes 0 and 1 to indicate that an assessment of vessel traffic characteristics and/or bridge capacity has determined that navigation protection is not required. AASHTO's Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges provides a method for assessing an existing bridge's vulnerability to vessel collision. Codes 0 and 1 should not be assigned based on field observation. Use codes 4 and 5 to indicate that observed conditions necessitate a review of vessel traffic characteristics, bridge capacity, and protective system capability to determine whether the bridge is adequately protected from vessel collision.

Example Navigable Waterway Data for Bridge Number 15558X

The bridge carries North Hanley Road over Wabash Avenue, Burlington Northern/Santa Fe (BNSF) Railroad, and Berkeley Branch Coldwater Creek. The design plans do not identify a navigation channel and there is no correspondence in the bridge file indicating that the Coast Guard exercises jurisdiction over navigation on the waterway.



Figure 123. Berkeley Branch Coldwater Creek below Bridge Number 15558X.

Since Item B.N.01 (*Navigable Waterway*) is coded N, the remaining items in this subsection are not reported.

Table 13. Navigable Waterway data items in the Features Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.N.01	*Navigable Waterway*	N
B.N.02	*Navigation Minimum Vertical Clearance*	
B.N.03	*Movable Bridge Maximum Navigation Vertical Clearance*	
B.N.04	*Navigation Channel Width*	
B.N.05	*Navigation Channel Minimum Horizontal Clearance*	
B.N.06	*Substructure Navigation Protection*	

SECTION 5: LOADS, LOAD RATING, AND POSTING

This section has data items that have been grouped by the following three subsections: Loads and Load Rating, Load Posting Status, and Load Evaluation and Posting.

The data items in the Loads and Load Rating subsection provide information on the load carrying capacity of bridges, as well as the method used to determine the capacity and load posting. These items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. Some of the data items remain static once a bridge has been inventoried, but others may change after reevaluation of the load rating.

The data items in the Load Posting Status subsection provide information on the status of the bridge with regards to weight or other load restrictions. These items are considered part of the Posting Status Data Set and have a many-to-one relationship with a bridge when applicable. The data for these items may change after reevaluation of the load rating.

The data items in the Load Evaluation and Posting subsection provide information on the load carrying capacity the bridge with respect to the legal load configurations established by AASHTO, FHWA, the State transportation department, Federal agency, or Tribal government. These items are considered part of the Posting Evaluation Data Set and have a many-to-one relationship with a bridge when applicable. The data for these items may change after reevaluation of the load rating.

The following data items are included in this section.

SUBSECTION 5.1: LOADS AND LOAD RATING

Item ID	Data Item
B.LR.01	Design Load
B.LR.02	Design Method
B.LR.03	Load Rating Date
B.LR.04	Load Rating Method
B.LR.05	Inventory Load Rating Factor
B.LR.06	Operating Load Rating Factor
B.LR.07	Controlling Legal Load Rating Factor
B.LR.08	Routine Permit Loads

SUBSECTION 5.2: LOAD POSTING STATUS

Item ID	Data Item
B.PS.01	Load Posting Status
B.PS.02	Posting Status Change Date

Item ID	Data Item
B.EP.01	Legal Load Configuration
B.EP.02	Legal Load Rating Factor
B.EP.03	Posting Type
B.EP.04	Posting Value

SUBSECTION 5.1: LOADS AND LOAD RATING

The data items in this subsection provide information on the load carrying capacity of the bridge, as well as the method used to determine the capacity and load posting. These data items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. Some of the data items remain static once a bridge has been inventoried, but others may change after reevaluation of the load rating.

The following data items are included in this subsection.

Item ID	Data Item
B.LR.01	Design Load
B.LR.02	Design Method
B.LR.03	Load Rating Date
B.LR.04	Load Rating Method
B.LR.05	Inventory Load Rating Factor
B.LR.06	Operating Load Rating Factor
B.LR.07	Controlling Legal Load Rating Factor
B.LR.08	Routine Permit Loads

B.LR.01 Design Load

Format	Frequency	Item ID
AN (8)	I	B.LR.01

Specification

Report the live load for which the bridge was designed using one of the following codes.

Code	Description
H10	H-10
H15	H-15
H20	H-20
HS15	HS-15
HS20	HS-20
HS20M	HS-20 and Military
HS20Plus	Greater than HS-20
HL93	HL-93
HL93Plus	Greater than HL-93
RR	Railroad
U	Unknown
X	Other

Commentary

For widened or rehabilitated bridges, code the most restrictive design load governing any portion of the bridge.

Use code HS20M when the bridge is designed to accommodate both the HS-20 and the alternate military load.

Use codes HS20Plus and HL93Plus when the HS-20 or HL-93 design load configuration is increased proportionally above that specified in the AASHTO design specifications.

Use code U when the design plans are not available and the likely design load cannot be inferred from design characteristics of the bridge or agency policy at the time the bridge was built. A code other than U can be reported when design plans are not available, but the design load can be inferred from design characteristics of the bridge or agency policy at the time the bridge was built.

Use code X when the design load is known but is not based on AASHTO or railroad design load configurations.

NDOT Commentary – Design Load
HL93 is to be used only for HL93 AASHTO design load configurations.

HS20 is used for all other design load configurations.

Example

A bridge designed for an HS-20 load is later widened. The widening is designed for the HL-93 load. Report HS20.

B.LR.02 Design Method

Format	Frequency	Item ID
AN (4)	I	B.LR.02

Specification	Commentary
Report the method by which the bridge was designed using one of the following codes. Code – Description ASD – Allowable Stress Design LFD – Load Factor Design LRFD – Load and Resistance Factor Design U – Unknown X – Other	The codes describe the design methods used in accordance with AASHTO design specifications. For widened or rehabilitated bridges, code the design method associated with the code in Item B.LR.01 (*Design Load*). Use code U when the design plans are not available and the likely design method cannot be inferred from design characteristics of the bridge or agency policy at the time the bridge was built. A code other than U can be reported when design plans are not available, but the design method can be inferred from design characteristics of the bridge or agency policy at the time the bridge was built.

Example

A bridge designed for an HS-20 load using Load Factor design is later widened. The widened portion is designed for the HL-93 load using Load and Resistance Factor design. Item B.LR.01 (*Design Load*) has code HS20 reported. Report LFD.

B.LR.03 Load Rating Date

Format	Frequency	Item ID
YYYYMMDD	I	B.LR.03

Specification	Commentary
Report the date of the most recent load rating. Do not report this item if no rating analysis or evaluation has been performed	This item reflects the date of the most recent calculation or reevaluation of the load rating. The load rating may be performed independently and at a different date than the inspection. Defects discovered during inspections that may impact the strength or serviceability of the bridge typically require reevaluation of the load rating. When reevaluation of the load rating is completed, report the date of the reevaluation for this item. Refer to the following items when a new or updated load rating is completed: • B.LR.04 (*Load Rating Method*) • B.LR.05 (*Inventory Load Rating Factor*) • B.LR.06 (*Operating Load Rating Factor*) • B.LR.07 (*Controlling Legal Load Rating Factor*) • B.LR.08 (*Routine Permit Loads*)

Example

Load rating calculations found in the bridge record are dated September 5, 1999. Report 19990905.

A bridge rated for an HS-20 load using Load Factor rating is later widened. The entire bridge is re-rated using Load and Resistance Factor rating on July 23, 2012. Report 20120723.

B.LR.04 Load Rating Method

Format	Frequency	Item ID
AN (4)	I	B.LR.04

Specification

Report the method used to calculate the load rating using one of the following codes.

Code	Description
LFR	Load Factor Rating
ASR	Allowable Stress Rating
LRFR	Load and Resistance Factor Rating
LT	Load Testing
AR	Assigned Rating
EJ	Field evaluation and documented engineering judgment
N	No rating analysis or evaluation has been performed

Commentary

When different portions of a bridge are load rated using different methods, report the rating method associated with the controlling rating factor.

For information on applicable load rating methods, refer to the October 30, 2006 FHWA memorandum at: http://www.fhwa.dot.gov/bridge/nbis/103006.cfm

For information on using code AR, refer to the September 29, 2011 FHWA memorandum at: https://www.fhwa.dot.gov/bridge/110929.cfm

For information on using code EJ, refer to the February 2, 2011 FHWA memorandum at: https://www.fhwa.dot.gov/bridge/110202.cfm

Example

A bridge rated for an HS-20 load using Load Factor rating is later widened. The entire bridge is re-rated using Load and Resistance Factor rating. Report LRFR.

A steel truss bridge with steel beam approach spans originally rated using Allowable Stress Rating. The approach spans are re-rated using Load Factor Rating due to deterioration. The rating of the approach spans controls. Report LFR.

A bridge designed and checked using Load Factor Design and an HS-20 live load. The bridge meets the criteria stated in the September 29, 2011 FHWA memo and has an assigned load rating. Report AR.

A concrete bridge constructed in 1910 has no design plans. Load rating determined by a qualified engineer after field condition and live load history evaluation. Report EJ.

B.LR.05 Inventory Load Rating Factor

Format	Frequency	Item ID
N (4,2)	I	B.LR.05

Specification	Commentary
Report the inventory load rating factor, truncated to the hundredth, for the standard AASHTO HS-20 or HL-93 loadings, whichever is applicable based on the method reported in Item B.LR.04 (*Load Rating Method*). When temporary or supported conditions exist, as indicated in Item B.PS.01 (*Load Posting Status*), report the rating factor for the bridge including the temporary or supported conditions. Do not report this item when no rating analysis or evaluation has been performed.	For LRFR, this is the rating factor for the design load rating at the inventory level of reliability using the HL-93 loading considering all applicable strength and serviceability limit states. Refer to the AASHTO Manual for Bridge Evaluation for details of HS-20 and HL-93 loadings and limit states.

Example

A bridge has a calculated inventory load rating factor of 1.486. Report 1.48.

B.LR.06 Operating Load Rating Factor

Format	Frequency	Item ID
N (4,2)	I	B.LR.06

Specification	Commentary
Report the operating load rating factor, truncated to the hundredth, for the standard AASHTO HS-20 or HL-93 loadings, whichever is applicable based on the method reported in Item B.LR.04 (*Load Rating Method*). When temporary or supported conditions exist, as indicated in Item B.PS.01 (*Load Posting Status*), report the rating factor for the bridge including the temporary or supported conditions. Do not report this item when no rating analysis or evaluation has been performed.	For LRFR, this is the rating factor for the design load rating at the operating level of reliability using the HL-93 loading considering all applicable strength and serviceability limit states. Refer to the AASHTO Manual for Bridge Evaluation for details of HS-20 and HL-93 loadings and limit states.

Example

A bridge has a calculated operating load rating factor of 1.679. Report 1.67.

B.LR.07 Controlling Legal Load Rating Factor

Format	Frequency	Item ID
N (4,2)	I	B.LR.07

Specification	Commentary
Report the lowest (controlling) rating factor for the AASHTO, FHWA emergency vehicle, State transportation department, Federal agency, or Tribal government defined legal loads truncated to the hundredth. Do not report a rating factor that was calculated using reduced force effects from postings or restrictions that affect traffic operation, e.g. that limit speed, number of lanes, number of trucks, or do not allow commercial vehicles. Report the rating factor that represents an unrestricted operation. When temporary or supported conditions exist, as indicated in Item B.PS.01 (*Load Posting Status*), report the rating factor for the bridge including the temporary or supported conditions. Do not report this item when no rating analysis or evaluation has been performed. Do not report State, Federal, or Tribal defined configurations that represent loads which exceed legal loads (e.g. special or routine permit vehicles).	For LRFR method this would be the rating factor of "Legal Load Rating". For Allowable Stress and Load Factor rating methods this would be the operating rating factor. When all legal loads are enveloped by the design load type reported in Item B.LR.04 (*Load Rating Method*) and the corresponding rating factor reported in Item B.LR.06 (*Operating Load Rating Factor*), then the value in Item B.LR.06 can be reported for this item when rating factors for legal load configurations have not been calculated. Enveloped as used here means that the legal load rating factor or the operating rating factor for all legal loads will be greater than or equal to 1.0 when the design load legal load rating factor or operating rating factor exceeds a threshold value established by an engineering study. The value in Item B.LR.06 to be reported in this item should exceed this threshold value. This includes legal loads representing emergency vehicles with the weights and bridge locations specified in 23 U.S.C. 127(r). State legal loads are typically described in State laws (State vehicle codes). *NDOT Commentary – Controlling Legal Load Rating Factor* *This item is automatically calculated for submittal and in BrM and is not necessarily the rating factor for the lowest tonnage.*

Examples – Controlling Legal Load Rating Factor

A bridge has the following calculated legal load rating factors for the AASHTO legal loads and a State-defined legal load:

Legal Load Configuration	Rating Factor
Type 3	1.07
Type 3S2	0.88
Type 3-3	0.80
SU4	0.70
SU5	0.65
FL120	1.15

Report 0.65.

NDOT Example – Controlling Legal Load Rating Factor

In this example, the lowest tonnage would be from SU4 27 x 0.70 = 18.9 (post at 18 Tons) compared to SU5 with 31 x 0.65 = 20.15. Lowest rating factor does not always control the required posting tonnage. In a Nebraska load rating SU6 and SU 7 would also be included. The FL120 would be a Federal Legal load vehicle (as per BEP01) and is not used in Nebraska. In Nebraska, the standard three-vehicle posting sign would show the lowest tonnage of the five single unit trucks and also show the Type 3S2 and 3-3 truck posting tonnage if they have a Rating Factor less than 1.00.

Legal Load Configuration	Rating Factor	Gross Weight (tons)	Calculated Posting Values (tons)	Governing Posting Values (tons)
Type 3	1.07	25	26	18
Type SU 4	0.70	27	18	
Type SU 5	0.65	31	20	
Type SU 6	0.72	34.75	25	
Type SU 7	0.77	38.75	29	
Type 3S2	0.88	37	32	32
Type 3-3	0.80	43	34	34

B.LR.08 Routine Permit Loads

Format	Frequency	Item ID
AN (1)	I	B.LR.08

Specification	Commentary
Report whether the bridge carries routine permit loads or whether routine permit loads are restricted from the bridge using one of the following codes. Code – Description A – Bridge carries routine permit loads. Load capacity is adequate for all routine permit loads approved for the route segment; no routine permit loads are restricted. B – Bridge carries routine permit loads. Load capacity is adequate for some routine permit loads approved for the route segment, but some routine permit loads are restricted. C – Bridge does not carry routine permit loads. Load capacity is inadequate for all routine permit loads approved for the route segment. Routine permit loads are restricted from the bridge. N – Bridge does not carry routine permit loads. Routine permit loads are not approved for the route segment	This item is used to identify bridges where State routine permit loads must be considered in load rating and posting evaluations and to identify bridges where routine permit loads are restricted due to bridge load capacity limitations. Agencies have varying policies for issuing routine permits, from not issuing routine permits to issuing various routine permits when these loads exceed State legal loads. Some agencies may utilize maps that indicate highways and bridges that are restricted to routine permit loads or that allow routine permit loads. Use code A when all routine permit loads allowed to travel the route segment are also allowed to travel on the bridge. Use code B when not all routine permit loads allowed to travel the route segment are allowed to travel on the bridge. Use code C when all routine permit loads allowed to travel the route segment are restricted from the bridge. Use code N when the agency does not issue routine permits or routine permit loads are not approved for the route segment that is carried by the bridge. *NDOT Commentary – Routine Permit Loads* *This item is assigned by NDOT.*

Examples – Routine Permit Loads
A State issues a routine permit for eleven vehicle configurations to travel segments of interstate routes throughout the State. A bridge is on an interstate route segment which all eleven configurations are allowed to cross the bridge. Report A. A bridge is on a route segment that is included in a routine permit. The routine permit allows vehicles that do not exceed 55 tons and the limits of the Federal Bridge Formula B to travel the route segment, but the permit also restricts single unit vehicles exceeding State legal load from crossing the bridge. Report B. A bridge is on State Route 10 and is posted for legal loads. Route 10 is included in a routine permit. The permit restricts the routine permit vehicles from crossing bridges that are posted for legal loads. Report C. A State issues a routine permit for eleven vehicle configurations to travel segments of interstate routes throughout the State. A bridge is on an interstate route segment which is excluded from the permit and the route segment is not included in any other routine permit. Report N.

Example Loads and Load Rating Data for Bridge Number 15558X

The bridge was designed for the HS-20 load using Allowable Stress Design. The bridge was rerated on February 14, 2016 using the load factor rating method to assess Specialized Hauling Vehicles. The calculated inventory rating factor was 0.30 and the operating rating factor was 0.50. The controlling legal load rating factor was 0.44 for the SU7 truck. The route segment is included in a routine permit however routine permit vehicles would overstress the bridge and are not permitted to cross the bridge

Table 14. Loads and Load Rating data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.LR.01	*Design Load*	HS20
B.LR.02	*Design Method*	ASD
B.LR.03	*Load Rating Date*	20160214
B.LR.04	*Load Rating Method*	LFR
B.LR.05	*Inventory Load Rating Factor*	0.30
B.LR.06	*Operating Load Rating Factor*	0.50
B.LR.07	*Controlling Legal Load Rating Factor*	0.44
B.LR.08	*Routine Permit Loads*	C

SUBSECTION 5.2: LOAD POSTING STATUS

The data items in this subsection provide information on the status of the bridge with regards to weight or other load restrictions, and are considered part of the Posting Status Data Set. These data items have a many-to-one relationship with a bridge.

The posting status of a bridge may change multiple times between data submittals and throughout its service life, such as after reevaluation of the load rating. Data items in this subsection are reported for each change in posting status. Reporting posting status changes that were accepted into the NBI in prior years is not required unless it is found that the accepted data were incomplete or incorrect.

The following data items are included in this subsection.

Item ID	Data Item
B.PS.01	Load Posting Status
B.PS.02	Posting Status Change Date

B.PS.01 Load Posting Status

Format	Frequency	Item ID
AN (2)	I	B.PS.01

Specification	Commentary
Report the load posting status of the bridge using one of the codes in Table 15.	When temporary or supported conditions exist ensure that data items related to physical characteristics of the bridge (e.g. geometry, clearances, condition, and load rating) represent those characteristics of the temporary or supported bridge. When both a weight and other load restriction exist at the bridge, use the code for the weight restriction (code PP, TP, or SP).

Specification Continued

Table 15. Load Posting Status Codes.

	No restriction			Posted or restricted				Closed
	New	Open	Needs Action	Weight	Other	Needs Reduction	Missing	
Permanent	N	PO	PA	PP	PR	PD	PM	C
Temporary		TO	TA	TP	TR	TD	TM	C
Supported		SO	SA	SP	SR	SD	SM	C

Terms:

Permanent (P) – Permanent bridge in place with no temporary supports.

Temporary (T) – Temporary bridge in place to carry traffic while the permanent bridge is closed and awaiting repair, rehabilitation, or replacement.

Supported (S) – Bridge with temporary shoring, supports, repairs, or supplemental members in place to keep the bridge open pending the completion of active or imminent repair, or replacement projects.

New (N) – Bridge is newly constructed and not yet open to traffic but is expected to be open within 12 months.

Open (O) – Bridge is open with no restrictions.

Needs Action (A) – Bridge that is open with load posting recommended, but no posting signs in place, or a posting sign that is not legally enforceable.

Weight (P) – Bridge is posted with a weight limit sign or signs.

Other (R) – A posting sign or other traffic control device(s) at the bridge that reduces loading by reducing speed (to reduce impact), limiting the number of lanes or vehicles, or restricting commercial vehicles in general.

Needs Reduction (D) – Bridge is posted, with posting reduction recommended but not implemented.

Missing (M) – Bridge has a legally enforceable load posting and was posted, but one or more required signs are missing or illegible.

Closed (C) – Bridge is closed to all traffic.

NDOT Commentary – Load Posting Status

Needs Action (A) includes any bridge that is not posted but is required to be posted according to the most current Load Rating Summary Sheet (LRSS).

Needs Reduction (D) includes bridges posted higher than the recommended weight limit.

Team Leaders must report these Critical Findings related to this Item:

- *Postings greater than the most current LRSS.*
- *Missing posting signs, for example if they are stolen or vandalized.*
- *Bridges shown to be closed, but found open to traffic, often due to the public removing or moving the barricades.*

The Program Manager will update Item B.PS.01 after the Owner has completed any action needed to address a Critical Finding and has completed the Critical Finding Form.

B.PS.02 Posting Status Change Date

Format	Frequency	Item ID
YYYYMMDD	I	B.PS.02

Specification	Commentary
Report the date the bridge entered the status reported in Item B.PS.01 (*Load Posting Status*).	For bridges entering posted status, it is preferable that the reported date represent the date on which signs were properly installed at the bridge. The date the load posting became legally enforceable can also be used for this item when the installation date is unknown. When neither the installation nor legal enforcement date are known, the date the posting was first documented to be in place can be used for this item.

Example Load Posting Status Data for Bridge Number 15558X



Figure 124. Approach view with load posting sign for Bridge Number 15558X.

The bridge was posted for load in March 2005 (exact date unknown). Because of the February 14, 2016 load rating and posting evaluation (Value 1), a posting reduction is recommended and the new posting was implemented on April 15, 2016 Value 2). During an inspection on July 23, 2016 one of the posting signs was noted as missing (Value 3). The sign was replaced on September 5, 2016 (Value 4).

Table 16. Load Posting Status data items in the Posting Status Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)
B.PS.01	*Load Posting Status*	PD	PP	PM	PP
B.PS.02	*Posting Status Change Date*	20160214	20160415	20160723	20160905

SUBSECTION 5.3: LOAD EVALUATION AND POSTING

The data items in this subsection provide information on the load carrying capacity of the bridge with respect to the legal load configurations established by AASHTO, FHWA, the State transportation department, Federal agency, or Tribal government. These data items are considered part of the Posting Evaluation Data Set and have a many-to-one relationship with a bridge when applicable.

Data items in this subsection are reported, as applicable, for each legal load configuration evaluated when the bridge has undergone a load rating evaluation and each legal load configuration included in a posting when present at the bridge. The data for these items may change after reevaluation of the load rating.

The following data items are included in this subsection.

Item ID	Data Item
B.EP.01	Legal Load Configuration
B.EP.02	Legal Load Rating Factor
B.EP.03	Posting Type
B.EP.04	Posting Value

B.EP.01 Legal Load Configuration

Format	Frequency	Item ID
AN (15)	I	B.EP.01

Specification

Report the configuration of the AASHTO, FHWA, State transportation department, Federal agency, or Tribal government defined legal load using one of the following codes.

Code	Description
3	AASHTO Type 3
3S2	AASHTO Type 3S2
3-3	AASHTO Type 3-3
SU4	AASHTO SU4 truck
SU5	AASHTO SU5 truck
SU6	AASHTO SU6 truck
SU7	AASHTO SU7 truck
NRL	AASHTO Notional Rating Load
EV2	FHWA Type EV2 emergency vehicle
EV3	FHWA Type EV3 emergency vehicle
S#	State-defined legal load
F#	Federal-defined legal load
T#	Tribal-defined legal load

Replace the # character in the S#, F#, and T# codes with as many as 14 characters that serve as a unique identifier of each legal load configuration. Use consistent codes for all bridges in a State, Federal, or Tribal jurisdiction.

Use codes for AASHTO and FHWA legal load configurations when the configuration is identical to those configurations (identical axles, axle spacings, and axle weights).

Do not report State, Federal, or Tribal defined configurations that represent loads which exceed legal loads (e.g. special or routine permit vehicles).

Commentary

Refer to the AASHTO Manual for Bridge Evaluation for details of AASHTO legal load rating vehicle configurations.

Some State transportation departments, Federal agencies, and Tribal governments have legal load rating vehicle configurations representing loads that exceed the 23 U.S.C. 127(a)(1) and (2) interstate weight limits or that have force effects more severe than AASHTO legal load rating vehicles. The use of codes S#, F#, and T# allows for reporting the correlated legal load configurations used for load rating evaluation, load rating factors, and postings (when present at a bridge). This is supported by the establishment of a unique code for reporting each State, Federal, or Tribal defined legal load configuration, and the consistent use of that code throughout the inventory.

Only configurations that are used to evaluate the capacity to carry legal loads and their posting requirements are reported.

For information on the load rating and load posting of emergency vehicles, refer to the November 3, 2016 FHWA memorandum at: https://www.fhwa.dot.gov/bridge/loadrating/161103.cfm

NDOT Commentary – Legal Load Configuration
This item is maintained by NDOT based on Load Rating review.
NDOT uses a 37 Ton 3S2 (N3S2) and a 43 Ton 3-3 (N3-3) which are slightly heavier than the similar AASHTO vehicles. Due to this difference the N3S2 and the N3-3 are reported as State-defined legal loads for the purpose of the FHWA submittal.

B.EP.02 Legal Load Rating Factor

Format	Frequency	Item ID
N (4,2)	I	B.EP.02

Specification	Commentary
Report the rating factor for the legal load configuration truncated to the hundredth. Report the rating factor for the legal load configuration without consideration of reduced force effects from postings or restrictions that affect traffic operation, e.g. that limit speed, number of lanes, number of trucks, or do not allow commercial vehicles. Do not report this item when a bridge posting includes the legal load configuration, but there is not a calculated legal load rating factor for the configuration. When temporary or supported conditions exist, as indicated in Item B.PS.01 (*Load Posting Status*), report the rating factor for the bridge including the temporary or supported conditions.	For LRFR method this would be the rating factor of "Legal Load Rating". For Allowable Stress and Load Factor rating methods this would be the operating rating factor When the legal load configuration does not have a load rating evaluation because it is enveloped by a design load type and corresponding calculated design load rating factor, a value is not reported for the legal load configuration. Enveloped as used here means that the legal load rating factor or the operating rating factor for the legal load configuration will be greater than or equal to 1.0 when the design load has a legal load rating factor or operating rating factor that exceeds a threshold value established by an engineering study. When the legal load configuration does not have a load rating evaluation because it is enveloped by a screening level legal load model, e.g. AASHTO Notional Rating Load, and corresponding calculated screening load rating factor, a value is not reported for the legal load configuration. A value is reported for the screening load. Enveloped as used here means that the legal load rating factor or the operating rating factor for the legal load configuration will be greater than or equal to 1.0 when the screening level legal load has a legal load rating factor or operating rating factor that exceeds a threshold value established by an engineering study. *NDOT Commentary – Legal Load Rating Factor* *This item is maintained by NDOT based on Load Rating review.*

Examples – Legal Load Rating Factor
A bridge has a calculated legal load rating factor of 0.926 for the AASHTO Type 3S2 load. Report 0.92. A bridge does not have a calculated legal load rating factor for the AASHTO SU4 truck because the AASHTO Notional Rating Load has a legal load rating factor of 1.21 which is greater than 1.0. Report 1.21 for the AASHTO Notional Rating Load. Do not report a value for the AASHTO SU4 truck. A bridge has a calculated legal load rating factor of 1.429 for State defined legal load S-NRLSHV which is the unique identifier code for the State's screening level legal load configuration for special hauling vehicles that are different than the AASHTO special hauling vehicles. Report 1.42 for the S-NRLSHV.

B.EP.03 Posting Type

Format	Frequency	Item ID
AN (17)	I	B.EP.03

Specification

Report the type of posting at the bridge restricting the vehicle reported in Item B.EP.01 (*Legal Load Configuration*) using one or more of the following codes.

Report multiple codes in the order shown separated by pipe (|) delimiters.

Code	Description
G	Gross Load
A	Single Axle Load
D	Tandem Axle Load
T	Truck Load
C	No commercial vehicles
S	Speed reduction
L	Number of lanes restricted
V	Number of vehicles restricted
X	Other

Do not report this item if no posting sign is used for the legal load configuration.

Commentary

This item is reported when a bridge is posted for the legal load configuration. Roadway postings are excluded.

NDOT Commentary – Posting Type

This item is determined by the Inspection Team Leader during routine inspection and entered into BrM.

Check to see that all signs required to show restricted weight limit, reduced speed limit, or impaired vertical clearance are in place per the requirements of the MUTCD.

If the structure is posted with a three-truck sign, code the Posting Type as T. Some single weight limit signs may still be in place on local roads. If the structure is posted with a single weight limit sign, code the Posting Type as G.

Examples

Report G for all legal load configurations, excluding emergency vehicles if the State uses a separate sign type for emergency vehicles.



Figure 125. Weight limit sign – gross load.

Report T for all legal load configurations, excluding emergency vehicles if the State uses a separate sign type for emergency vehicles.



Figure 126. Weight limit sign – truck silhouettes.

B.EP.04 Posting Value

Format	Frequency	Item ID
AN (15)	I	B.EP.04

Specification	Commentary
Report the weight limit value(s) shown on the load posting sign for the vehicle reported in Item B.EP.01 (*Legal Load Configuration*) rounded down to the nearest U.S. ton. Report multiple weight limit values in the order shown in Item B.EP.03 (*Posting Type*) separated by pipe (|) delimiters. Do not report this item if no posting sign is used for the legal load configuration. Do not report this item if Item B.EP.03 (*Posting Type*) only has codes C, S, L, or V reported.	This item is reported when a bridge is posted. Roadway postings are excluded. Multiple weight limit values are reported when a posting sign has more than one weight limit that restricts the legal load configuration, e.g. a single axle and tandem axle weight limit.

NDOT Commentary – Posting Value

This item is determined by the Inspection Team Leader during routine inspection and entered into BrM. The Inspection Team Leader must check the posted loads against the most current Load Rating Summary Sheet.

Check to see that all signs required to show restricted weight limit, reduced speed limit, or impaired vertical clearance are in place per the requirements of the MUTCD.

For any legal load vehicles with rating factors less than 1.00, Nebraska requires weight limits to be posted. The lowest tonnage for the five single unit vehicles (SUVs)is shown for the Type 3 vehicle, and the Type 3S2 and Type 3-3 are also shown. Load Rating for Emergency Vehicles is required for structures within one mile of the interstate. If weight restrictions for Emergency Vehicles is found necessary, a separate sign for their weight limits is required. (See Chapter 5, Load Rating for more information on load posting.)

Nebraska records observed posting sign values for the following vehicles.

Vehicle	***NE Item***
Type 3 (SUV)	*B.EP.04 A*
Type 3S2	*B.EP.04 B*
Type 3-3	*B.EP.04 C*

Capacity plates found on some Nebraska structures are not to be coded as weight limits for this item.

Examples – Posting Type	
Report 10 for all legal load configurations, excluding emergency vehicles if the State uses a separate sign type for emergency vehicles.  *Figure 127. Weight limit sign – gross load (10T).*	Report 8 for all AASHTO single unit configurations. Report 8 for FHWA EV2 and EV3 excluding if the State uses a separate sign type for emergency vehicles. Report 12 for AASHTO Type 3S2. Report 16 for AASHTO Type 3-3.  *Figure 128. Weight limit sign – truck silhouettes (8T, 12T, and 16T) for a State that load rates bridges for the AASTHO and FHWA emergency vehicle legal load configurations only.*

Example Load Evaluation and Posting Data for Bridge Number 15558X

The State load rates bridges for the AASHTO and FHWA emergency vehicle legal load configurations only. The February 14, 2016 load rating and posting evaluation calculated the following legal load rating factors and vehicle posting weights for the AASHTO legal load configurations. FHWA emergency vehicles were not evaluated.

	Type 3	SU4	SU5	SU6	SU7	Type 3S2	Type 3-3
Rating Factor	0.66	0.58	0.53	0.48	0.44	0.69	0.77
Vehicle Weight (ton)	25	27	31	34.45	38.75	36	40
Posting Weight (ton)	16.6	15.7	16.5	16.7	17.3	25.1	30.9
Use Posting Weight (ton)	15					25	30

The bridge was posted on April 15, 2016 with an MUTCD R12-5 weight limit sign:



Figure 129. View of MUTCD R12-5 weight limit sign for Bridge Number 15558X.

No separate sign is used by the State to post for specialized hauling vehicles and emergency vehicles beyond the single unit configuration on the R12-5 sign.

Table 17. Load Evaluation and Posting data items in the Load Evaluation Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)	Value (5)	Value (6)	Value (7)	Value (8)	Value (9)
B.EP.01	*Legal Load Configuration*	3	3S2	3-3	SU4	SU5	SU6	SU7	EV2	EV3
B.EP.02	*Legal Load*	0.66	0.69	0.77	0.58	0.53	0.48	0.44		

	Rating Factor									
B.EP.03	*Posting Type*	T	T	T	T	T	T	T	T	T
B.EP.04	*Posting Value*	15	25	30	15	15	15	15	15	15

NDOT Commentary

In the example above AASHTO vehicles are used. The weight of these vehicle matches the load rating vehicles used by Nebraska except in the case of the 3S2 and the 3-3. For these vehicles Nebraska uses a slightly greater weight of 37 and 43 tons respectively.

SECTION 6: INSPECTIONS

This section has data items that have been grouped by the following two subsections: Inspection Requirements and Inspection Events.

The data items in the Inspection Requirements subsection provide information about non-routine inspection types required, and special inspection features of the bridge. These items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. The data for items in this subsection typically remain static once a bridge has been inventoried.

The data items in the Inspection Events subsection provide information about each inspection performed for the bridge. These items are considered part of the Inspections Data Set and have a many-to-one relationship with a bridge. This subsection also has a data item for reporting inspection equipment used during an inspection. The data for these items change with each inspection.

The following data items are included in this section.

SUBSECTION 6.1: INSPECTION REQUIREMENTS

Item ID	Data Item
B.IR.01	NSTM Inspection Required
B.IR.02	Fatigue Details
B.IR.03	Underwater Inspection Required
B.IR.04	Complex Feature

SUBSECTION 6.2: INSPECTION EVENTS

Item ID	Data Item
B.IE.01	Inspection Type
B.IE.02	Inspection Begin Date
B.IE.03	Inspection Completion Date
B.IE.04	Nationally Certified Bridge Inspector
B.IE.05	Inspection Interval
B.IE.06	Inspection Due Date
B.IE.07	Risk-Based Inspection Interval Method
B.IE.08	Inspection Quality Control Date
B.IE.09	Inspection Quality Assurance Date
B.IE.10	Inspection Data Update Date
B.IE.11	Inspection Note
B.IE.12	Inspection Equipment

SUBSECTION 6.1: INSPECTION REQUIREMENTS

The data items in this subsection provide information about required non-routine inspection types, and special inspection features of the bridge, and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been inventoried.

The following data items are included in this subsection.

Item ID	Data Item
B.IR.01	NSTM Inspection Required
B.IR.02	Fatigue Details
B.IR.03	Underwater Inspection Required
B.IR.04	Complex Feature

B.IR.01 NSTM Inspection Required

Format	Frequency	Item ID
AN (1)	I	B.IR.01

Specification	Commentary
Report whether the bridge requires an NSTM inspection using one of the following codes. Code – Description N – NSTM inspection not required. Y – NSTM inspection required. I – NSTM inspection not required – Internal Redundancy S – NSTM inspection not required – System Redundancy Do not report this item for bridges that do not have steel members, as indicated in Items B.SP.04 (*Span Material*) and B.SB.03 (*Substructure Material*).	The intent of this item is to identify bridges that require NSTM inspection for any part of the bridge, to ensure they are inspected in accordance with the NBIS. It is the State's option to record a required NSTM inspection for any bridges meeting a State definition more rigorous than the FHWA definition of NSTM inspection. Use code N when an NSTM inspection is not required and codes I and S do not apply. Use code I when the bridge owner has demonstrated to FHWA, through the use of nationally recognized methods, that a member without load path redundancy is internally redundant, and it is determined that the bridge does not require an NSTM inspection. Use code S when the bridge owner has demonstrated to FHWA, through the use of nationally recognized methods, that a bridge without load path redundancy is system redundant, and it is determined that the bridge does not require an NSTM inspection.

B.IR.02 Fatigue Details

Format	Frequency	Item ID
AN (1)	I	B.IR.02

Specification	Commentary
Report whether the bridge has AASHTO fatigue category E or E' details using one of the following codes. Code — Description N — No E/E' details Y — E/E' details are present Do not report this item for bridges that do not have steel members.	This item provides data to identify bridges that have details most prone to fatigue. Refer to the BIRM or AASHTO LRFD Bridge Design Specifications for fatigue categories.

B.IR.03 Underwater Inspection Required

Format	Frequency	Item ID
AN (1)	I	B.IR.03

Specification	Commentary
Report whether an underwater inspection is required under normal flow conditions using one of the following codes. Code Description N Underwater inspection not required Y Underwater inspection required Do not report this item for bridges that do not pass over water as indicated in Item B.F.01 (*Feature Type*).	The intent of this item is to identify bridges that require an underwater inspection per the NBIS. Use code Y when during a typical routine inspection, any portion of a bridge substructure and the surrounding channel cannot be inspected to the mudline at low water by wading or probing, generally requiring diving or other appropriate technique. Use code N when during a typical routine inspection, all portions of a bridge substructure and the surrounding channel can be inspected to the mudline at low water by wading or probing. If this item was previously reported as Y because an underwater inspection is generally required, it should continue to be reported as Y even for instances of unusually low flow where all portions of the substructure can be inspected by wading and probing, and an underwater inspection is not required. This applies only if the low flow condition is truly unusual and is not likely to reoccur during the next inspection interval. The reported code for this item may change in the rare circumstance where long-term environmental conditions change for inspection access to underwater portions of the substructure.

B.IR.04 Complex Feature

Format	Frequency	Item ID
AN (1)	I	B.IR.04

Specification	Commentary
Report whether the bridge has a complex feature by using one of the following codes. Code Description N Bridge does not have complex feature Y Bridge has a complex feature	The intent of this item is to identify bridges with complex features as defined by the NBIS. Bridges with complex features are typically identified in agency policies and procedures. *NDOT Commentary – Complex Feature* *The NBIS defines Complex Features as: "Bridge component(s) or member(s) with advanced or unique structural members or operational characteristics, construction methods, and/or requiring specific inspection procedures. This includes mechanical and electrical elements of moveable spans and cable-related members of suspension and cable-stayed superstructures." In Nebraska the only bridges with complex features are:* *S002 50816* *S030 37847* *S068 00044*

Example Inspection Requirement Data for Bridge Number 15558X

The bridge carries North Hanley Road over Wabash Avenue, Burlington Northern/Santa Fe (BNSF) Railroad, and Berkeley Branch Coldwater Creek. The bridge has seven spans with an intermediate hinge in span four.

Main spans one through three are continuous, cast-in-place reinforced concrete voided slabs. Slabs are reinforced with uncoated bars (black bars) and protected with an active cathodic protection system. Slabs have a microsilica modified concrete overlay with a surface penetrating sealer.

Main span four is a cast-in-place reinforced concrete voided slab supported at the far end by cantilever portions of the steel beams extending from span five. Slabs are reinforced with uncoated bars (black bars) and protected with an active cathodic protection system. Slabs have a microsilica modified concrete overlay with a surface penetrating sealer.

Main spans five through seven are continuous, rolled steel beams (W35x135) that are painted. There are nine beam lines in each span. The beams support a cast-in-place, reinforced concrete deck that is reinforced with epoxy coated reinforcing steel. The beams are composite with the deck. The deck has a monolithic, sacrificial concrete wearing surface with a surface penetrating sealer. The deck has no stay-in-place forms.

The bridge does not have NSTMs, does not have category E/E' fatigue details, and is not complex.

The bridge crosses over a concrete lined creek with no substructure units in the creek. An underwater inspection is not required.

Table 18. Inspection Requirement data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.IR.01	*NSTM Inspection Required*	N
B.IR.02	*Fatigue Details*	N
B.IR.03	*Underwater Inspection Required*	N
B.IR.04	*Complex Feature*	N

SUBSECTION 6.2: INSPECTION EVENTS

The data items in this subsection provide information about each inspection performed for the bridge and are considered part of the Inspections Data Set. These data items have a many-to-one relationship with a bridge.

Data items in this subsection are reported for each inspection performed on the bridge. If more than one type of inspection is performed on a given inspection date, a separate inspection data set is reported for each inspection type performed. This uniquely identifies reported information for multiple inspection types that may occur during a calendar year or between submittals of data to FHWA. Reporting inspection events that were accepted into the NBI in prior years is not required unless it is found that the accepted data were incomplete or incorrect. To correct previously submitted inspection event data for a given inspection date and type, report a new complete inspection event data set representative of that event that includes the originally submitted data for Items B.IE.01 (*Inspection Type*) and B.IE.02 (*Inspection Begin Date*).

The following data items are included in this subsection.

Item ID	Data Item
B.IE.01	Inspection Type
B.IE.02	Inspection Begin Date
B.IE.03	Inspection Completion Date
B.IE.04	Nationally Certified Bridge Inspector
B.IE.05	Inspection Interval
B.IE.06	Inspection Due Date
B.IE.07	Risk-Based Inspection Interval Method
B.IE.08	Inspection Quality Control Date
B.IE.09	Inspection Quality Assurance Date
B.IE.10	Inspection Data Update Date
B.IE.11	Inspection Note
B.IE.12	Inspection Equipment

B.IE.01 Inspection Type

Format	Frequency	Item ID
AN (1)	EI	B.IE.01

Specification	Commentary
Report the inspection type or scour monitoring performed using one of the following codes. Code — Description 1 — Initial 2 — Routine 3 — Underwater 4 — NSTM 5 — Damage 6 — In-Depth 7 — Special 8 — Service 9 — Scour Monitoring	Use code 2 when all portions of a bridge substructure and the surrounding channel have been inspected to the mudline at low water visually, or by wading or probing during routine inspections. Use code 3 when all portions of a bridge substructure reported Y for Item B.IR.03 (*Underwater Inspection Required*) is inspected by wading and probing in an instance of unusually low flow. If this is performed during a Routine inspection, record both a routine and underwater inspection. Use code 9 when scour monitoring is performed as required by a Scour POA for a triggering storm event. This can include periodic remote electronic readings of streambed changes when required in the POA. If multiple site visits occur for a triggering storm event, record this item once for that storm event. Use code 8 when a Service Inspection is performed for a bridge with a risk-based routine inspection interval that exceeds 48 months.

Examples

The initial inspection of a widened bridge. Report 1.

An inspection scheduled every twelve months of an entire bridge that is in poor condition. Report 2.

An unscheduled inspection to assess the damage resulting from a vehicular impact. Report 5.

An inspection to perform a hands-on inspection of pins using non-destructive testing methods. Report 6.

An inspection to use non-destructive testing methods to assess the condition of the cables (complex feature) of a cable-stayed bridge. Report 6.

An inspection of only the girders (controlling members) of a load restricted bridge. Report 7.

B.IE.02 Inspection Begin Date

Format	Frequency	Item ID
YYYYMMDD	EI	B.IE.02

Specification	Commentary
Report the date for the inspection type performed. For multiple day inspections, record the first day that field inspection begins.	The intent of this item is to report the inspection dates for the inspection types in Item B.IE.01 (*Inspection Type*), since the previous data submittal to FHWA. If multiple site visits occur for scour monitoring inspections, for a triggering storm event, report the first site visit date for that storm event.

Examples

For Bridge 0004794A:

A Routine and NSTM inspection started on August 1, 2020.
- Report 20200801 for the Routine inspection.
- Report 20200801 for the NSTM inspection.

An Underwater inspection started on August 31, 2020. Report 20200831.

The bridge was struck by an over-height vehicle on November 22, 2020, requiring a Damage inspection on the same day. Report 20201122.

The damage in the example above was repaired, and a one-time Special inspection of the repair was performed on December 23, 2020. Report 20201223.

B.IE.03 Inspection Completion Date

Format	Frequency	Item ID
YYYYMMDD	EI	B.IE.03

Specification	Commentary
Report the completion date for the inspection type performed. For single day inspections, report the same date that field inspection begins.	The intent of this item is to report the field inspection completion dates for all inspections. If multiple site visits occur for scour monitoring inspections, for a triggering storm event, report the last site visit date for that storm event.

Examples

A Routine and NSTM inspection started on August 1, 2020. The Routine inspection was completed on August 2, 2020, and the NSTM inspection was completed on August 4, 2020.

- Report 20200802 for the Routine inspection.
- Report 20200804 for the NSTM inspection.

An Underwater inspection started on August 31, 2020, and completed on September 1, 2020. Report 20200901.

B.IE.04 Nationally Certified Bridge Inspector

Format	Frequency	Item ID
AN (15)	EI	B.IE.04

Specification	Commentary
Report the unique code identifying the Nationally Certified Bridge Inspector (team leader) responsible for the inspection type performed.	The intent of this item is to indicate the Nationally Certified Bridge Inspector (team leader) present at the inspection, for each inspection type required by the NBIS. The unique identifier code is assigned by the State DOT, Federal agency, or Tribal government. Agencies may choose not to report this item for inspection types defined in the NBIS that do not require a Nationally Certified Bridge Inspector (team leader), even if one is present during the inspection. *NDOT Commentary* *Team leader and Assistant Inspector IDs are the initials from first and last name followed by a 4-digit number. Assistant inspector IDs may be recorded with NE Items 400A-D.*
Examples	

A Routine (53DJS007 team leader) and NSTM (53DMO003 team leader) inspection started on August 1, 2020.

- Report 53DJS007 for the Routine inspection.
- Report 53DMO003 for the NSTM inspection.

An Underwater inspection (53WFC004 team leader) was performed on August 31, 2020. Report 53WFC004.

B.IE.05 Inspection Interval

Format	Frequency	Item ID
N (2,0)	EI	B.IE.05

Specification	Commentary
Report the planned interval in number of months between the current and next scheduled inspection for the type associated with Items B.IE.01 (*Inspection Type*) and B.IE.03 (*Inspection Completion Date*) items. Report 0 for damage inspections, scour monitoring inspections, or when a special inspection does not have a defined inspection interval.	The intent of this item is to report the planned interval at which the bridge is to be inspected per the NBIS and agency policies and procedures. This interval should be evaluated after each inspection and adjusted as necessary. *NDOT Commentary – Inspection Interval* *For additional guidance on inspection intervals see the NDOT Bridge Inspection webpage* *https://dot.nebraska.gov/business-center/bridge/inspection/*

Examples
A Routine and NSTM inspection started on August 1, 2020. The Routine inspection is on an approved 48-month extended interval, but after the inspection it was determined the interval be adjusted to 24 months due to worsening structural deterioration. The NSTM inspection is on a 24-month interval. • Report 24 for the Routine inspection. • Report 24 for the NSTM inspection. An Underwater inspection was performed on August 31, 2020. The Underwater inspection is on a 72-month extended interval. Report 72.

B.IE.06 Inspection Due Date

Format	Frequency	Item ID
YYYYMMDD	C	B.IE.06

Specification	Commentary

Do not report this item as it is calculated by the FHWA. The default calculation is the value reported in Item B.IE.03 (*Inspection Completion Date*) plus the value reported in Item B.IE.05 (*Inspection Interval*).	The intent of this item is to provide the inspection due date for the inspection types defined in the B.IE.01 (*Inspection Type*) where applicable. This item is only calculated for inspection types which have an inspection interval.

B.IE.07 Risk-Based Inspection Interval Method

Format	Frequency	Item ID
AN (1)	EI	B.IE.07

Specification	Commentary

Specification	Commentary
Report the risk-based inspection interval method using one of the following codes. Code Description N Not applicable 1 Method 1 2 Method 2	The intent of this item is to report the risk-based inspection interval method, described in the NBIS, for determining the inspection interval. Method 1, as described in the NBIS, is when inspection intervals are determined by a simplified assessment of risk to classify each bridge into one of three risk levels with an inspection interval not to exceed 12, 24, or 48 months. Method 2, as described in the NBIS, is when inspection intervals are determined by a more rigorous assessment of risk to classify each bridge, or a group of bridges, into one of four risk levels with an inspection interval not to exceed 12, 24, 48, or 72 months. Use code N when Item B.IE.01 (*Inspection Type*) is 1, 5, 6, 7, 8 or 9. *NDOT Commentary – Risk-Based Inspection Interval Method* *Nebraska has all bridges on inspection intervals by Method 1.* *For inspection interval criteria see guidance on the NDOT Bridge Inspection webpage. https://dot.nebraska.gov/business-center/bridge/inspection/*

B.IE.08 Inspection Quality Control Date

Format	Frequency	Item ID
YYYYMMDD	EI	B.IE.08

Report the date that the QC review was completed. Do not report when a QC review was not performed.	The intent of this item is to identify inspections that have had independent QC reviews to maintain inspection quality at or above a specified level. Agency QC procedures often vary, and every inspection might not receive an independent QC review. Bridge inspections might be selected for QC reviews based on representative bridge types or other agency defined methods. *NDOT Commentary – Inspection QC Date* *See Chapter 4.8 Quality Control for Guidance.*

Examples

A Routine and NSTM inspection started on August 1, 2020. The Routine inspection was completed on August 2, 2020. The NSTM inspection was completed on August 4, 2020. An agency QC review was performed on the Routine and NSTM inspections on September 15, 2020.

- Report 20200915 for the Routine inspection.
- Report 20200915 for the NSTM inspection.

The bridge above was then struck by an over-height vehicle on November 22, 2020 requiring Damage inspection. The damage was repaired, and a one-time Special inspection of the repair was performed on December 23, 2020. No agency QC review was performed on the Damage and Special inspections.

- Do not report this item for the Damage inspection.
- Do not report this item for the Special inspection.

B.IE.09 Inspection Quality Assurance Date

Format	Frequency	Item ID
YYYYMMDD	EI	B.IE.09

Specification	Commentary

Report the date that the QA review was completed. Do not report when a QA review was not performed.	The intent of this item is to identify inspections that have had independent QA reviews to measure or verify the overall quality of the inspection program. Agency QA procedures often vary in the definition of a review period and number of inspections reviewed. Bridge inspections might be randomly selected for agency QA reviews or selected based on representative bridge type, region, district, or other agency defined bridge populations.
Example	
A Routine and NSTM inspection started on August 1, 2020. The Routine inspection was completed on August 2, 2020. The NSTM inspection was completed on August 4, 2020. An agency QC review was performed on the Routine and NSTM inspections on September 15, 2020. The Routine inspection was randomly selected for an agency QA review according to agency policies and procedures, which was performed on January 4, 2021. Report 20210104 for the Routine inspection.	

B.IE.10 Inspection Data Update Date

Format	Frequency	Item ID
YYYYMMDD	EI	B.IE.10
Specification	Commentary	

Report the date that the NBI inspection data were entered or updated in the State transportation department, Federal agency, or Tribal government inventory.	The intent of this item is to verify that a complete NBI inspection data set is accepted and is entered or updated in the inventory within the timeframes required by the NBIS.

Example

A Routine and NSTM inspection started on August 1, 2020. The Routine inspection was completed on August 2, 2020, and the NSTM inspection was completed on August 4, 2020. An agency QC review was performed on the Routine and NSTM inspections on September 15, 2020. The agency database was updated on September 16, 2020, for the Routine and NSTM inspections.

- Report 20200916 for the Routine inspection.
- Report 20200916 for the NSTM inspection.

B.IE.11 Inspection Note

Format	Frequency	Item ID
AN (300)	EI	B.IE.11

Specification	Commentary

Report a brief description of the members or features inspected when limited portions of the bridge are inspected. Use consistent terms to describe similar inspections.	This item is intended to capture a brief description of the members inspected when limited portions of the bridge are inspected such as for Underwater, NSTM, In-depth, Special, and Damage inspections, or for scour monitoring. This item is also used to describe the purpose for Special inspections performed following extreme events such as floods, hurricanes, and earthquakes. *NDOT Commentary – Inspection Note* *For additional guidance on Inspection Notes see Chapter 3 Appendix E: Inspection Note Quality*

Examples

A NSTM inspection was performed, including hands-on inspection of all girders and floor beams in spans 2 and 3.

- Report "Hands-on inspection of all girders and floor beams in spans 2 and 3."

An Underwater inspection was performed on August 31,2020 with divers for piers 4-7 during a period of low water.

- Report "Dove piers 4-7 at low water, with deficiencies in the splash zone noted and photographed. Team leaders 034 and 116 both participated, but TL 116 was the team leader in charge."

The bridge was struck by an over-height vehicle on November 22, 2020 requiring a Damage inspection.

- Report "East portal and bracing given a hands-on inspection via bucket truck; mag-particle testing used in several locations where a crack was suspected."

The damage was repaired, and a one-time Special inspection of the repair was performed on December 25, 2020.

- Report "East portal and bracing given a hands-on inspection via bucket truck."

A scour critical bridge experienced flood water elevations up to the web of the exterior girder. Per the scour POA, scour monitoring was immediately completed by a team leader.

- Report "Bridge was visually monitored for damage and alignment issues during flooding."

B.IE.12 Inspection Equipment

Format	Frequency	Item ID
AN (120)	EI	B.IE.12

Specification	Commentary

Report all access and inspection equipment used to perform the inspection using one or more of the following codes. Report multiple codes separated by pipe (|) delimiters. Do not report this item if none of the access and inspection equipment below was used. Code Description Access AN No access equipment used A01 Ladder A02 Bucket lift vehicle A03 Under bridge inspection vehicle A04 Rigging A05 Waders A06 Boat A07 Snorkel A08 SCUBA A09 Surface supplied air A10 Remotely Operated Vehicle (ROV) A11 Video pole A12 Borescope A13 Unmanned aerial systems (UAS) A14 Service Traveler A15 Rope AX Other Codes continued next page.	This item is used to provide information about access and inspection equipment used in addition to standard equipment for each inspection. Refer to the BIRM for a listing of standard equipment. Remotely operated vehicles include any remotely controlled device used to provide video access to members of a bridge via ground, water surface, or underwater. Use code AN when none of the listed access equipment codes apply for the inspection performed. Use code A13 when unmanned aerial systems (UAS), also referred to as drones, are used to supplement inspections. Use code IN when none of the listed inspection equipment codes apply for the inspection performed. Use code I13 when underwater imaging technologies such as side scan sonar are used to supplement underwater inspections. NDE and testing inspection equipment listed represent only more common or general types. Use the most closely related code or use code IX for types not listed.
Specification Continued – Inspection Equipment	

Code	Description
	Inspection
IN	No inspection equipment used
I01	Ultrasonic
I02	Ground-penetrating radar
I03	Infrared thermography
I04	Radiographic testing
I05	Impact echo
I06	Electromagnetic methods
I07	Rebound & penetration methods
I08	Acoustic emissions testing
I09	Dye penetrant
I10	Magnetic particle
I11	Eddy current
I12	Boring or drilling
I13	Underwater imaging
I14	Depth finder/fathometer
I15	Stress wave Timer
I16	Chain Drag
IX	Other

Examples – Inspection Equipment

A NSTM inspection was performed, including hands-on inspection of all girders and floor beams in spans 2 and 3. An under-bridge inspection vehicle was used to gain access and magnetic particle testing was done to check fatigue details for cracking.

- Report A03|I10 for the NSTM inspection.

An underwater inspection was performed with divers using a boat and surface supplied air. Before the dive, side-scan sonar was performed to capture underwater images.

- Report A06|A09|I13 for the underwater inspection.

The bridge was struck by an over-height vehicle requiring a damage inspection. A hands-on inspection was performed using a bucket truck for access. Dye penetrant testing was used in several locations where cracks were suspected. The tip of identified cracks was determined using Eddy Current testing.

- Report A02|I09|I11 for the damage inspection.

A scour critical bridge experienced flood water elevations up to the web of the exterior girder. Per the scour POA, scour monitoring was immediately completed by a team leader. A remotely operated water vehicle was used that was equipped with underwater imaging technology.

- Report A10|I13 for the scour monitoring inspection.

A routine inspection was performed using a ladder and waders for access. Only hammers, tape measures, calipers, probing rods and other standard inspection equipment were used.

- Report A01|A05 for the routine inspection.

A routine inspection was performed without use of special access or inspection equipment.

- Do not report this item for the routine inspection.

Example Inspection Events Data for Bridge Number 15558X

A Routine inspection was performed on the bridge that began March 17, 2016, and was completed on March 18, 2016. Ken F. Faster was the team leader for the Routine inspection. His agency assigned him a unique code (29KFF007) identifying him as a Nationally Certified Bridge Inspector. The Routine inspection interval established for this bridge is 24 months, using agency policy and Method 1 in the NBIS. The inspection received a QC review by Ken's supervisor on March 25, 2016, and upon approval, the data were uploaded to the agency's production database. The bridge was selected for a QA review that was completed on March 17, 2017. All portions of the bridge were visually inspected during the Routine inspection using a ladder and video pole for access, and an infrared thermography camera to supplement visual inspection. Since all portions of the bridge were inspected, Item B.IE.11 (Inspection Note) does not need to be reported.

A Special inspection was performed on the bridge that began April 1, 2016, and was completed on April 1, 2016. A representative of the active cathodic protection system performed an operational inspection of the system. The representative is not a Nationally Certified Bridge Inspector. Therefore, Item B.IE.4 (Nationally Certified Bridge Inspector) is not reported. The Special inspection interval established for this bridge using agency policy is 12 months. The inspection received a QC review by the State Program Manager on April 8, 2016 and upon approval, the data were uploaded to the agency's production database. A QA review was not performed. Since only the active cathodic protection system was inspected for the RC voided slab portions of spans one to four, an inspection note is reported. The representative used a ladder for access and specialized inspection equipment. The system was operational.

Table 19. Inspection Events data items in the Inspections Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)
B.IE.01	*Inspection Type*	2	7
B.IE.02	*Inspection Begin Date*	20160317	20160401
B.IE.03	*Inspection Completion Date*	20160318	20160401
B.IE.04	*Nationally Certified Bridge Inspector*	29KFF007	
B.IE.05	*Inspection Interval*	24	12
B.IE.06	*Inspection Due Date* (Calculated by FHWA*)	20180318*	20170401*
B.IE.07	*Risk-Based Inspection Interval Method*	1	N
B.IE.08	*Inspection Quality Control Date*	20160325	20160408
B.IE.09	*Inspection Quality Assurance Date*	20170317	
B.IE.10	*Inspection Data Update Date*	20160325	20160408
B.IE.11	*Inspection Note*		Inspected active cathodic protection systems on spans 1 to 4. System Operational.
B.IE.12	*Inspection Equipment*	A1|A11|I3	A1|IX

SECTION 7: BRIDGE CONDITION

This section has data items that have been grouped by the following five subsections: Component Condition Ratings, Element Identification, Element Conditions, Appraisal, and Work Events.

The data items in the Component Condition Ratings subsection provide information about the condition of the bridge and waterway(s). These items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. The data for these items may change after each inspection.

The data items in the Element Identification subsection provide information about the elements present on the bridge, and the total quantity of each element as defined in the AASHTO MBEI. The data for these items typically remain static once a bridge has been inventoried. The data items in the Element Conditions subsection provide information about the condition of bridge elements as defined in the AASHTO MBEI. The data for these items may change after each inspection. Element data are only required to be reported to FHWA for bridges that carry NHS routes, while reporting is optional for bridges that carry non-NHS routes. These items are considered part of the Elements Data Set and have a many-to-one relationship with a bridge when applicable.

The data items in the Appraisal subsection provide information about potential bridge vulnerabilities. These items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been inventoried.

The data items in the Work Events subsection provide information about the year the bridge was built, and subsequent work performed on the bridge. Item B.W.01 (*Year Built*) is considered part of the Primary Data Set and has a one-to-one relationship with a bridge. Items B.W.02 (*Year Work Performed*) and B.W.03 (*Work Performed*) are considered part of the Work Data Set and have a many-to-one relationship with a bridge. The data for these items may change periodically as work is completed for a bridge.

The following data items are included in this section.

SUBSECTION 7.1: COMPONENT CONDITION RATINGS

Item ID	Data Item
B.C.01	Deck Condition Rating
B.C.02	Superstructure Condition Rating
B.C.03	Substructure Condition Rating
B.C.04	Culvert Condition Rating
B.C.05	Bridge Railing Condition Rating
B.C.06	Bridge Railing Transitions Condition Rating
B.C.07	Bridge Bearings Condition Rating
B.C.08	Bridge Joints Condition Rating
B.C.09	Channel Condition Rating
B.C.10	Channel Protection Condition Rating
B.C.11	Scour Condition Rating
B.C.12	Bridge Condition Classification
B.C.13	Lowest Condition Rating Code
B.C.14	NSTM Inspection Condition
B.C.15	Underwater Inspection Condition

SUBSECTION 7.2: ELEMENT IDENTIFICATION

Item ID	Data Item
B.E.01	Element Number
B.E.02	Element Parent Number
B.E.03	Element Total Quantity

SUBSECTION 7.3: ELEMENT CONDITIONS

Item ID	Data Item
B.CS.01	Element Quantity Condition State One
B.CS.02	Element Quantity Condition State Two
B.CS.03	Element Quantity Condition State Three
B.CS.04	Element Quantity Condition State Four

SUBSECTION 7.4: APPRAISAL

Item ID	Data Item
B.AP.01	Approach Roadway Alignment
B.AP.02	Overtopping Likelihood
B.AP.03	Scour Vulnerability
B.AP.04	Scour Plan of Action
B.AP.05	Seismic Vulnerability

SUBSECTION 7.5: WORK EVENTS

Item ID	Data Item
B.W.01	Year Built
B.W.02	Year Work Performed
B.W.03	Work Performed

SUBSECTION 7.1: COMPONENT CONDITION RATINGS

The data items in this subsection provide condition information for the bridge and waterway(s) and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge. The data for these items may change after each inspection.

The following data items are included in this subsection.

Item ID	Data Item
B.C.01	Deck Condition Rating
B.C.02	Superstructure Condition Rating
B.C.03	Substructure Condition Rating
B.C.04	Culvert Condition Rating
B.C.05	Bridge Railing Condition Rating
B.C.06	Bridge Railing Transitions Condition Rating
B.C.07	Bridge Bearings Condition Rating
B.C.08	Bridge Joints Condition Rating
B.C.09	Channel Condition Rating
B.C.10	Channel Protection Condition Rating
B.C.11	Scour Condition Rating
B.C.12	Bridge Condition Classification
B.C.13	Lowest Condition Rating Code
B.C.14	NSTM Inspection Condition
B.C.15	Underwater Inspection Condition

Items B.C.12 *(Bridge Condition Classification*) and B.C.13 (*Lowest Condition Rating Code*) are calculated by FHWA using data from other items in the SNBI. The data item pages explain how these items are calculated and recorded in the NBI, and are presented for reference only. These items are not intended to be reported by an inspector or designated agency personnel. Therefore, the wording of the specifications and commentary is different (passive voice) than for other items (active voice) in this subsection.

Condition ratings indicate the existing field conditions of the bridge components and waterway. A condition rating code must therefore consider the type, location, and severity of the defects; the extent to which they exist throughout the item being evaluated; and the degree to which the defects affect strength and/or performance of the bridge or component.

Determine the condition rating codes for the bridge components (*Items B.C.01 through B.C.07*) by correlating field observations with Table 20. The remaining condition ratings *(Items B.C.08 through B.C.11*) can be determined using the tables embedded in the item descriptions. These tables define the condition ratings in terms of defect severity, extent, and effect on strength and/or performance of the bridge or component. The term "defect", used in these tables indicates a problem with the bridge component that may be caused by deterioration, damage, or an inherent defect.

As used in the condition rating tables, an inherent defect is not indicative of damage or deterioration but is characteristic of the material or results from normal construction practices. A minor defect is one where damage or deterioration has initiated but is not yet considered significant. A moderate defect is one where damage or deterioration are significant, but the strength and performance of the component are not affected. A major defect affects the strength and/or performance of the component, as determined by a structural and/or hydraulic review. For joints, bearings, railings, and railing transitions, a major defect prevents the component from functioning as intended.

A defect is considered widespread when it is present in many separate areas of the component, while an isolated defect occurs in one or a few concentrated locations. The term "some" is used when the defect prevalence is more than isolated and less than widespread.

Load posting alone, for an existing bridge designed for less than current legal loads, is not considered a defect and does not affect the condition rating code.

Evaluate portions of bridge components that are supported or strengthened by temporary members also considering the condition of the temporary members.

Optional tables provided in Appendix C give additional guidance on various defects and deterioration mechanisms.

Use Table 20 to determine condition rating codes for the bridge component items in this section (*Items B.C.01 through B.C.07*). The entire code description must be satisfied for the code to apply.

Table 20. Codes and descriptions for component condition ratings.

Code	Condition	Description
N	NOT APPLICABLE	Component does not exist.
9	EXCELLENT	Isolated inherent defects.
8	VERY GOOD	Some inherent defects.
7	GOOD	Some minor defects.
6	SATISFACTORY	Widespread minor or isolated moderate defects.
5	FAIR	Some moderate defects; strength and performance of the component are not affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance of the component is affected.
3	SERIOUS	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	CRITICAL	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions in order to keep the bridge open.
1	IMMINENT FAILURE	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.
0	FAILED	Bridge is closed due to component condition, and is beyond corrective action. Replacement is required to restore service.

B.C.01 Deck Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.01

Specification	Commentary
Report the deck component condition rating using one of the codes in Table 20 *. Report N when Item B.SP.09 (*Deck Material and Type*) is 0.	This item represents the condition of the deck as determined from the inspection of all deck surfaces (top, underside, and edges). Visual assessments may be supplemented with non-destructive or destructive testing results.

Commentary Continued

Use destructive or non-destructive testing results or visual condition indicators of materials covering the surfaces being assessed when top, underside or both surfaces are not visible for assessment. Past inspection reports and repair records may also provide supplemental information to aid in the determination of the condition rating.

Do not consider the condition of non-monolithic wearing surfaces (i.e. overlays), stay-in-place deck forms, joint assemblies, expansion devices, bridge rails, or scuppers when determining the condition rating code for this item, except insofar as they indicate the condition of the deck itself.

Consider the condition of a joint header only when the deck serves as a joint header.

For bridges with integral decks/top flanges (e.g. rigid frames, decked girders or tee beams, voided slab beams, box girders, etc.), the deck condition may affect the superstructure condition rating; however, the superstructure condition does not affect the deck condition rating.

The deck and superstructure condition ratings are the same for solid slab bridges.

NDOT Commentary – Deck Condition Rating

* *NDOT has provided refined versions of Table 20 (below) that are to be used for Nebraska Bridge Inspections.*

All decks should be examined for slipperiness to determine if a hazard exists. Also, check drainage to see that the decks are well drained with no areas where water will pond and produce a hazard to traffic. Check drains and scuppers to see that they are open and clear. Check to see that drain outlets do not discharge water where it may be detrimental to other members of the structure, cause fill and bank erosion, or spill onto a traveled way below. Problems should be documented in inspection notes and reported as per section 4.5.9.4.

Situation	***Specification***
Bridges with a gravel overlay where half or more of the concrete deck is not visible	*Code based on observable areas of top and bottom of deck.*
Bridges that have received an asphalt overlay without waterproofing membrane between the last inspection and the current inspection (i.e. within the last 2 years)	*No higher than previous inspection rating*
Bridges with an asphalt overlay and membrane or concrete overlay that had concrete deck repairs done under a contract.	*Code based on observable areas of top and bottom of deck. If the pre-overlay condition code was 8 or 9 the condition may remain unchanged. Otherwise, the condition code may increase by up to 2 points from its value prior to the overlay not to exceed 7.*
Bridges with a concrete overlay where the original concrete deck is not visible	*Rate as if it is a single-course integral deck*

Previous policy was to code all bridge with an asphalt overlay no higher than 5. This coding unfairly penalized bridges with decks coded higher than 5 prior to an asphalt overlay and decks that received contracted repairs that are covered with a protective surface. Bridges with an existing asphalt overlay that have been coded as 5 per previous policy shall remain as 5 until condition of the deck warrants further reduction.

The condition of the wearing surface/protective system, curbs, sidewalks, parapets, fascias, and scuppers shall not be considered in the overall deck evaluation.

Element	
Curbs	*Examine concrete curbs for cracks, spalls and deterioration. Note any loss of height resulting from building-up surfacing on the deck.* *Timber wheel guards, including scupper blocks, should be checked for splits, checks and decay. Check to determine if they are bolted securely in place*
Sidewalks	*Examine concrete sidewalks for cracks, scaling potholing, spalling or other deterioration. Note condition at joints, especially at the abutments, for differential movement, which could open the joint or make an offset which would be a hazard to pedestrians.* *All sidewalks should be examined for proper drainage and to see that the surface is not excessively rough. Any item which constitutes a hazard for pedestrians should be noted and corrected.*

Table 20 A. NDOT Guidance for Concrete Deck Condition Codes

Concrete Deck		
Item B.C.01 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*
9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the deck.*
8	*VERY GOOD*	*No spalling, scaling or delamination.* *Minor hairline transverse cracking.*
7	*GOOD*	*Deck cracks with or without efflorescence (cracks are sealable).* *Light scaling (1/4" depth or less).* *Visible tire wear in the wheel lines.* *Area of the deck has been repaired or is deteriorating, 5% or less.* *No spalling*
6	*SATISFACTORY*	*2% or less of the deck spalled.* *Medium scaling (1/4" - 1/2" in depth).* *Area of the deck has been repaired or is deteriorating, less than 10%.* *Excessive number of open cracks (excessive being at 5' intervals or less over the entire deck) with or without efflorescence.*
5	*FAIR*	*Less than 5% of the deck spalled.* *Excessive cracking resulting in spalling.* *Heavy scaling (1/2" - 1" in depth).* *Area of the deck has been repaired or is deteriorating, 10% - 29% including any repaired areas and/or areas in need of repair.*
4	*POOR*	*Area of the deck has been repaired or is deteriorating, 30% - 60 % including any repaired areas and/or areas in need of repair.* *Area of the deck that is spalled, more than 5%.*
3	*SERIOUS*	*Area of the deck has been repaired or is deteriorating, more than 60 %.*
*2**	*CRITICAL*	*Advanced deterioration of primary structural elements. The need for repair is urgent. Bridge must be closed to traffic until the condition is reviewed by an engineer.*
*1**	*IMMINENT FAILURE*	*Major deterioration of deck. Bridge is closed to traffic, but redecking may put it back in service.*
*0**	*FAILED*	*Out of service - beyond correction action.*
** Requires a Critical Finding*		

Concrete decks must be checked for cracking, leaching, scaling, pot-holing, spalling and other evidence of deterioration. Each item must be evaluated to determine its effect on the structure and the work required to restore the loss of structural integrity and maintain a smooth riding surface. Evidence of deterioration in the reinforcing steel must be examined closely to determine its extent. Decks which are treated with deicing salts or are located in a salt air environment are especially apt to be affected.

For additional information on deck evaluation, see Chapter 4 Bridge Inspection in this Manual.

Asphaltic or other type wearing surface on a deck may hide defects in the deck until they are well advanced. The surfacing must be examined very carefully for evidence of deterioration in the deck. Such defects may show as cracking or breaking up of the surfacing or in excessive deflection. The underside of the deck slab should always be examined for indications of deterioration or distress. Note any evidence of water passing through cracks in the slab.

Table 20 B. NDOT Guidance for Steel Deck Condition Codes

Steel Deck		
Item B.C.01 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*
9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the deck.*
8	*VERY GOOD*	*No rusting of steel decking.* *Steel decking tightly secured to floor system.*
7	*GOOD*	*Minor surface rusting of steel deck.* *Steel deck a little loose at some connections.*
6	*SATISFACTORY*	*Considerable rusting of steel deck with indications of initial section loss.* *Steel deck is loose at many locations.*
5	*FAIR*	*Heavy rusting of steel decking with areas of section loss.* *Steel deck is loose at numerous locations*
4	*POOR*	*Heavy rusting of steel decking resulting in considerable section loss and some holes through deck. Necessitating the replacement of the entire deck.*
3	*SERIOUS*	*Steel decking should be replaced before reaching this condition.*
*2**	*CRITICAL*	*Advanced deterioration of primary structural elements.* *Fatigue cracks in steel may be present. Bridge must be closed to traffic until the condition is reviewed by an engineer.*
*1**	*IMMINENT FAILURE*	*Major deterioration of deck. Bridge is closed to traffic, but redecking action may put it back in service.*
*0**	*FAILED*	*Out of service - beyond correction action.*
** Requires a Critical Finding*		

Steel decks should be checked for corrosion and unsound welds. It is important to maintain an impervious surface over a steel plate deck to protect against corrosion of the steel, especially in a salt air environment and in areas where deicing salts are used.

Table 20 C. NDOT Guidance for Timber Deck Condition Codes

Timber Plank Deck		
Item B.C.01 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*
9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the deck.*
8	*VERY GOOD*	*No rotten or crushed wood.* *No splitting of timber planks.* *Timber planks tightly secured to floor system.*
7	*GOOD*	*Minor cracking or splitting of wood.* *Planks a little loose at some locations.*
6	*SATISFACTORY*	*A number of rotten or crushed planks in need of replacement.* *Many planks cracked or split.* *Planks are loose at many locations.*
5	*FAIR*	*Numerous rotten or crushed planks in need of replacement.* *Numerous planks cracked or split.* *Majority of planks are loose.*
4	*POOR*	*Majority of the planks are rotten, crushed and/or splitting, necessitating the replacement of the entire deck.*
3	*SERIOUS*	*More than 60% of the deck is deteriorating. This area would include any repaired areas and/or areas in need of repair.* *Timber decking should be replaced before reaching this condition.*
*2**	*CRITICAL*	*Advanced deterioration of primary structural elements.* *Bridge must be closed to traffic until the condition is reviewed by an engineer.*
*1**	*IMMINENT FAILURE*	*Major deterioration of deck. Bridge is closed to traffic, but redecking action may put it back in service.*
*0**	*FAILED*	*Out of service - beyond correction action.*
** Requires a Critical Finding*		

Timber decks are to be examined for decay at their contact surfaces where they bear on the stringers and between layers of planking or laminated pieces. Note any looseness which may have developed from inadequate nailing or where the spikes have worked loose. Observation under passing traffic will reveal looseness or excessive deflection in the members.

See the following pages for example photographs of Timber Decks with condition codes of 7, 6, 5, and 4.

Item B.C.01 Code	Condition	Description
7	*GOOD*	*Minor cracking or splitting of wood.* *Planks a little loose at some locations.*

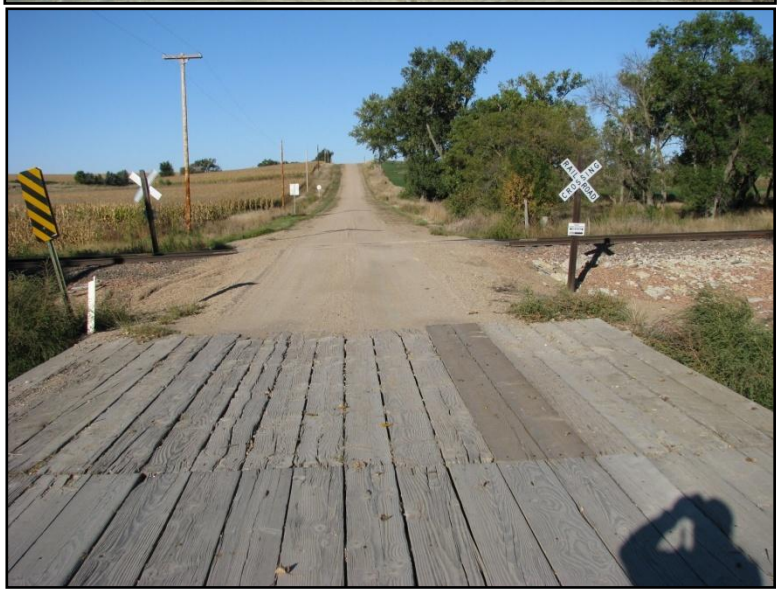


Item B.C.01 Code	Condition	Description
6	*SATISFACTORY*	*A number of rotten or crushed planks in need of replacement.* *Many planks cracked or split.* *Planks are loose at many locations.*



Item B.C.01 Code	*Condition*	*Description*
5	*FAIR*	*Numerous rotten or crushed planks in need of replacement.* *Numerous planks cracked or split.* *Majority of planks are loose.*





Item B.C.01 Code	*Condition*	*Description*
4	*POOR*	*Majority of the planks are rotten, crushed and/or splitting, necessitating the replacement of the entire deck.*



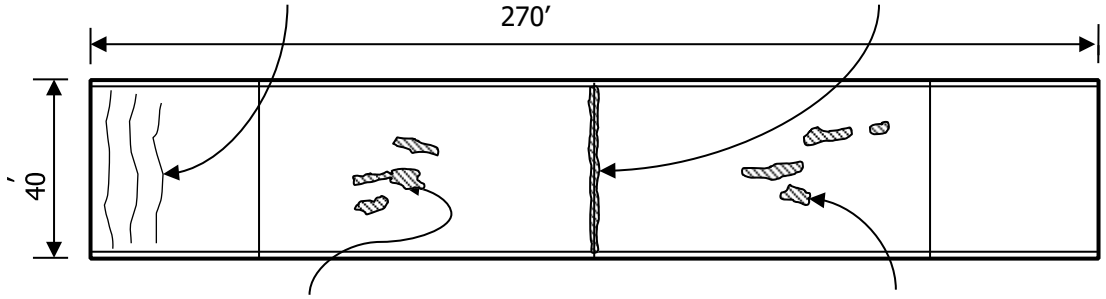


Example – Deck Condition Rating

Reinforced concrete (RC) bridge deck approximately 270′ long x 40′ wide with the following noted defects.

Location 1: Full width transverse cracks, 0.010″ wide, spaced at 3′ to 5′ full length of deck. ~40 ft^2 total area.

Location 2: Spalls >1″ deep along full length of expansion joint (Figure 132). for



Location 3: Spalls up to 24″x18″ and >1″ with exposed rebar (no section loss) patched areas that are unsound. ~100 ft$_2$ total area.

Location 4: Spalls up to 24″x12″ and >1″ deep with exposed rebar (no section loss) and patched areas that are unsound. ~130 ft^2 total area.

Figure 130. Deck plan view showing defects.



Figure 131. Deck spalling along joint. Location 2.



Figure 132. Typical deck spall with exposed rebar. Locations 3 and 4.

Example Continued – Deck Condition Rating

Summary of Findings:

Location	Defect(s)	Severity	Extent
1	Cracking	Inherent	Throughout (widespread)
2	Spalling	Moderate	~ 40 ft^2 (isolated)
3	Spalling with exposed rebar, patched area that is unsound	Moderate	~ 100 ft^2 (isolated)
4	Spalling with exposed rebar, patched area that is unsound	Moderate	~ 130 ft^2 (isolated)

Results: There are several areas of isolated moderate defects that can best be characterized together as "some moderate defects." The rest of the deck surface has inherent defects. There are no defects visible on the underside of the deck, and none of the observed defects appear to indicate more significant problems. The deck is best characterized as having "some moderate defects." Report 5.

B.C.02 Superstructure Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.02

Specification	Commentary
Report the superstructure component condition rating using one of the codes in Table 20 *. Report N when M, A, or W is not reported for Item B.SP.01 (*Span Configuration Designation*).	This item represents the condition of the superstructure as determined from the inspection of all superstructure members.

Commentary Continued

Consider primary load carrying members when determining the condition rating code for this item. Consider secondary members only if they adversely impact the primary members. Visual assessments may be supplemented with non-destructive or destructive testing results.

The superstructure includes:

- members above the bearings for bridges with non-integral superstructure and substructure;
- girders/beams for integral superstructures;
- members above the spring line for arch bridges;
- slabs of concrete rigid frame bridges; and
- legs, knees and girders for concrete and steel rigid K-Frame or Delta-Frame bridges.

Consider the condition of headwalls and spandrel walls that are integral with the superstructure. Consider the condition of wingwalls that are integral with the superstructure (continuation of the superstructure), to the first expansion joint.

Do not consider the condition of bearings when determining the condition rating code for this item except to the extent that the bearings are causing distress in the superstructure.

Do not consider the condition of protective coating systems when determining the condition rating code for this item except to the extent that problems with the protective coating system are indicative of problems with the underlying superstructure material. A well-formed patina on weathering steel is considered a protective coating and is not considered a defect.

Do not consider the presence of drift, debris, and soil accumulation when determining the condition rating code for this item, except to the extent that these items are causing distress in the superstructure.

Superstructure types without substructures may be affected by scour. When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, scour is considered when reporting the code for this item. In this case, observed conditions also indicate a need to reevaluate Item B.AP.03 (*Scour Vulnerability*). Observed scour that is less than the tolerable limit determined in the scour appraisal does not affect this item.

Commentary Continued – Superstructure Condition Rating

For structures with integral decks/top flanges (e.g. rigid frames, decked girders or tee beams, voided slab beams, box girders, etc.), the deck condition may affect the superstructure condition rating; however, the superstructure condition does not affect the deck condition rating.

The deck and superstructure condition ratings are the same for solid slab bridges.

NDOT Commentary – Superstructure Condition Rating

** NDOT has provided refined versions of Table 20 (below) that are to be used for Nebraska Bridge Inspections.*

Superstructure Condition Rating

Where the deck is an integral part of the superstructure, as for concrete slab bridges (both cast-in-place and deck panel-type bridges), the superstructure rating and the deck rating should be the same.

Where the deck is not an integral part of the superstructure but contributes to the structural capacity of the superstructure, as for steel or concrete girder bridges with composite decks, the superstructure condition rating may be different than the deck rating. The superstructure condition rating, however, may be affected by the deck condition.

Steel Stringers and Girders

Examine steel stringers and girders for cracking and corrosion at bearings where they support the deck and at connections.

Inspect weld areas for cracks, especially at re-entrant corners and copes and where vibration and movement could produce fatigue. A likely place would be flange to web welds close to separator or cross frame connections.

Each hanger assembly must be accessed by any means necessary for a close visual inspection to detect any misalignment of link bars, pins or other parts, looseness of pin nuts, etc.

Any pins with abnormal indications should be further investigated internally by ultrasound methods. Written comments shall document all defects.

Trusses

Examination of any truss will normally begin with sighting along the truss chord members to determine any misalignment either vertical or horizontal. Any deviation from the normal alignment must, of course, be fully investigated to determine its cause.

Examine truss and bracing members for traffic damage. Portal bracing usually is the most restrictive overhead clearance and consequently is most susceptible to damage from over height loads.

Check the conditions of the pins at the connections and see that the nuts and keys are in place. Also, see that spacers on the pins are holding eye-bars and looped rods in their proper position.

Check rivets and bolts to see that none are loose, worn or sheared.

Concrete Superstructure

Cast-in-place concrete beams are to be checked for cracking and any disintegration of the concrete, especially over bearings. Girders over a traveled way must be checked for any damage resulting from being struck by over height loads passing under the bridge.

Prestressed concrete girders are to be examined for alignment, cracking and deterioration of the concrete. Check for cracking or spalling in the area around the bearings, and at cast-in-place diaphragms where creep and humping of the girders may have had an effect.

When cracking is found, locations of the cracks and their size should be carefully noted for future reference and comparison.

Concrete slabs may be inspected similar to concrete decks.

Timber Stringers

Check bridging for soundness and tightness.

Examine timber stringers for splitting, cracking, and excessive deflection. Look for crushing and evidence of decay where they bear on the bent caps or abutment seats and at their top edge where the floor is supported.

See Chapter 5 Load Rating material specific considerations for timber for the definition of common defects.

Table 20 D. NDOT Guidance for Concrete Slab Condition Codes

Concrete Slab Bridges		
Item B.C.02 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*
9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the structure.*
8	*VERY GOOD*	*No scaling, spalling, or delamination, top and/or bottom. Only minor hairline cracking.*
7	*GOOD*	*Open cracks without disintegration.* *Light scaling.* *Visible wear in wheel lines.* *Ponding water.* *Rust stains on surface.* *Cracks with or without efflorescence, top and/or bottom.*
6	*SATISFACTORY*	*Area of deck spalled, 2% or less.* *Medium scaling (1/4" - 1/2" in depth).* *Raveling of joints.* *Area of top surface that has been repaired or shows signs of deterioration, less than 10%.* *Cracks with or without efflorescence, top and/or bottom.*
5	*FAIR*	*Area of top surface that has been repaired or shows signs of deterioration,10% - 29%.* *Cracks with or without efflorescence, top and/or bottom.*
4	*POOR*	*Area of top surface that has been repaired or shows signs of deterioration, 30% - 60%.* *Cracks with or without efflorescence, top and/or bottom.*
3	*SERIOUS*	*Area of top surface that has been repaired or shows signs of deterioration, more than 60%. Cracks with or without efflorescence, top and/or bottom.*
*2**	*CRITICAL*	*Need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete.*
*1**	*IMMINENT FAILURE*	*Facility is closed. Study should determine the feasibility for repair.*
*0**	*FAILED*	*Facility is closed and is beyond repair.*
** Requires a Critical Finding*		

Table 20 E. NDOT Guidance for Concrete Girder Condition Codes

Concrete Girder Bridges		
Item B.C.02 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*
9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the structure.*
8	*VERY GOOD*	*Minor collision damage involving chipped or spalled concrete.*
7	*GOOD*	*Hairline cracks in concrete girders without disintegration.*
6	*SATISFACTORY*	*Minor cracking.* *Deterioration of structural elements.*
5	*FAIR*	*Substantial but not critical collision damage to concrete girders exposing reinforcing or prestressing* *Deterioration of deck girder ends, slab ends, precast ends, etc.*
4	*POOR*	*Critical collision damage sustained to concrete girders with severed reinforcing or prestressing. Precautionary measures such as traffic restrictions or temporary shoring may be needed.* *Substantial disintegration of deck girder, slab, precast units, etc.*
3	*SERIOUS*	*Disintegration of or damage condition of a structural member which requires traffic restriction or shoring.*
*2**	*CRITICAL*	*The need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete.*
*1**	*IMMINENT FAILURE*	*Facility is closed. Study should determine the feasibility for repair.*
*0**	*FAILED*	*Facility is closed and is beyond repair.*
** Requires a Critical Finding*		

Table 20 F. NDOT Guidance for Steel Girder Condition Codes

Steel		
Item B.C.02 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*
9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the structure.*
8	*VERY GOOD*	*Bent steel or slight misalignment, not requiring repairs.*
7	*GOOD*	*Surface rust in localized areas without any section loss.*
6	*SATISFACTORY*	*Initial section loss (heavy rust) in localized areas of structural steel members in non-critical stress areas.*
5	*FAIR*	*Substantial but not critical collision damage to structural support elements, steel girders, trusses, etc.* *Initial section loss (heavy rust) in localized areas of structural steel members in critical stress areas.*
4	*POOR*	*Critical collision damage sustained to structural support elements. Precautionary measures such as traffic restrictions or temporary shoring may be needed.* *Significant section loss (heavy rust) of structural steel girder in critical stress areas. (More than 30% section loss).*
3	*SERIOUS*	*Disintegration of or damage condition of a structural member which requires traffic restriction or shoring. Severe section loss (heavy rust) or structural steel member in critical stress areas requiring immediate repairs. (More than 50% loss of section).*
*2**	*CRITICAL*	*The need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete.*
*1**	*IMMINENT FAILURE*	*Facility is closed. Study should determine the feasibility for repair.*
*0**	*FAILED*	*Facility is closed and is beyond repair.*
** Requires a Critical Finding*		

Table 20 G. NDOT Guidance for Timber Stringer Condition Codes

Timber		
Item B.C.02 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*
9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the structure.*
8	*VERY GOOD*	*Insignificant cracking or splitting of timber beams or stringers at insignificant locations.*
7	*GOOD*	*Minor decay, cracking, splitting, or crushing of timber beams or stringers.*
6	*SATISFACTORY*	*Some decay, cracking, splitting, or crushing of timber beams or stringers.*
5	*FAIR*	*Substantial decay, cracking, splitting or crushing of timber beams or stringers.*
4	*POOR*	*Extensive decay, cracking, splitting, or crushing of timber beams or stringers.* *Damage by insects such as termites or carpenter ants.*
3	*SERIOUS*	*Severe decay, cracking, splitting, or crushing of timber beams or stringers.* *Closing of bridge should be considered.*
*2**	*CRITICAL*	*The need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete.*
*1**	*IMMINENT FAILURE*	*Facility is closed. Study should determine the feasibility for repair.*
*0**	*FAILED*	*Facility is closed and is beyond repair.*
** Requires a Critical Finding*		

Examples – Superstructure Condition Rating

Two-span steel truss. Each span is 200′ long x 34′ wide. The following defects are noted.

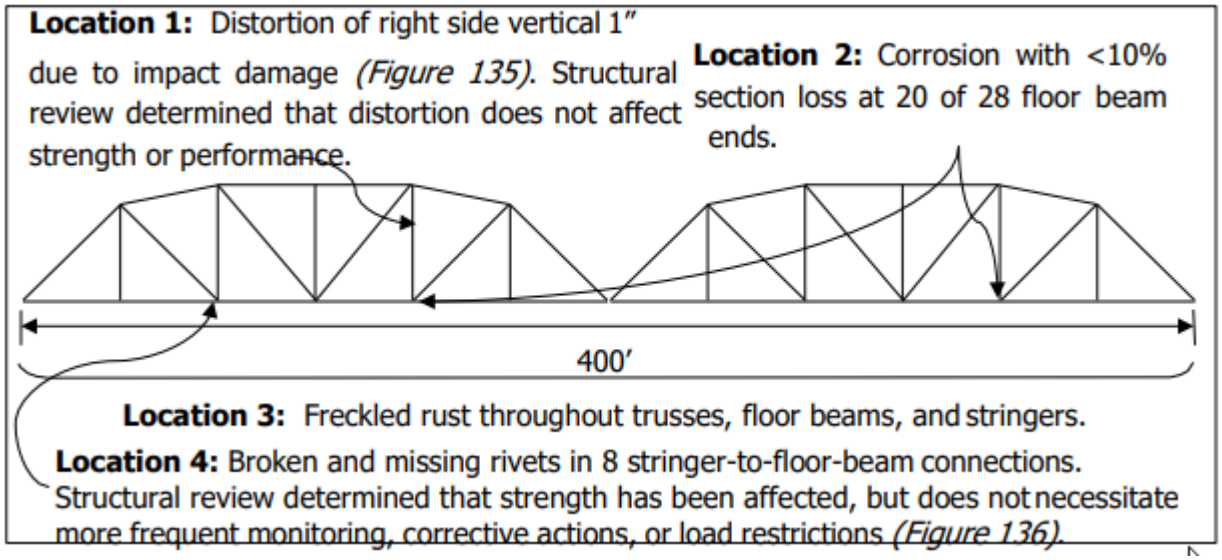


Figure 133. Elevation view of a truss bridge showing superstructure defect locations.



Figure 134. Distortion in truss vertical. Location 1. (Source: Colorado DOT)

Example Continued – Superstructure Condition Rating



Figure 135. Missing rivets in stringer-to-floor-beam connection. Location 4. (Source: Colorado DOT)

Summary of Findings:

Location	Defect(s)	Severity	Extent
1	Distortion	Moderate	One location (isolated)
2	Corrosion with section loss	Moderate	More than a few locations (some)
3	Corrosion	Minor	Throughout (widespread)
4	Connection	Major	A few locations (isolated)

Results: Isolated major defects affecting strength, and some moderate defects that do not affect strength or performance. Therefore, the superstructure is best characterized as having isolated major defects that do not necessitate more frequent monitoring, corrective actions, or load restrictions. Report 4.

B.C.03 Substructure Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.03

Specification	Commentary
Report the substructure component condition rating using one of the codes in Table 20 *. Report N when only C and/or V is reported for Item B.SP.01 (*Span Configuration Designation*).	This item addresses the condition of piers, abutments, piles, footings, and other substructure members.

Commentary Continued

For bridges that have substructures not visible for inspection, use appropriate visual condition indicators from the superstructure or surrounding foundation materials to determine the applicable code. Visual assessments may be supplemented with non-destructive or destructive testing results.

Consider the condition of integral abutment wingwalls to the first construction or expansion joint when determining the condition rating code for this item.

Do not consider the condition of protective coatings, fenders and other substructure protection systems when determining the condition rating code for this item, except to the extent that these items indicate distress of the substructure, or adversely affect its condition.

Do not consider the presence of drift, debris, and soil accumulation when determining the condition rating code for this item, except to the extent that these items are causing distress in the substructure.

The substructure includes:

- backwalls and the members below the bearings for bridges with non-integral superstructure and substructure;
- members below the girders/beams for integral superstructures;
- thrust blocks and other members below the spring line for arch bridges;
- legs of concrete rigid frame bridges;
- abutments and footings/foundations below the leg bearings for concrete and steel rigid K-Frame or Delta-Frame bridges; and
- foundation piles exposed by erosion or scour.

When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, scour is considered in the coding of this item. In this case, observed conditions also indicate a need to reevaluate Item B.AP.03 (*Scour Vulnerability).* Observed scour that is less than the tolerable limit determined in the scour appraisal does not affect this item.

NDOT Commentary – Substructure Condition Rating

* *NDOT has provided refined versions of Table 20 (below) that are to be used for Nebraska Bridge Inspections.*

Piers and Abutments

Investigate the footings for evidence of significant scour or undercutting. Conducting the inspection at the season of lowest water elevation will facilitate this work.

Particular attention should be given to foundations on spread footings where scour or erosion can be much more critical than a foundation on piles. However, be aware that scour and undercutting of a pier or abutment on piles can also be quite serious.

Any exposed piling must be inspected.

If erosion has occurred on one face of a pier only, leaving solid material on the opposite face, or if earth or rock fills have been piled against substructure units, such unbalanced loading must be recorded and reported.

Examine all exposed concrete for the existence and severity of cracks and any deterioration of the concrete itself. The horizontal surfaces of the tops of the piers and abutments are particularly vulnerable.

Bents

Bents are substructures where the bearing piles are the vertical columns supporting the superstructure. This category includes timber, concrete and steel pile bents, plus frameworks founded on piles or spread footings.

There are situations where the loss of even one pile may overstress the abutment or bent cap, thus adversely affecting the structural stability of the entire bridge. Examples of this situation include where two deteriorated pile next to each other in a row, or a deteriorated end pile supporting an overhanging pile cap. Inspectors should include a comment in the notes and not hesitate to use a low rating for the substructure.

Inspect all submerged piles for deterioration and loss of section.

All damage and section loss must be recorded.

If the estimated individual pile area loss exceeds 10%, it must be reported on the BrM comment field.

Pile group collective section area loss (for a group of piles in a single substructure) shall be calculated as follows:

$$\text{Pile group collective section area loss} = \frac{Sum\ of\ individual\ pile\ section\ area\ loss}{Sum\ of\ individual\ pile\ section\ area,\ \ original}$$

Timber piles must be checked for the following:

- *General decay and section loss, especially in areas where they are alternately wet and dry. The most likely place for this condition to be found is at the ground line. Hammer sounding will many times reveal an unsound area.*
- *Internal decay and section loss - Although piles may appear sound on the outer surface, some may contain advanced interior decay. Creosoted piles, for example, may decay in the core area where the preservative treatment has not penetrated, even though the outside surface shows no evidence of deterioration. Hammer sounding will many times reveal an*

unsound pile. Boring will allow measurement of the decay in the center. Holes made for testing which might promote decay shall be filled with treated wooden plugs.

- *Decay at locations where timber pile contact another element such as the top of piles and where the bracing members are fastened are very susceptible to decay.*
- *Decay at locations where timber piles are in contact with earth or other accumulated material.*
- *Decay at locations where timber pile are in contact with earth or other extraneous material that may have accumulated against the pile.*

Table 20 H. NDOT Guidance for Concrete Substructure Condition Codes

Concrete		
Item B.C.03 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*

9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the structure.* *Insignificant damage caused by drift or collision (e.g. scrape marks on concrete).*
8	*VERY GOOD*	*Near new condition with only hairline shrinkage cracking.*
7	*GOOD*	*Small (less than 1/16") cracks in abutment backwalls (not shrinkage cracks).* *Spalls around bearing devices not affecting the devices.* *Minor collision damage to piling or bracing.* *Repairs not required.* *Minor spalling of concrete pile.*
6	*SATISFACTORY*	*Cracks (greater than 1/16") in abutment backwalls, leaching showing rust stains.* *Collision damage.* *Bracing severely damaged or torn off.* *Pier columns show map cracking that should be sealed. (Less than 10% spalling or cracking of concrete pile).* *No reinforcing visible.* *Moderate scouring, no action needed.*
5	*FAIR*	*Leaching through abutment backwall.* *Significant spalling of concrete.* *Abutments leaning in because of settlement or earth load.* *Spalls around bearing devices, concrete deteriorating, bearing affected.* *Reinforcing may be visible.* *Pile collective area loss on any one substructure unit, 10% to 19%.* *Significant scouring and undermining of spread footings, between 10%-20%.*
4	*POOR*	*Major spalling or concrete deteriorating around bearing devices affecting bearing.* *Need for repairs is urgent.* *Pile collective area loss on any one substructure unit, 20% to 29%.* *Extensive scouring and undermining of spread footings, between 20% and 30% affecting stability.* *Rehabilitation urgently needed.*

Table continued on next page.

Concrete		
Item B.C.03 Code	***Condition***	***Description***
3	*SERIOUS*	*Integral wings separated from abutment.* *Dirt spilling through back wall.* *Girder seats breaking up.*

		Shoring recommended. *Pile collective area loss on any one substructure unit, 30% to 49%.* *Two adjacent pile (next to each other in one bent or one abutment) have advanced section loss.* *End pile under pile cap has section loss.* *Spread footings undermined between 30% and 50%.* *Rehabilitation is urgent.* *Traffic restrictions should be considered.*
*2**	*CRITICAL*	*The need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete.* *On the verge of collapse, backwall disintegrating, girder seats breaking up.* *Shoring required.* *Pile collective area loss on any one substructure unit, 50% or more.* *Spread footings undermined more than 50%.* *Immediate rehabilitation required.*
*1**	*IMMINENT FAILURE*	*Facility is closed. Study should determine the feasibility for repair.*
*0**	*FAILED*	*Facility is closed and is beyond repair.*
** Requires a Critical Finding*		

Table 20 I. NDOT Guidance for Steel Substructure Condition Codes

Steel		
Item B.C.03 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*

9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the structure. Insignificant damage caused by drift or collision (e.g. scrape marks on steel).*
8	*VERY GOOD*	*Near new condition.*
7	*GOOD*	*Minor surface rusting of steel pile or backwall.*
6	*SATISFACTORY*	*Heavy rusting of backwall with initial section loss.* *Pile collective section area loss on any one substructure unit, less than 10%.*
5	*FAIR*	*Heavy rusting of backwall with localized significant section loss.* *Pile collective section area loss on any one substructure unit, 10% to 19%.*
4	*POOR*	*Heavy rusting of backwall with widespread significant section loss.* *Need for repairs is urgent.* *Pile collective section area loss on any one substructure unit, 20% to 29%.* *Extensive scouring and undermining of backwall affecting stability of fill.* *Rehabilitation urgently needed.*
3	*SERIOUS*	*Integral wings separated from abutment.* *Dirt spilling through holes in backwall.* *Shoring recommended.* *Pile collective section area loss on any one substructure unit, 30% to 49%.* *Two adjacent piles (next to each other in one bent or abutment) have greater than 30% section loss.* *End pile under pile cap has greater than 30% section loss.* *Rehabilitation is urgent.* *Traffic restrictions should be considered.*
*2**	*CRITICAL*	*The need for repair or rehabilitation is urgent.* *Facility must be closed until the indicated repair is complete.* *On the verge of collapse, backwall is disintegrating.* *Shoring required.* *Pile collective section area loss on any one substructure unit, 50% or more.* *Backwall completely undermined, affecting approach fill.* *Immediate rehabilitation required.*
*1**	*IMMINENT FAILURE*	*Facility is closed. Study should determine the feasibility for repair.*
*0**	*FAILED*	*Facility is closed and is beyond repair.*
** Requires a Critical Finding*		

Table 20 J. NDOT Guidance for Timber Substructure Condition Codes

Timber		
Item B.C.03 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*For example, a culvert.*

9	*EXCELLENT*	*No noticeable or noteworthy deficiencies that affect the condition of the structure.* *Insignificant damage caused by drift or collision (e.g. scrape marks on timber).*
8	*VERY GOOD*	*Near new condition.*
7	*GOOD*	*Insignificant decay, cracking, spitting or crushing of timber.*
6	*SATISFACTORY*	*Widespread minor decay, cracking, splitting or crushing of timber.* *A few timber members may need replacement in abutment back walls and wings.* *Pile collective section area loss on any one substructure unit, less than 10%.*
5	*FAIR*	*Substantial decay, cracking, spitting or crushing of timber members requiring some replacement.* *Pile collective section area loss on any one substructure unit, 10% to 19%.*
4	*POOR*	*Significant decay, cracking, splitting or crushing of timber members requiring widespread replacement.* *Need for repairs is urgent.* *Pile collective section area loss on any one substructure unit, 20% to 29%.* *Extensive scouring or undermining of backwall affecting stability of fill.* *Rehabilitation urgently needed.*
3	*SERIOUS*	*Wings separated from abutment.* *Dirt spilling through deteriorated backwall timbers.* *Shoring recommended.* *Pile collective section area loss on any one substructure unit, 30% to 49%.* *Two adjacent piles (next to each other in one bent or abutment) have greater than 30% section loss.* *End pile under pile cap has greater than 30% section loss.* *Rehabilitation is urgent.* *Traffic restrictions should be considered.*
*2**	*CRITICAL*	*The need for repair or rehabilitation is urgent.* *Facility must be closed until the indicated repair is complete.* *On the verge of collapse, backwall is disintegrating.* *Shoring required.* *Pile collective section area loss on any one substructure unit, 50% or more.* *Backwall completely undermined, affecting approach fill.* *Immediate rehabilitation required.*

Table continued on next page.

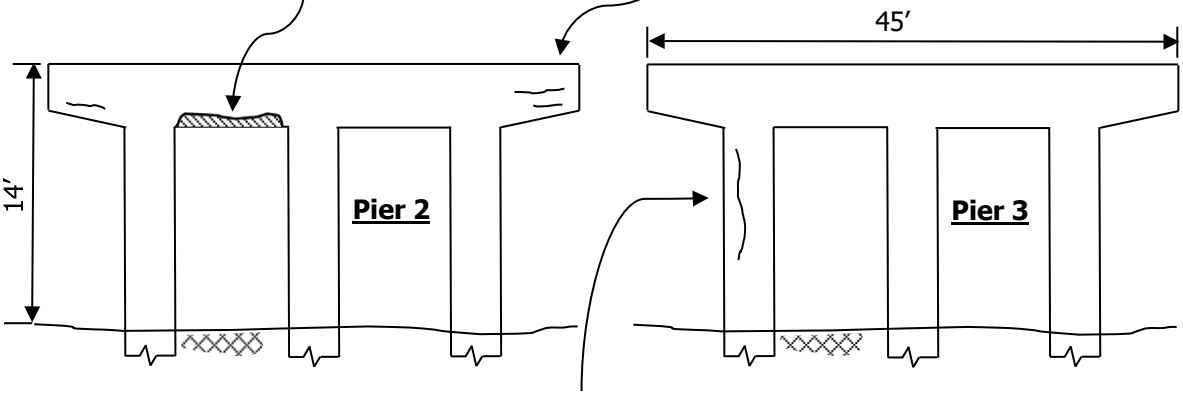
Timber		
Item B.C.03 Code	***Condition***	***Description***
*1**	*IMMINENT FAILURE*	*Facility is closed. Study should determine the feasibility for repair.*
*0**	*FAILED*	*Facility is closed and is beyond repair.*

** Requires a Critical Finding*

Example – Substructure Condition Rating
Four span prestressed concrete bridge with reinforced concrete abutments and piers. No defects at the abutments or at Pier 1. The following defects are noted at the other piers:

Location 1: Spall 12′ long x 2″ deep with exposed rebar and rust staining (Figure 138).

Location 2: Cracks 3′ long x 0.04″ wide with rust staining, both cantilevers.



Location 3: Previously noted crack 11′ long x 3/16″ wide (Figure 139). Structural review determined that crack does not affect strength or performance.

Figure 136. Elevation view of two concrete column piers showing substructure defect locations.



Figure 138. Spall in Pier 2 cap beam. Location 1



Figure 137. Crack in Pier 3 column. Location 3

Summary of Findings:

Location	Defect(s)	Severity	Extent
1	Spall with exposed rebar; rust staining	Moderate	12′ of one cap beam (isolated)
2	Cracking with rust staining	Moderate	6′ of one cap beam (isolated)
3	Cracking	Moderate	11′ crack in one column (isolated)

Results: There are several areas of isolated moderate defects that can best be characterized together as "some moderate defects." Strength and performance of the component are not affected. Report 5.

B.C.04 Culvert Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.04

Specification	Commentary
Report the culvert component condition rating using one of the codes in Table 20 *. Report N when C or V is not reported for Item B.SP.01 (*Span Configuration Designation*).	This item addresses the condition of culverts. The condition assessment includes footings, piles, and other foundation members when present.

Commentary Continued

For culverts that have components not visible for inspection, use appropriate visual condition indicators from the roadway or surrounding foundation materials to determine the applicable code. Visual assessments may be supplemented with non-destructive or destructive testing results.

Consider the condition of integral wingwalls and headwalls to the first construction or expansion joint when determining the condition rating code for this item.

Do not consider the condition of protective coatings and other culvert protection systems when determining the condition rating code for this item, except to the extent that these items indicate distress of the culvert, or adversely affect its condition.

Do not consider the presence of drift, debris, and soil accumulation when determining the condition rating code for this item, except to the extent that these items are causing distress in the culvert.

The culvert includes:

- buried pipe or box;
- footings below the walls of a 3-sided box; and • foundation piles exposed by erosion or scour.

When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, scour is considered in the coding of this item. In this case, observed conditions also indicate a need to reevaluate Item B.AP.03 (*Scour Vulnerability*). Observed scour that is less than the tolerable limit determined in the scour appraisal does not affect this item.

NDOT Commentary – Culvert Condition Rating

* *NDOT has provided a refined version of Table 20 (next page) that are to be used for Nebraska Bridge Inspections.*

Table 20 K. NDOT Guidance for Culvert Condition Codes

Culverts		
Item B.C.04 Code	***Condition***	***Description***
N	*NOT APPLICABLE*	*Use if structure is not a culvert.*
9	*EXCELLENT*	*No deficiencies.*
8	*VERY GOOD*	*No noticeable or noteworthy deficiencies which affect the condition of the culvert. Insignificant scrape marks caused by drift.*
7	*GOOD*	*Shrinkage cracks, light scaling, and insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift with no misalignment and not requiring corrective action. Some minor scouring has occurred near curtain walls, wingwalls or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting.*
6	*SATISFACTORY*	*Deterioration or initial disintegration, minor chloride contamination, cracking with some leaching, or spalls on concrete or masonry walls and slabs. Local minor scouring at curtain walls, wingwalls or pipes. Metal culverts have a smooth curvature, non-symmetrical shape, significant corrosion or moderate pitting.*
5	*FAIR*	*Moderate to major deterioration or disintegration, extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion, or deep pitting.*
4	*POOR*	*Large spalls, heavy scaling, wide cracks, considerable efflorescence or opened construction joint permitting loss of backfill. Considerable scouring or erosion at curtain walls, wingwalls or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.*
3	*SERIOUS*	*Any condition described in Code 4, but which is excessive in scope. Severe movement or differential settlement of the segments, or loss of fill. Holes may exist in walls or slabs. Integral wingwalls nearly severed from culvert. Severe scour or erosion at curtain walls, wingwalls or pipes. Metal culverts have extreme distortion and deflection in one section, extensive corrosion, or deep pitting with scattered perforations.*
*2**	*CRITICAL*	*Integral wingwalls collapsed severe settlement of roadway due to loss of fill. Section of culvert may have failed and can no longer support embankment. Complete undermining at curtain walls and pipes. Metal culverts have extreme distortion and deflection throughout with extensive perforations and deflection throughout with extensive perforations due to corrosion. Structure must be closed until corrective action taken.*
*1**	*IMMINENT FAILURE*	*Bridge closed. Corrective action may put back in light service.*
*0**	*FAILED*	*Bridge closed. Replacement necessary.*
** Requires a Critical Finding*		

Example – Culvert Condition Rating

Three-span corrugated metal pipe culvert. Each pipe is 8’ in diameter and 100’ long. The pipes are spaced 4’ apart. The following defects are noted.

Location 1: Corrosion 20’ long x 2’ wide, with section loss affecting the strength – typical at all pipe inverts (Figure 141).

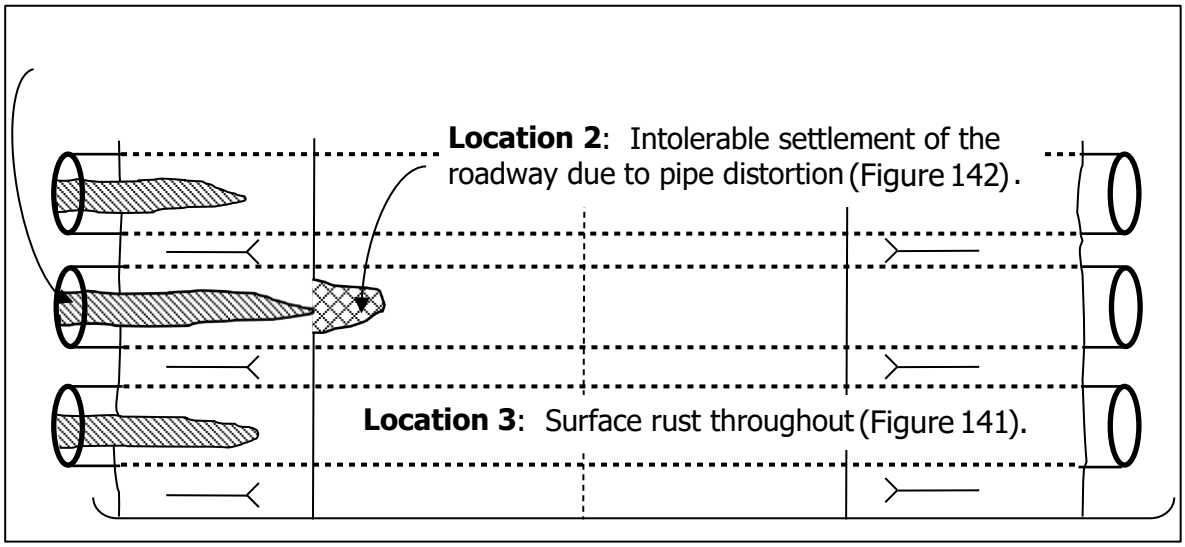


Figure 139. Plan view of pipe culvert showing defects.



Figure 140. Corroded pipe culvert inlet. Location 1 and 3. (Source: Alaska DOT)



Figure 141. Roadway settlement over pipe culvert. Location 2. (Source: Alaska DOT)

Example Continued – Culvert Condition Rating

Summary of Findings:

Location	Defect(s)	Severity	Extent
1	Corrosion with section loss	Major	20% of total barrel length (some)
2	Distortion	Major	Isolated
3	Corrosion	Minor	Throughout (widespread)

Results: The culvert has major defects that, together, seriously affect strength and performance. The condition necessitates more frequent monitoring or corrective actions. Report 3.

B.C.05 Bridge Railings Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.05

Specification	Commentary
Report the bridge railing condition rating using one of the codes in Table 20. Report N when there are no bridge railings present.	This item addresses the condition of all types and shapes of bridge railings (parapets, median barriers, or structure mounted) located on the bridge or that cross over buried structures. The condition assessment includes the portions of the railings, posts, blocking, and curbs that are part of the bridge railing system.

Commentary Continued

Do not consider pedestrian railings when coding this item, except to the extent that the pedestrian railing is integral to the traffic barrier.

Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying railing material.

Example

Steel W-beam bridge railing on both sides of a 300’ long bridge. The following defect is noted:

Description: Damage-induced distortion of the rail for a length of 25’. Three posts are no longer connected to the deck. No other defects.



Defect: Distortion
Severity: Major
Extent: 25’ of the railing (isolated)

Figure 142. Collision-induced distortion of bridge railing.

Results: The railing is best characterized as having “isolated major defects.” Report 4.

B.C.06 Bridge Railing Transitions Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.06

Specification	Commentary
Report the bridge railing transitions condition rating using one of the codes in Table 20. Report N when there are no bridge railing transitions present.	This item addresses the condition of the transition from the bridge railing to the approach guardrail. The condition assessment includes the portions of the railings, posts, blocking, and curbs that are part of the bridge railing transitions. Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying railing transition material. *NDOT Commentary – Bridge Railings Transitions Condition Rating* *Post spacing at the bridge rail end needs to be 1'-6 ¾" or less.* *Post spacing in the next section before the standard guard rail needs to be 3'- 1½" or less.* *Concrete tapers used in urban areas shall have a minimum length of 20'-0" to be considered adequate.* *Transition* • *A "smooth transition" by means of a continuation of the bridge barrier, guard rail anchored to the bridge end, or other effective means, protects the traffic from direct collision with the bridge rail ends.* • *Exposed rail ends, posts and sharp changes in the alignment of the railing should be rated zero.*

B.C.07 Bridge Bearings Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.07

Specification	Commentary
Report the bridge bearing condition rating using one of the codes in Table 20. Report N for bridges without bearings.	This item addresses the condition of all types and shapes of bridge bearings. Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying bearing material. In cases where the bearing device is not visible, the condition can be assessed based on alignment, grade across the joint, or other indirect indicators of the condition.

NDOT Commentary – Bridge Bearings Condition Rating

Bearings devices are a separate structural device that transmit loads from the superstructure to the substructure. Bearing devices accommodate physical movement and/or thermal expansion and contraction of the superstructure. These devices also accommodate rotation of the superstructure caused by loads on the superstructure in the spans adjacent to the substructure. A superstructure stringer (steel or timber) setting on a pile cap does not have a bearing, though a steel-to-steel connection may be welded. Photos guidance is provided for some common situations in Nebraska. Inspectors should review the BIRM for complete descriptions of bearing types.

Coding is based on the SNBI Condition Ratings codes in Table 20 and records the overall condition.

Inspection notes should include information on the condition such as:

- *The relative horizontal position between the superstructure and the substructure of bearing device and the ambient temperature at the time of the measurements.*
- *The condition of anchor bolts, such as rust, distortion or being sheared off.*
- *Any evidence that the bearing device has frozen and is not allowing deflection and rotation*

Examples – Bridge Bearings Condition Rating

Description: 5 of 25 bearings have 10% bearing area loss.



Defect: Loss of bearing area
Severity: Moderate
Extent: 20% of bearings (some)

Figure 143. Loss of bearing area for elastomeric bearing. (Source: Oregon DOT)

Results: The bearings are best characterized as having "some moderate defects." Report 5.

Examples Continued – Bridge Bearings Condition Rating

Description: 8 of 20 bearings are rotated beyond performance limits. The anchor bolts at these locations are bent and the nuts are loose. Surface rust is present on all bearings.



Defect: Alignment and connection
Severity: Major
Extent: 8 bearings (widespread)

Defect: Corrosion
Severity: Minor
Extent: All bearings

Figure 144. Misaligned rocker bearing. (Source: Alaska DOT)

Results: The bearings can best be characterized as having "major defects" affecting performance. Condition necessitates more frequent monitoring or corrective actions. Report 3.

Description: 20 of 20 bearings have surface rust with no section loss. Bearings are free to move and alignment is as expected for temperature conditions.



Defect: Corrosion
Severity: Minor
Extent: All bearings

Figure 145. Surface rust on moveable bearing.

Results: The bearings are best characterized as having "widespread minor defects." Report 6.

B.C.08 Bridge Joints Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.08

Specification

Report the bridge deck joint condition using one of the following codes. The entire code description must be satisfied for the code to apply.

Code	Condition	Description
N	NOT APPLICABLE	Bridge does not have deck joints.
9	EXCELLENT	Isolated inherent defects.
8	VERY GOOD	Some inherent defects.
7	GOOD	Some minor defects.
6	SATISFACTORY	Widespread minor or isolated moderate defects.
5	FAIR	Some moderate defects.
4	POOR	Widespread moderate or isolated major defects.
3	SERIOUS	Some major defects.
2	CRITICAL	Widespread major defects.
1	IMMINENT FAILURE	Joints have failed and are ineffective.
0	FAILED	Joints have failed and present a safety hazard.

Commentary

This item addresses the condition of all types and shapes of bridge deck joints. The condition assessment includes all aspects of the joints such as any seals, headers (metal or concrete), connections, and other metal members.

When a joint is designed as an open joint, leakage or lack of a seal is not considered a defect.

Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying joint material.

In cases where the joint is not visible, the condition can be assessed based on other indirect indicators of the condition.

Examples – Bridge Joints Condition Rating

Description: All compression seal joints are partially filled with debris, but are still free to move. Seals are intact.



Defect: Debris impaction
Severity: Minor
Extent: All joints (widespread)

Figure 146. Joint partially filled with debris.

Results: The joints are best characterized as having "widespread minor defects." Report 6.

Description: Strip seal joint 44' long at each end of a bridge. 3" deep x 12" wide x 6' long spall with exposed rebar in deck adjacent to joint header. Joint is loose, but functioning. Strip seal is intact. No other defects.



Defect: Adjacent deck or header
Severity: Moderate
Extent: 6' of one joint (isolated)

Figure 147. Spall in joint header. (Source: Colorado DOT)

Results: The joints are best characterized as having "isolated moderate defects." Report 6.

Examples Continued – Bridge Joints Condition Rating

Description: Compression seal joint 56′ long at each end of a bridge. The seal is torn and partially pulled out for the full length of both joints. Performance of the joints is affected.



Defect: Seal damage
Severity: Moderate
Extent: All joints (widespread)

Figure 148. Joint seal is torn and partially pulled out.

Results: The joints can best be characterized as having "widespread moderate defects." Report 4.

B.C.09 Channel Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.09

Specification

Report the channel condition using one of the following codes. The entire code description must be satisfied for the code to apply.

Code	Condition	Description
N	NOT APPLICABLE	Bridge does not cross over water.
9	EXCELLENT	No defects.
8	VERY GOOD	Inherent defects only.
7	GOOD	Some minor defects.
6	SATISFACTORY	Widespread minor or isolated moderate defects.
5	FAIR	Moderate defects; bridge and approach roadway are not threatened.
4	POOR	Widespread moderate or isolated major defects; bridge and/or approach roadway is threatened.
3	SERIOUS	Major defects; bridge or approach roadway is seriously threatened. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	CRITICAL	Major defects. Bridge or approach roadway is severely threatened. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions in order to keep the bridge open.
1	IMMINENT FAILURE	Bridge is closed to traffic due to channel condition. Channel rehabilitation may return the bridge to service.
0	FAILED	Bridge is closed due to channel condition, and is beyond corrective action. Bridge location or design can no longer accommodate the channel, and bridge replacement is needed to restore service.

Commentary

This item is used to provide a condition rating for the channel at the bridge. Consider the channel upstream and downstream only insofar as it threatens the bridge and approach roadway.

The condition of channel protection devices is addressed under a separate item. Refer to Item B.C.10 (*Channel Protection Condition Rating*).

For concrete lined channels, channel defects typically do not apply, except for Aggradation and Debris. The condition of the channel lining would be addressed by Item B.C.10 (*Channel Protection Condition Rating*).

NDOT Commentary – Channel Condition Rating

Inspectors must observe the adequacy of the waterway opening under the structure. See that the waterway is not obstructed, but that it allows free flow of water. Obstructions such as debris or growth may contribute to scour and may be a potential fire hazard to the structure. Watch for sand and gravel bars deposited in the channel which may direct stream flow in such a manner as to cause harmful scour at piers and abutments.

In addition to observing the effect the waterway is having on the bridge and its approaches, observe the surrounding area to see if the bridge and its approaches are causing any problems or potential problems. Items to look for will include possible flooding from inadequate openings at the structure, erosion of banks or levees from improper protection, or improper skew of the piers or abutments.

Refer to Table 54 for coding guidance.

Coding this item 0, 1, or 2 requires a Critical Finding

Examples – Channel Condition Rating

Single span bridge. Channel is aggrading and requires periodic excavation to maintain a tolerable hydraulic opening. The thalweg has migrated such that flow is directed at one abutment (Figure 150) and threatens the approach roadway. However, a structural and hydraulic review has determined that the stability of the bridge is not impacted.



Defects: Aggradation and migration
Severity: Moderate
Extent: Widespread

Figure 149. Bridge elevation view of channel condition. (Source: Alaska DOT)



Figure 150. Looking downstream from bridge at excavated material. (Source: Alaska DOT)

Results: The channel can best be characterized as having "widespread moderate defects." Report 4.

B.C.10 Channel Protection Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.10

Specification

Report the condition of the channel protection device(s) using one of the following codes. The entire code description must be satisfied for the code to apply.

Code	Condition	Description
N	NOT APPLICABLE	Bridge does not cross over water or channel protection devices do not exist.
9	EXCELLENT	Isolated inherent defects.
8	VERY GOOD	Some inherent defects.
7	GOOD	Some minor defects.
6	SATISFACTORY	Widespread minor or isolated moderate defects.
5	FAIR	Some moderate defects; performance of the channel protection is not affected.
4	POOR	Widespread moderate or isolated major defects; performance of channel protection is affected.
3	SERIOUS	Major defects; performance of channel protection is seriously affected. Condition typically necessitates more frequent monitoring or corrective actions.
2	CRITICAL	Major defects; channel protection is severely compromised. Condition typically necessitates more frequent monitoring or corrective actions.
1	IMMINENT FAILURE	Channel protection has failed, but corrective action could restore it to working condition.
0	FAILED	Channel protection is beyond repair and must be replaced.

Commentary

This item is used to provide a condition rating for channel protection devices.

Evaluate the condition and effectiveness of channel protection devices installed on banks or in the stream to mitigate channel issues that may impact the bridge. When reporting this item, consider erosion and scour, damage (unraveling, displacement, separation, and sagging), and material defects (scaling, abrasion, spalling, corrosion, cracking, splitting, and decay).

Channel protection devices are considered countermeasures that control, inhibit, delay, or minimize stream instability and scour problems, including river training and armoring countermeasures.

River training countermeasures may include: spurs, bendway weirs, guide banks, drop structures, and check dams. Additional river training countermeasures can be found in HEC-23 and elsewhere.

Commentary Continued – Channel Protection Condition Rating

Armoring countermeasures may include: rock riprap, grouted riprap, concrete slope paving, articulating concrete blocks, gabion mattresses, and grout-filled mats. Additional armoring countermeasures can be found in HEC-23 and elsewhere.

For bridges that have countermeasures not visible for inspection, use appropriate visual condition indicators to determine the applicable code. These may include measurements taken at the bridge face(s) during every inspection to help determine degree of degradation, aggradation, and/or channel migration.

For this item, a minor defect does not limit the effectiveness of the channel protection, while a moderate defect may limit its effectiveness. A major defect indicates that the channel protection is missing or is no longer effective as determined by a hydraulic review.

Example – Channel Protection Condition Rating

Description: Some stones are missing and revetment has limited effectiveness. Streambed is scouring and undermining the remaining riprap and culvert.



Defects: Scour and damage
Severity: Moderate
Extent: Widespread

Figure 151. Scour and missing riprap at concrete box culvert outlet.

Results: The channel can best be characterized as having "widespread moderate defects." Performance of the channel protection is affected. Report 4.

B.C.11 Scour Condition Rating

Format	Frequency	Item ID
AN (1)	EI	B.C.11

Specification

Report the scour condition that represents the observed or measured scour using one of the following codes. The entire code description must be satisfied for the code to apply.

Code	Condition Description
N	Bridge does not cross over water.
9	No scour.
8	Insignificant scour.
7	Some minor scour.
6	Widespread minor or isolated moderate scour.
5	Moderate scour; strength and stability of the bridge are not affected.
4	Widespread moderate or isolated major scour; strength and/or stability of the bridge is affected.
3	Major scour; strength and/or stability of the bridge is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	Major scour; strength and/or stability of the bridge is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
1	Bridge is closed to traffic due to scour condition. Channel rehabilitation may return the bridge to service.
0	Bridge is closed due to scour condition, and is beyond corrective action. Bridge replacement is needed to restore service.

Commentary

Refer to Item B.AP.03 (*Scour Vulnerability*) to verify if the bridge has been determined to be stable or unstable for appraised scour conditions.

Consider design scour depth and critical scour depth, commonly found in hydraulic designs, scour evaluations, and POAs, when determining the scour condition ratings.

When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, this indicates a need to reevaluate Item B.AP.03 (*Scour Vulnerability*).

NDOT Commentary – Scour Condition Rating

At time of inspection, the inspector should review NDOT policy on cross-sections in Chapter 6. Roadway runoff erosion is not considered scour for this item, but is coded per NE Items 326 (Embankment Erosion) and 344 (Abutment Walls Undermined).

Examples – Scour Condition Rating

Description: Three span scour critical bridge founded on spread footings not on bedrock. The scour elevation for three spread footings at Pier 2 is at the bottom of the footings with one footing having one foot of undermining at one corner. Agency plans to monitor more frequently to keep the bridge open until repairs are completed.



Severity: Major
Extent: 3 of 6 pier footings

Figure 152. Exposed column footing in stream.

Results: The scour condition is best characterized as "major scour" that necessitates more frequent monitoring. Bridge is seriously affected. Report 3.

Examples Continued – Scour Condition Rating

Description: Scour critical bridge. Critical scour limit was established in the Plan of Action. Inspectors measured the following streambed cross-section (Figure 154).

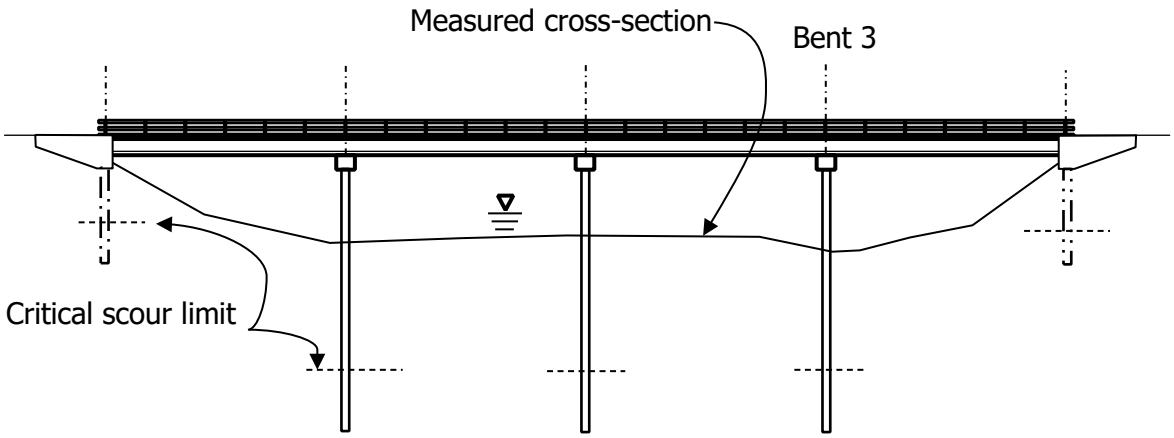


Figure 153. Elevation view showing scour elevations and stream cross-section for a bridge.

Severity: Minor (scour at Bent 3, does not exceed tolerable limit)
Extent: One of five substructure units (Isolated).

Results: The scour condition is best characterized as "isolated minor scour." Report 7.

Description: Scour critical bridge. Critical scour limit was established in the Plan of Action. Inspectors measured the following streambed cross-section (Figure 155), which indicates a scour depth at one bent that is below the critical scour elevation.

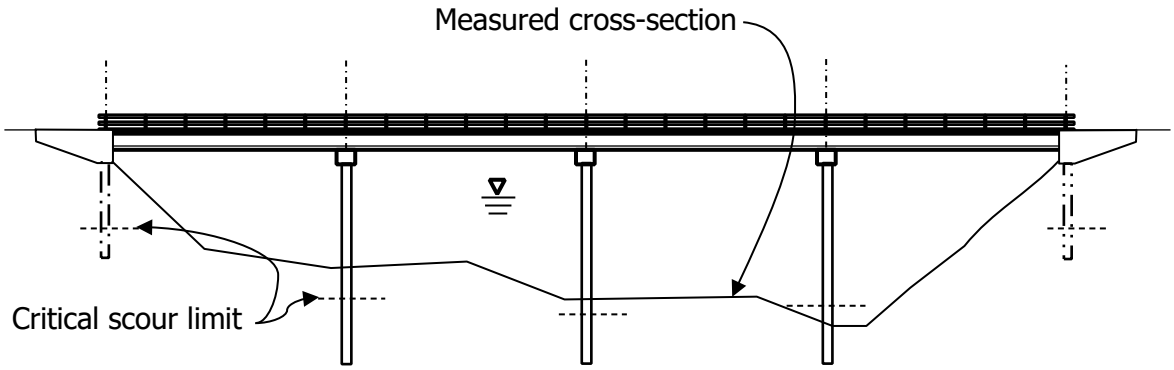


Figure 154. Elevation view showing critical scour limits and stream cross-section for a bridge.

Severity: Moderate
Extent: 2 of 5 substructure units (some)

Severity: Major
Extent: 1 of 5 substructure units (isolated)

Results: The scour condition is best characterized as "major scour". The bridge is closed until corrective actions are completed. Report 1.

Examples Continued – Scour Condition Rating

Description: Bridge was appraised for scour vulnerability and not considered scour critical. No scour calculations and no structural stability analysis were performed. Piles are end bearing on rock. Inspectors measured the following streambed cross-section, which indicates a scour depth at two piers that is not consistent with the scour assessment assumptions.

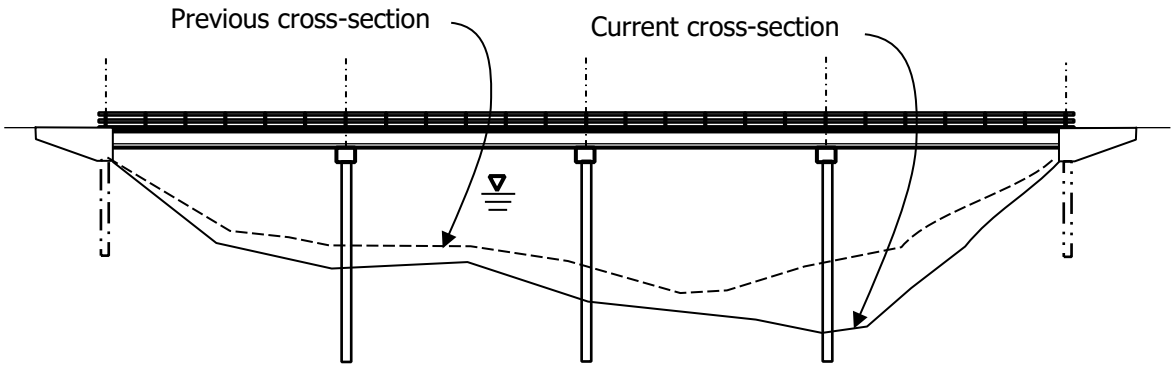


Figure 155. Elevation view showing current cross-section and previous cross-section for a bridge over water.

Severity: Moderate
Extent: 1 of 5 substructure units (isolated)

Severity: Major
Extent: 1 of 5 substructure units (isolated)

Results: The scour condition is best characterized as "isolated major scour". The defects warrant a structural and/or hydraulic review to determine the effect on strength and/or stability of the bridge. Report 4.

Since observed conditions are not consistent with the scour appraisal assumptions, then scour is considered in the coding of B.C.03 (*Substructure Condition Rating*). In this case, observed conditions also indicate a need to reevaluate Item B.AP.03 (*Scour Vulnerability*).

B.C.12 Bridge Condition Classification

Format	Frequency	Item ID
AN (1)	C	B.C.12

Specification

This item is calculated by FHWA and is not required to be reported. The bridge condition classification is indicated using one of the following codes.

Code	Condition	Lowest Condition Rating
G	Good	7, 8, or 9
F	Fair	5 or 6
P	Poor	4, 3, 2, 1, or 0

Commentary

For the purposes of national performance measures, the method of assessment to determine the classification of a bridge is the minimum (i.e. lowest) condition rating code from the following items:

B.C.01 (*Deck Condition Rating*),
B.C.02 (*Superstructure Condition Rating*),
B.C.03 (*Substructure Condition Rating*), and
B.C.04 (*Culvert Condition Rating*).

Examples

Code G is calculated and recorded for a reinforced concrete closed-spandrel wall arch bridge with the following component condition rating item codes: • B.C.02 (*Superstructure Condition Rating*) = 7

- B.C.03 (*Substructure Condition Rating*) = 8

Code F is calculated and recorded for a corrugated metal pipe culvert with the following component condition rating item code:

- B.C.04 (*Culvert Condition Rating*) = 5

Code P is calculated and recorded for a steel box girder bridge with the following component condition rating codes:

- B.C.01 (*Deck Condition Rating*) = 4
- B.C.02 (*Superstructure Condition Rating*) = 6
- B.C.03 (*Substructure Condition Rating*) = 7

B.C.13 Lowest Condition Rating Code

Format	Frequency	Item ID
AN (1)	C	B.C.13

Specification	Commentary
This item is calculated by FHWA and is not required to be reported. The code for this item is the lowest condition rating code from the following items: B.C.01 (*Deck Condition Rating*), B.C.02 (*Superstructure Condition Rating*), B.C.03 (*Substructure Condition Rating*), and B.C.04 (*Culvert Condition Rating*).	

Examples

Code 7 is calculated and recorded for a reinforced concrete closed-spandrel wall arch bridge with the following component condition rating item codes:

- B.C.02 (*Superstructure Condition Rating*) = 7
- B.C.03 (*Substructure Condition Rating*) = 8

Code 5 is calculated and recorded for a corrugated metal pipe culvert with the following component condition rating item code:

- B.C.04 (*Culvert Condition Rating*) = 5

Code 4 is calculated and recorded for a steel box girder bridge with the following component condition rating codes:

- B.C.01 (*Deck Condition Rating*) = 4
- B.C.02 (*Superstructure Condition Rating*) = 6
- B.C.03 (*Substructure Condition Rating*) = 7

B.C.14 NSTM Inspection Condition

Format	Frequency	Item ID
AN (1)	EI	B.C.14

Specification	Commentary
Report the condition rating of the Non-Redundant Steel Tension Members (NSTM) using one of the codes in Table 20. Do not report this item when Item B.IR.01 (*NSTM Inspection Required*) is N.	This item represents the condition of NSTM(s) identified to be inspected in the NSTM inspection procedures, and incorporated into the superstructure or substructure condition rating. For a bridge with NSTM(s) in both the superstructure and substructure, report only the lower of the two condition values for the condition of the NSTM(s).

B.C.15 Underwater Inspection Condition

Format	Frequency	Item ID
AN (1)	EI	B.C.15

Specification	Commentary
Report the condition rating of the underwater members of the substructure or culvert based on the underwater inspection using one of the codes in Table 20. Do not report this item when Item B.IR.03 (*Underwater Inspection Required*) is N.	This item represents the condition of underwater members identified to be inspected in the underwater inspection procedures, and incorporated into the substructure or culvert condition rating. If this item has previously been reported because an underwater inspection is generally required, it should continue to be reported even for instances of unusually low flow where all portions of the substructure can be inspected by wading and probing, and an underwater inspection is not required. This applies only if the low flow condition is truly unusual and is not likely to reoccur during the next inspection interval. The requirement to report this item may change in the rare circumstance where long-term environmental conditions change for inspection access to underwater portions of the substructure or culvert. *NDOT Commentary – Underwater Inspection Condition* *The underwater inspection process is described in Chapter 4 in this Manual.*

Example Component Condition Ratings Data for Bridge Number 15558X

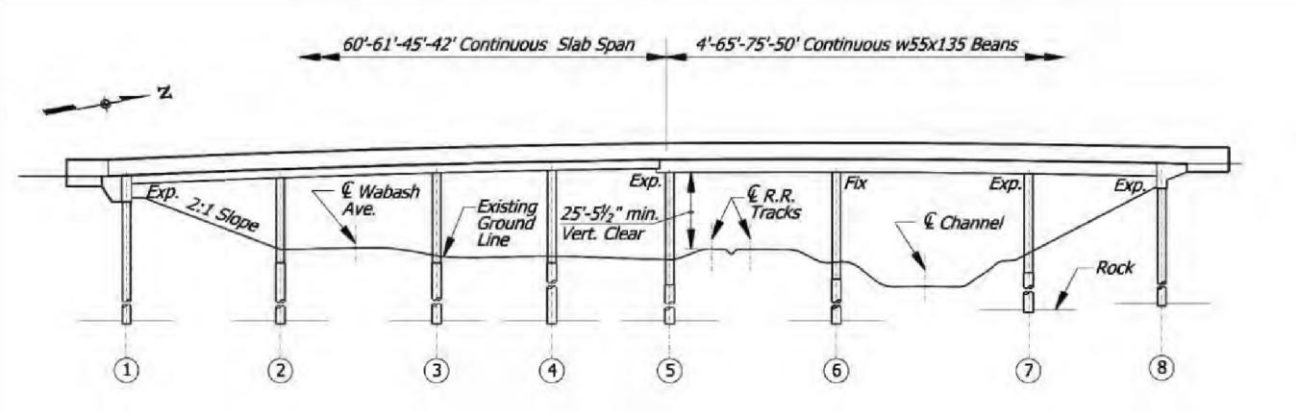


Figure 156. Elevation view indicating substructure unit numbers for Bridge Number 15558X. (Source: Missouri DOT)

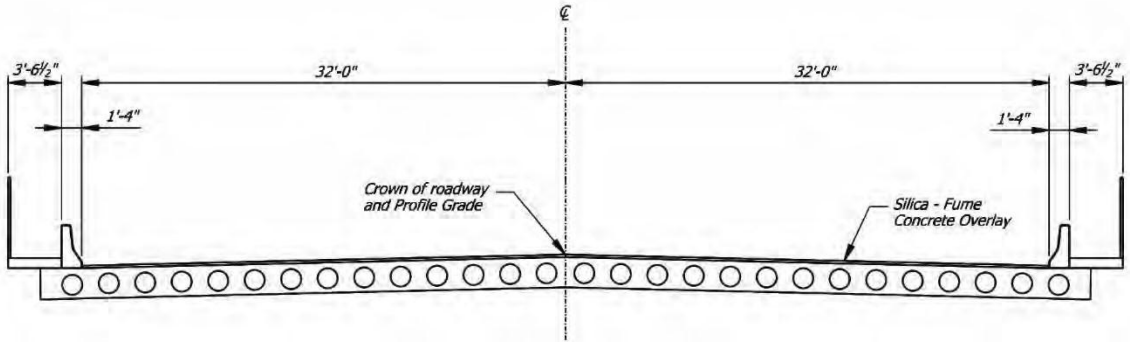


Figure 157. Cross-section view of RC voided slab spans one to four for Bridge Number 15558X. (Source: Missouri DOT)

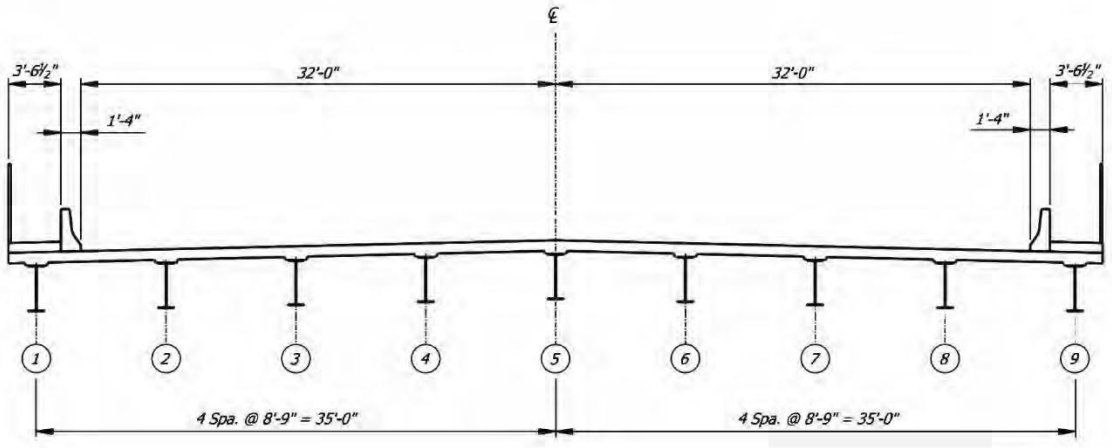


Figure 158. Cross-section view, looking north, indicating steel beam numbering in spans five to seven for Bridge Number 15558X. (Source: Missouri DOT)

Deck Condition Rating: The top surface has pattern cracking typical throughout. Medium width cracks (0.03" to 0.05" wide) spaced 1' to 3' (Figure 160). There are medium width (0.03" to 0.05" wide) diagonal cracks at the corners.



Figure 159. Transverse cracking in top of RC deck for Bridge Number 15558X.

The underside has medium width (0.02” to 0.04” wide) transverse cracks spaced at 3’ throughout with surface white efflorescence and no rust staining (Figure 161). Typical on steel beam spans.



Figure 160. Transverse cracking with efflorescence on underside of RC deck for Bridge Number 15558X.

There are medium width (0.03” to 0.05” wide) longitudinal cracks in the microsilica modified concrete overlay spaced 1’ to 3’ (Figure 162 and Figure 163). Typical on RC voided slab spans.



Figure 161. Longitudinal cracking in wearing surface for Bridge Number 15558X.



Figure 162. Closer view of cracking in wearing surface for Bridge Number 15558X.

The deck is characterized as having widespread minor defects. Report 6 for Item B.C.01 (*Deck Condition Rating*).

Superstructure Condition Rating: Steel beams have isolated locations of spot surface corrosion and peeling paint near mid-span diaphragms (Figure 164).



Figure 163. Spot surface corrosion on steel beams for Bridge Number 15558X.

Cantilever ends of the steel beams have surface corrosion, but no measurable section loss (Figure 165).



Figure 164. Surface corrosion on cantilever steel beam ends for Bridge Number 15558X.

RC voided slab has six spalled areas at the center construction joint with exposed rebar; largest spall (5′ x 1′ x 2″) has nine transverse and two longitudinal exposed rebars. Rebars have surface rust, but no measurable section loss (Figure 166). There are various delaminated areas throughout the east half. There are medium width (0.03″ to 0.05″ wide) longitudinal cracks typical throughout east half with efflorescence and rust present at many locations.



Figure 165. Spalls with exposed rebar on underside of RC voided slab for Bridge Number 15558X.

Unsound patches exist along the east edge at the south abutment. Unsound patches also exist near the joint between the RC voided slab and steel beams.



Figure 166. Unsound patched areas and efflorescence on underside of RC voided slab for Bridge Number 15558X.

The superstructure is characterized as having some moderate defects. Report 5 for Item B.C.02 (*Superstructure Condition Rating*).

Substructure Condition Rating: The south abutment has medium width (0.03" to 0.05") vertical and horizontal cracks typical throughout the abutment and backwall with efflorescence and rust staining (Figure 168).



Figure 167. Cracking in south RC abutment for Bridge Number 15558X.

Bent 5 has delaminated areas on the south face of the bent cap on the west end. Bent 6 has a small spall and delaminated areas near the base on the west side. Bent 7 has medium width (0.02" to 0.05") vertical cracks in the west column (Figure 169).



Figure 168. Cracking in RC column at Bent 7 for Bridge Number 15558X.

The north abutment has medium width (0.03" to 0.05" wide) vertical cracks and moderate map cracking in the northwest corner with efflorescence and rust staining. There are insignificant width (0.010" wide) vertical cracks in the semi-integral RC end diaphragm and insignificant width diagonal cracks under the beams (Figure 170). There are medium width horizontal cracks under Beam 9.



Figure 169. Cracking in north RC abutment for Bridge Number 15558X.

The substructure is characterized as having isolated moderate defects. Report 6 for Item B.C.03 (*Substructure Condition Rating*).

Culvert Condition Rating: The bridge is not a culvert. Report N for Item B.C.04 (*Culvert Condition Rating*).

Bridge Railings Condition Rating: There are isolated instances of vertical, insignificant width cracks (width less than 0.012") with surface white efflorescence.



Figure 170. Typical RC bridge railing condition for Bridge Number 15558X.

The bridge railings are characterized as having isolated minor defects. Report 7 for Item. B.C.05 (*Bridge Railings Condition Rating*).

Bridge Railing Transitions Condition Rating: There are two loose fasteners that connect the thrie-beam to the RC railing at each transition. Each transition also has isolated spot surface corrosion (Figure 172)



Figure 171. Typical condition of thrie-beam bridge transition railing for Bridge Number 15558X.

The bridge railing transitions are characterized as having isolated minor defects. Report 7 for Item B.C.06 (*Bridge Railing Transitions Condition Rating*).

Bridge Bearings Condition Rating: There is pack rust on masonry plates below rockers for all eight bearings at the south abutment. Bearing movement is restricted based on temperature at the time of inspection. There is no evidence of distress in the adjoining slab superstructure.



Figure 172. Typical rocker bearing with movement restricted by pack rust for Bridge Number 15558X.

All nine pot bearings supporting the RC voided slab on the cantilever portion of the steel beams have surface corrosion, but are functioning as intended. No defects noted for the remaining 54 bearings.



Figure 173. Typical pot bearings with surface rust for Bridge Number 15558X.



Figure 174. Closer view of typical pot bearings with surface rust for Bridge Number 15558X.

The bridge bearings are characterized as having isolated major defects. Report 4 for Item B.C.07 (*Bridge Bearings Condition Rating*).

Bridge Joints Condition Rating: The seal is ripped and punctured completely through along the entire strip seal joint between the steel span and RC voided slab span.



Figure 175. Strip seal bridge joint for Bridge Number 15558X.



Figure 176. Strip seal ripped and punctured completely through for Bridge Number 15558X.

The bridge joint is characterized as having widespread major defects. Report 2 for Item B.C.08 (*Bridge Joints Condition Rating*).

Channel: There are large deposits of debris with heavy vegetation in the creek (Figure 178). The creek is characterized as having moderate defects. Report 5 for Item B.C.09 (*Channel Condition Rating*).



Figure 177. RC lined channel with debris and vegetation for Bridge Number 15558X.

Channel Protection Condition Rating: There are medium width cracks (0.02" to 0.05") spaced greater than 3' throughout the walls of the RC channel lining (Figure 178). The channel protection is characterized as having widespread minor defects. Report 6 for Item B.C.10 (*Channel Protection Condition Rating*).

Scour Condition Rating: There is no scour observed. The channel has a RC liner. Report 9 for Item B.C.11 (*Scour Condition Rating*).

Bridge Condition Classification: FHWA calculated Item B.C.12 (*Bridge Condition Classification*).

Lowest Condition Rating Code: FHWA calculated Item B.C.13 (*Lowest Condition Rating Code*).

NSTM Inspection Condition: The bridge does not require an NSTM inspection. Do not report Item B.C.14 (*NSTM Inspection Condition*).

Underwater Inspection Condition: The bridge does not require an underwater inspection. Do not report Item B.C.15 (*Underwater Inspection Condition*).

Table 21. Component Condition Ratings data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.C.01	*Deck Condition Rating*	6
B.C.02	*Superstructure Condition Rating*	5
B.C.03	*Substructure Condition Rating*	6
B.C.04	*Culvert Condition Rating*	N
B.C.05	*Bridge Railings Condition Rating*	7
B.C.06	*Bridge Railing Transitions Condition Rating*	7
B.C.07	*Bridge Bearings Condition Rating*	4
B.C.08	*Bridge Joints Condition Rating*	2
B.C.09	*Channel Condition Rating*	5
B.C.10	*Channel Protection Condition Rating*	6
B.C.11	*Scour Condition Rating*	9
B.C.12	*Bridge Condition Classification* (Determined by FHWA*)	F*
B.C.13	*Lowest Condition Rating Code* (Determined by FHWA*)	5*
B.C.14	*NSTM Inspection Condition*	
B.C.15	*Underwater Inspection Condition*	

SUBSECTION 7.2: ELEMENT IDENTIFICATION

The data items in this subsection provide information about the elements inventoried for the bridge, and the total quantity of each element. These data items are considered part of the Elements Data Set and have a many-to-one relationship with a bridge when applicable.

Element data are only required to be reported to FHWA for bridges that carry NHS routes, while reporting is optional for bridges that do not carry NHS routes. Refer to B.F.01 (*Feature Type*), B.F.02 (*Feature Location*), and B.H.03 (*NHS Designation*) for data indicating NHS routes carried on bridges.

Data items for this subsection are reported for each element present on a bridge and the data for these items may change after each inspection.

The following data items are included in this subsection.

Item ID	Data Item
B.E.01	Element Number
B.E.02	Element Parent Number
B.E.03	Element Total Quantity

Refer to the AASHTO Manual for Bridge Element Inspection (AASHTO MBEI) for element descriptions and quantity calculations.

Refer to Table 22 or Figure 181 for a listing of elements for which data are reported to FHWA.

Ensure correlation between elements reported in this subsection and codes reported for items in the Bridge Material and Type section.

Elements that are entirely below ground and not accessible for inspection, such as piles and pile caps/footings, are not intended to be reported until they become exposed and visible for inspection. However, element data can be reported for elements that are not visible for inspection, or may become visible for inspection and are subsequently covered, by reporting the best available data for those elements.

Table 22. Bridge elements reported to FHWA.

Element	Units	Element Number					
		Steel	PSC	RC	Timber	Masonry	Other
Deck/Slab							
Deck	ft^2		13	12	31		60
Open Grid Deck	ft^2	28					
Concrete Filled Grid Deck	ft^2	29					
Corrugated or Orthotropic Deck	ft^2	30					
Slab	ft^2			38	54		65
Top Flange	ft^2		15	16			
Superstructure							
Closed Web/Box Girder	ft	102	104	105			106
Girder/Beam	ft	107	109	110	111		112
Stringer	ft	113	115	116	117		118
Truss	ft	120			135		136
Arch	ft	141	143	144	146	145	142
Main Cable	ft	147					
Secondary Cable	each	148					149
Floor Beam	ft	152	154	155	156		157
Pin, Pin and Hanger Assembly	each	161					
Gusset Plate	each	162					
Substructure							
Column	each	202	204	205	206		203
Column Tower (Trestle)	ft	207			208		
Pier Wall	ft			210	212	213	211
Abutment	ft	219		215	216	217	218
Pile Cap/Footing	ft			220			
Pile	each	225	226	227	228		229
Pier Cap	ft	231	233	234	235		236
Culvert							
Culvert	ft	240	245	241	242	244	243
Bridge Rail							
Bridge Rail	ft	330*		331	332	334	333
Joint							
Strip Seal	ft	300					
Pourable	ft	301					
Compression	ft	302					
Assembly with Seal (Modular)	ft	303					
Open	ft	304					
Assembly without Seal	ft	305					
Other	ft	306					
Bearing							
Elastomeric	each	310					
Movable (roller, sliding, etc.)	each	311					
Enclosed/Concealed	each	312					
Fixed	each	313					
Pot	each	314					
Disk	each	315					
Other	each	316					
Wearing Surface and Protective Coatings							
Wearing Surface	ft^2	510					
Steel Protective Coating	ft^2	515					
Concrete Protective Coating	ft^2	521					

*Element 330-Metal Bridge Rail may include steel or aluminum rails.

B.E.01 Element Number

Format	Frequency	Item ID
N (4,0)	EI	B.E.01

Specification	Commentary
Report the applicable element number (EN) for each element reported for the bridge.	Refer to Table 22 for element numbers reported to FHWA.

Example

Values shown in the shaded cells, with italicized text, under column B.E.01 are the data for the elements in this example.

Element	B.E.01 EN
RC Deck	*12*
Wearing Surface	*510*
Open Joint	*304*
RC Bridge Railing	*331*
Steel Beam/Girder	*107*
Steel Protective Coating	*515*
Elastomeric Bearings	*310*
RC Columns	*205*
RC Pier Wall	*210*
RC Abutment	*215*
RC Pier Cap	*234*

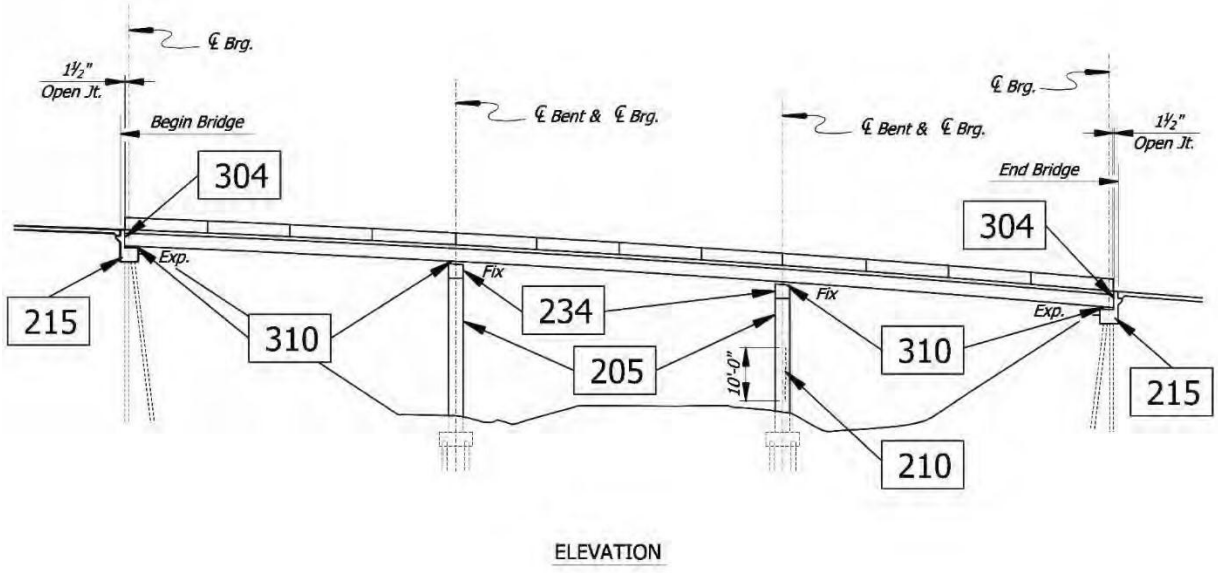


Figure 178. Bridge elevation view from construction plans for a three-span steel beam bridge. (Source: Alabama DOT)

Example Continued – Element Number

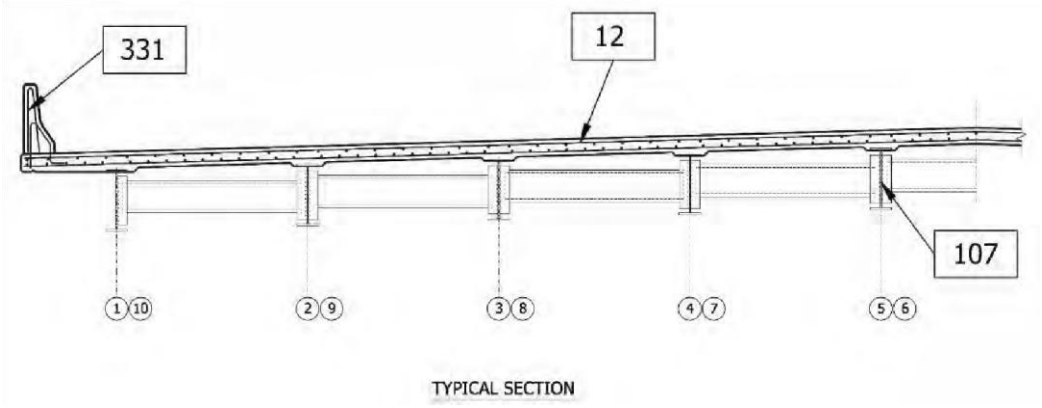


Figure 179. Typical bridge superstructure cross-section view from construction plans for a steel multi-beam bridge. (Source: Alabama DOT)

B.E.02 Element Parent Number

Format	Frequency	Item ID
N (4,0)	EI	B.E.02

Specification	Commentary
Report the element number of the protected element for each protective system element reported for the bridge. Do not report this item for elements that do not have a protective system.	Refer to Table 22 for wearing surface and protective coatings elements reported to FHWA.

Example

Values shown in the shaded cells, with italicized text, under column B.E.02 are the element parent number (EPN) data for the element numbers shown in column B.E.01 in this example.

Element	B.E.01	B.E.02
	EN	EPN
RC Deck	12	
Wearing Surface	510	*12*
Open Joint	304	
RC Bridge Railing	331	
Steel Beam/Girder	107	
Steel Protective Coating	515	*107*
Elastomeric Bearings	310	
RC Columns	205	
RC Pier Wall	210	
RC Abutment	215	
RC Pier Cap	234	

B.E.03 Element Total Quantity

Format N	Frequency	Item ID
(8,0)	EI	B.E.03

Specification	Commentary
Report the total element quantity (Total Qty) to the nearest whole unit of measure for each applicable element reported for the bridge.	Refer to the AASHTO MBEI for details on the calculation of total element quantities for applicable elements.

Example

Quantities shown in the shaded cells, with italicized text, under column B.E.03 are the data for the element numbers shown in column B.E.01 in this example.

Element	B.E.01 EN	B.E.02 EPN	B.E.03 Total Qty
RC Deck (ft^2)	12		*16217*
Wearing Surface (ft^2)	510	12	*15783*
Open Joint (ft)	304		*158*
RC Bridge Railing (ft)	331		*412*
Steel Beam/Girder (ft)	107		*2054*
Steel Protective Coating (ft^2)	515	107	*15728*
Elastomeric Bearings (each)	310		*40*
RC Columns (each)	205		*8*
RC Pier Wall (ft)	210		*54*
RC Abutment (ft)	215		*182*
RC Pier Cap (ft)	234		*150*

Example Element Identification Data for Bridge Number 15558X

The following is a description of the elements and their total quantity. A table can be found at the end that summarizes the element identification data for this example.

There is a reinforced concrete deck (EN 12) supported on three continuous spans of steel beams. The deck area is 14,462 ft^2. The deck is protected with 12,550 ft^2 of penetrating sealer (EN 521, EPN 12).

There are four spans of a cast-in-place reinforced concrete voided slab (EN 38). The slab area is 15,340 ft^2. The slab is protected with 13,312 ft^2 of micro-silica modified concrete overlay (EN 510, EPN 38). The overlay is protected with 13,312 ft^2 of penetrating sealer (EN 521, EPN 510).

There are 806 ft of reinforced concrete bridge railing (EN 331).

There is one strip seal expansion joint (EN 300), near an intermediate support, that is 78 ft measured along the skew.

There are three continuous spans with 1,755 ft of W36x135 steel beams (EN 107). The beams have 15,287 ft^2 of steel protective coating (EN 515, EPN 107).

There are eight movable bearings (EN 311) at one abutment. The movable bearings have 62 ft^2 of steel protective coating (EN 515, EPN 311).

There are 27 elastomeric bearings (EN 310), nine at each of the three intermediate substructure units. Each bearing includes steel bolsters (risers). The bearings have 333 ft^2 of steel protective coating (EN 515, EPN 310).

There is one semi-integral abutment with nine elastomeric bearings. Each bearing includes steel bolsters (risers) with a steel protective coating. Since the abutment is semi-integral, the bearings have been cast in concrete and therefore concealed (EN 312).

There are nine pot bearings (EN 314) at an intermediate support. The pot bearings have 61 ft^2 of steel protective coating (EN 515, EPN 314).

There are 230 ft of reinforced concrete abutments (EN 215).

There are 122 ft of reinforced concrete pier wall (EN 210) that serves as a crash wall near the railroad tracks.

There are 21 reinforced concrete columns (EN 205).

There are 223 ft of reinforced concrete pier cap (EN 234).

No piles, pile caps, or footings were exposed and visible for inspection so these elements do not need to be reported.

In Table 23, Item B.E.02 (EPN) is not reported for elements under column B.E.01 (EN) where cells are shaded, with no text, under column B.E.02 (EPN).

Table 23. Data items in the Elements Data Set for Bridge Number 15558X.

B.E.01	B.E.02	B.E.03
EN	EPN	Total Qty
12		14462
521	12	12550
38		15340
510	38	13312
521	510	13312
107		1755
515	107	15287
205		21
210		122
215		230
234		223
300		78
310		27
515	310	333
311		8
515	311	62
312		9
314		9
515	314	61
331		806

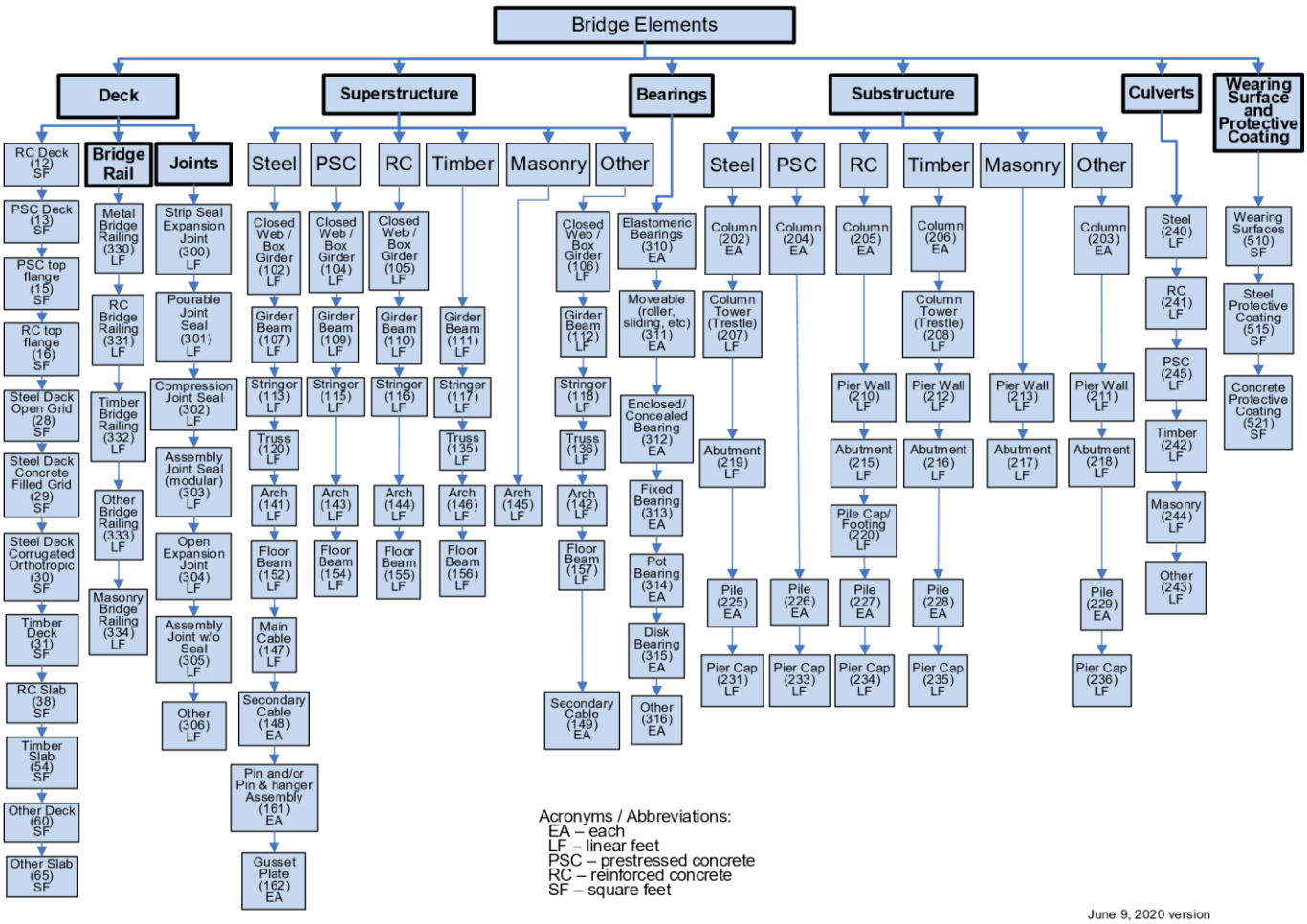


Figure 180. Bridge elements reported to FHWA.

SUBSECTION 7.3: ELEMENT CONDITIONS

The data items in this subsection provide information about the element condition quantity that exists in each of four condition states for the respective elements reported in the Element Identification subsection. These items are considered part of the Elements Data Set and have a many-to-one relationship with a bridge when applicable.

Element data are only required to be reported to FHWA for bridges that carry NHS routes, while reporting is optional for bridges that do not carry NHS routes. Refer to B.F.01 (*Feature Type*), B.F.02 (*Feature Location*), and B.H.03 (*NHS Designation*) for data indicating NHS routes carried on bridges.

Data items for this subsection are reported for each element present on a bridge, and the data for these items may change after each inspection.

The following data items are included in this subsection.

Item ID	Data Item
B.CS.01	Element Quantity Condition State One
B.CS.02	Element Quantity Condition State Two
B.CS.03	Element Quantity Condition State Three
B.CS.04	Element Quantity Condition State Four

Refer to the AASHTO Manual for Bridge Element Inspection (AASHTO MBEI) for element defect and condition state definitions.

Refer to Table 22 or Figure 181 for listing of elements for which data are reported to FHWA. Specific material defects as shown in the AASHTO MBEI are not reported to FHWA.

All elements have four defined condition states. The severity of multiple distress paths or deficiencies is defined in the AASHTO MBEI for each condition state, with the general intent of the condition states as follows: Condition State One (CS1) – Good, Condition State Two (CS2) – Fair, Condition State Three (CS3) – Poor, and Condition State Four (CS4) – Severe.

The sum of the quantities recorded for items B.CS.01 (*Element Quantity Condition State One*), B.CS.02 (*Element Quantity Condition State Two*), B.CS.03 (*Element Quantity Condition State Three*), and B.CS.04 (*Element Quantity Condition State Four*) must equal the quantity recorded in item B.E.03 (*Element Total Quantity*).

Elements that are entirely below ground and not accessible for inspection, such as piles and pile caps/footings, are not intended to be reported until they become exposed and visible for inspection. However, element data can be reported for elements that are not visible for inspection, or may become visible for inspection and are subsequently covered, by reporting the best available data for those elements.

B.CS.01 Element Quantity Condition State One

Format	Frequency	Item ID
N (8,0)	EI	B.CS.01

Specification	Commentary
Report the element quantity assigned to condition state one (CS1 Qty) to the nearest whole unit of measure for each element reported for the bridge.	Refer to the AASHTO MBEI for element defect and condition state definitions. *NDOT Commentary – Element Quantity CS1* *See Chapter 3 EI for NDOT Element inspection guidance.*

Example

Quantities shown in the shaded cells, with italicized text, under column B.CS.01 are the data for the element numbers shown under column B.E.01 in this example.

Element	B.E.01 EN	B.E.02 EPN	B.E.03 Total Qty	B.CS.01 CS1 Qty
RC Deck (ft^2)	12		16217	*0*
Wearing Surface (ft^2)	510	12	15783	*15083*
Open Joint (ft)	304		158	*100*
RC Bridge Railing (ft)	331		412	*360*
Steel Beam/Girder (ft)	107		2054	*1044*
Steel Protective Coating (ft^2)	515	107	15728	*0*
Elastomeric Bearings (each)	310		40	*30*
RC Columns (each)	205		8	*4*
RC Pier Wall (ft)	210		54	*44*
RC Abutment (ft)	215		182	*140*
RC Pier Cap (ft)	234		150	*105*

B.CS.02 Element Quantity Condition State Two

Format	Frequency	Item ID
N (8,0)	EI	B.CS.02

Specification	Commentary
Report the element quantity assigned to condition state two (CS2 Qty) to the nearest whole unit of measure for each element reported for the bridge.	Refer to the AASHTO MBEI for element defects and condition state definitions.

Example

Quantities shown in the shaded cells, with italicized text, under column B.CS.02 are the data for the element numbers shown under column B.E.01 in this example.

Element	B.E.01 EN	B.E.02 EPN	B.E.03 Total Qty	B.CS.01 CS1 Qty	B.CS.02 CS2 Qty
RC Deck (ft^2)	12		16217	0	*16000*
Wearing Surface (ft^2)	510	12	15783	15083	*500*
Open Joint (ft)	304		158	100	*58*
RC Bridge Railing (ft)	331		412	360	*40*
Steel Beam/Girder (ft)	107		2054	1044	*1000*
Steel Protective Coating (ft^2)	515	107	15728	0	*5628*
Elastomeric Bearings (each)	310		40	30	*5*
RC Columns (each)	205		8	4	*4*
RC Pier Wall (ft)	210		54	44	*5*
RC Abutment (ft)	215		182	140	*30*
RC Pier Cap (ft)	234		150	105	*30*

B.CS.03 Element Quantity Condition State Three

Format	Frequency	Item ID
N (8,0)	EI	B.CS.03

Specification	Commentary
Report the element quantity assigned to condition state three (CS3 Qty) to the nearest whole unit of measure for each element reported for the bridge.	Refer to the AASHTO MBEI for element defects and condition state definitions.

Example

Quantities shown in the shaded cells, with italicized text, under column B.CS.03 are the data for the element numbers shown under column B.E.01 in this example.

Element	B.E.01	B.E.02	B.E.03	B.CS.01	B.CS.02	B.CS.03
	EN	EPN	Total Qty	CS1 Qty	CS2 Qty	CS3 Qty
RC Deck (ft^2)	12		16217	0	16000	*217*
Wearing Surface (ft^2)	510	12	15783	15083	500	*0*
Open Joint (ft)	304		158	100	58	*0*
RC Bridge Railing (ft)	331		412	360	40	*12*
Steel Beam/Girder (ft)	107		2054	1044	1000	*10*
Steel Protective Coating (ft^2)	515	107	15728	0	5628	*10000*
Elastomeric Bearings (each)	310		40	30	5	*5*
RC Columns (each)	205		8	4	4	*0*
RC Pier Wall (ft)	210		54	44	5	*5*
RC Abutment (ft)	215		182	140	30	*12*
RC Pier Cap (ft)	234		150	105	30	*15*

B.CS.04 Element Quantity Condition State Four

Format	Frequency	Item ID
N (8,0)	EI	B.CS.04

Specification	Commentary
Report the element quantity assigned to condition state four (CS4 Qty) to the nearest whole unit of measure for each element reported for the bridge.	Refer to the AASHTO MBEI for element defects and condition state definitions.

Example

Quantities shown in the shaded cells, with italicized text, under column B.CS.04 are the data for the element numbers shown under column B.E.01 in this example.

Element	B.E.01	B.E.02	B.E.03	B.CS.01	B.CS.02	B.CS.03	B.CS.04
	EN	EPN	Total Qty	CS1 Qty	CS2 Qty	CS3 Qty	CS4 Qty
RC Deck (ft^2)	12		16217	0	16000	217	*0*
Wearing Surface (ft^2)	510	12	15783	15083	500	0	*200*
Open Joint (ft)	304		158	100	58	0	*0*
RC Bridge Railing (ft)	331		412	360	40	12	*0*
Steel Beam/Girder (ft)	107		2054	1044	1000	10	*0*
Steel Protective Coating (ft^2)	515	107	15728	0	5628	10000	*100*
Elastomeric Bearings (each)	310		40	30	5	5	*0*
RC Columns (each)	205		8	4	4	0	*0*
RC Pier Wall (ft)	210		54	44	5	5	*0*
RC Abutment (ft)	215		182	140	30	12	*0*
RC Pier Cap (ft)	234		150	105	30	15	*0*

Example Element Data Set

This example shows the progression of element data sets considering all inspections performed since the last reporting of data to FHWA and ending with the data set (Table 26) that would be reported to FHWA.

Table 24. Element data set for a complete routine inspection performed since the last reporting of data to FHWA.

B.E.01	B.E.02	B.E.03	B.CS.01	B.CS.02	B.CS.03	B.CS.04
EN	EPN	Total Qty	CS1 Qty	CS2 Qty	CS3 Qty	CS4 Qty
12		16217	0	16000	217	0
510	12	15783	15083	500	0	200
107		2054	1044	1000	10	0
515	107	15728	0	5628	10000	100
205		8	4	4	0	0
210		54	44	5	5	0
215		182	140	30	12	0
234		150	105	30	15	0
304		158	100	58	0	0
310		40	30	5	5	0
331		412	360	40	12	0

Preservation work was completed on the reinforced concrete deck (EN 12) and steel open girder/beam (EN 107). An inspection was performed prior to reporting data to FHWA to update the condition of the following elements: steel protective coating (EN 515), steel open girder/beam (EN 107 - with section loss), reinforced concrete deck (EN 12), new wearing surface (EN 510), and new pourable joints (EN 301). The element data for this inspection is shown in Table 25.

Table 25. Element data collected for a one-time special inspection performed to account for preservation work that occurred after the inspection data shown in Table 24 and prior to reporting data to FHWA.

B.E.01	B.E.02	B.E.03	B.CS.01	B.CS.02	B.CS.03	B.CS.04
EN	EPN	Total Qty	CS1 Qty	CS2 Qty	CS3 Qty	CS4 Qty
12		16217	0	*16217*	*0*	0
510	12	15783	*15783*	*0*	0	*0*
107		2054	*2044*	*0*	10	0
515	107	15728	*15728*	*0*	*0*	*0*
301		158	*158*	*0*	0	0

Cells shaded, with italicized text, in columns B.E.01, B.CS.01, B.CS.02, B.CS.03, and B.CS.04 show changes in data from Table 24.

Table 26. Element data set reported to FHWA reflecting all inspections performed since the last reporting of data to FHWA.

B.E.01	B.E.02	B.E.03	B.CS.01	B.CS.02	B.CS.03	B.CS.04
EN	EPN	Total Qty	CS1 Qty	CS2 Qty	CS3 Qty	CS4 Qty
12		16217	0	*16217*	*0*	0
510	12	15783	*15783*	*0*	0	*0*
107		2054	*2044*	*0*	10	0
515	107	15728	*15728*	*0*	*0*	*0*
301		158	*158*	*0*	0	0
205		8	4	4	0	0
210		54	44	5	5	0
215		182	140	30	12	0
234		150	105	30	15	0
310		40	30	5	5	0
331		412	360	40	12	0

Cells shaded, with italicized text, in columns B.E.01, B.CS.01, B.CS.02, B.CS.03, and B.CS.04 show changes in data from Table 24.

Example Element Conditions Data for Bridge Number 15558X

The following is a description of the elements, their total quantity, and condition state quantities. A table can be found at the end that summarizes the element data for this example.

There is a reinforced concrete deck (EN 12) supported on three continuous spans of steel beams. The deck area is 14,462 ft^2 of which 7,431 ft^2 was determined to be in good condition (CS1) and 7,031 in fair condition (CS2). The deck is protected with 12,550 ft^2 of penetrating sealer (EN 521, EPN 12) of which 5,519 ft^2 was determined to be in fair condition (CS2) and 7,031 ft^2 in poor condition (CS3).

There are four spans of a cast-in-place reinforced concrete voided slab (EN 38). The slab area is 15,340 ft^2 of which 11,474 ft^2 was determined to be in good condition (CS1) and 3,866 ft^2 in fair condition (CS2). The slab is protected with 13,312 ft^2 of micro-silica modified concrete overlay (EN 510, EPN 38) of which 6,812 ft^2 was determined to be in good condition (CS1) and 6,500 ft^2 in fair condition (CS2). The overlay is protected with 13,312 ft^2 of penetrating sealer (EN 521, EPN 510) of which 6,812 ft^2 was determined to be in fair condition (CS2) and 6,500 ft^2 in poor condition (CS3).

There are 806 ft of reinforced concrete bridge railing (EN 331) on the bridge of which 427 ft was determined to be in good condition (CS1) and 379 ft in fair condition (CS2).

There is one strip seal expansion joint (EN 300), near an intermediate support, that is 78 ft measured along the skew. The joint was determined to have 78 ft in poor condition (CS3).

There are three continuous spans with 1,755 ft of W36x135 steel beams (EN 107) of which 1,648 ft was determined to be in good condition (CS1) and 107 ft in fair condition (CS2). The beams have 15,287 ft^2 of steel protective coating (EN 515, EPN 107) of which 10,609 ft^2 was determined to be in good condition (CS1), 4,628 ft^2 in fair condition (CS2), and 50 ft^2 in severe condition (CS4).

There are eight movable bearings (EN 311) at one abutment of which eight have been determined to be in fair condition (CS2). The movable bearings have 62 ft^2 of steel protective coating (EN 515, EPN 311) of which 32 ft^2 has been determined to be in fair condition (CS2) and 30 ft^2 in severe condition (CS4).

There are 27 elastomeric bearings (EN 310), nine at each of the three intermediate substructure units, of which 14 were determined to be in good condition (CS1) and 13 in fair condition (CS2). Each bearing includes steel bolsters (risers). The bearings have 333 ft^2 of steel protective coating (EN 515, EPN 310) of which 233 ft^2 was determined to be in fair condition (CS2) and 100 ft^2 in severe condition (CS4).

There is one semi-integral abutment with nine elastomeric bearings. Each bearing includes steel bolsters (risers) with a steel protective coating. Since the abutment is semi-integral, the bearings have been cast in concrete and therefore concealed (EN 312). The bearings were determined to be in good condition (CS1).

There are nine pot bearings (EN 314) at an intermediate support of which nine were determined to be in fair condition (CS2). The pot bearings have 61 ft^2 of steel protective coating (EN 515, EPN 314) of which 31 ft^2 was determined to be in fair condition (CS2) and 30 ft^2 in severe condition (CS4).

There are 230 ft of reinforced concrete abutments (EN 215) of which 117 ft was determined to be in good condition (CS1) and 113 ft in fair condition (CS2).

There are 122 ft of reinforced concrete pier wall (EN 210) that serves as a crash wall near the railroad tracks of which 122 ft was determined to be in good condition (CS1).

There are 21 reinforced concrete columns (EN 205) of which 14 were determined to be in good condition (CS1) and seven in fair condition (CS2).

There are 223 ft of reinforced concrete pier cap (EN 234) of which 223 ft was determined to be in good condition (CS1).

No piles, pile caps, or footings were exposed and visible for inspection so these elements do not need to be reported.

In Table 27, Item B.E.02 (EPN) is not reported for elements under column B.E.01 (EN) where cells are shaded, with no text, under column B.E.02 (EPN).

Table 27. Data items in the Elements Data Set for Bridge Number 15558X.

B.E.01	B.E.02	B.E.03	B.CS.01	B.CS.02	B.CS.03	B.CS.04
EN	EPN	Total Qty	CS1 Qty	CS2 Qty	CS3 Qty	CS4 Qty
12		14462	7431	7031	0	0
521	12	12550	0	5519	7031	0
38		15340	11474	3866	19	0
510	38	13312	6812	6500	0	0
521	510	13312	0	6812	6500	0
107		1755	1648	107	0	0
515	107	15287	10609	4628	0	50
205		21	14	7	0	0
210		122	122	0	0	0
215		230	117	113	0	0
234		223	223	0	0	0
300		78	0	0	78	0
310		27	14	13	0	0
515	310	333	0	233	0	100
311		8	0	8	0	0
515	311	62	0	32	0	30
312		9	9	0	0	0
314		9	0	9	0	0
515	314	61	0	31	0	30
331		806	427	379	0	0

SUBSECTION 7.4: APPRAISAL

The data items in this subsection provide information about potential bridge vulnerabilities. These data items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been initially inventoried and inspected, or verified during subsequent inspections.

The following data items are included in this subsection.

Item ID	Data Item
B.AP.01	Approach Roadway Alignment
B.AP.02	Overtopping Likelihood
B.AP.03	Scour Vulnerability
B.AP.04	Scour Plan of Action
B.AP.05	Seismic Vulnerability

B.AP.01 Approach Roadway Alignment

Format	Frequency	Item ID
AN (1)	EI	B.AP.01

Specification	Commentary
Report the speed reduction at the bridge using one of the following codes. Code – Description G – Good F – Fair P – Poor	This item identifies bridges that do not function adequately due to the horizontal or vertical alignment of the bridge and approach roadway. It is not intended that the alignment be compared to current standards, but rather to the existing roadway alignment. The basic criterion is how the alignment of the bridge and approach roadway relates to the general highway alignment for the section of highway the bridge carries.

Commentary Continued

Do not consider speed reductions due to the bridge width or intersecting highways when reporting this item.

The posted speed at the bridge is compared to the posted speed of the general highway segment. Operating speed at the bridge is used in place of posted speed at the bridge when a posted speed is not present at the bridge. Operating speed of the general highway segment is used in place of posted speed of the general highway segment when a posted speed is not present on the general highway segment.

Use code G when the speed is no different at the bridge than the rest of the highway segment that crosses the bridge.

Use code F when the speed is noticeably different at the bridge than the rest of the highway segment that crosses the bridge.

Use code P when the speed is substantially different at the bridge than the rest of the highway segment that crosses the bridge.

B.AP.02 Overtopping Likelihood

Format	Frequency	Item ID
AN (1)	EI	B.AP.02

Specification

Report the likelihood of the waterway overtopping the bridge using one of the following codes.

Code	Description
0	Never
1	Remote – once every 100 years or less frequently
2	Very low – once every 51 to 99 years
3	Low – once every 26 to 50 years
4	Moderate – once every 11 to 25 years
5	High – once every 3 to 10 years
6	Very High – once every 2 years or more frequently

Do not report this item if the bridge does not cross over a waterway as indicated in Item B.F.01 (*Feature Type*).

Commentary

An overtopping occurrence is when the waterway overtops the riding surface carried on the bridge.

Bridge overtopping likelihood, since the year built (B.W.01), is typically determined from historical bridge inspection or maintenance records, hydraulic studies, local residents/landowners, and/or site indicators including highwater marks on the bridge or its surroundings, debris remains on bridge upper members, etc.

For newer bridges with limited historical inspection or maintenance information, hydraulic design information can be used to establish an overtopping likelihood.

This item does not apply to the likelihood of the waterway overtopping approach roadways.

B.AP.03 Scour Vulnerability

Format	Frequency	Item ID
AN (1)	I	B.AP.03

Specification

Report the scour vulnerability of the bridge using one of the following codes.

Code	Description
0	Scour appraisal has not been completed.
A	Scour appraisal completed. Bridge determined to be stable for scour.
B	Scour appraisal completed. Bridge determined to be stable for scour, dependent upon designed, and functioning countermeasures.
C	Scour appraisal completed. Bridge could become unstable for scour. Temporary (not designed) countermeasure installed to mitigate scour. Bridge is scour critical.
D	Scour appraisal completed. Bridge is, or may become, unstable for scour. Bridge is scour critical.
E	Scour appraisal has not been completed. Temporary (not designed) countermeasure installed to mitigate scour.
U	Scour appraisal has not been completed due to unknown foundations.

Do not report this item if the bridge does not cross over a waterway as indicated in Item B.F.01 (*Feature Type*).

Commentary

The intent of this item is to report the status and vulnerability determination from scour appraisals required by the NBIS.

The codes for this item are based on the appraised scour vulnerability as described in HEC-18, Evaluating Scour at Bridges; HEC-23, Bridge Scour and Stream Instability Countermeasures; and HEC-20, Stream Stability at Highway Structures.

Scour appraisals are typically performed by a multidisciplinary team of hydraulic, geotechnical, and structural engineers (Scour Appraisal Team).

FHWA Hydraulic Technical Advisories, manuals, and software can be found at: https://www.fhwa.dot.gov/engineering/hydraulics/index.cfm.

Refer to item B.C.11 (*Scour Condition Rating*) in the Component Condition Ratings subsection to address field observed scour conditions and the effect on bridge components.

Use code B when designed, installed, and functioning countermeasures are used to address potential scour and to maintain bridge stability for new or existing bridges, or bridges with unknown foundations.

Use code B when the Scour Appraisal Team determines that the in-place, non-designed countermeasures are fully functioning and are appropriate to mitigate the risk of scour.

Use code C for bridges that could become unstable for the potential scour, and temporary countermeasures are installed that were not designed.

NDOT Commentary – Scour Vulnerability

All bridges over waterways are to be evaluated for scour vulnerability by an interdisciplinary scour assessment team (ISAT) as described in Chapter 6 to determine their vulnerability to failure during flood events. Scour assessment is completed following FHWA Technical Advisory T 5140.23 and Hydraulic Engineering Circular (HEC) 18. The assessment is for all substructure elements of the abutments and wings, including but not limited to, steel and concrete piling, timber planking, and poured concrete walls.

For each scour critical bridge and bridges with unknown foundations that do not have designed or functioning scour countermeasures, a Scour Plan of Action (B.AP.04) must be developed (see FHWA Technical Advisory T 5140.23, HEC 18 and HEC 23).

The ISAT assigns a code for Item B.AP.03. The inspector for each routine inspection of a bridge over water does not assign a code for Item B.AP.03; however, they will assign/review codes for Items B.C.09, B.C.10 and B.C.11 which record conditions found by the inspector and flag scour issues for the ISAT. There are additional scour-related items described in Chapter 3 NE.

Substructure Condition (B.C.03) is independent of Scour Vulnerability. A bridge may be vulnerable to scour and have a substructure in any condition.

B.AP.04 Scour Plan of Action

Format	Frequency	Item ID
AN (1)	I	B.AP.04

Specification

Report whether the bridge has a scour plan of action (POA) implemented using one of the following codes.

Code	Description
0	A scour POA is not required.
N	A scour POA is required, but not implemented.
Y	A scour POA is required and implemented.

Do not report this item if the bridge does not cross over a waterway as indicated in Item B.F.01 (*Feature Type*).

Commentary

The NBIS requires a scour POA for bridges over water that are determined to be scour critical or have unknown foundations.

More information on scour POA can be found at the FHWA Hydraulics Engineering website: https://www.fhwa.dot.gov/engineering/hydraulics/bridgehyd/poa.cfm.

Use code 0 if a bridge was considered scour critical, but now has designed, installed, and fully functional scour countermeasures.

A scour POA is a document that addresses, based on risk, a schedule for repair or installation of scour countermeasures, and/or the monitoring, inspection, closing, and opening a bridge to traffic during and after flood events to protect the traveling public.

A scour POA is implemented when those responsible for actions under the plan are aware of their responsibilities, and are exercising them when called for during or after a triggering event.

A bridge should have a scour POA when it could become unstable for scour, and temporary countermeasures are installed that were not designed.

B.AP.05 Seismic Vulnerability

Format	Frequency	Item ID
AN (1)	I	B.AP.05

Specification	Commentary
Report the seismic vulnerability of the bridge using one of the following codes. Code – Description 0 – Seismic evaluation not completed N – Bridge does not require seismic evaluation due to low anticipated ground motion or agency prioritization. A – Seismic evaluation completed. Bridge determined to meet the agency's performance criteria established for the evaluation without need for retrofit. B – Seismic evaluation completed. Satisfactory performance is dependent upon a designed, installed, and functioning retrofit. Retrofit is in place. C – Seismic evaluation completed. Satisfactory performance is dependent upon a designed, installed, and functioning retrofit. Partial retrofit is in place. D – Seismic evaluation completed. Satisfactory performance is dependent upon a designed, installed, and functioning retrofit. Retrofit is not in place.	This item provides available information resulting from seismic evaluation and retrofit programs that an agency may have performed of their own volition. The codes allow for a broad interpretation based on the reporting agency's methods and evaluation criteria. In lieu of agency-developed evaluation criteria, refer to the FHWA Seismic Retrofitting Manual for Highway Structures: Part 1 – Bridges, Publication No. FHWA-HRT-06-032, January 2006, for guidance on assessing the vulnerability of highway structures to the effects of earthquakes, and implementing retrofit measures to improve performance. Use code A when bridge is designed to meet applicable performance criteria established by the design specifications in effect at the time of construction and bridge would be expected to meet current agency established performance criteria. Use code C when only certain portions of the bridge have been retrofitted but not all portions of the bridge have been retrofitted to meet agency performance criteria.

Example Appraisal Data for Bridge Number 15558X

The operating speed of vehicles is noticeably different at the bridge than the rest of the highway segment that crosses the bridge. Report F for Item B.AP.01 (*Approach Roadway Alignment*).



Figure 181. Approach roadway for Bridge Number 15558X, looking south.



Figure 182. Approach roadway with speed limit sign for Bridge Number 15558X, looking north.

The bridge deck is well above expected and historical flood elevations and is anticipated to never be overtopped. Report 0 for Item B.AP.02 (*Overtopping Likelihood*).

A scour appraisal has been completed for the bridge and the bridge has been determined to be stable for scour. Therefore, the bridge does not require a scour plan of action. Report A for Item B.AP.03 (*Scour Vulnerability*). Report 0 for Item B.AP.04 (*Scour Plan of Action*).

The bridge is in a seismically vulnerable area and had a seismic evaluation completed using agency criteria. The bridge has been retrofitted with designed, installed, and functioning earthquake restrainer assemblies. Report B for Item B.AP.05 (*Seismic Vulnerability*).

Table 28. Appraisal data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.AP.01	*Approach Roadway Alignment*	F
B.AP.02	*Overtopping Likelihood*	0
B.AP.03	*Scour Vulnerability*	A
B.AP.04	*Scour Plan of Action*	0
B.AP.05	*Seismic Vulnerability*	B

SUBSECTION 7.5: WORK EVENTS

The data items in this subsection provide information about the year the bridge was built, and subsequent work performed on the bridge. These items provide information to assist in identifying the age of the bridge, substantiate condition rating changes, and assess service life.

Item B.W.01 (*Year Built*) is considered part of the Primary Data Set and has a one-to-one relationship with a bridge. The data for this item typically remain static once a bridge has been inventoried.

Items B.W.02 (*Year Work Performed*) and B.W.03 (*Work Performed*) are considered part of the Work Data Set and have a many-to-one relationship with a bridge. These items are reported for each year regardless of whether work was completed in that year. Reporting work events that were accepted into the NBI in prior years is not required unless it is found that the accepted data were incomplete or incorrect. To correct previously submitted work data for a given year, report a new complete work data set representative of that year.

The following data items are included in this subsection.

Item ID	**Data Item**
B.W.01	Year Built
B.W.02	Year Work Performed
B.W.03	Work Performed

B.W.01 Year Built

Format	Frequency	Item ID
N (4,0)	I	B.W.01

Specification	Commentary
Report the year in which original construction was completed and the bridge was able to carry traffic. For phased construction, report the year in which the first phase was completed and the bridge was able to carry traffic.	This date reflects the date when construction was completed, regardless of when the bridge was opened to traffic. Rehabilitation and/or widening of a bridge does not change the year built. If any portion of the bridge remains, the year built does not change. Provide a best estimate when the year built is unknown; do not assign a default value.

B.W.02 Year Work Performed

Format	Frequency	Item ID
N (4,0)	I	B.W.02

Specification	Commentary
Report the year that work was completed on a bridge. For phased construction, report the year in which the first phase was completed and the bridge was able to carry traffic. This item is reported for each year regardless of whether work was completed on a bridge in that year.	This item identifies when work was completed to improve the functionality of a bridge, prevent deterioration from occurring, preserve a bridge, or restore the strength or performance of a bridge. Work performed should be identifiable by inspectors conducting an initial inspection following bridge replacement or rehabilitation. For other work types, information can be obtained from work tracking systems. When tracking systems are not readily accessible, estimate based on knowledge, observed changes and condition improvements since the previous inspection, applied stencils or stamps, wear, etc.

Examples

A lane was added in 2016 during a corridor widening project. Report 2016.

The deck, superstructure, railing, deck joints, and bearings were replaced on existing abutments in 2017. Report 2017.

All bearings and two of three deck joints were replaced in 2015. Report 2015.

Major rehabilitation was performed on a deck in multiple stages. The first stage was completed and opened to traffic in 2018. The final stage was completed in 2020. Report 2018.

B.W.03 Work Performed

Format	Frequency	Item ID
AN (120)	I	B.W.03

Specification

Report all work completed on the bridge in each year, using one or more of the codes shown in the work category tables below.

Report multiple codes separated by pipe (|) delimiters.

Report all types of work when improvement, rehabilitation, or preservation work categories were performed in combination (one or more work types from Table 30, 31, 32, and/or 33).

Do not report bridge improvement or bridge preservation (Table 30, 32, or 33) when the work resulted from replacement of a bridge (including replacement of all culvert barrels), or replacement of the deck, superstructure, or substructure, (Table 29 or Table 31 replacement work types).

Report only major rehabilitation when both major and minor rehabilitation were completed on the same component (e.g. the deck, superstructure, substructure, or culvert).

Do not report routine maintenance or routine repair.

Report 0 when no work is completed or when work is completed that does not correspond with the work included in the following work category tables.

Table 29. Bridge replacement code.

Code	Description
BR1	Replaced

Table 30. Bridge improvement codes.

Code	Description
IP1	Widened
IP2	Raised
IP3	Strengthened by retrofit
IP4	Seismic retrofit

Table 31. Rehabilitation codes for deck, superstructure, substructure, and culvert.

Code				Description
Deck	Superstructure	Substructure	Culvert	
DK1	SP1	SB1		Replaced
DK2	SP2	SB2	CU2	Major Rehabilitation
DK3	SP3	SB3	CU3	Minor Rehabilitation

Specification Continued – Work Performed

Table 32. Preservation codes for deck, superstructure, substructure, and culvert.

Code				Description
Deck	Superstructure	Substructure	Culvert	
DK4			CU4	Overlaid
DK5	SP5	SB5	CU5	Sealed
DK6	SP6	SB6	CU6	Coating (New or Replaced)
DK7	SP7	SB7	CU7	Coating (Preserved)

Table 33. Other preservation codes.

Code						Description
Bearings	Deck Joints	Bridge Railings or Transitions	Scour Countermeasures	Channel Protection	Channel	
BG1	JT1	RT1	SC1	CP1		Installed or Replaced
BG2	JT2	RT2	SC2	CP2		Repaired
					CH1	Condition Improved

Commentary – Work Performed

This item is used to indicate work that was completed to improve the functionality of a bridge, prevent deterioration from occurring, preserve a bridge, or restore the strength or performance of a bridge.

Use deck, superstructure, and substructure work codes as applicable, and only when work is performed on span configurations that are not reported as culverts in Item B.SP.01 (*Span Configuration Designation*); i.e. M, A, or W is reported. Use culvert work codes as applicable, and only when work is performed on span configurations that are reported as culverts in Item B.SP.01 (*Span Configuration Designation*); i.e. C or V is reported.

Routine maintenance or routine repair work to be excluded from reporting include actions that may be performed on isolated deficiencies, may be reactive in nature, and do not add measurable service life given the small work quantity. Instead, they are intended to maintain a minimum acceptable performance level. Generally, routine maintenance or routine repair does not improve component condition ratings. Examples of routine maintenance or routine repairs that are not reported are: deck patching to correct isolated spalls or punctures that are affecting rideability or safety, sidewalk repairs to correct isolated defects that affect public safety, and repair of isolated impact damage to railings or transitions.

Work performed should be identifiable by inspectors conducting an initial inspection following bridge replacement or rehabilitation. For other work types, information can be obtained from work tracking systems. When tracking systems are not readily accessible, estimate based on knowledge, observed changes and condition improvements since the previous inspection, applied stencils or stamps, wear, etc.

Use code BR1 (Table 29) when the bridge is replaced and the same bridge number is retained. This item is generally not reported when a bridge is replaced, because it is preferable that a new bridge number is assigned.

Commentary Continued – Work Performed

Use code BR1 when all barrels of a culvert were replaced and the same bridge number is retained.

Use codes IP1, IP2, IP3, and IP4 (Table 30) for functional and seismic improvements. Use code IP3 when the bridge was retrofitted to increase its load capacity beyond the original design capacity.

Use codes DK1, SP1, and SB1 (Table 31) for replacement of the deck, superstructure, and substructure, respectively. Use these codes only when the whole component on the bridge is replaced.

Use codes DK2, SP2, SB2, and CU2 (Table 31) for major rehabilitation work. Major rehabilitation is defined as the major work required to restore the structural integrity or serviceability of a bridge as well as the work to correct major safety defects. These codes also apply when one or more spans, barrels, or units were replaced, but not all.

Use codes DK3, SP3, SB3, and CU3 (Table 31) for minor rehabilitation work, not to include minor repairs. Minor rehabilitation is defined as minor work required to preserve or restore the structural integrity or serviceability of a bridge, as well as the work to correct minor safety defects. For this specification, it generally should include work that affects no more than 25 percent of the deck area within any span, or 25 percent of any one substructure unit or culvert barrel.

Use codes CU2 or CU3, as applicable, when culvert invert paving or encasement restores strength or performance, although it may also prevent deterioration.

Use deck, superstructure, substructure, and culvert preservation codes (Table 32) for preventive maintenance and preservation work that may also include some minor repairs.

Use code DK4 (Table 32) for overlay work. Also use codes DK2 or DK3 (Table 31), if applicable based on quantity, when work includes exposing the top mat of deck reinforcing steel.

Use codes SP7, SB7, and CU7 (Table 32) when zone coating, spot coating, or overcoating was applied to repair and extend the life of existing coatings.

Use codes CU6 or CU7, as applicable, for culvert pipe invert paving or encasement intended only to prevent deterioration.

Use codes CP1 or CP2 (Table 33) when channel protection work was completed at or adjacent to the bridge to mitigate channel issues that may impact the bridge.

Use code CH1 (Table 33) when the channel was improved by means other than protection systems or in addition to protection systems (e.g. horizontal realignment, excavation of aggregated material, or removal of large debris deposits). Use this code when work was completed at or adjacent to the bridge to mitigate channel issues that may impact the bridge.

Examples – Work Performed
A lane was added during a corridor widening project. Report IP1. A low-build surface sealer was placed on the deck, and deck joints were repaired. Report DK5|JT2. The deck, superstructure, railing, deck joints, and bearings were replaced on existing abutments. Report DK1|SP1 since the railing, deck joints, and bearing replacement resulted from the deck and superstructure replacement. The deck concrete was removed to just below the top mat of reinforcing steel over 35 percent of the deck area, the deck was patched and overlaid with a thin epoxy, and the superstructure coating was removed and replaced. Report DK2|DK4|SP6. Girder end reinforcement plates were added to restore strength at 20% of the girder ends in one of three spans. Report SP3. All bearings and two of three deck joints were replaced. Report BG1|JT1. All bearings were replaced, two of three deck joints were replaced, and one deck joint was repaired. Report BG1|JT1|JT2. The far masonry abutment had work performed to correct a local scour hole and the settled and displaced bottom course of masonry stone. The masonry was repositioned and underpinned and a designed riprap scour countermeasure was installed around the abutment. Report SB3|SC1. One of six HDPE pipes was replaced, and the remaining pipes had all transverse joints repaired with inner concrete collars. Report CU2 since this work includes both major and minor rehabilitation on the same component. Girders had minor rehabilitation to restore multiple locations with section loss, the coating was replaced, and bolted cover plates were added to increase strength beyond the original design capacity. Report SP3|SP6|IP3.

Example Work Events Data for Bridge Number 15558X

Original bridge construction was completed in 1974. The superstructure coating was replaced and the deck was replaced and opened to traffic in the fall of 2015. A thin epoxy overlay was applied to the recently replaced deck during the following spring of 2016. No work was completed in 2017.

Table 34. Work Events data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.W.01	*Year Built*	1974

Table 35. Work Events data items in the Work Data Set for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)
B.W.02	*Year Work Performed*	2015	2016	2017
B.W.03	*Work Performed*	SP6|DK1	DK4	0

QUALITY CONTROL

The NBIS defines Quality Control (QC) as "procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level."

Quality Control is defined for NDOT's program as a system of routine technical activities, to measure and control the quality of the bridge inventory data or report as it is being developed. The QC system is designed to include general methods such as accuracy checks on data acquisition and calculations, and the use of approved standardized procedures for measurement, calculation, recording information and reporting. QC activities include:

- Documents, data, or calculations signed by a PE, must have QC completed by an individual of equivalent or better qualifications than the originator (this is typically documented when the QC individual signs or initials the documents);
- See that the technical activity has followed procedures set by NDOT;
- Providing routine and consistent checks for data integrity, correctness and completeness;
- Identifying and address errors and/or omissions;
- Documenting inventory data;
- Recording all QC activities.

Quality Control for this program is the responsibility of the consultant or agency actually conducting the activity. Quality Control checks are conducted on every product of a program operation, and thus at a much higher frequency than quality assurance checks. When the QC on a program product is complete, it is finished and deliverable to the Bridge Owner for their records.

Consultants providing professional services to Bridge Owners must submit a Quality Control plan to the Bridge Owner for review and approval. QC must be done on the deliverables prior to submittal to the Bridge Owner.

NDOT completes QC on data that has been entered into the BrM database on a continual basis.

QUALITY ASSURANCE

Quality Assurance (QA) of all load rating data in the Bridge Inventory will be performed by NDOT or their selected agent. The QA program activities are described in Chapter 1 of this Manual.

REVISION HISTORY

Rev	Date	Description
0	2010 January 25	Initial Issue of Chapter
1	2011 November 01	Revision 1
2	2013 March 04	Revision 2
3	2015 March 15	Revision 3
4	2016 March 11	Revision 4
5	2017 March 16	Revision 5
6	2018 March	Revision 6
7	2020 March	Revision 7
8	2025 July	Revision 8 – SNBI Compliance

FORMS

Forms used in completing inspections that are mentioned in this Chapter are listed below. Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOT Bridge Inspection Program website at http://dot.nebraska.gov/business-center/bridge/inspection/ for the current list of applicable forms and the most recent versions of each form.

Name	DR Form
Structural Inventory and Appraisal	N/A

ADDITIONAL GUIDANCE

Memos, bulletins and other guidance that may have been issued after the issuance of the current revision of this Chapter can be found at the NDOT Bridge Inspection Program website at http://dot.nebraska.gov/business-center/bridge/inspection/

Participants are urged to check this site to ensure they have all the most current information and forms.

APPENDIX A: COMPREHENSIVE EXAMPLE DATA SETS & DATA ITEMS FOR BRIDGE NUMBER 15558X

Shaded cells in the following tables indicate when data items are not reported or left blank according to the data item specifications.

Table 36. Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.ID.01	*Bridge Number*	15558X
B.ID.02	*Bridge Name*	North Hanley Road Bridge
B.ID.03	*Previous Bridge Number*	0
B.L.01	*State Code*	29
B.L.02	*County Code*	189
B.L.03	*Place Code*	4906
B.L.04	*Highway Agency District*	5
B.L.05	*Latitude*	38.755356
B.L.06	*Longitude*	-90.334486
B.L.07	*Border Bridge Number*	N
B.L.08	*Border Bridge State or Country Code*	
B.L.09	*Border Bridge Inspection Responsibility*	
B.L.10	*Border Bridge Designated Lead State*	
B.L.11	*Bridge Location*	0.4 miles north on N Hanley Rd from intersection with Airport Rd
B.L.12	*Metropolitan Planning Organization*	East-West Gateway Council of Governments
B.CL.01	*Owner*	L01
B.CL.02	*Maintenance Responsibility*	L01
B.CL.03	*Federal or Tribal Land Access*	N
B.CL.04	*Historic Significance*	N
B.CL.05	*Toll*	N
B.CL.06	*Emergency Evacuation Designation*	N
B.RH.01	*Bridge Railings*	3504
B.RH.02	*Transitions*	S92
B.G.01	*NBIS Bridge Length*	400.6
B.G.02	*Total Bridge Length*	407.6
B.G.03	*Maximum Span Length*	75.0
B.G.04	*Minimum Span Length*	45.0
B.G.05	*Bridge Width Out-to-Out*	73.8
B.G.06	*Bridge Width Curb-to-Curb*	64.0
B.G.07	*Left Curb or Sidewalk Width*	3.5
B.G.08	*Right Curb or Sidewalk Width*	3.5
B.G.09	*Approach Roadway Width*	66.7
B.G.10	*Bridge Median*	0

Item ID	Data Item	Value
B.G.11	*Skew*	45
B.G.12	*Curved Bridge*	N
B.G.13	*Maximum Bridge Height*	38
B.G.14	*Sidehill Bridge*	N
B.G.15	*Irregular Deck Area*	
B.G.16	*Calculated Deck Area (Determined by FHWA*)*	30080.9*
B.LR.01	*Design Load*	HS20
B.LR.02	*Design Method*	ASD
B.LR.03	*Load Rating Date*	20160214
B.LR.04	*Load Rating Method*	LFR
B.LR.05	*Inventory Load Rating Factor*	0.30
B.LR.06	*Operating Load Rating Factor*	0.50
B.LR.07	*Controlling Legal Load Rating Factor*	0.44
B.LR.08	*Routine Permit Loads*	C
B.IR.01	*NSTM Inspection Required*	N
B.IR.02	*Fatigue Details*	N
B.IR.03	*Underwater Inspection Required*	N
B.IR.04	*Complex Feature*	N
B.C.01	*Deck Condition Rating*	6
B.C.02	*Superstructure Condition Rating*	5
B.C.03	*Substructure Condition Rating*	6
B.C.04	*Culvert Condition Rating*	N
B.C.05	*Bridge Railings Condition Rating*	7
B.C.06	*Bridge Railing Transitions Condition Rating*	7
B.C.07	*Bridge Bearings Condition Rating*	4
B.C.08	*Bridge Joints Condition Rating*	2
B.C.09	*Channel Condition Rating*	5
B.C.10	*Channel Protection Condition Rating*	6
B.C.11	*Scour Condition Rating*	9
B.C.12	*Bridge Condition Classification (Determined by FHWA*)*	F*
B.C.13	*Lowest Condition Rating Code (Determined by FHWA*)*	5*
B.C.14	*NSTM Inspection Condition*	
B.C.15	*Underwater Inspection Condition*	
B.AP.01	*Approach Roadway Alignment*	F
B.AP.02	*Overtopping Likelihood*	0
B.AP.03	*Scour Vulnerability*	A
B.AP.04	*Scour Plan of Action*	0
B.AP.05	*Seismic Vulnerability*	B
B.W.01	*Year Built*	1974

Table 37. Features Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)	Value (5)
B.F.01	*Feature Type*	H01	H02	R01	W01	P01
B.F.02	*Feature Location*	C	B	B	B	C
B.F.03	*Feature Name*	North Hanley Road	Wabash Ave.	BNSF RR	Berkeley Branch Coldwater Creek	Sidewalk east and west sides
B.H.01	*Functional Classification*	3	7			
B.H.02	*Urban Code*	77770	77770			
B.H.03	*NHS Designation*	Y	N			
B.H.04	*National Highway Freight Network*	N	N			
B.H.05	*STRAHNET Designation*	N	N			
B.H.06	*LRS Route ID*	N	N			
B.H.07	*LRS Mile Point*					
B.H.08	*Lanes On Highway*	4	2			
B.H.09	*Annual Average Daily Traffic*	8376	300			
B.H.10	*Annual Average Daily Truck Traffic*	838	45			
B.H.11	*Year of Annual Average Daily Traffic*	2014	2014			
B.H.12	*Highway Maximum Usable Vertical Clearance*	99.9	22.4			
B.H.13	*Highway Minimum Vertical Clearance*	99.9	21.7			
B.H.14	*Highway Minimum Horizontal Clearance, Left*		0			
B.H.15	*Highway Minimum Horizontal Clearance, Right*		7.6			
B.H.16	*Highway Maximum Usable Surface Width*	64	22			
B.H.17	*Bypass Detour Length*	1	999			
B.H.18	*Crossing Bridge Number*					
B.RR.01	*Railroad Service Type*			F		
B.RR.02	*Railroad Minimum Vertical Clearance*			23.4		
B.RR.03	*Railroad Minimum Horizontal Offset*			14.0		
B.N.01	*Navigable Waterway*				N	
B.N.02	*Navigation Minimum Vertical Clearance*					
B.N.03	*Movable Bridge Maximum Navigation Vertical Clearance*					
B.N.04	*Navigation Channel Width*					
B.N.05	*Navigation Channel Minimum Horizontal Clearance*					
B.N.06	*Substructure Navigation Protection*					

Table 38. Routes Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)
B.RT.01	*Route Designation*	R01	R01
B.RT.02	*Route Number*	0	0
B.RT.03	*Route Direction*	NS	EW
B.RT.04	*Route Type*	5	5
B.RT.05	*Service Type*	1	1

Table 39. Span Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)
B.SP.01	*Span Configuration Designation*	M01	M02	M03
B.SP.02	*Number of Spans*	3	1	3
B.SP.03	*Number of Beam Lines*	1	1	9
B.SP.04	*Span Material*	C01	C01	S01
B.SP.05	*Span Continuity*	2	4	2
B.SP.06	*Span Type*	S02	S02	G02
B.SP.07	*Span Protective System*	S02	S02	C01
B.SP.08	*Deck Interaction*	IM	IM	CU
B.SP.09	*Deck Material and Type*	C01	C01	C01
B.SP.10	*Wearing Surface*	C06	C06	C01
B.SP.11	*Deck Protective System*	C02	C02	C02
B.SP.12	*Deck Reinforcing Protective System*	S02	S02	C01
B.SP.13	*Deck Stay-In-Place Forms*	0	0	0

Table 40. Substructure Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)	Value (5)
B.SB.01	*Substructure Configuration Designation*	A01	A02	P01	P02	P03
B.SB.02	*Number of Substructure Units*	1	1	3	2	1
B.SB.03	*Substructure Material*	C01	C01	C01	C01	C01
B.SB.04	*Substructure Type*	A02	A05	B01	B02	B01
B.SB.05	*Substructure Protective System*	0	0	0	0	0
B.SB.06	*Foundation Type*	S02	S02	S02	S02	S02
B.SB.07	*Foundation Protective System*	0	0	0	0	0

Table 41. Posting Status Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)
B.PS.01	*Load Posting Status*	PD	PP	PM	PP
B.PS.02	*Posting Status Change Date*	20160214	20160415	20160723	20160905

Table 42. Posting Evaluation Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)	Value (3)	Value (4)	Value (5)	Value (6)	Value (7)	Value (8)	Value (9)
B.EP.01	*Legal Load Configuration*	3	3S2	3-3	SU4	SU5	SU6	SU7	EV2	EV3
B.EP.02	*Legal Load Rating Factor*	0.66	0.69	0.77	0.58	0.53	0.48	0.44		
B.EP.03	*Posting Type*	T	T	T	T	T	T	T	T	T
B.EP.04	*Posting Value*	15	25	30	15	15	15	15	15	15

Table 43. Inspections Data Sets for Bridge Number 15558X.

Item ID	Data Item	Value (1)	Value (2)
B.IE.01	*Inspection Type*	2	7
B.IE.02	*Inspection Begin Date*	20160317	20160401
B.IE.03	*Inspection Completion Date*	20160318	20160401
B.IE.04	*Nationally Certified Bridge Inspector*	29KFF007	
B.IE.05	*Inspection Interval*	24	12
B.IE.06	*Inspection Due Date (Calculated by FHWA*)*	20180318*	20170401*
B.IE.07	*Risk-Based Inspection Interval Method*	1	N
B.IE.08	*Inspection Quality Control Date*	20160325	20160408
B.IE.09	*Inspection Quality Assurance Date*	20170317	
B.IE.10	*Inspection Data Update Date*	20160325	20160408
B.IE.11	*Inspection Note*		Inspected active cathodic protection system on spans 1 to 4. System operational.
B.IE.12	*Inspection Equipment*	A1|A11|I3	A1|IX

Table 44. Elements Data Sets for Bridge Number 15558X.

Item ID	B.E.01	B.E.02	B.E.03	B.CS.01	B.CS.02	B.CS.03	B.CS.04
Data Item	*Element Number*	*Element Parent Number*	*Element Total Quantity*	*Element Quantity Condition State One*	*Element Quantity Condition State Two*	*Element Quantity Condition State Three*	*Element Quantity Condition State Four*
Value (1)	12		14462	7431	7031	0	0
Value (2)	521	12	12550	0	5519	7031	0
Value (3)	38		15340	11474	3866	19	0
Value (4)	510	38	13312	6812	6500	0	0
Value (5)	521	510	13312	0	6812	6500	0
Value (6)	107		1755	1648	107	0	0
Value (7)	515	107	15287	10609	4628	0	50
Value (8)	205		21	14	7	0	0
Value (9)	210		122	122	0	0	0
Value (10)	215		230	117	113	0	0
Value (11)	234		223	223	0	0	0
Value (12)	300		78	0	0	78	0
Value (13)	310		27	14	13	0	0
Value (14)	515	310	333	0	233	0	100
Value (15)	311		8	0	8	0	0
Value (16)	515	311	62	0	32	0	30
Value (17)	312		9	9	0	0	0
Value (18)	314		9	0	9	0	0
Value (19)	515	314	61	0	31	0	30
Value (20)	331		806	427	379	0	0

Table 44 formatting is different than other tables for page fit purposes and indicates multiple element entries for a bridge.

Table 45. Work Data Sets for Bridge Number 15558X.

Item ID	**Data Item**	**Value (1)**	**Value (2)**	**Value (3)**
B.W.02	*Year Work Performed*	2015	2016	2017
B.W.03	*Work Performed*	SP6|DK1	DK4	0

APPENDIX B: INDEXES - DATA SETS, SECTIONS, AND ITEMS

Sorted by Data Set then Section

Data Set	Section	Item ID	Data Item Name	Format
1 - Primary	1 - Bridge Identification	B.CL.01	Owner	AN (4)
1 - Primary	1 - Bridge Identification	B.CL.02	Maintenance Responsibility	AN (4)
1 - Primary	1 - Bridge Identification	B.CL.03	Federal or Tribal Land Access	AN (30)
1 - Primary	1 - Bridge Identification	B.CL.04	Historic Significance	AN (1)
1 - Primary	1 - Bridge Identification	B.CL.05	Toll	AN (1)
1 - Primary	1 - Bridge Identification	B.CL.06	Emergency Evacuation Designation	AN (1)
1 - Primary	1 - Bridge Identification	B.ID.01	Bridge Number	AN (15)
1 - Primary	1 - Bridge Identification	B.ID.02	Bridge Name	AN (300)
1 - Primary	1 - Bridge Identification	B.ID.03	Previous Bridge Number	AN (15)
1 - Primary	1 - Bridge Identification	B.L.01	State Code	N (2,0)
1 - Primary	1 - Bridge Identification	B.L.02	County Code	N (3,0)
1 - Primary	1 - Bridge Identification	B.L.03	Place Code	N (5,0)
1 - Primary	1 - Bridge Identification	B.L.04	Highway Agency District	AN (2)
1 - Primary	1 - Bridge Identification	B.L.05	Latitude	N (9,6)
1 - Primary	1 - Bridge Identification	B.L.06	Longitude	N (10,6)
1 - Primary	1 - Bridge Identification	B.L.07	Border Bridge Number	AN (15)
1 - Primary	1 - Bridge Identification	B.L.08	Border Bridge State or Country Code	AN (2)
1 - Primary	1 - Bridge Identification	B.L.09	Border Bridge Inspection Responsibility	AN (1)
1 - Primary	1 - Bridge Identification	B.L.10	Border Bridge Designated Lead State	N (2,0)
1 - Primary	1 - Bridge Identification	B.L.11	Bridge Location	AN (300)
1 - Primary	1 - Bridge Identification	B.L.12	Metropolitan Planning Organization	AN (300)
1 - Primary	2 - Bridge Material and Type	B.RH.01	Bridge Railings	AN (4)
1 - Primary	2 - Bridge Material and Type	B.RH.02	Transitions	AN (4)
1 - Primary	3 - Bridge Geometry	B.G.01	NBIS Bridge Length	N (7,1)
1 - Primary	3 - Bridge Geometry	B.G.02	Total Bridge Length	N (7,1)
1 - Primary	3 - Bridge Geometry	B.G.03	Maximum Span Length	N (5,1)
1 - Primary	3 - Bridge Geometry	B.G.04	Minimum Span Length	N (5,1)
1 - Primary	3 - Bridge Geometry	B.G.05	Bridge Width Out-to-Out	N (4,1)
1 - Primary	3 - Bridge Geometry	B.G.06	Bridge Width Curb-to-Curb	N (4,1)
1 - Primary	3 - Bridge Geometry	B.G.07	Left Curb or Sidewalk Width	N (3,1)
1 - Primary	3 - Bridge Geometry	B.G.08	Right Curb or Sidewalk Width	N (3,1)
1 - Primary	3 - Bridge Geometry	B.G.09	Approach Roadway Width	N (4,1)
1 - Primary	3 - Bridge Geometry	B.G.10	Bridge Median	AN (1)
1 - Primary	3 - Bridge Geometry	B.G.11	Skew	N (2,0)
1 - Primary	3 - Bridge Geometry	B.G.12	Curved Bridge	AN (2)
1 - Primary	3 - Bridge Geometry	B.G.13	Maximum Bridge Height	N (4,0)
1 - Primary	3 - Bridge Geometry	B.G.14	Sidehill Bridge	AN (1)
1 - Primary	3 - Bridge Geometry	B.G.15	Irregular Deck Area	N (10,1)

Sorted by Data Set then Section

Data Set	Section	Item ID	Data Item Name	Format
1 - Primary	3 - Bridge Geometry	B.G.16	Calculated Deck Area	N (10,1)
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.01	Design Load	AN (8)
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.02	Design Method	AN (4)
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.03	Load Rating Date	YYYYMMDD
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.04	Load Rating Method	AN (4)
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.05	Inventory Load Rating Factor	N (4,2)
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.06	Operating Load Rating Factor	N (4,2)
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.07	Controlling Legal Load Rating Factor	N (4,2)
1 - Primary	5 - Loads, Load Rating, and Posting	B.LR.08	Routine Permit Loads	AN (1)
1 - Primary	6 - Inspections	B.IR.01	NSTM Inspection Required	AN (1)
1 - Primary	6 - Inspections	B.IR.02	Fatigue Details	AN (1)
1 - Primary	6 - Inspections	B.IR.03	Underwater Inspection Required	AN (1)
1 - Primary	6 - Inspections	B.IR.04	Complex Feature	AN (1)
1 - Primary	7 - Bridge Condition	B.AP.01	Approach Roadway Alignment	AN (1)
1 - Primary	7 - Bridge Condition	B.AP.02	Overtopping Likelihood	AN (1)
1 - Primary	7 - Bridge Condition	B.AP.03	Scour Vulnerability	AN (1)
1 - Primary	7 - Bridge Condition	B.AP.04	Scour Plan of Action	AN (1)
1 - Primary	7 - Bridge Condition	B.AP.05	Seismic Vulnerability	AN (1)
1 - Primary	7 - Bridge Condition	B.C.01	Deck Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.02	Superstructure Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.03	Substructure Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.04	Culvert Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.05	Bridge Railing Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.06	Bridge Railing Transitions Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.07	Bridge Bearings Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.08	Bridge Joints Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.09	Channel Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.10	Channel Protection Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.11	Scour Condition Rating	AN (1)
1 - Primary	7 - Bridge Condition	B.C.12	Bridge Condition Classification	AN (1)
1 - Primary	7 - Bridge Condition	B.C.13	Lowest Condition Rating Code	AN (1)
1 - Primary	7 - Bridge Condition	B.C.14	NSTM Inspection Condition	AN (1)
1 - Primary	7 - Bridge Condition	B.C.15	Underwater Inspection Condition	AN (1)
1 - Primary	7 - Bridge Condition	B.W.01	Year Built	N (4,0)
10 - Routes	4 - Features	B.RT.01	Route Designation (many-to-one)	AN (3)
10 - Routes	4 - Features	B.RT.02	Route Number	AN (15)
10 - Routes	4 - Features	B.RT.03	Route Direction	AN (2)
10 - Routes	4 - Features	B.RT.04	Route Type	AN (1)
10 - Routes	4 - Features	B.RT.05	Service Type	AN (1)
2 - Features	4 - Features	B.F.01	Feature Type (many-to-one)	AN (3)

Sorted by Data Set then Section				
Data Set	**Section**	**Item ID**	**Data Item Name**	**Format**
2 - Features	4 - Features	B.F.02	Feature Location	AN (1)
2 - Features	4 - Features	B.F.03	Feature Name	AN (300)
2 - Features	4 - Features	B.H.01	Functional Classification	AN (1)
2 - Features	4 - Features	B.H.02	Urban Code	AN (5)
2 - Features	4 - Features	B.H.03	NHS Designation	AN (1)
2 - Features	4 - Features	B.H.04	National Highway Freight Network	AN (1)
2 - Features	4 - Features	B.H.05	STRAHNET Designation	AN (1)
2 - Features	4 - Features	B.H.06	LRS Route ID	AN (120)
2 - Features	4 - Features	B.H.07	LRS Mile Point	N (8,3)
2 - Features	4 - Features	B.H.08	Lanes on Highway	N (2,0)
2 - Features	4 - Features	B.H.09	Annual Average Daily Traffic	N (8,0)
2 - Features	4 - Features	B.H.10	Annual Average Daily Truck Traffic	N (8,0)
2 - Features	4 - Features	B.H.11	Year of Annual Average Daily Traffic	N (4,0)
2 - Features	4 - Features	B.H.12	Highway Maximum Usable Vertical Clearance	N (3,1)
2 - Features	4 - Features	B.H.13	Highway Minimum Vertical Clearance	N (3,1)
2 - Features	4 - Features	B.H.14	Highway Minimum Horizontal Clearance, Left	N (3,1)
2 - Features	4 - Features	B.H.15	Highway Minimum Horizontal Clearance, Right	N (3,1)
2 - Features	4 - Features	B.H.16	Highway Maximum Usable Surface Width	N (3,1)
2 - Features	4 - Features	B.H.17	Bypass Detour Length	N (3,0)
2 - Features	4 - Features	B.H.18	Crossing Bridge Number	AN (15)
2 - Features	4 - Features	B.N.01	Navigable Waterway	AN (1)
2 - Features	4 - Features	B.N.02	Navigation Minimum Vertical Clearance	N (4,1)
2 - Features	4 - Features	B.N.03	Movable Bridge Maximum Navigation Vertical Clearance	N (4,1)
2 - Features	4 - Features	B.N.04	Navigation Channel Width	N (5,1)
2 - Features	4 - Features	B.N.05	Navigation Channel Minimum Horizontal Clearance	N (5,1)
2 - Features	4 - Features	B.N.06	Substructure Navigation Protection	AN (1)
2 - Features	4 - Features	B.RR.01	Railroad Service Type	AN (2)
2 - Features	4 - Features	B.RR.02	Railroad Minimum Vertical Clearance	N (3,1)
2 - Features	4 - Features	B.RR.03	Railroad Minimum Horizontal Offset	N (3,1)
3 - Span Sets	2 - Bridge Material and Type	B.SP.01	Span Configuration Designation (many-to-one)	AN (3)
3 - Span Sets	2 - Bridge Material and Type	B.SP.02	Number of Spans	N (4,0)
3 - Span Sets	2 - Bridge Material and Type	B.SP.03	Number of Beam Lines	N (3,0)
3 - Span Sets	2 - Bridge Material and Type	B.SP.04	Span Material	AN (3)
3 - Span Sets	2 - Bridge Material and Type	B.SP.05	Span Continuity	AN (1)
3 - Span Sets	2 - Bridge Material and Type	B.SP.06	Span Type	AN (3)
3 - Span Sets	2 - Bridge Material and Type	B.SP.07	Span Protective System	AN (3)
3 - Span Sets	2 - Bridge Material and Type	B.SP.08	Deck Interaction	AN (2)
3 - Span Sets	2 - Bridge Material and Type	B.SP.09	Deck Material and Type	AN (3)
3 - Span Sets	2 - Bridge Material and Type	B.SP.10	Wearing Surface	AN (3)

Sorted by Data Set then Section				
Data Set	**Section**	**Item ID**	**Data Item Name**	**Format**
3 - Span Sets	2 - Bridge Material and Type	B.SP.11	Deck Protective System	AN (3)
3 - Span Sets	2 - Bridge Material and Type	B.SP.12	Deck Reinforcing Protective System	AN (3)
3 - Span Sets	2 - Bridge Material and Type	B.SP.13	Deck Stay-in-Place Forms	AN (3)
4 - Substructure Sets	2 - Bridge Material and Type	B.SB.01	Substructure Configuration Designation (many-to-one)	AN (3)
4 - Substructure Sets	2 - Bridge Material and Type	B.SB.02	Number of Substructure Units	N (3,0)
4 - Substructure Sets	2 - Bridge Material and Type	B.SB.03	Substructure Material	AN (3)
4 - Substructure Sets	2 - Bridge Material and Type	B.SB.04	Substructure Type	AN (3)
4 - Substructure Sets	2 - Bridge Material and Type	B.SB.05	Substructure Protective System	AN (3)
4 - Substructure Sets	2 - Bridge Material and Type	B.SB.06	Foundation Type	AN (3)
4 - Substructure Sets	2 - Bridge Material and Type	B.SB.07	Foundation Protective System	AN (3)
5 - Posting Status	5 - Loads, Load Rating, and Posting	B.PS.01	Load Posting Status (many-to-one)	AN (2)
5 - Posting Status	5 - Loads, Load Rating, and Posting	B.PS.02	Posting Status Change Date	YYYYMMDD
6 - Posting Evaluation	5 - Loads, Load Rating, and Posting	B.EP.01	Legal Load Configuration (many-to-one)	AN (15)
6 – Posting Evaluation	5 - Loads, Load Rating, and Posting	B.EP.02	Legal Load Rating Factor	N (4,2)
6 - Posting Evaluation	5 - Loads, Load Rating, and Posting	B.EP.03	Posting Type	AN (17)
6 - Posting Evaluation	5 - Loads, Load Rating, and Posting	B.EP.04	Posting Value	AN (15)
7 - Inspections	6 – Inspections	B.IE.01	Inspection Type (many-to-one)	AN (1)
7 - Inspections	6 – Inspections	B.IE.02	Inspection Begin Date	YYYYMMDD
7 - Inspections	6 – Inspections	B.IE.03	Inspection Completion Date	YYYYMMDD
7 - Inspections	6 – Inspections	B.IE.04	Nationally Certified Bridge Inspector	AN (15)
7 - Inspections	6 – Inspections	B.IE.05	Inspection Interval	N (2,0)
7 - Inspections	6 – Inspections	B.IE.06	Inspection Due Date	YYYYMMDD
7 - Inspections	6 – Inspections	B.IE.07	Risk-Based Inspection Interval Method	AN (1)
7 - Inspections	6 – Inspections	B.IE.08	Inspection Quality Control Date	YYYYMMDD
7 - Inspections	6 – Inspections	B.IE.09	Inspection Quality Assurance Date	YYYYMMDD
7 - Inspections	6 – Inspections	B.IE.10	Inspection Data Update Date	YYYYMMDD
7 - Inspections	6 – Inspections	B.IE.11	Inspection Note	AN (300)
7 - Inspections	6 – Inspections	B.IE.12	Inspection Equipment	AN (120)
8 - Elements	7 - Bridge Condition	B.CS.01	Element Quantity Condition State One	N (8,0)
8 - Elements	7 - Bridge Condition	B.CS.02	Element Quantity Condition State Two	N (8,0)
8 - Elements	7 - Bridge Condition	B.CS.03	Element Quantity Condition State Three	N (8,0)
8 - Elements	7 - Bridge Condition	B.CS.04	Element Quantity Condition State Four	N (8,0)
8 - Elements	7 - Bridge Condition	B.E.01	Element Number (many-to-one)	N (4,0)
8 - Elements	7 - Bridge Condition	B.E.02	Element Parent Number	N (4,0)
8 - Elements	7 - Bridge Condition	B.E.03	Element Total Quantity	N (8,0)
9 - Work	7 - Bridge Condition	B.W.02	Year Work Performed (many -to-one)	N (4,0)
9 - Work	7 - Bridge Condition	B.W.03	Work Performed	AN (120)

Sorted by Item ID

Item ID	Data Item Name	Format	Data Set	Section
B.AP.01	Approach Roadway Alignment	AN (1)	1 - Primary	7 - Bridge Condition
B.AP.02	Overtopping Likelihood	AN (1)	1 - Primary	7 - Bridge Condition
B.AP.03	Scour Vulnerability	AN (1)	1 - Primary	7 - Bridge Condition
B.AP.04	Scour Plan of Action	AN (1)	1 - Primary	7 - Bridge Condition
B.AP.05	Seismic Vulnerability	AN (1)	1 - Primary	7 - Bridge Condition
B.C.01	Deck Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.02	Superstructure Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.03	Substructure Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.04	Culvert Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.05	Bridge Railing Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.06	Bridge Railing Transitions Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.07	Bridge Bearings Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.08	Bridge Joints Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.09	Channel Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.10	Channel Protection Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.11	Scour Condition Rating	AN (1)	1 - Primary	7 - Bridge Condition
B.C.12	Bridge Condition Classification	AN (1)	1 - Primary	7 - Bridge Condition
B.C.13	Lowest Condition Rating Code	AN (1)	1 - Primary	7 - Bridge Condition
B.C.14	NSTM Inspection Condition	AN (1)	1 - Primary	7 - Bridge Condition
B.C.15	Underwater Inspection Condition	AN (1)	1 - Primary	7 - Bridge Condition
B.CL.01	Owner	AN (4)	1 - Primary	1 - Bridge Identification
B.CL.02	Maintenance Responsibility	AN (4)	1 - Primary	1 - Bridge Identification
B.CL.03	Federal or Tribal Land Access	AN (30)	1 - Primary	1 - Bridge Identification
B.CL.04	Historic Significance	AN (1)	1 - Primary	1 - Bridge Identification
B.CL.05	Toll	AN (1)	1 - Primary	1 - Bridge Identification
B.CL.06	Emergency Evacuation Designation	AN (1)	1 - Primary	1 - Bridge Identification
B.CS.01	Element Quantity Condition State One	N (8,0)	8 - Elements	7 - Bridge Condition
B.CS.02	Element Quantity Condition State Two	N (8,0)	8 - Elements	7 - Bridge Condition
B.CS.03	Element Quantity Condition State Three	N (8,0)	8 - Elements	7 - Bridge Condition
B.CS.04	Element Quantity Condition State Four	N (8,0)	8 - Elements	7 - Bridge Condition
B.E.01	Element Number (many-to-one)	N (4,0)	8 - Elements	7 - Bridge Condition
B.E.02	Element Parent Number	N (4,0)	8 - Elements	7 - Bridge Condition
B.E.03	Element Total Quantity	N (8,0)	8 - Elements	7 - Bridge Condition
B.EP.01	Legal Load Configuration (many-to-one)	AN (15)	6 - Posting Evaluation	5 - Loads, Load Rating, and Posting
B.EP.02	Legal Load Rating Factor	N (4,2)	6 – Posting Evaluation	5 - Loads, Load Rating, and Posting
B.EP.03	Posting Type	AN (17)	6 - Posting Evaluation	5 - Loads, Load Rating, and Posting
B.EP.04	Posting Value	AN (15)	6 - Posting Evaluation	5 - Loads, Load Rating, and Posting
B.F.01	Feature Type (many-to-one)	AN (3)	2 - Features	4 - Features
B.F.02	Feature Location	AN (1)	2 - Features	4 - Features
B.F.03	Feature Name	AN (300)	2 - Features	4 - Features

Sorted by Item ID

Item ID	Data Item Name	Format	Data Set	Section
B.G.01	NBIS Bridge Length	N (7,1)	1 - Primary	3 - Bridge Geometry
B.G.02	Total Bridge Length	N (7,1)	1 - Primary	3 - Bridge Geometry
B.G.03	Maximum Span Length	N (5,1)	1 - Primary	3 - Bridge Geometry
B.G.04	Minimum Span Length	N (5,1)	1 - Primary	3 - Bridge Geometry
B.G.05	Bridge Width Out-to-Out	N (4,1)	1 - Primary	3 - Bridge Geometry
B.G.06	Bridge Width Curb-to-Curb	N (4,1)	1 - Primary	3 - Bridge Geometry
B.G.07	Left Curb or Sidewalk Width	N (3,1)	1 - Primary	3 - Bridge Geometry
B.G.08	Right Curb or Sidewalk Width	N (3,1)	1 - Primary	3 - Bridge Geometry
B.G.09	Approach Roadway Width	N (4,1)	1 - Primary	3 - Bridge Geometry
B.G.10	Bridge Median	AN (1)	1 - Primary	3 - Bridge Geometry
B.G.11	Skew	N (2,0)	1 - Primary	3 - Bridge Geometry
B.G.12	Curved Bridge	AN (2)	1 - Primary	3 - Bridge Geometry
B.G.13	Maximum Bridge Height	N (4,0)	1 - Primary	3 - Bridge Geometry
B.G.14	Sidehill Bridge	AN (1)	1 - Primary	3 - Bridge Geometry
B.G.15	Irregular Deck Area	N (10,1)	1 - Primary	3 - Bridge Geometry
B.G.16	Calculated Deck Area	N (10,1)	1 - Primary	3 - Bridge Geometry
B.H.01	Functional Classification	AN (1)	2 - Features	4 - Features
B.H.02	Urban Code	AN (5)	2 - Features	4 - Features
B.H.03	NHS Designation	AN (1)	2 - Features	4 - Features
B.H.04	National Highway Freight Network	AN (1)	2 - Features	4 - Features
B.H.05	STRAHNET Designation	AN (1)	2 - Features	4 - Features
B.H.06	LRS Route ID	AN (120)	2 - Features	4 - Features
B.H.07	LRS Mile Point	N (8,3)	2 - Features	4 - Features
B.H.08	Lanes on Highway	N (2,0)	2 - Features	4 - Features
B.H.09	Annual Average Daily Traffic	N (8,0)	2 - Features	4 - Features
B.H.10	Annual Average Daily Truck Traffic	N (8,0)	2 - Features	4 - Features
B.H.11	Year of Annual Average Daily Traffic	N (4,0)	2 - Features	4 - Features
B.H.12	Highway Maximum Usable Vertical Clearance	N (3,1)	2 - Features	4 - Features
B.H.13	Highway Minimum Vertical Clearance	N (3,1)	2 - Features	4 - Features
B.H.14	Highway Minimum Horizontal Clearance, Left	N (3,1)	2 - Features	4 - Features
B.H.15	Highway Minimum Horizontal Clearance, Right	N (3,1)	2 - Features	4 - Features
B.H.16	Highway Maximum Usable Surface Width	N (3,1)	2 - Features	4 - Features
B.H.17	Bypass Detour Length	N (3,0)	2 - Features	4 - Features
B.H.18	Crossing Bridge Number	AN (15)	2 - Features	4 - Features
B.ID.01	Bridge Number	AN (15)	1 - Primary	1 - Bridge Identification
B.ID.02	Bridge Name	AN (300)	1 - Primary	1 - Bridge Identification
B.ID.03	Previous Bridge Number	AN (15)	1 - Primary	1 - Bridge Identification
B.IE.01	Inspection Type (many-to-one)	AN (1)	7 - Inspections	6 – Inspections
B.IE.02	Inspection Begin Date	YYYYMMDD	7 - Inspections	6 – Inspections

Sorted by Item ID

Item ID	Data Item Name	Format	Data Set	Section
B.IE.03	Inspection Completion Date	YYYYMMDD	7 - Inspections	6 – Inspections
B.IE.04	Nationally Certified Bridge Inspector	AN (15)	7 - Inspections	6 – Inspections
B.IE.05	Inspection Interval	N (2,0)	7 - Inspections	6 – Inspections
B.IE.06	Inspection Due Date	YYYYMMDD	7 - Inspections	6 – Inspections
B.IE.07	Risk-Based Inspection Interval Method	AN (1)	7 - Inspections	6 – Inspections
B.IE.08	Inspection Quality Control Date	YYYYMMDD	7 - Inspections	6 – Inspections
B.IE.09	Inspection Quality Assurance Date	YYYYMMDD	7 - Inspections	6 – Inspections
B.IE.10	Inspection Data Update Date	YYYYMMDD	7 - Inspections	6 – Inspections
B.IE.11	Inspection Note	AN (300)	7 - Inspections	6 – Inspections
B.IE.12	Inspection Equipment	AN (120)	7 - Inspections	6 – Inspections
B.IR.01	NSTM Inspection Required	AN (1)	1 - Primary	6 - Inspections
B.IR.02	Fatigue Details	AN (1)	1 - Primary	6 - Inspections
B.IR.03	Underwater Inspection Required	AN (1)	1 - Primary	6 - Inspections
B.IR.04	Complex Feature	AN (1)	1 - Primary	6 - Inspections
B.L.01	State Code	N (2,0)	1 - Primary	1 - Bridge Identification
B.L.02	County Code	N (3,0)	1 - Primary	1 - Bridge Identification
B.L.03	Place Code	N (5,0)	1 - Primary	1 - Bridge Identification
B.L.04	Highway Agency District	AN (2)	1 - Primary	1 - Bridge Identification
B.L.05	Latitude	N (9,6)	1 - Primary	1 - Bridge Identification
B.L.06	Longitude	N (10,6)	1 - Primary	1 - Bridge Identification
B.L.07	Border Bridge Number	AN (15)	1 - Primary	1 - Bridge Identification
B.L.08	Border Bridge State or Country Code	AN (2)	1 - Primary	1 - Bridge Identification
B.L.09	Border Bridge Inspection Responsibility	AN (1)	1 - Primary	1 - Bridge Identification
B.L.10	Border Bridge Designated Lead State	N (2,0)	1 - Primary	1 - Bridge Identification
B.L.11	Bridge Location	AN (300)	1 - Primary	1 - Bridge Identification
B.L.12	Metropolitan Planning Organization	AN (300)	1 - Primary	1 - Bridge Identification
B.LR.01	Design Load	AN (8)	1 - Primary	5 - Loads, Load Rating, and Posting
B.LR.02	Design Method	AN (4)	1 - Primary	5 - Loads, Load Rating, and Posting
B.LR.03	Load Rating Date	YYYYMMDD	1 – Primary	5 - Loads, Load Rating, and Posting
B.LR.04	Load Rating Method	AN (4)	1 - Primary	5 - Loads, Load Rating, and Posting
B.LR.05	Inventory Load Rating Factor	N (4,2)	1 - Primary	5 - Loads, Load Rating, and Posting
B.LR.06	Operating Load Rating Factor	N (4,2)	1 - Primary	5 - Loads, Load Rating, and Posting
B.LR.07	Controlling Legal Load Rating Factor	N (4,2)	1 - Primary	5 - Loads, Load Rating, and Posting
B.LR.08	Routine Permit Loads	AN (1)	1 - Primary	5 - Loads, Load Rating, and Posting
B.N.01	Navigable Waterway	AN (1)	2 - Features	4 - Features
B.N.02	Navigation Minimum Vertical Clearance	N (4,1)	2 - Features	4 - Features
B.N.03	Movable Bridge Maximum Navigation Vertical Clearance	N (4,1)	2 - Features	4 - Features
B.N.04	Navigation Channel Width	N (5,1)	2 - Features	4 - Features
B.N.05	Navigation Channel Minimum Horizontal Clearance	N (5,1)	2 - Features	4 - Features

Sorted by Item ID

Item ID	Data Item Name	Format	Data Set	Section
B.N.06	Substructure Navigation Protection	AN (1)	2 - Features	4 - Features
B.PS.01	Load Posting Status (many-to-one)	AN (2)	5 - Posting Status	5 - Loads, Load Rating, and Posting
B.PS.02	Posting Status Change Date	YYYYMMDD	5 - Posting Status	5 - Loads, Load Rating, and Posting
B.RH.01	Bridge Railings	AN (4)	1 - Primary	2 - Bridge Material and Type
B.RH.02	Transitions	AN (4)	1 - Primary	2 - Bridge Material and Type
B.RR.01	Railroad Service Type	AN (2)	2 - Features	4 - Features
B.RR.02	Railroad Minimum Vertical Clearance	N (3,1)	2 - Features	4 - Features
B.RR.03	Railroad Minimum Horizontal Offset	N (3,1)	2 - Features	4 - Features
B.RT.01	Route Designation (many-to-one)	AN (3)	10 - Routes	4 - Features
B.RT.02	Route Number	AN (15)	10 - Routes	4 - Features
B.RT.03	Route Direction	AN (2)	10 - Routes	4 - Features
B.RT.04	Route Type	AN (1)	10 - Routes	4 - Features
B.RT.05	Service Type	AN (1)	10 - Routes	4 - Features
B.SB.01	Substructure Configuration Designation (many-to-one)	AN (3)	4 - Substructure Sets	2 - Bridge Material and Type
B.SB.02	Number of Substructure Units	N (3,0)	4 - Substructure Sets	2 - Bridge Material and Type
B.SB.03	Substructure Material	AN (3)	4 - Substructure Sets	2 - Bridge Material and Type
B.SB.04	Substructure Type	AN (3)	4 - Substructure Sets	2 - Bridge Material and Type
B.SB.05	Substructure Protective System	AN (3)	4 - Substructure Sets	2 - Bridge Material and Type
B.SB.06	Foundation Type	AN (3)	4 - Substructure Sets	2 - Bridge Material and Type
B.SB.07	Foundation Protective System	AN (3)	4 - Substructure Sets	2 - Bridge Material and Type
B.SP.01	Span Configuration Designation (many-to-one)	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.02	Number of Spans	N (4,0)	3 - Span Sets	2 - Bridge Material and Type
B.SP.03	Number of Beam Lines	N (3,0)	3 - Span Sets	2 - Bridge Material and Type
B.SP.04	Span Material	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.05	Span Continuity	AN (1)	3 - Span Sets	2 - Bridge Material and Type
B.SP.06	Span Type	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.07	Span Protective System	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.08	Deck Interaction	AN (2)	3 - Span Sets	2 - Bridge Material and Type
B.SP.09	Deck Material and Type	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.10	Wearing Surface	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.11	Deck Protective System	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.12	Deck Reinforcing Protective System	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.SP.13	Deck Stay-in-Place Forms	AN (3)	3 - Span Sets	2 - Bridge Material and Type
B.W.01	Year Built	N (4,0)	1 - Primary	7 - Bridge Condition
B.W.02	Year Work Performed (many -to-one)	N (4,0)	9 - Work	7 - Bridge Condition
B.W.03	Work Performed	AN (120)	9 - Work	7 - Bridge Condition

Sorted by Data Item Name

Data Item Name	Item ID	Format	Section	Data Set
Annual Average Daily Traffic	B.H.09	N (8,0)	4 - Features	2 - Features
Annual Average Daily Truck Traffic	B.H.10	N (8,0)	4 - Features	2 - Features
Approach Roadway Alignment	B.AP.01	AN (1)	7 - Bridge Condition	1 - Primary
Approach Roadway Width	B.G.09	N (4,1)	3 - Bridge Geometry	1 - Primary
Border Bridge Designated Lead State	B.L.10	N (2,0)	1 - Bridge Identification	1 - Primary
Border Bridge Inspection Responsibility	B.L.09	AN (1)	1 - Bridge Identification	1 - Primary
Border Bridge Number	B.L.07	AN (15)	1 - Bridge Identification	1 - Primary
Border Bridge State or Country Code	B.L.08	AN (2)	1 - Bridge Identification	1 - Primary
Bridge Bearings Condition Rating	B.C.07	AN (1)	7 - Bridge Condition	1 - Primary
Bridge Condition Classification	B.C.12	AN (1)	7 - Bridge Condition	1 - Primary
Bridge Joints Condition Rating	B.C.08	AN (1)	7 - Bridge Condition	1 - Primary
Bridge Location	B.L.11	AN (300)	1 - Bridge Identification	1 - Primary
Bridge Median	B.G.10	AN (1)	3 - Bridge Geometry	1 - Primary
Bridge Name	B.ID.02	AN (300)	1 - Bridge Identification	1 - Primary
Bridge Number	B.ID.01	AN (15)	1 - Bridge Identification	1 - Primary
Bridge Railing Condition Rating	B.C.05	AN (1)	7 - Bridge Condition	1 - Primary
Bridge Railing Transitions Condition Rating	B.C.06	AN (1)	7 - Bridge Condition	1 - Primary
Bridge Railings	B.RH.01	AN (4)	2 - Bridge Material and Type	1 - Primary
Bridge Width Curb-to-Curb	B.G.06	N (4,1)	3 - Bridge Geometry	1 - Primary
Bridge Width Out-to-Out	B.G.05	N (4,1)	3 - Bridge Geometry	1 - Primary
Bypass Detour Length	B.H.17	N (3,0)	4 - Features	2 - Features
Calculated Deck Area	B.G.16	N (10,1)	3 - Bridge Geometry	1 - Primary
Channel Condition Rating	B.C.09	AN (1)	7 - Bridge Condition	1 - Primary
Channel Protection Condition Rating	B.C.10	AN (1)	7 - Bridge Condition	1 - Primary
Complex Feature	B.IR.04	AN (1)	6 - Inspections	1 - Primary
Controlling Legal Load Rating Factor	B.LR.07	N (4,2)	5 - Loads, Load Rating, and Posting	1 - Primary
County Code	B.L.02	N (3,0)	1 - Bridge Identification	1 - Primary
Crossing Bridge Number	B.H.18	AN (15)	4 - Features	2 - Features
Culvert Condition Rating	B.C.04	AN (1)	7 - Bridge Condition	1 - Primary
Curved Bridge	B.G.12	AN (2)	3 - Bridge Geometry	1 - Primary
Deck Condition Rating	B.C.01	AN (1)	7 - Bridge Condition	1 - Primary
Deck Interaction	B.SP.08	AN (2)	2 - Bridge Material and Type	3 - Span Sets
Deck Material and Type	B.SP.09	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Deck Protective System	B.SP.11	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Deck Reinforcing Protective System	B.SP.12	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Deck Stay-in-Place Forms	B.SP.13	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Design Load	B.LR.01	AN (8)	5 - Loads, Load Rating, and Posting	1 - Primary
Design Method	B.LR.02	AN (4)	5 - Loads, Load Rating, and Posting	1 - Primary
Element Number (many-to-one)	B.E.01	N (4,0)	7 - Bridge Condition	8 - Elements

Sorted by Data Item Name

Data Item Name	Item ID	Format	Section	Data Set
Element Parent Number	B.E.02	N (4,0)	7 - Bridge Condition	8 - Elements
Element Quantity Condition State Four	B.CS.04	N (8,0)	7 - Bridge Condition	8 - Elements
Element Quantity Condition State One	B.CS.01	N (8,0)	7 - Bridge Condition	8 - Elements
Element Quantity Condition State Three	B.CS.03	N (8,0)	7 - Bridge Condition	8 - Elements
Element Quantity Condition State Two	B.CS.02	N (8,0)	7 - Bridge Condition	8 - Elements
Element Total Quantity	B.E.03	N (8,0)	7 - Bridge Condition	8 - Elements
Emergency Evacuation Designation	B.CL.06	AN (1)	1 - Bridge Identification	1 - Primary
Fatigue Details	B.IR.02	AN (1)	6 - Inspections	1 - Primary
Feature Location	B.F.02	AN (1)	4 - Features	2 - Features
Feature Name	B.F.03	AN (300)	4 - Features	2 - Features
Feature Type (many-to-one)	B.F.01	AN (3)	4 - Features	2 - Features
Federal or Tribal Land Access	B.CL.03	AN (30)	1 - Bridge Identification	1 - Primary
Foundation Protective System	B.SB.07	AN (3)	2 - Bridge Material and Type	4 - Substructure Sets
Foundation Type	B.SB.06	AN (3)	2 - Bridge Material and Type	4 - Substructure Sets
Functional Classification	B.H.01	AN (1)	4 - Features	2 - Features
Highway Agency District	B.L.04	AN (2)	1 - Bridge Identification	1 - Primary
Highway Maximum Usable Surface Width	B.H.16	N (3,1)	4 - Features	2 - Features
Highway Maximum Usable Vertical Clearance	B.H.12	N (3,1)	4 - Features	2 - Features
Highway Minimum Horizontal Clearance, Left	B.H.14	N (3,1)	4 - Features	2 - Features
Highway Minimum Horizontal Clearance, Right	B.H.15	N (3,1)	4 - Features	2 - Features
Highway Minimum Vertical Clearance	B.H.13	N (3,1)	4 - Features	2 - Features
Historic Significance	B.CL.04	AN (1)	1 - Bridge Identification	1 - Primary
Inspection Begin Date	B.IE.02	YYYYMMDD	6 – Inspections	7 - Inspections
Inspection Completion Date	B.IE.03	YYYYMMDD	6 – Inspections	7 - Inspections
Inspection Data Update Date	B.IE.10	YYYYMMDD	6 – Inspections	7 - Inspections
Inspection Due Date	B.IE.06	YYYYMMDD	6 – Inspections	7 - Inspections
Inspection Equipment	B.IE.12	AN (120)	6 – Inspections	7 - Inspections
Inspection Interval	B.IE.05	N (2,0)	6 – Inspections	7 - Inspections
Inspection Note	B.IE.11	AN (300)	6 – Inspections	7 - Inspections
Inspection Quality Assurance Date	B.IE.09	YYYYMMDD	6 – Inspections	7 - Inspections
Inspection Quality Control Date	B.IE.08	YYYYMMDD	6 – Inspections	7 - Inspections
Inspection Type (many-to-one)	B.IE.01	AN (1)	6 – Inspections	7 - Inspections
Inventory Load Rating Factor	B.LR.05	N (4,2)	5 - Loads, Load Rating, and Posting	1 - Primary
Irregular Deck Area	B.G.15	N (10,1)	3 - Bridge Geometry	1 - Primary
Lanes on Highway	B.H.08	N (2,0)	4 - Features	2 - Features
Latitude	B.L.05	N (9,6)	1 - Bridge Identification	1 - Primary
Left Curb or Sidewalk Width	B.G.07	N (3,1)	3 - Bridge Geometry	1 - Primary
Legal Load Configuration (many-to-one)	B.EP.01	AN (15)	5 - Loads, Load Rating, and Posting	6 - Posting Evaluation
Legal Load Rating Factor	B.EP.02	N (4,2)	5 - Loads, Load Rating, and Posting	6 – Posting Evaluation

Sorted by Data Item Name

Data Item Name	Item ID	Format	Section	Data Set
Load Posting Status (many-to-one)	B.PS.01	AN (2)	5 - Loads, Load Rating, and Posting	5 - Posting Status
Load Rating Date	B.LR.03	YYYYMMDD	5 - Loads, Load Rating, and Posting	1 - Primary
Load Rating Method	B.LR.04	AN (4)	5 - Loads, Load Rating, and Posting	1 - Primary
Longitude	B.L.06	N (10,6)	1 - Bridge Identification	1 - Primary
Lowest Condition Rating Code	B.C.13	AN (1)	7 - Bridge Condition	1 - Primary
LRS Mile Point	B.H.07	N (8,3)	4 - Features	2 - Features
LRS Route ID	B.H.06	AN (120)	4 - Features	2 - Features
Maintenance Responsibility	B.CL.02	AN (4)	1 - Bridge Identification	1 - Primary
Maximum Bridge Height	B.G.13	N (4,0)	3 - Bridge Geometry	1 - Primary
Maximum Span Length	B.G.03	N (5,1)	3 - Bridge Geometry	1 - Primary
Metropolitan Planning Organization	B.L.12	AN (300)	1 - Bridge Identification	1 - Primary
Minimum Span Length	B.G.04	N (5,1)	3 - Bridge Geometry	1 - Primary
Movable Bridge Maximum Navigation Vertical Clearance	B.N.03	N (4,1)	4 - Features	2 - Features
National Highway Freight Network	B.H.04	AN (1)	4 - Features	2 - Features
Nationally Certified Bridge Inspector	B.IE.04	AN (15)	6 – Inspections	7 - Inspections
Navigable Waterway	B.N.01	AN (1)	4 - Features	2 - Features
Navigation Channel Minimum Horizontal Clearance	B.N.05	N (5,1)	4 - Features	2 - Features
Navigation Channel Width	B.N.04	N (5,1)	4 - Features	2 - Features
Navigation Minimum Vertical Clearance	B.N.02	N (4,1)	4 - Features	2 - Features
NBIS Bridge Length	B.G.01	N (7,1)	3 - Bridge Geometry	1 - Primary
NHS Designation	B.H.03	AN (1)	4 - Features	2 - Features
NSTM Inspection Condition	B.C.14	AN (1)	7 - Bridge Condition	1 - Primary
NSTM Inspection Required	B.IR.01	AN (1)	6 - Inspections	1 - Primary
Number of Beam Lines	B.SP.03	N (3,0)	2 - Bridge Material and Type	3 - Span Sets
Number of Spans	B.SP.02	N (4,0)	2 - Bridge Material and Type	3 - Span Sets
Number of Substructure Units	B.SB.02	N (3,0)	2 - Bridge Material and Type	4 - Substructure Sets
Operating Load Rating Factor	B.LR.06	N (4,2)	5 - Loads, Load Rating, and Posting	1 - Primary
Overtopping Likelihood	B.AP.02	AN (1)	7 - Bridge Condition	1 - Primary
Owner	B.CL.01	AN (4)	1 - Bridge Identification	1 - Primary
Place Code	B.L.03	N (5,0)	1 - Bridge Identification	1 - Primary
Posting Status Change Date	B.PS.02	YYYYMMDD	5 - Loads, Load Rating, and Posting	5 - Posting Status
Posting Type	B.EP.03	AN (17)	5 - Loads, Load Rating, and Posting	6 - Posting Evaluation
Posting Value	B.EP.04	AN (15)	5 - Loads, Load Rating, and Posting	6 - Posting Evaluation
Previous Bridge Number	B.ID.03	AN (15)	1 - Bridge Identification	1 - Primary
Railroad Minimum Horizontal Offset	B.RR.03	N (3,1)	4 - Features	2 - Features
Railroad Minimum Vertical Clearance	B.RR.02	N (3,1)	4 - Features	2 - Features
Railroad Service Type	B.RR.01	AN (2)	4 - Features	2 - Features
Right Curb or Sidewalk Width	B.G.08	N (3,1)	3 - Bridge Geometry	1 - Primary
Risk-Based Inspection Interval Method	B.IE.07	AN (1)	6 – Inspections	7 - Inspections

Sorted by Data Item Name

Data Item Name	Item ID	Format	Section	Data Set
Route Designation (many-to-one)	B.RT.01	AN (3)	4 - Features	10 - Routes
Route Direction	B.RT.03	AN (2)	4 - Features	10 - Routes
Route Number	B.RT.02	AN (15)	4 - Features	10 - Routes
Route Type	B.RT.04	AN (1)	4 - Features	10 - Routes
Routine Permit Loads	B.LR.08	AN (1)	5 - Loads, Load Rating, and Posting	1 - Primary
Scour Condition Rating	B.C.11	AN (1)	7 - Bridge Condition	1 - Primary
Scour Plan of Action	B.AP.04	AN (1)	7 - Bridge Condition	1 - Primary
Scour Vulnerability	B.AP.03	AN (1)	7 - Bridge Condition	1 - Primary
Seismic Vulnerability	B.AP.05	AN (1)	7 - Bridge Condition	1 - Primary
Service Type	B.RT.05	AN (1)	4 - Features	10 - Routes
Sidehill Bridge	B.G.14	AN (1)	3 - Bridge Geometry	1 - Primary
Skew	B.G.11	N (2,0)	3 - Bridge Geometry	1 - Primary
Span Configuration Designation (many-to-one)	B.SP.01	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Span Continuity	B.SP.05	AN (1)	2 - Bridge Material and Type	3 - Span Sets
Span Material	B.SP.04	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Span Protective System	B.SP.07	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Span Type	B.SP.06	AN (3)	2 - Bridge Material and Type	3 - Span Sets
State Code	B.L.01	N (2,0)	1 - Bridge Identification	1 - Primary
STRAHNET Designation	B.H.05	AN (1)	4 - Features	2 - Features
Substructure Condition Rating	B.C.03	AN (1)	7 - Bridge Condition	1 - Primary
Substructure Configuration Designation (many-to-one)	B.SB.01	AN (3)	2 - Bridge Material and Type	4 - Substructure Sets
Substructure Material	B.SB.03	AN (3)	2 - Bridge Material and Type	4 - Substructure Sets
Substructure Navigation Protection	B.N.06	AN (1)	4 - Features	2 - Features
Substructure Protective System	B.SB.05	AN (3)	2 - Bridge Material and Type	4 - Substructure Sets
Substructure Type	B.SB.04	AN (3)	2 - Bridge Material and Type	4 - Substructure Sets
Superstructure Condition Rating	B.C.02	AN (1)	7 - Bridge Condition	1 - Primary
Toll	B.CL.05	AN (1)	1 - Bridge Identification	1 - Primary
Total Bridge Length	B.G.02	N (7,1)	3 - Bridge Geometry	1 - Primary
Transitions	B.RH.02	AN (4)	2 - Bridge Material and Type	1 - Primary
Underwater Inspection Condition	B.C.15	AN (1)	7 - Bridge Condition	1 - Primary
Underwater Inspection Required	B.IR.03	AN (1)	6 - Inspections	1 - Primary
Urban Code	B.H.02	AN (5)	4 - Features	2 - Features
Wearing Surface	B.SP.10	AN (3)	2 - Bridge Material and Type	3 - Span Sets
Work Performed	B.W.03	AN (120)	7 - Bridge Condition	9 - Work
Year Built	B.W.01	N (4,0)	7 - Bridge Condition	1 - Primary
Year of Annual Average Daily Traffic	B.H.11	N (4,0)	4 - Features	2 - Features
Year Work Performed (many -to-one)	B.W.02	N (4,0)	7 - Bridge Condition	9 - Work

APPENDIX C: COMPONENT CONDITION RATING GUIDANCE

The following provides defect severity guidance that can be used in combination with the various condition rating code definition tables, in Subsection 7.1 – Component Condition Ratings, to determine the appropriate condition rating codes.

Table 46. All Materials - defect severity guidance for component condition ratings.

Defect	Minor	Moderate
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.
Settlement	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits, but is less than the critical limits established for the bridge.

The Settlement defect applies to substructure components, pipes, and other components that may be directly affected by settlement. Superstructure and deck components that indirectly show the effects of settlement are evaluated by the resulting defects. Tolerable settlement can be considered as uniform or differential settlement that is not causing other bridge defects or increased impact on the bridge.

The critical limit for scour is the scour depth at which the bridge becomes unstable.

Table 47. Concrete - defect severity guidance for component condition ratings.

Defect	Minor	Moderate
Delamination, Spalling, Patched Area	Delamination, small spall, or patched area that is sound.	Large spall or patched area that is unsound or showing distress.
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss.
Exposed Prestressing	Present without section loss.	Present with section loss.
Cracking	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.
Abrasion, Wear, Scaling	Exposed coarse aggregate, but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix.
Efflorescence, Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.

The concrete crack defect description definitions describe generalized distress, but the width, spacing, location, orientation, and structural or non-structural nature of the cracking should also be considered.

In general, cracks can be considered:

- Insignificant – crack width less than 0.004 inches (prestressed) or 0.012 inches (reinforced), or medium width cracks that have been sealed.
- Medium – crack width ranging from 0.004 – 0.009 inches (prestressed) or 0.012 to 0.05 inches (reinforced).
- Wide – crack width wider than 0.009 inches (prestressed) or 0.05 inches (reinforced).
- Medium pattern (map) – crack spacing of 1 ft. to 3 ft.
- Heavy pattern (map) – crack spacing less than 1 ft.

In general, spall size can be considered:

- Small spall - 1 inch or less deep or 6 inches or less in diameter.
- Large spall - greater than 1 inch deep or greater than 6 inches in diameter.

The rust staining defect applies only to reinforcing steel.

Table 48. Steel - defect severity guidance for component condition ratings.

Defect	Minor	Moderate
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is evident.
Cracking	Crack that has been effectively arrested.	Crack that has not been arrested.
Connection	Loose fasteners, or pack rust without distortion. Connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion.

A well-formed patina on weathering steel is considered a protective coating and is not considered a defect. The Connection defect applies to any members of a component that are fastened by bolts, rivets, or welds.

Table 49. Masonry - defect severity guidance for component condition ratings.

Defect	Minor	Moderate
Efflorescence, Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.
Mortar Breakdown	Cracking or partial depth voids.	Full depth voids.
Splits, Spalls	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting.
Patched Area	Sound patch.	Unsound patch.
Displacement	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing.

Table 50. Timber - defect severity guidance for component condition ratings.

Defect	Minor	Moderate
Cracking	Crack that has been effectively arrested.	Crack that has not been arrested.
Connection	Loose fasteners, or pack rust without distortion. Connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion.
Decay, Section Loss	Affects up to 10% of the member section.	Affects more than 10% of the member section.
Checks, Shakes	Penetrates 5% to 50% of the thickness of the member; not in a high stress zone.	Penetrates more than 50% of the member thickness and length equal to or greater than the member depth, or penetrates more than 5% of the member thickness in a high stress zone.
Splits, Delamination	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth.
Abrasion, Wear	Affects up to 10% of the member section.	Affects more than 10% of the member section.

In general, checks and shakes can be considered insignificant when there is surface penetration less than 5% of the member thickness regardless of location.

Table 51. Other Materials - defect severity guidance for component condition ratings.

Defect	Minor	Moderate
Deterioration	Breakdown or deterioration has initiated.	Significant deterioration or breakdown.

For "Other Materials" the deterioration defect or other applicable defects shown within this table may apply. "Other Materials" include FRP, iron, aluminum, or materials other than concrete, steel, timber, or masonry. The "Other" category can also be considered when FRP is used as a repair material and is the predominant material type visible for inspection.

Common Deterioration Types for FRP:

- Blistering, discoloration, or wrinkling (Deterioration)
- Delaminations or voids (Delamination)
- Fiber exposure (Spall or Cracking)
- Scratches or cracks (Cracking)
- Creep or shrinkage (Distortion)

Common Deterioration Types for Iron:

- Defects are similar to steel

Common Deterioration Types for Aluminum:

- Fatigue cracking
- Pitting (Section Loss)
- Corrosion – occurs commonly when in direct contact with fresh concrete if not coated or protected

Table 52. Other Materials - defect severity guidance for component condition ratings.

Defect	Minor	Moderate
Movement	Minor restriction.	Restricted.
Alignment	Lateral or vertical alignment that is inconsistent with temperature conditions, but is tolerable.	Approaching limits of lateral or vertical alignment for the bearing.
Bulging, Splitting, Tearing	Bulging less than 15% of bearing thickness.	Bulging 15% or more of bearing thickness. Splitting or tearing. Bearing's surfaces are not parallel.
Loss of Bearing Area	Up to 10%	More than 10%.
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is evident.
Connection	Loose fasteners, or pack rust without distortion. Connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion.

Table 53. Bridge Joints - defect severity guidance for component condition ratings.

Defect	Minor	Moderate	Major
Leakage	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Cracking	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Seal Damage	Seal abrasion without punctures.	Punctured, torn, or partially pulled out.	Punctured completely through, pulled out, or missing.
Debris Impaction	Partially filled with hardpacked material, but still allowing free movement.	Completely filled; impacts joint movement.	Completely filled; prevents joint movement.
Adjacent Deck or Header	Edge delamination or spall 1" or less deep or 6" or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1" deep or greater than 6" diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area, or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage	Freckled rust. Metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal, or impact damage. Joint still functioning.	Section loss, cracking of the metal, damage, or connection failure that prevents the joint from functioning as intended.

Table 54. Channel - defect severity guidance for component condition ratings.

Defect	Minor	Moderate	Major
Alignment	Flow angle of attack 15-30 degrees with respect to the bridge substructure, or 5-15 degrees with respect to wall piers.	Flow angle of attack 30-45 degrees with respect to the bridge substructure, or 15-30 degrees with respect to wall piers.	Flow angle of attack more than 45 degrees with respect to the bridge substructure, or more than 30 degrees with respect to wall piers.
Migration	Thalweg has moved from its baseline location, but movement has arrested or does not threaten the bridge or approach roadway.	Thalweg movement has not arrested and impacts embankment stability.	Thalweg movement has begun to undermine approach roadway.
Degradation	Exists within tolerable limits or has arrested.	Sloughing of banks, resulting in vertical embankments on both sides of the channel. Bridge is not yet impacted.	Sloughing of banks, resulting in vertical embankments on both sides of the channel. Bridge is impacted.
Aggradation	Exists within tolerable limits or has arrested.	Exceeds tolerable limits. Hydraulic opening is significantly blocked, increasing potential for overtopping or channel restriction.	Hydraulic opening is mostly blocked. May cause frequent overtopping or channel restriction.
Debris	Restricts channel slightly, or is prone to build-up.	Large deposits exist and restrict the channel, causing increased water velocities, redirecting stream flow, or eroding banks.	Hydraulic opening mostly blocked, significantly redirecting stream flow or impacting waterway capacity.
Bank Erosion/ Instability	Erosion/instability that does not impact the bridge or approach roadway.	Significant erosion/instability that is progressing toward the bridge or approach roadway.	Stability of the approach roadway embankment is impacted.

APPENDIX D: SNBI-NBI DATA ITEM MAPPING

Sorted by Item ID

Item ID	Data Item Name	NBI/NE Item Number*	NBI/NE/BrM 6.X Item Name*
B.AP.01	Approach Roadway Alignment	72	Approach Alignment
B.AP.02	Overtopping Likelihood	42B N/A	Type of Service Under Bridge Overtopping Frequency (yr) (BrM)
B.AP.03	Scour Vulnerability	42B 113	Type of Service Under Bridge Scour Critical
B.AP.04	Scour Plan of Action	42B 358C	Type of Service Under Bridge Scour Plan of Action Effective Date (358C)
B.AP.05	Seismic Vulnerability	N/A	N/A
B.C.01	Deck Condition Rating	58	Deck
B.C.02	Superstructure Condition Rating	59	Superstructure
B.C.03	Substructure Condition Rating	60	Substructure
B.C.04	Culvert Condition Rating	62	Culvert
B.C.05	Bridge Railing Condition Rating	36A	Rails
B.C.06	Bridge Railing Transitions Condition Rating	36B	Transitions
B.C.07	Bridge Bearings Condition Rating	BIP Item: 311	Bearing Devices (Condition)
B.C.08	Bridge Joints Condition Rating	N/A	N/A
B.C.09	Channel Condition Rating	61	Channel
B.C.10	Channel Protection Condition Rating	61	Channel
B.C.11	Scour Condition Rating	113 364	Scour Critical Bridges Is There a Scour Problem
B.C.12	Bridge Condition Classification	N/A	N/A
B.C.13	Lowest Condition Rating Code	58 59 60 62	Deck Superstructure Substructure Culvert
B.C.14	NSTM Inspection Condition	92AA 59	Fracture Critical Details Superstructure
B.C.15	Underwater Inspection Condition	92BA 60	Underwater Inspection Substructure
B.CL.01	Owner	22	Owner
B.CL.02	Maintenance Responsibility	21	Maint. Resp.
B.CL.03	Federal or Tribal Land Access	105	Federal Lands Highways
B.CL.04	Historic Significance	37	Historical Significance
B.CL.05	Toll	20	Toll Facility
B.CL.06	Emergency Evacuation Designation	N/A	N/A
B.CS.01	Element Quantity Condition State One	N/A	N/A
B.CS.02	Element Quantity Condition State Two	N/A	N/A
B.CS.03	Element Quantity Condition State Three	N/A	N/A
B.CS.04	Element Quantity Condition State Four	N/A	N/A
B.E.01	Element Number (many-to-one)	N/A	N/A
B.E.02	Element Parent Number	N/A	N/A
B.E.03	Element Total Quantity	N/A	N/A

Sorted by Item ID

Item ID	Data Item Name	NBI/NE Item Number*	NBI/NE/BrM 6.X Item Name*
B.EP.01	Legal Load Configuration (many-to-one)	N/A	N/A
B.EP.02	Legal Load Rating Factor	N/A	N/A
B.EP.03	Posting Type	203A 203B 203C	Posted Weight Limit
B.EP.04	Posting Value	203A 203B 203C	Posted Weight Limit
B.F.01	Feature Type (many-to-one)	42A 42B	Type of Service On Bridge Type of Service Under Bridge
B.F.02	Feature Location	42A 42B	Type of Service On Bridge Type of Service Under Bridge
B.F.03	Feature Name	6A	Feature Intersected
B.G.01	NBIS Bridge Length	49	Structure length
B.G.02	Total Bridge Length	49	Structure Length
B.G.03	Maximum Span Length	48	Length of Maximum Span
B.G.04	Minimum Span Length	45 43B 48 359C	Number of Spans in Main Unit Structure Type, Main Length of Maximum Span Culvert Span Length
B.G.05	Bridge Width Out-to-Out	52	Deck Width (out-to-out)
B.G.06	Bridge Width Curb-to-Curb	51	Roadway crb-crb
B.G.07	Left Curb or Sidewalk Width	50A	Curb Sidewalk width/Left
B.G.08	Right Curb or Sidewalk Width	50B	Curb Sidewalk width/Right
B.G.09	Approach Roadway Width	32	Approach Road
B.G.10	Bridge Median	33	Bridge Median
B.G.11	Skew	34	Skew
B.G.12	Curved Bridge	N/A	N/A
B.G.13	Maximum Bridge Height	54B 357 359D	Minimum Vertical Underclearance Drop from Upstream Deck to Flowline Culvert Height
B.G.14	Sidehill Bridge	N/A	N/A
B.G.15	Irregular Deck Area	35	Structure Flared
B.G.16	Calculated Deck Area	N/A	N/A
B.H.01	Functional Classification	26	National Functional Classification of Inventory Route
B.H.02	Urban Code	4	Urban/Municipal Code
B.H.03	NHS Designation	104	Highway System of the Inventory Route
B.H.04	National Highway Freight Network	110	Designated National network
B.H.05	STRAHNET Designation	100	STRAHNET Highway Designation
B.H.06	LRS Route ID	13A 13B	LRS Inventory Route Subroute Number
B.H.07	LRS Mile Point	11	Kilometer/Mile Point
B.H.08	Lanes on Highway	28A	Lanes
B.H.09	Annual Average Daily Traffic	29	Recent ADT

Sorted by Item ID

Item ID	Data Item Name	NBI/NE Item Number*	NBI/NE/BrM 6.X Item Name*
B.H.10	Annual Average Daily Truck Traffic	109 29	Recent ADT Truck %
B.H.11	Year of Annual Average Daily Traffic	30	ADT Year
B.H.12	Highway Maximum Usable Vertical Clearance	10	Inventory Route Minimum Vert Clear
B.H.13	Highway Minimum Vertical Clearance	54A 53 54B	Reference Feature Minimum Vertical Clearance Over Bridge Roadway Minimum Vertical Underclearance
B.H.14	Highway Minimum Horizontal Clearance, Left	55A 56	Reference Feature Minimum Lateral Clearance, Left Side
B.H.15	Highway Minimum Horizontal Clearance, Right	55A 55B	Reference Feature Minimum Lateral Clearance, Right Side
B.H.16	Highway Maximum Usable Surface Width	51	Bridge Roadway Width, Curb-to-Curb
B.H.17	Bypass Detour Length	19	Detour Length
B.H.18	Crossing Bridge Number	N/A	N/A
B.ID.01	Bridge Number	N/A	Bridge (BrM)
B.ID.02	Bridge Name	N/A	Name (BrM)
B.ID.03	Previous Bridge Number	8	NBI Structure No
B.IE.01	Inspection Type (many-to-one)	N/A	Primary Type (BrM)
B.IE.02	Inspection Begin Date	90	Inspection Date
B.IE.03	Inspection Completion Date	90	Inspection Date
B.IE.04	Nationally Certified Bridge Inspector	N/A	Inspector (BrM)
B.IE.05	Inspection Interval	91	Designated Inspection Frequency
B.IE.06	Inspection Due Date	N/A	Next Date (BrM)
B.IE.07	Risk-Based Inspection Interval Method	N/A	N/A
B.IE.08	Inspection Quality Control Date	N/A	QC Approval Date (BrM)
B.IE.09	Inspection Quality Assurance Date	N/A	N/A
B.IE.10	Inspection Data Update Date	N/A	N/A
B.IE.11	Inspection Note	N/A	Inspection Notes (BrM)
B.IE.12	Inspection Equipment	N/A	N/A
B.IR.01	NSTM Inspection Required	92AA	Fracture Critical Details
B.IR.02	Fatigue Details	N/A	Cover Plates on Steel Girder (BrM)
B.IR.03	Underwater Inspection Required	92BA	Underwater Inspection
B.IR.04	Complex Feature	N/A	N/A
B.L.01	State Code	1	State Code
B.L.02	County Code	3	County Code
B.L.03	Place Code	4	Urban/Municipal Code
B.L.04	Highway Agency District	2	State Highway Department District
B.L.05	Latitude	16	Latitude
B.L.06	Longitude	17	Longitude
B.L.07	Border Bridge Number	99	Border Bridge Struct No
B.L.08	Border Bridge State or Country Code	98A	Neighboring State Code

Sorted by Item ID

Item ID	Data Item Name	NBI/NE Item Number*	NBI/NE/BrM 6.X Item Name*
B.L.09	Border Bridge Inspection Responsibility	98A N/A	Neighboring State Code
B.L.10	Border Bridge Designated Lead State	1 98A N/A	State Code Neighboring State Code
B.L.11	Bridge Location	9	Location
B.L.12	Metropolitan Planning Organization	N/A	MPO (BrM)
B.LR.01	Design Load	31	Design Load
B.LR.02	Design Method	63	Method Used to Determine Operating Rating
B.LR.03	Load Rating Date	N/A	N/A
B.LR.04	Load Rating Method	381 63	Load Rating Program used Method Used to Determine Operating Rating
B.LR.05	Inventory Load Rating Factor	66	Inventory Rating
B.LR.06	Operating Load Rating Factor	64	Operating Rating
B.LR.07	Controlling Legal Load Rating Factor	N/A	N/A
B.LR.08	Routine Permit Loads	N/A	N/A
B.N.01	Navigable Waterway	38 42B	Navigation Control Type of Service Under Bridge
B.N.02	Navigation Minimum Vertical Clearance	38 42B 54B	Navigation Control Type of Service Under Bridge Minimum Vertical Underclearance
B.N.03	Movable Bridge Maximum Navigation Vertical Clearance	38 42B 43B 116	Navigation Control Type of Service Under Bridge Structure Type, Main Minimum Navigation Vertical Clearance
B.N.04	Navigation Channel Width	38 40	Navigation Control Navigation Horizontal Clearance
B.N.05	Navigation Channel Minimum Horizontal Clearance	38	Navigation Control
B.N.06	Substructure Navigation Protection	111	Pier or Abutment Protection (for Navigation)
B.PS.01	Load Posting Status (many-to-one)	41	Structure Open, Posted, or Closed to Traffic
B.PS.02	Posting Status Change Date	N/A	N/A
B.RH.01	Bridge Railings	36A	Rails
B.RH.02	Transitions	36B	Transitions
B.RR.01	Railroad Service Type	42A 42B	Type of Service on Bridge Type of Service Under Bridge
B.RR.02	Railroad Minimum Vertical Clearance	54A 54B	Reference Feature Minimum Vertical Underclearance
B.RR.03	Railroad Minimum Horizontal Offset	55A 55B 56	Reference Feature Minimum Lateral Underclearance, Right Minimum Lateral Underclearance, Left
B.RT.01	Route Designation (many-to-one)	5A	Record type
B.RT.02	Route Number	5D 5E 102	Rte.# Directional Suffix Direction of Traffic
B.RT.03	Route Direction	5E 102	Directional Suffix Direction of Traffic
B.RT.04	Route Type	5B	Kind Hwy (Rt Prefix)

Sorted by Item ID

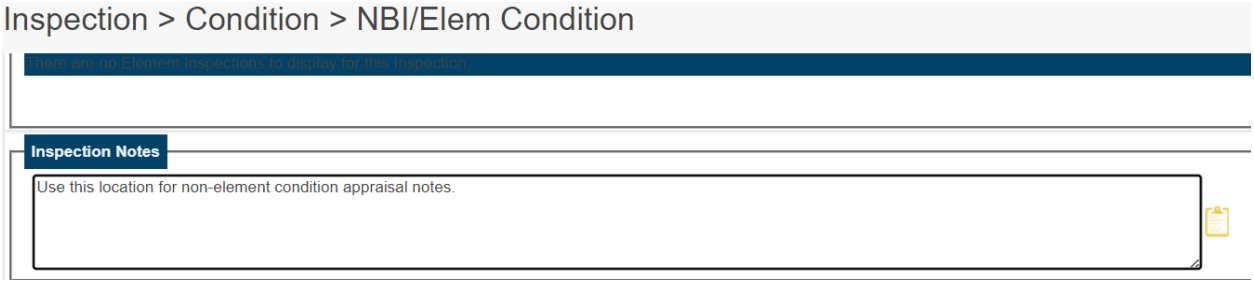
Item ID	Data Item Name	NBI/NE Item Number*	NBI/NE/BrM 6.X Item Name*
B.RT.05	Service Type	5C	Desig. Level Service
B.SB.01	Substructure Configuration Designation (many-to-one)	43A 43B	Structure Material, Main Structure Type, Main
B.SB.02	Number of Substructure Units	45 46	Number of Spans in Main Unit Number of Approach Spans
B.SB.03	Substructure Material	367	Substructure Material
B.SB.04	Substructure Type	43A 43B	Structure Material, Main Structure Type, Main
B.SB.05	Substructure Protective System	43A 43B	Structure Material, Main Structure Type, Main
B.SB.06	Foundation Type	321	Piling Type
B.SB.07	Foundation Protective System	43A 43B	Structure Material, Main Structure Type, Main
B.SP.01	Span Configuration Designation (many-to-one)	43B 46	Structure Material, Main Number of Approach Spans
B.SP.02	Number of Spans	45 46	Number of Spans in Main Unit Number of Approach Spans
B.SP.03	Number of Beam Lines	N/A	N/A
B.SP.04	Span Material	43A	Structure Material, Main
B.SP.05	Span Continuity	43A 43B	Structure Material, Main Structure Type, Main
B.SP.06	Span Type	43B	Structure Type, Main
B.SP.07	Span Protective System	N/A	N/A
B.SP.08	Deck Interaction	107 43B	Deck Structure Type Structure Type, Main
B.SP.09	Deck Material and Type	107	Deck Structure Type
B.SP.10	Wearing Surface	107 108A	Deck Structure Type Type of Wearing Surface
B.SP.11	Deck Protective System	107 108B	Deck Structure Type Type of Membrane
B.SP.12	Deck Reinforcing Protective System	107 108C	Deck Structure Type Deck Protection
B.SP.13	Deck Stay-in-Place Forms	Elements: 9530 N/A	SIP Deck Forms
B.W.01	Year Built	27	Year Built
B.W.02	Year Work Performed (many -to-one)	106	Year Reconstruct
B.W.03	Work Performed	106	Year Reconstruct

**Refers to the NBI/NE/BrM Data Item preceding the SNBI Item; doesn't necessarily provide a clean, full transition of data.*

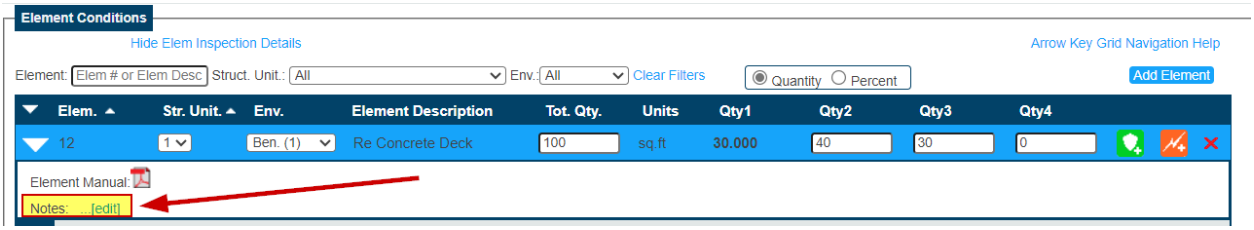
APPENDIX E: INSPECTION NOTE QUALITY

It is required to provide bridge inspection notes which describe and justify any rating of 5 or less for the Bridge Component Condition Ratings (B.C.01 Through B.C.15). Also provide notes for any bridge elements that have any quantity appraised in Condition State (CS) 3, or 4. Notes should clearly describe the type, size, and location of any defects.

NBI condition notes should be provided in BrM > Inspection > Condition > NBI/Elem Condition > Inspection Notes.

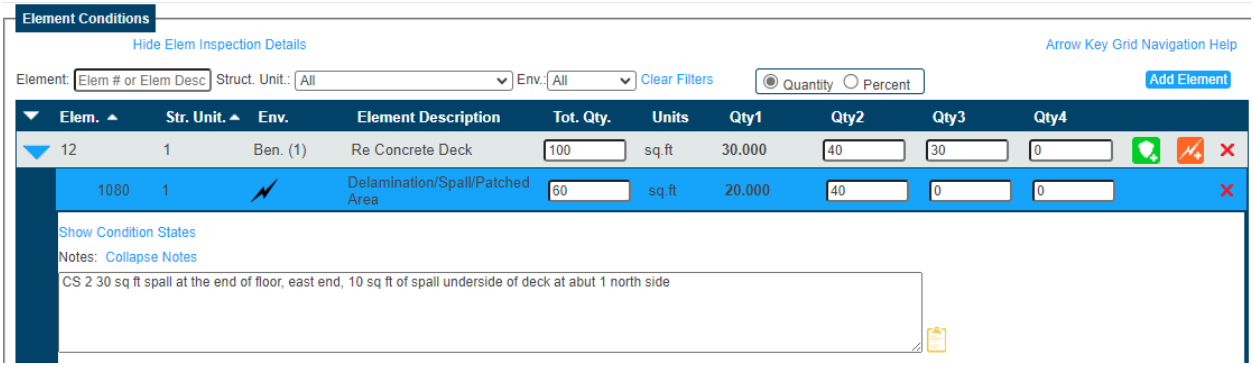


Element condition notes should be provided in BrM > Inspection > Condition > NBI/Elem Condition > Element Conditions in the Notes field of the relevant bridge element. The screenshot below shows the location of the Notes edit field for a reinforced concrete bridge deck element. Similar Notes editing is available for each element.



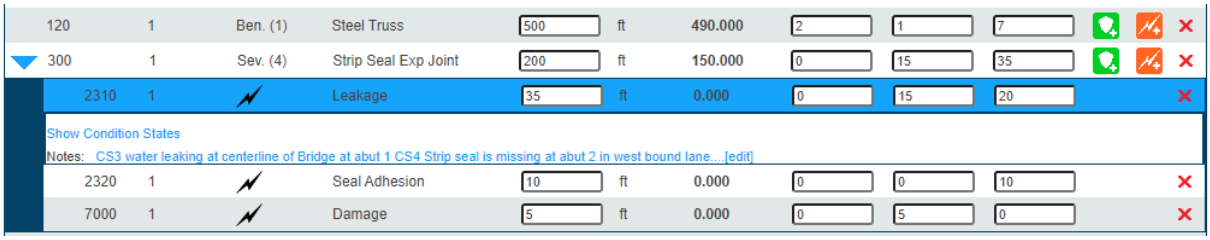
Examples:

Concrete deck with 1080 defect:



If an element has multiple Condition State defects, each has a note as to how much is where.

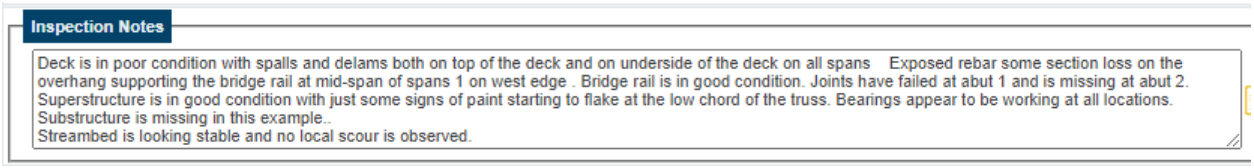
Strip Seal Example:



120	1	Ben. (1)	Steel Truss	500	ft	490.000	2	1	7		
300	1	Sev. (4)	Strip Seal Exp Joint	200	ft	150.000	0	15	35		
2310	1		Leakage	35	ft	0.000	0	15	20		
Show Condition States											
Notes: CS3 water leaking at centerline of Bridge at abut 1 CS4 Strip seal is missing at abut 2 in west bound lane....[edit]											
2320	1		Seal Adhesion	10	ft	0.000	0	0	10		
7000	1		Damage	5	ft	0.000	0	5	0		

Note that there is some CS-3 and CS-4 defects. A separate note for each Condition State is required.

NBI Inspection Notes Example:



Notes are required for any NBI condition rating of 5 or less. The general notes should be detailed as to location and the quantity of the defect.

Example:

- 11/18/2022 Delineators present at North corners only. Deck has minor splitting and moderate wear throughout. Both bridge rails have damage at south end. All steel elements have **heavy rust**. Spans 1 and 5 are in fair condition. Spans 2 and 3 East **exterior stringers lean out at top**. Abutment backwall and pile lean **North at top by 2 to 3 feet**, backwall planks are settling with small gaps developing. Abutment 1, Pile 1 has 10% section loss. Bent 2 is comprised of damaged original pile with new pile and corbels to support the cap. Bent 3, Pile 1 has flange damage, waler weld is cracked on North side. Bent 3, South waler is distorted between Piles 3-4. Abutment 2 is buried.

Above is an example of an inspection note that is lacking some detail.

1. The note calls out "heavy rust". The bridge had surface rust. If there is "heavy rust", there should a call out as to the remaining section.
2. "exterior stringers lean out at top". There should a dimension or sketch detailing the amount of rotation from vertical. (There were no photos either showing defect)
3. "Abutment 1 piling lean North at top by 2 to 3 feet". There should be a measurement of how much this pile is out of plumb. The next time it is inspected, the inspector can see if the pile is leaning more or is stable.

Keep complete notes. Use photos and sketches to back up or supplement your notes.

3-EI.1 GENERAL 9
3-EI.2 REFERENCES 10
3-EI.2.1 Element Inspection 10
3-EI.2.2 SNBI and Other Inspection Data 11
3-EI.3 ELEMENT INSPECTION BASICS 12
3-EI.3.1 Structure Units – Basics 12
3-EI.3.2 Elements – Basics 12
3-EI.3.3 Environment – Basics 13
3-EI.3.4 Defects and Condition States – Basics 14
3-EI.3.5 National Bridge Elements (NBE) Groupings 14
3-EI.3.6 Bridge Management Elements (BME) Groupings 15
3-EI.3.7 Bridge Elements Reported to FHWA 17
3-EI.4 ELEMENT INSPECTION INPUT INTO BrM 18
3-EI.5 STRUCTURE UNITS 18
Two Span Slab 20
Approach & Main Spans 21
Paving, Approach & Main Spans 22
3-EI.6 ENVIRONMENT 23
3-EI.7 DEFECT ILLUSTRATIONS 24
3-EI.7.1 Area Estimate Illustrations - Damage 24
3-EI.7.2 Area Estimate Illustrations – Cracking 31
3-EI.7.3 Linear Estimate Illustrations 35
3-EI.8 ELEMENT CONDITION LANGUAGE 36
3-EI.9 DECKS AND SLABS 37
3-EI.9.1 General 37
3-EI.9.2 Reinforced Concrete 38
12 Reinforced Concrete Deck 39
16 Reinforced Concrete Top Flange 39
38 Reinforced Concrete Slab – Solid 39
9038 Reinforced Concrete Slab – Voided 39
3-EI.9.3 Prestressed Concrete 40
13 Prestressed Concrete Deck 41
15 Prestressed Concrete Top Flange 41
3-EI.9.4 Steel 42
28 Steel Deck with Open Grid 43
29 Steel Deck with Concrete Filled Grid 43
30 Steel Deck Corrugated/Orthotropic/Etc. 43
3-EI.9.5 Timber 44
31 Timber Deck 45
54 Timber Slab 46

3-EI.9.6 Other 47

60 Other Deck 48
65 Other Slab 48

3-EI.10 RAILINGS 49

3-EI.10.1 General 49
3-EI.10.2 Metal Rail 51

330 Metal Bridge Railing 52
9333 Metal Approach Railing 52
9338 Metal Transition Railing 52
9343 Flexible Barrier Terminal Section 53
9344 Crash Cushions Terminal Section 55

3-EI.10.3 Reinforced Concrete Rail 56

331 Reinforced Concrete Bridge Railing – Closed 57
9331 Reinforced Concrete Bridge Railing – Open 57
9334 Reinforced Concrete Approach Railing – Closed 57
9335 Reinforced Concrete Approach Railing – Open 57
9336 Reinforced Concrete Approach Rail On Wingwall 58
9339 Reinforced Concrete Transition Railing – Closed 58
9340 Reinforced Concrete Transition Railing – Open 58

3-EI.10.4 Timber Rail 59

332 Timber Bridge Railing 60
9332 Timber Approach Railing 61
9341 Timber Transition Railing 61

3-EI.10.5 Masonry Rail 62

334 Masonry Bridge Railing 63
9345 Masonry Approach Railing 63

3-EI.10.6 Other 64

333 Other Bridge Railing 66
9337 Other Approach Railing 66
9342 Other Transition Railing 66

3-EI.11 SUPERSTRUCTURE 67

3-EI.11.1 General 67
3-EI.11.2 Steel 68

102 Steel Closed Web/Box Girder 69
9102 High Performance Steel Closed Web/Box Girder 69
107 Steel Open Girder/Beam 69
9101 Steel Open Girder/Beam With Cover Plate 70
9107 High Performance Steel Open Girder/Beam 70
113 Steel Stringer 70
120 Steel Truss 70
141 Steel Arch 71
152 Steel Floor Beam 71
9152 Cross Frame 71

147 Steel Main Cables 71
148 Secondary Steel Cables 72
161 Steel Pin and Pin & Hanger Assembly or Both 72
162 Steel Gusset Plate 73

3-EI.11.3 Prestressed Concrete 74

104 Prestressed Concrete Closed Web/Box Girder 75
109 Prestressed Concrete Open Girder/Beam 75
9104 Prestressed Concrete Inverted T Girder 75
9106 Prestressed Concrete NU Girder 75
9109 Prestressed Concrete Double T Beam 76
115 Prestressed Concrete Stringer 76
143 Prestressed Concrete Arch 76
154 Prestressed Concrete Floor Beam 76

3-EI.11.4 Reinforced Concrete 77

105 Reinforced Concrete Closed Web/Box Girder 78
110 Reinforced Concrete Open Girder/Beam 78
116 Reinforced Concrete Stringer 78
144 Reinforced Concrete Arch 78
155 Reinforced Concrete Floor Beam 79

3-EI.11.5 Timber 80

111 Timber Open Girder/Beam 81
117 Timber Stringer 82
135 Timber Truss 82
146 Timber Arch 82
156 Timber Floor Beam 82

3-EI.11.6 Masonry 83

145 Masonry Arch 84

3-EI.11.7 Other 85

106 Other Closed Web/Box Girder 86
112 Other Open Girder/Beam 87
118 Other Stringer 87
136 Other Truss 87
142 Other Arch 87
157 Other Floor Beam 88
149 Other Secondary Cable 88

3-EI.12 BEARINGS 89

3-EI.12.1 General 89
3-EI.12.2 Elastomeric Bearings 90

310 Elastomeric Bearing 91

3-EI.12.3 Movable Bearings 92

311 Movable Bearing 93
9311 Rocker With Pin Bearing 94
9312 Roller Bearing 94
9313 Sliding Plate Bearing 95

3-EI.12.4 Enclosed/Concealed Bearings 96
312 Enclosed/Concealed Bearing 97
3-EI.12.5 Fixed Bearings 98
313 Fixed Bearing 99
9303 Fixed Pinned Bearing 100
9304 Fixed Plate Bearing 100
3-EI.12.6 Pot Bearings 101
314 Pot Bearing 103
3-EI.12.7 Disk Bearings 104
315 Disk Bearing 105
3-EI.12.8 Other Bearings 106
316 Other Bearing 107
3-EI.13 SUBSTRUCTURE 108
3-EI.13.1 General 108
3-EI.13.2 Steel 109
202 Steel Column 110
9202 Submerged Steel Column 111
207 Steel Tower 111
9207 Submerged Steel Tower 111
219 Steel Abutment 112
9219 Submerged Steel Abutment 112
9248 Steel Grade Beam Cap 113
225 Steel Pile 113
9225 Submerged Steel Pile 113
9231 Steel Grade Beam Pile 114
231 Steel Pier Cap 114
9237 Steel Wingwall 114
9243 Steel Headwall 116
3-EI.13.3 Prestressed Concrete 117
204 Prestressed Concrete Column 118
9204 Submerged Prestressed Concrete Column 118
226 Prestressed Concrete Pile 119
9226 Submerged Prestressed Concrete Pile 119
9232 Prestressed Concrete Grade Beam Pile 119
233 Prestressed Concrete Pier Cap 120
3-EI.13.4 Reinforced Concrete 121
205 Reinforced Concrete Column 122
9205 Submerged Reinforced Concrete Column 122
210 Reinforced Concrete Pier Wall 123
9210 Submerged Reinforced Concrete Pier Wall 123
215 Reinforced Concrete Abutment 123
9215 Submerged Reinforced Concrete Abutment 124
220 Reinforced Concrete Pile Cap/Footing 124

9220 Submerged Reinforced Concrete Pile Cap/Footing 125
9230 Reinforced Concrete Grade Beam Cap 125
227 Reinforced Concrete Pile 125
9227 Submerged Reinforced Concrete Pile 126
9234 Reinforced Concrete Grade Beam Pile 126
234 Reinforced Concrete Pier Cap 126
9238 Reinforced Concrete Wingwall 127
9244 Reinforced Concrete Headwall 127

3-EI.13.5 Timber 128

206 Timber Column 130
9206 Submerged Timber Column 130
208 Timber Trestle 130
9208 Submerged Timber Trestle 131
212 Timber Pier Wall 131
9212 Submerged Timber Pier Wall 131
216 Timber Abutment 132
9216 Submerged Timber Abutment 132
228 Timber Pile 133
9228 Submerged Timber Pile 133
9235 Timber Grade Beam Pile 133
235 Timber Pier Cap 134
9240 Timber Wingwall 134
9245 Timber Headwall 135

3-EI.13.6 Masonry 136

213 Masonry Pier Wall 137
9213 Submerged Masonry Pier Wall 137
217 Masonry Abutment 138
9217 Submerged Masonry Abutment 138
9261 Rectangular Mechanically Stabilized Earth Abutment 139
9262 Cruciform Mechanically Stabilized Earth Abutment 139
9263 Block Mechanically Stabilized Earth Abutment 140
9241 Masonry Wingwall 140
9246 Masonry Headwall 141

3-EI.13.7 Other 142

203 Other Column 144
9203 Submerged Other Column 144
211 Other Pier Wall 144
9211 Submerged Other Pier Wall 145
218 Other Abutments 145
9218 Submerged Other Abutments 146
229 Other Pile 146
9229 Submerged Other Pile 146
9236 Other Grade Beam Pile 147
236 Other Pier Cap 147
9242 Other Wingwall 147
9247 Other Headwall 148

3-EI.14 CULVERTS 149

3-EI.14.1 General 149
3-EI.14.2 Steel 150
240 Steel Culvert 151
9270 Steel Arpon 151
3-EI.14.3 Prestressed Concrete 153
245 Prestressed Concrete Culvert 154
3-EI.14.4 Reinforced Concrete 155
241 Reinforced Concrete Culvert 156
9271 Reinforced Concrete Apron 156
3-EI.14.5 Timber 158
242 Timber Culvert 160
9272 Timber Arpon 160
3-EI.14.6 Masonry 161
244 Masonry Culvert 162
9273 Masonry Apron 162
3-EI.14.7 Other 163
243 Other Culvert 165
9274 Other Apron 165
3-EI.15 JOINTS 166
3-EI.15.1 General 166
3-EI.15.2 Strip Seal Joints 167
300 Strip Seal Expansion Joint 168
3-EI.15.3 Pourable Seal Joints 169
301 Pourable Seal Joint 170
3-EI.15.4 Compression Seal Joints 171
302 Compression Seal Joint 173
9401 Preformed Silicone Joint 173
3-EI.15.5 Assembly Joints 174
303 Assembly Joint With Seal 175
305 Assembly Joint Without Seal 176
3-EI.15.6 Open Joints 177
304 Open Expansion Joint 178
3-EI.15.7 Other Joints 179
306 Other Joint 180
3-EI.15.8 Joint Nosing 181
9402 Joint Nosing 182
3-EI.16 APROACH AND PAVING SLABS 182

3-EI.16.1 General 182
3-EI.16.2 Prestressed Concrete 183
320 Prestressed Concrete Paving Slab 184
3-EI.16.3 Reinforced Concrete 184
321 Reinforced Concrete Paving Slab 185
3-EI.17 WEARING SURFACES 185
3-EI.17.1 General 185
3-EI.17.2 Asphalt Overlays 185
9511 Asphalt Overlay 186
9512 Asphalt Overlay with Membrane 187
3-EI.17.3 Thin Lift Overlays 187
9514 Multilayer-Polymer Overlay (Epoxy and/or Polyester) 188
3-EI.17.4 Thick Lift Overlays 188
9516 Concrete Overlay (HDLS) 189
9517 Latex Modified Overlay 189
9518 Silica Fume Overlay 189
3-EI.17.5 Timber Planks 190
9519 Timber Running Planks 191
3-EI.17.6 Other Overlays 192
9515 Other Overlay 192
3-EI.17.7 Stay-in-Place Form 193
9530 Steel Stay-in-Place Forms (SIP) 194
3-EI.18 PROTECTIVE SYSTEMS 194
3-EI.18.1 General 194
3-EI.18.2 Sealers / Water Proofers 195
9521 Healer/Sealers 195
9522 Silane/Siloxane Water Proofers 196
3-EI.18.3 Steel Protective Coatings 196
3-EI.18.4 Weathering Patina 197
9541 Weathering Steel Protective Coating 197
3-EI.18.5 Other Steel Coatings 198
9540 Steel Paint Protective Coating 198
9542 Galvanized Steel Protective Coating 199
9543 Other Steel Protective Coating 199
3-EI.18.6 Concrete Reinforcing Steel Protective Systems 199
520 Concrete Reinforcing Steel Protective System 199
3-EI.19 COUNTERMEASURES 200
3-EI.19.1 General 200

9250 Riprap 201
9251 A-Jack 201
9252 Spur Dikes 202
9253 Gabions 202
9254 Articulating Blocks 203
9255 Concrete Slope Protection 203
9256 Other Slope Protection 204

3-EI.20 OTHER CONDITION ASSESSMENT MARKERS 204

3-EI.20.1 General 204
3-EI.20.2 Chloride Contamination 204

9550 Deck Chlorides at Reinforcement Level 204

3-EI.20.3 Electrical Potentiality 205

9551 Electrical Potential at Reinforcement Level 205

3-EI.20.4 Flow Restrictions 206

9552 Debris Blocking Flow 206
9553 Silt in Culvert Barrel 207

3-EI.21 QUALITY CONTROL 208

3-EI.22 QUALITY ASSURANCE 208

3-EI.23 REVISION HISTORY 208

3-EI.24 FORMS 209

3-EI.1 GENERAL

The Moving Ahead for Progress in the 21st Century Act (MAP-21) required each state and appropriate Federal agencies to report bridge element level data to the US Department of Transportation Secretary. The Federal Highway Administration (FHWA) will use the data to review condition of bridges on the National Highway System (NHS) for evaluation of state transportation agency results as part of MAP-21 required National Highway Performance Program.

More importantly, gathering Element Inspection (EI) data provides Bridge Owners with a more detailed picture of the health of their bridges than the broad Specifications for the National Bridge Inventory (SNBI) Condition ratings (superstructure, substructure, deck,culvert, etc.) that have been collected for all bridges, both on and off the NHS since the National Bridge Inspection Standards (NBIS) were established in the 1970s. Condition ratings and other functional and geometric data for bridges historically allowed FHWA to use the Sufficiency Rating for funding prioritization.

The overall condition ratings have not allowed Owners to identify localized problems (i.e. issues with protective systems such as paint, or failure of bridge joints and the resultant damage to major elements), identify repairs, or develop actions needed to preserve their assets.

Detailed data from EI allows Owners to manage their bridge inventory more effectively, allowing them to:

- Quantify and describe element condition observed during inspection and the extent of deterioration.
- Identify candidates for preservation, maintenance, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement practices/strategies.
- Predict future deterioration of bridge elements for schedule purposes.
- Manage their budgets for bridge preservation.

FHWA is working with state agencies nationwide to help them improve their Bridge Management Systems “to do the right activity, to the right bridge, at the right time and at the right cost.”

Bridge EI has been in use by other state transportation agencies since the 1990s. NDOT began use of EI beginning in 2014. Local Bridge Owners are encouraged, but not required to use EI to help them manage and preserve their bridges.

3-EI.2 REFERENCES

The information in the NDOT's Bridge Inspection Program Manual supplements requirements, procedures, and information in documents by:

- The American Association of State Highway and Transportation Officials (AASHTO)
- The U.S. Department of Transportation, Federal Highway Administration (FHWA)
- The National Cooperative Highway Research Program (NCHRP)

The References list of documents applicable to bridge inspection is included in the Manual Appendix. The current National Bridge Inspection Standards (NBIS) are also included in the Manual Appendix. The Specifications for the National Bridge Inventory (SNBI) are included in Chapter 3 SNBI. FHWA anticipates these will be revised.

Persons involved with the Nebraska Bridge Inspection Program and the bridge inventory must be knowledgeable of the requirements in National Bridge Inspection Standards, the AASHTO *Manual for Bridge Element Inspection*, the AASHTO *Manual for Bridge Evaluation*, and FHWA publications, technical advisories and publications related to the NBIS.

The NBIS takes precedence over any material contained in the reference manuals i.e. AASHTO Manual. Where there may be implied or conflicting language between the documents, the nationwide direction provided by the NBIS will always govern.

For more information and examples on element data, see the Elements subsections (7.2 and 7.3) of Chapter 3 SNBI.

3-EI.2.1 Element Inspection

Element Inspection in this Chapter is based on The AASHTO *Manual for Bridge Element Inspection*, Second Edition, 2019, and current interims. The condition reporting is based on standard National Bridge Elements (NBEs), standard Bridge Management Elements (BMEs) and Agency Defined Elements (ADEs). AASHTO has also defined standard defects for four condition states (Good, Fair, Poor, Severe). An agency can also define Agency Defined Defects (ADDs) using the four condition states. ADEs may also be sub-elements of NBEs or BMEs.

The following publications are the background and early information on Element Inspection:

- 1985 – NCHRP Project 12-28: Bridge and Pontis Management software
- 1987 – NCHRP Report 300: Element based Bridge Management Systems (BMS)
- 1993 – FHWA CoRe Element Report recommendations
- 1996 – AASHTO CoRe Element Guidelines adopted (2002 & 2010 Interim Revisions)
- 2011 – AASHTO Guide Manual for Bridge Element Inspection, First Edition

DRAFT

3-EI.2.2 SNBI and Other Inspection Data

The FHWA Specifications for the National Bridge Inventory data items, along with their definitions, descriptions, and guidance are included in Chapter 3 SNBI of the BIP Manual.

The NE Data Items included in Chapter 3 NE are not submitted to the FHWA and do not print on a structure's Structural Inventory and Appraisal (SI&A) report.

These were developed by the NDOT Bridge Division and are used for bridge maintenance and bridge management purposes. The assignment of a particular rating or code to any item will only indicate that action is required or desired, but will not imply that action will be taken or is pending.

The following list is a summary of NE Items related to hydraulic waterway evaluation for bridges that still need to be recorded with element inspection.

NE Item No.	Description	EI Inspection
344	Abutment Walls Undermined	Defect Flag (6000)
345	Crossing a Canal	See Ch 3-NE
347	Noticeable Contraction of Stream	See Ch 3-NE
348	Local Scour at Piers/Abutments	Defect Flag (6000)
354A	Flow Against Abutment	See Ch 3-NE
355	Alignment with Flow	See Ch 3-NE
357	Drop from Upstream Deck to Flowline	See Ch 3-NE
357A	Drop from Upstream Deck to Ground at Abutment 1	See Ch 3-NE
357B	Drop from Upstream Deck to Ground at Abutment 2	See Ch 3-NE
358C	Scour Plan of Action Effective Date	See Ch 3-NE

The following list is a summary of NE items related to culverts that still need to be recorded with element inspection.

NE Item No.	Description	EI Inspection
324	Culvert Ends	EI Element Wingwall & Headwall
326	Embankment Erosion	See Ch. 3-NE.
328	Flowline Drop at Culvert Inlet	See Ch. 3-NE
329	Flowline Drop at Culvert Outlet	See Ch. 3-NE
330	Culvert Silt in Barrel	NDOT BME - 9553

3-EI.3 ELEMENT INSPECTION BASICS

NDOT uses AASHTOWare BrM Software for recording all bridge inspection data, both element inspections and non-element inspections.

There are approximately 3,600 bridges in Nebraska that are State owned or on the National Highway System (NHS). The majority of NHS bridges are owned by the State.

3-EI.3.1 Structure Units – Basics

Structure Units are used to group and organize elements. A bridge may have one or more structure span units, and these may correspond to spans, or groups of spans. In addition to superstructure span units, the SNBI has introduced structure units corresponding with substructure units (Items B.SB.01 through B.SB.07) that are used for inventory purposes, not condition-based coding. NDOT will maintain use of superstructure span units for elements.

The superstructure material, design, and construction affect reporting of element inspection data. SNBI Item B.SP.04 (Span Material), Item B.SP.05 (Span Continuity), and Item B.SP.06 (Span Type) report the material, construction, and design for a bridge.

Generally, bridges with a single material/design/construction will be reported as a single structural span unit in BrM and recorded with the total quantity of each element on the bridge. For example, a 200-foot, three-span, prestressed concrete continuous beam bridge with four girder lines will have 800 linear feet of the element Prestressed Concrete Girder/Beam, NBE 109.

If an inspector has questions concerning how to determine the structure span unit for major highway bridges with joints or interchange bridges with ramps/gores, they should contact the Bridge Division and review bridge plans for direction.

For more information, see Section 3-EI.5 Structure Units.

3-EI.3.2 Elements – Basics

Elements

An element is defined as a specific component of part of the bridge structure that is assessed for its condition, safety, and functionality. Elements are quantified from the plans prior to the inspection. If plans are not available, field measurements will be the source of the information to develop the elements and their quantities. There are some elements that can only be identified correctly from plans, such as pier piles that are surrounded by concrete for protection. All elements have the following characteristics:

1. The element number is the unique number assigned to represent that element.
2. The element name is the unique name used to define that element
3. Element quantities are reported in set units of measure feet (ft), square feet (ft2), or each (ea).
4. All elements can be classified in one of three categories: National Bridge Element (NBE), Bridge Management Element (BME), or Agency-Developed Element (ADE)
5. Each element has four condition states: Condition State 1 (CS1 – Good), Condition State 2 (CS2 – Fair), Condition State 3 (CS3 – Poor), and Condition State 4 (CS4 – Severe).

DRAFT

National Bridge Elements (NBE):

The National Bridge Elements (NBEs) represent the primary structural components of bridges necessary to determine the overall condition and safety of the primary load carrying members. The NBEs are designed to remain consistent from agency to agency across the country to facilitate and standardize the capture of bridge element conditions at the national level.

Bridge Management Elements (BME):

Bridge Management Elements (BMEs) include components of bridges such as joints, wearing surfaces, and protective coating systems and deck/slab protection The BMEs are defined with a recommended set of condition assessment language that can be modified to suit the agencies' needs as these elements are not intended to be utilized for the purposes of national policy-making

Agency-Developed Elements (ADE):

The Agency-Developed Elements (ADEs) presented in this Manual provide the flexibility for an agency to define custom elements in accordance with the defined element framework that may be sub-elements of NBEs or BMEs, or may be ADEs without ties to the other elements defined in this Manual.

3-EI.3.3 Environment – Basics

Elements are assigned an environment which indicates the likelihood that the element may deteriorate. AASHTO has defined four environments: Benign, Low, Moderate, and Severe. NDOT has defined a fifth environment: Hidden.

Environment states are for:

- Capturing environmental conditions that an element must function.
- The likelihood of failure during service.

For more information, see Section 3-EI.6 Environment.

DRAFT

3-EI.3.4 Defects and Condition States – Basics

The AASHTO standard defects are included in this Chapter for the convenience of the inspector.

NDOT has also defined defects for state use that are in addition to the standard defects. For each defect, the four condition states are described in detail.

All elements shall have associated defects (unless element determined to be in condition state 1). Defects are unique to the element and element material (i.e. concrete, steel, timber, etc.). It is the inspector's responsibility to determine the appropriate defects per unit of measure of the element to be listed under the element on the report. Every defect has four condition states:

- Condition State 1 (CS1): Good
    - CS1 defects are usually considered inherent or insignificant.
- Condition State 2 (CS2): Fair
    - CS2 defects are generally considered minor.
- Condition State 3 (CS3): Poor
    - CS3 defects are generally considered moderate.
- Condition State 4 (CS4): Severe
    - CS4 defects are usually considered major and require structural review.

Given that all elements are three diminsional, where multiple condition states exist within a unit of measure only the predominant defect in severity and extent is recorded. Given multiple defects of the same condition state within a unit of measure, the inspector will determine the defect that is controlling the deterioration and shall be the only defect reported for that unit of measure. The other overlapping defects located within the unit of measure shall be captured by the inspector under the element note or appropriate defect notes. The sum of all of the reported quantities in each condition state must equal the total quantity of the element. This will quantify the element's condition state.

Additional element condition language is referenced in Section 3-EI.8 Element Condition Language.

3-EI.3.5 National Bridge Elements (NBE) Groupings

AASHTO MBEI Manual Appendix C; also see Section NDOT NBE Groupings Chart in Manual Appendix B.

DRAFT

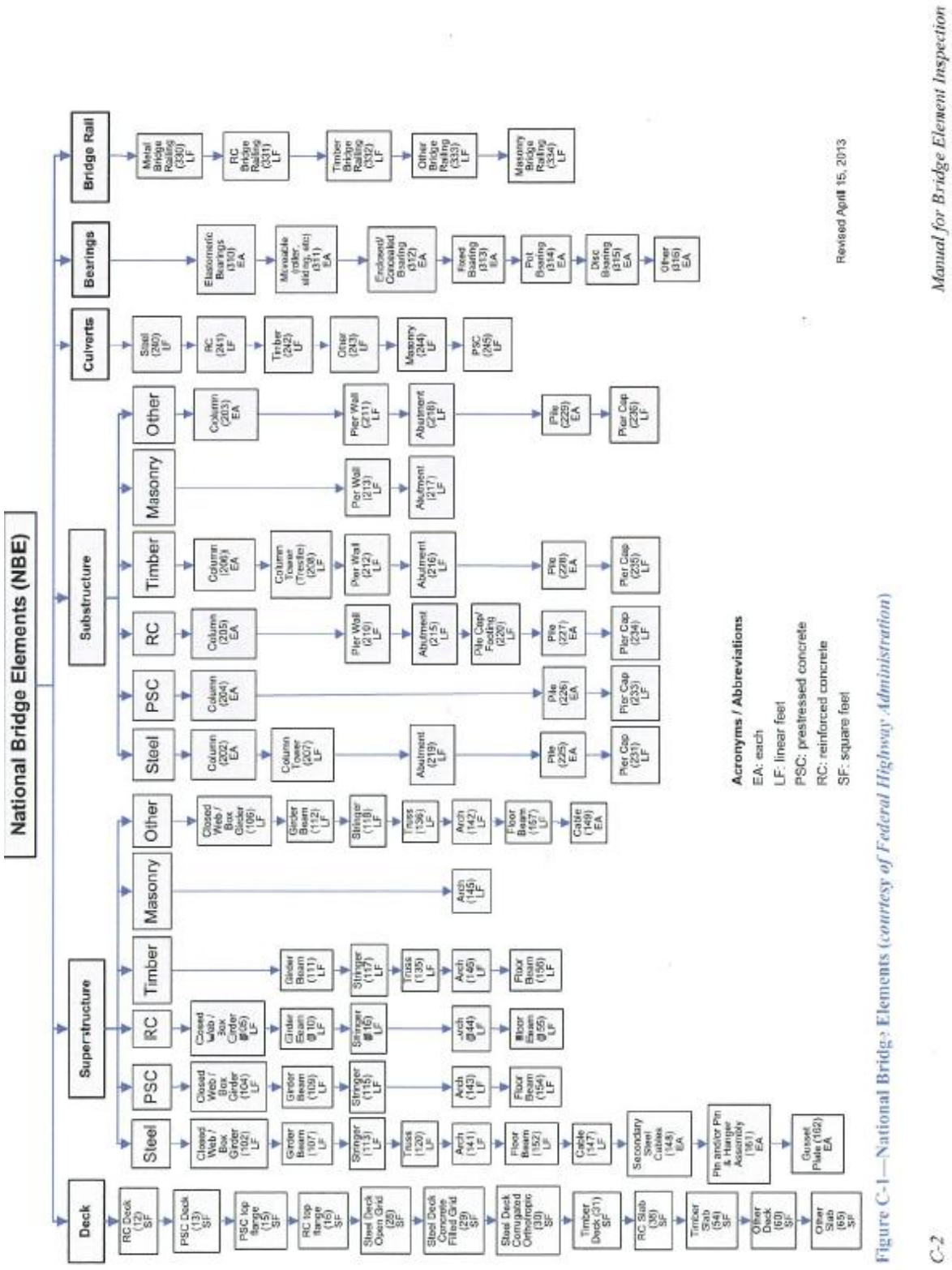


Figure C-1—National Bridge Elements (*courtesy of Federal Highway Administration*)

3-EI.3.6 Bridge Management Elements (BME) Groupings

AASHTO MBEI Manual Appendix C; also see Section NDOT BME Groupings Chart in Appendix B..

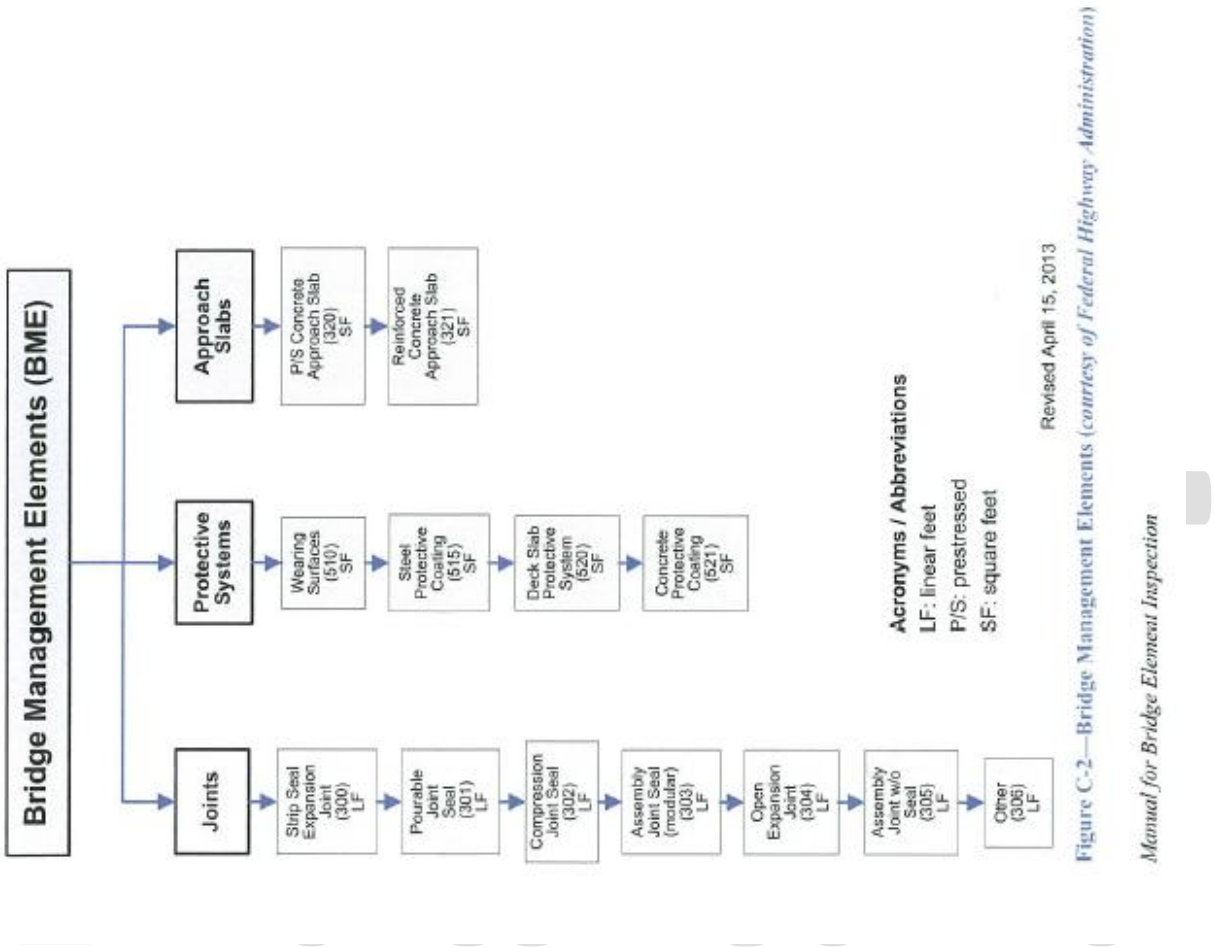


Figure C-2—Bridge Management Elements (*courtesy of Federal Highway Administration*)

Manual for Bridge Element Inspection

3-EI.3.7 Bridge Elements Reported to FHWA

From Chapter 3 SNBI, Table 22.

7.2 – ELEMENT IDENTIFICATION

Table 22. Bridge elements reported to FHWA.

Element	Units	Element Number					
		Steel	PSC	RC	Timber	Masonry	Other
Deck/Slab							
Deck	ft^2		13	12	31		60
Open Grid Deck	ft^2	28					
Concrete Filled Grid Deck	ft^2	29					
Corrugated or Orthotropic Deck	ft^2	30					
Slab	ft^2			38	54		65
Top Flange	ft^2		15	16			
Superstructure							
Closed Web/Box Girder	ft	102	104	105			106
Girder/Beam	ft	107	109	110	111		112
Stringer	ft	113	115	116	117		118
Truss	ft	120			135		136
Arch	ft	141	143	144	146	145	142
Main Cable	ft	147					
Secondary Cable	each	148					149
Floor Beam	ft	152	154	155	156		157
Pin, Pin and Hanger Assembly	each	161					
Gusset Plate	each	162					
Substructure							
Column	each	202	204	205	206		203
Column Tower (Trestle)	ft	207			208		
Pier Wall	ft			210	212	213	211
Abutment	ft	219		215	216	217	218
Pile Cap/Footing	ft			220			
Pile	each	225	226	227	228		229
Pier Cap	ft	231	233	234	235		236
Culvert							
Culvert	ft	240	245	241	242	244	243
Bridge Rail							
Bridge Rail	ft	330*		331	332	334	333
Joint							
Strip Seal	ft	300					
Pourable	ft	301					
Compression	ft	302					
Assembly with Seal (Modular)	ft	303					
Open	ft	304					
Assembly without Seal	ft	305					
Other	ft	306					
Bearing							
Elastomeric	each	310					
Movable (roller, sliding, etc.)	each	311					
Enclosed/Concealed	each	312					
Fixed	each	313					
Pot	each	314					
Disk	each	315					
Other	each	316					
Wearing Surface and Protective Coatings							
Wearing Surface	ft^2	510					
Steel Protective Coating	ft^2	515					
Concrete Protective Coating	ft^2	521					

*Element 330-Metal Bridge Rail may include steel or aluminum rails.

3-EI.4 ELEMENT INSPECTION INPUT INTO BRM

EI data is input by the Program Management (PM) Staff and TLs.

The PM Staff inputs those types that are typically Initial (I) inspection items (total quantities for each element).

The TL inputs quantities of each element in the condition state noted during inspection.

TL also must provide notes related to their inspection.

Element Inspection comments are required for any element rated in Condition State (CS)-3 or CS-4. These comments shall be recorded as element level comments on the elements grid of the BrM.

Inspection level notes shall be recorded on the notes summary tab.

When a condition state is deemed to be a CS-4 it is a Critical Finding and NDOT requires that the structure be closed. The intent is that if the Owner wishes to open the bridge, then a bridge engineer will review the structure (typically, an inspector is not a bridge engineer). After the review, the bridge can be opened if the structural review and analysis allows or the engineer's opinion is that the bridge can be opened. A Critical Finding Report must show and document the decisions. See Chapter 4 Bridge Inspection for instructions on notifications and filing this report.

3-EI.5 STRUCTURE UNITS

The inventory of elements and conditions will need to be completed, identified and grouped by structure units. Currently there are two acceptable methods for grouping bridge elements:

By each physical span of the bridge (i.e. span-by-span) or,

By elements grouped by common design and material superstructure combinations.

Based on the following information, the NDOT decided to group their bridge elements by common design and material superstructure combinations and not by each physical span of the bridge.

For each grouping method, element records were created from the information contained in the NDOT bridge asset management database. After analyzing the results for each grouping method, the following conclusions were derived:

- Regardless of the grouping method selected, the number of records that will be required for describing a bridge increases exponentially as the number of span groups increases.
- The span-by-span data set had a significant increase in the number of base elements by a factor of nearly 4-to-1 over the design and material superstructure combination data sets. Please note that the increased number of elements did not provide enough additional information in order to allow project development and maintenance activities to pinpoint future project needs based on element data alone.
- Notes on defects and/or future project needs would not be reduced by collecting the additional data required by the span-by-span method.
- Regardless of the grouping method utilized, picture and defect locations are still required as part of the inspection and the number of notations would still be the same.
- By utilizing a smaller dataset, data accuracy would be increased.
- By utilizing a smaller dataset, the amount of effort required to perform data management would be reduced.

The structure unit code and sequence number will have a specific designation and is based on the following:

- Units and elements will be numbered increasing from the south to the north or from the west to the east (see following examples).
- Elements will be assigned a structure span unit type based on the span hierarchy that is defined in SNBI Item B.SP.01 (Span Configuration Designtion). In addition, an NDOT span type has been defined to account for the paving section that leads to the beginning of the bridge. The structure span unit hierarchy types are:
    - Main Spans – These units are defined in SNBI Item B.SP.01 as M## or C## (Main or Culvert), and are the highest within the hierarchy and will have a starting sequence number of "1" with a structure unit code of "M".
    - Approach Spans – These units are defined in SNBI Item B.SP.01 as A##, and will be assigned the next sequence number after the main span with a structure unit code of "A". Each additional approach span will be assigned the next sequence number but retain the same structure unit code of "A".
    - Paving Spans – These spans are defined as the spans that approach the bridge and are comprised of grade beams, grade beam piles and/or paving slabs. Paving spans will be assigned the next sequence number after the main span and/or approach spans in conjunction with a structure unit code of "P". Each additional paving span will be assigned the next sequence number but retain the same structure unit code of "P".
    - Other Spans – These spans are defined in SNBI Item B.SP.01 as V## or W## (Culvert Extension or Widening), and will be assigned the next sequece number after the main, approach, and/or the paving spans in conjunction with a a structure unit code of "O". Each additional other span will be assigned the next sequence number but retain the same structure code of "O".
- Elements that share multiple spans with the same structure unit type will be assigned to the unit that has the lower structure sequence (i.e. if two main spans share a pier cap, the pier cap will be assigned to the first main structure unit).
- Elements that share multiple spans that have different span unit types will be assigned as follows:
    - Main Span/Approach Span element will be assigned to the Main Span.
    - Main Span/Paving Span element will be assigned to the Main Span.
    - Main Spain/Other Span element will be assigned to the Main Span.
    - Approach Span/Paving Span element will be assigned to the Approach Span.
    - Approach Span/Other Span element will be assigned to the Approach Span.
    - Paving Span/Other Span element will be assigned to the Paving Span.

Group designations for the various span unit types are as follows:

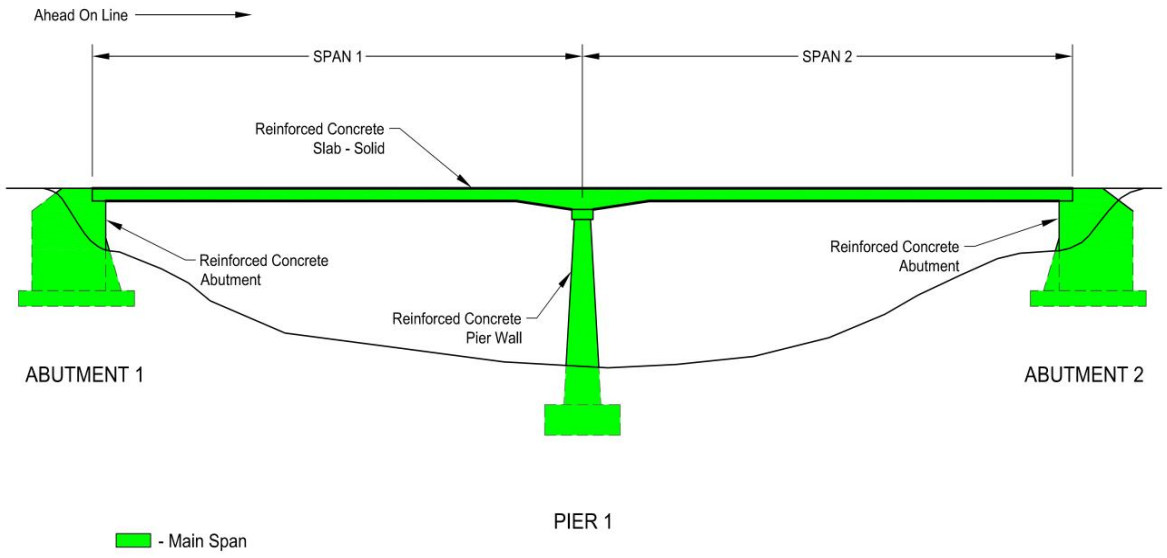
DRAFT

Code	Description
M	Main Units – This section will contain all of the elements that are part of the major bridge but are not part of the Approach Units, Paving Units, or Other Units.
A	Approach Units – This section will contain all of the elements that are a part of the designated approach, are a part of the major structure and are leading to the main span.
P	Paving Units – This section will contain all of the elements that are not part of the major structure but are an integral part of the structure: • Paving Slabs • Grade Beams • Grade Beam Piles
O	Other Units – This section will contain all of the elements on a widened or extended portion of the structure.

DRAFT

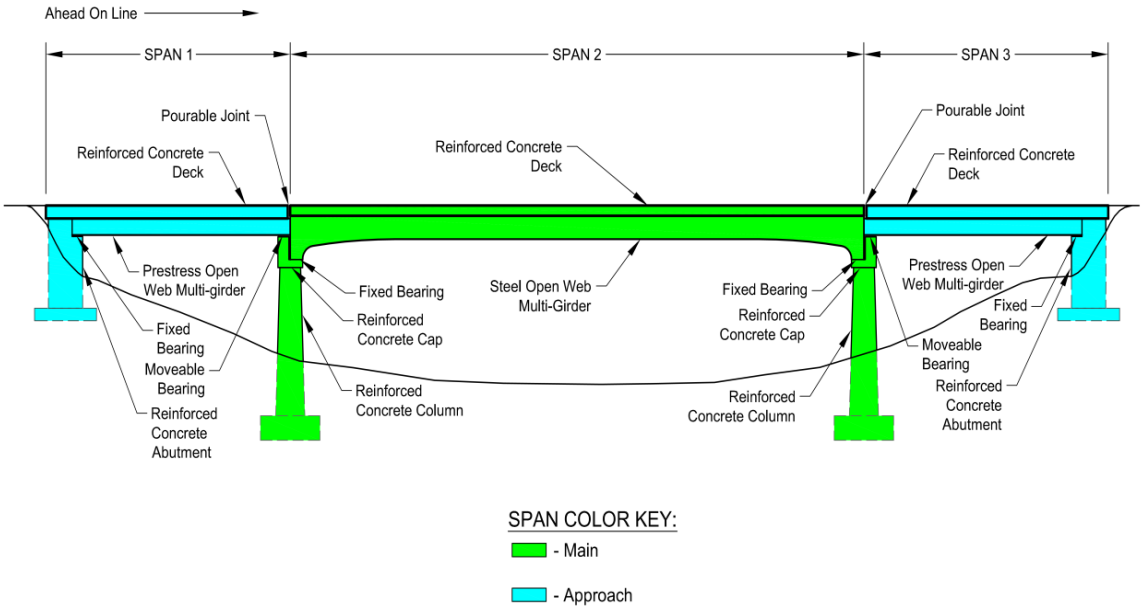
The following are general examples of how elements will be assigned based on bridge configuration:

Two Span Slab



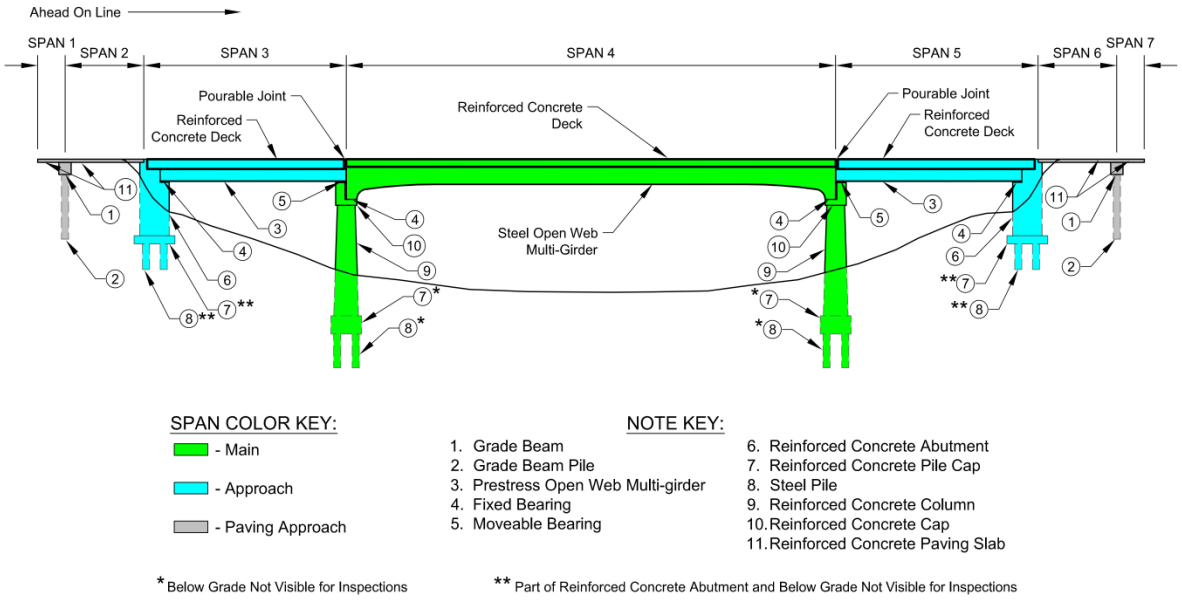
Span Unit Type	Span Unit Number	Element Number
Main	1	38 - R/C Slab - Solid (x2) (Span 1 and Span 2)
Main	1	210 - R/C Pier Wall (Between Span 1 and Span 2)
Main	1	215 - R/C Abutment (x2) (Span 1 and Span 2)

Approach & Main Spans



Span Unit Type	Span Unit Number	Element Number
Main	1	12 - R/C Deck (Span 2)
Main	1	301 - Pourable Joint Seal (x2) (Span 2)
Main	1	107 - Steel Open Girder/Beam (Span 2)
Main	1	9304 - Fix Plate Bearing (x2) (Span 2)
Main	1	205 - R/C Column (x2) (Span 2)
Main	1	234 - R/C Pier Cap (x2) (Span 2)
Approach	2	12 - R/C Deck (x2) (Span 1 and 3)
Approach	2	109 - Prestressed Concrete Open Girder/Beam (x2) (Span 1 and 3)
Approach	2	9304 - Fix Plate Bearing (x2) (Span 1 and 3)
Approach	2	9228 - Roller Bearing (x2) (Span 1 and 3)
Approach	2	215 - R/C Abutment (x2) (Span 1 and 3)

Paving, Approach & Main Spans



Span Unit Type	Span Unit Number	Element Number
Main	1	12 - R/C Deck (Span 4)
Main	1	301 - Pourable Joint Seal (x2) (Span 4)
Main	1	107 - Steel Open Girder/Beam (Span 4)
Main	1	9304 - Fix Plate Bearing (x2) (Span 4)
Main	1	205 - R/C Column (x2) (Span 4)
Main	1	234 - R/C Pier Cap (x2) (Span 4)
Approach	2	12 - R/C Deck (x2) (Span 3 & 5)
Approach	2	109 - Prestressed Concrete Open Girder/Beam (x2) (Span 3 & 5)
Approach	2	9304 - Fix Plate Bearing (x2) (Span 3 & 5)
Approach	2	9228 - Roller Bearing (x2) (Span 3 & 5)
Approach	2	215 - R/C Abutment (x2) (Span 3 & 5)
Paving	3	321 - R/C Paving Slab (x4) (Span 1, 2, 6 & 7)
Paving	3	9230 - Grade Beam Cap (x2) (Span 1, 2, 6 & 7)
Paving	3	9234 - R/C Grade Beam Pile (x2) (Span 1, 2, 6 & 7)
		**R/C Pile Cap and Steel Pile not included from Span 4 because the elements are not visible for inspection.* ***R/C Pile Cap and Steel Pile not included from Span 3 and 5 because the elements are included in the abutment quantity and the elements are not visible for inspection.* ****Grade Beam Cap and R/C Grade Beam Pile are included in the element list for Span Unit 3 for Bridge Management purposes even though they are not visible for inspection. These elements will be identified as an Environment State "0".*

3-EI.6 ENVIRONMENT

[see MBE 3.13]

Elements exposed to different environmental factors and service environments deteriorate differently. These factors may include:

- Operational activities from traffic volumes and truck movements,
- Exposure to water, road salt, and other corrosive materials,
- Condition of protective and water proofing systems, or
- Temperature extremes, either from nature or human activity.

When inventorying and assessing the condition of the elements, an inspector should consider the environment in which the element is operating. The environmental designation of an element can change over time; as it would, for example, if operating policies were changed to reduce the use of road salt. However, by definition, the environmental designation for any element cannot change as the result of maintenance work or deterioration. Note that "hidden elements" (an element that has never been exposed, or was exposed and then covered) should be coded "0" under the environmental designation. Grade beam piling and grade beams are the only "hidden" elements. Once the grade beam caps or piling become exposed they shall be evaluated and recorded under the appropriate environment.

Environment	Description
1—Benign	Neither environmental factors nor operating practices are likely to significantly change the condition of the element over time, or their effects have been mitigated by the presence of highly effective protective systems.
2—Low	Environmental factors, operating practices, or both either do not adversely influence the condition of the element, or their effects are substantially lessened by the application of effective protective systems.
3—Moderate	Any change in the condition of the element is likely to be quite normal as measured against the environmental factors, operating practices, or both that are considered typical by the agency.
4—Severe	Environmental factors, operating practices, or both contribute to the rapid decline in the condition of the element. Protective systems are not in place or are ineffective.

DRAFT

3-EI.7 DEFECT ILLUSTRATIONS

3-EI.7.1 Area Estimate Illustrations - Damage

[see MBE 3.12]

This section includes diagrams that can be used to estimate the amount of damage in a particular CS. The area estimates are presented in terms of percentage of the total area shown in the diagram. The area of each diagram represents 4000 sq ft of surface area configured as a 40 ft x 100 ft scale diagram. The diagrams can be used to assist in estimating an area of damage by comparing the appearance of the diagram with conditions observed in the field.

Figures 3.12-1 through 3.12-6 illustrate areas of damage distributed in different configurations. For example, Figure 3.12-la illustrates 1 percent damage that is widely distributed, Figure 3.12-lb illustrates 1 percent damage that is moderately distributed, and Figure 3.12-lc illustrates 1 percent damage in a single area. Areas of 1 percent, 3 percent, 5 percent, 10 percent, 25 percent, and 50 percent are illustrated in the diagrams.

DRAFT

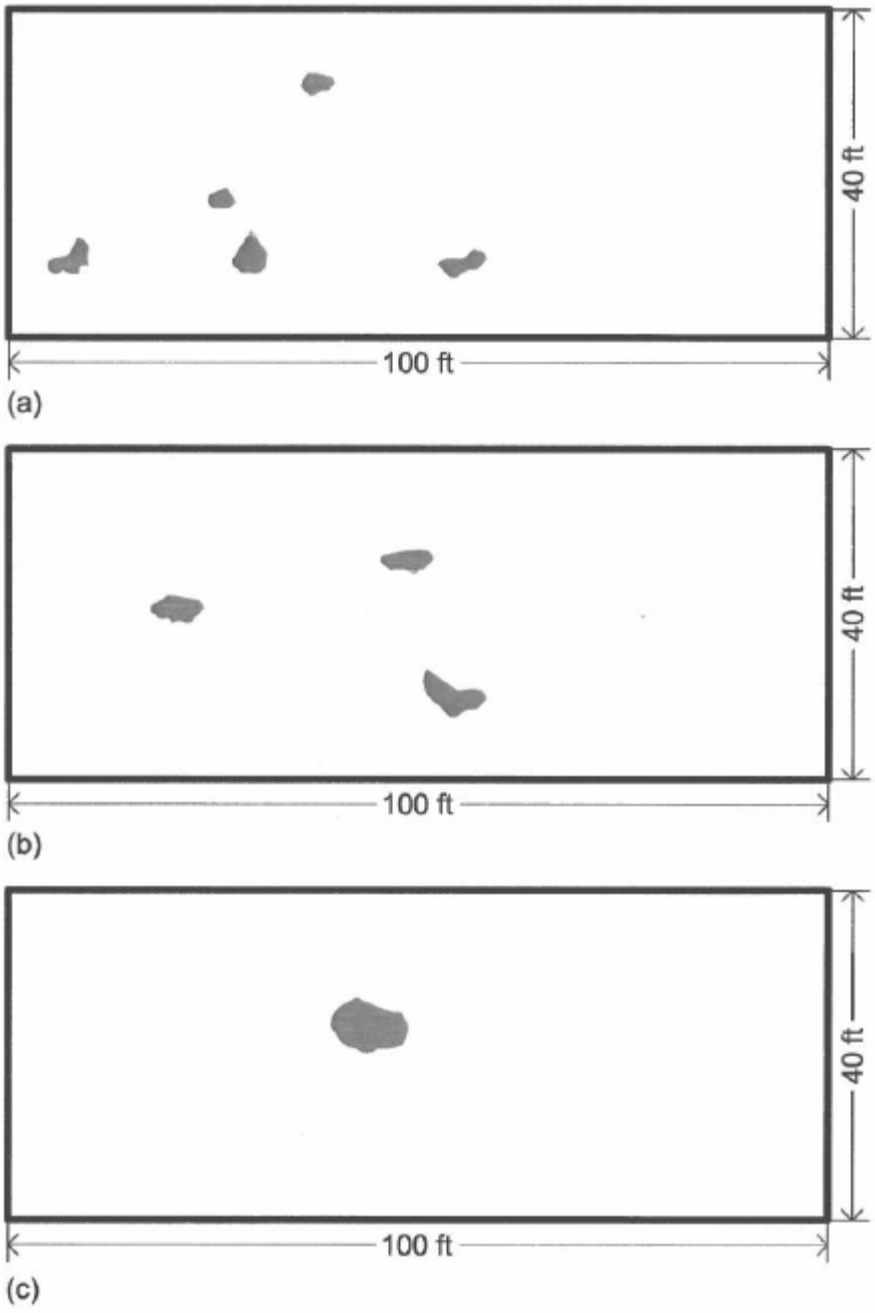


Figure 3.12-1. a), b), and c) area quantity estimate showing 1 percent of area damaged

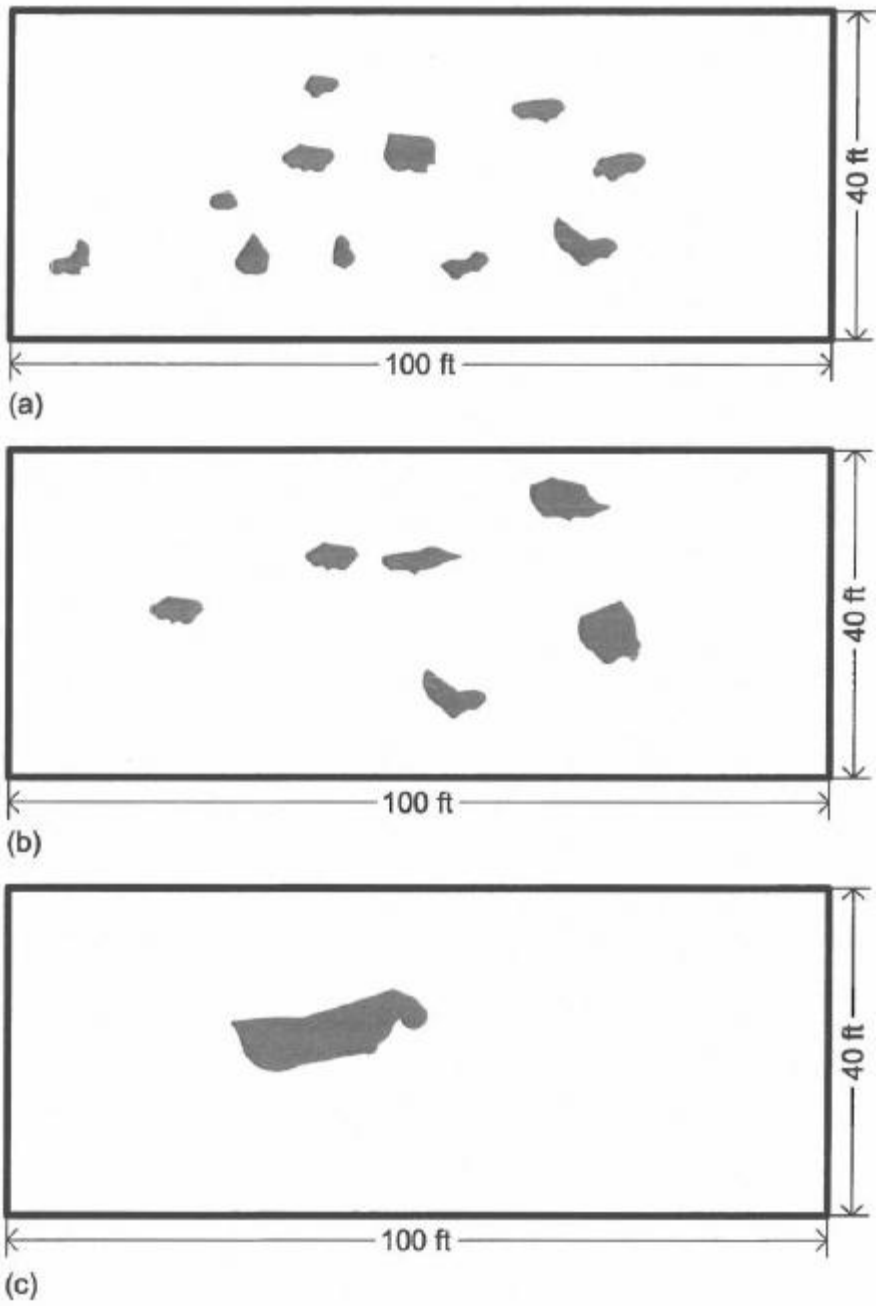


Figure 3.12-2. a), b), and c) area quantity estimate showing 3 percent of area damaged

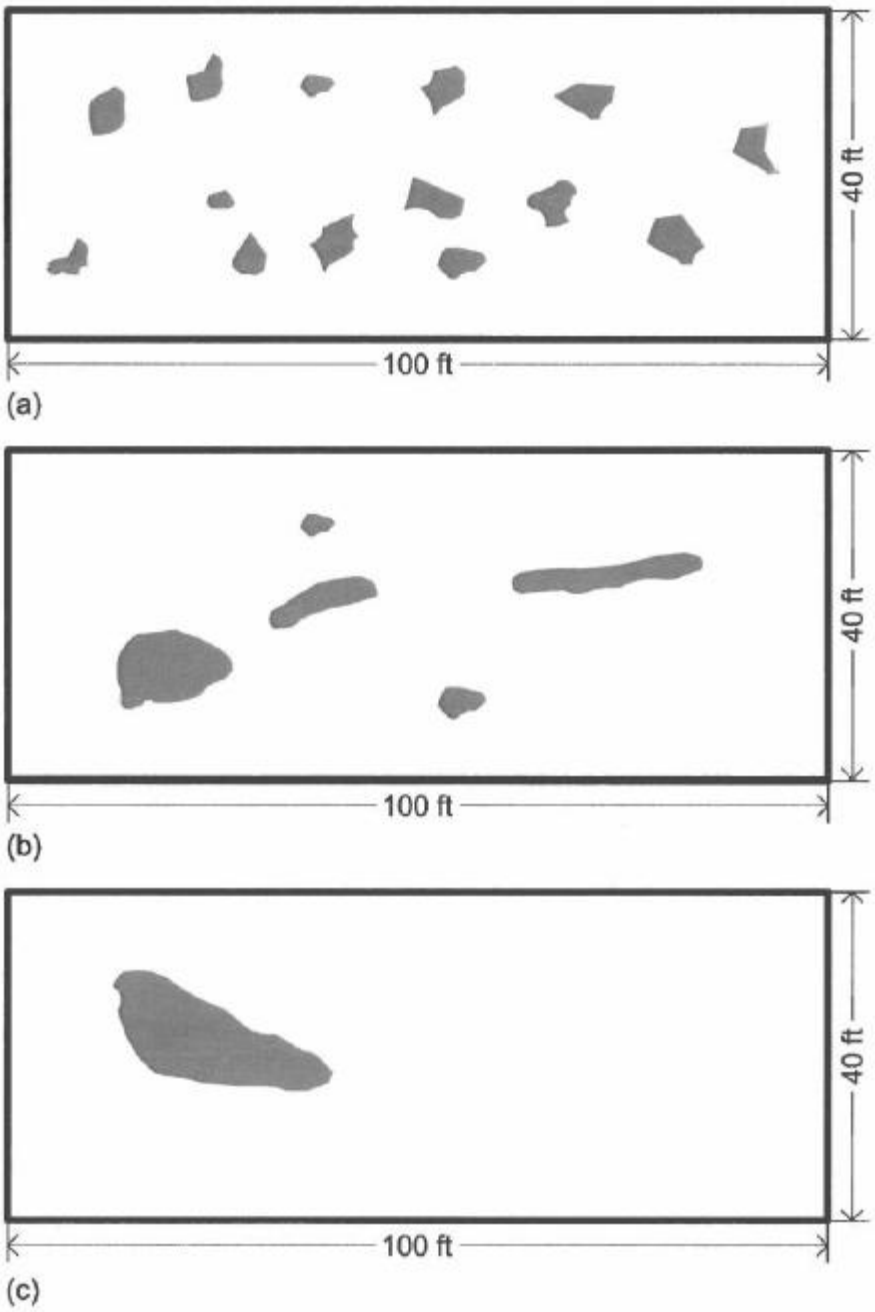


Figure 3.12-3. a), b), and c) area quantity estimate showing 5 percent of area damaged

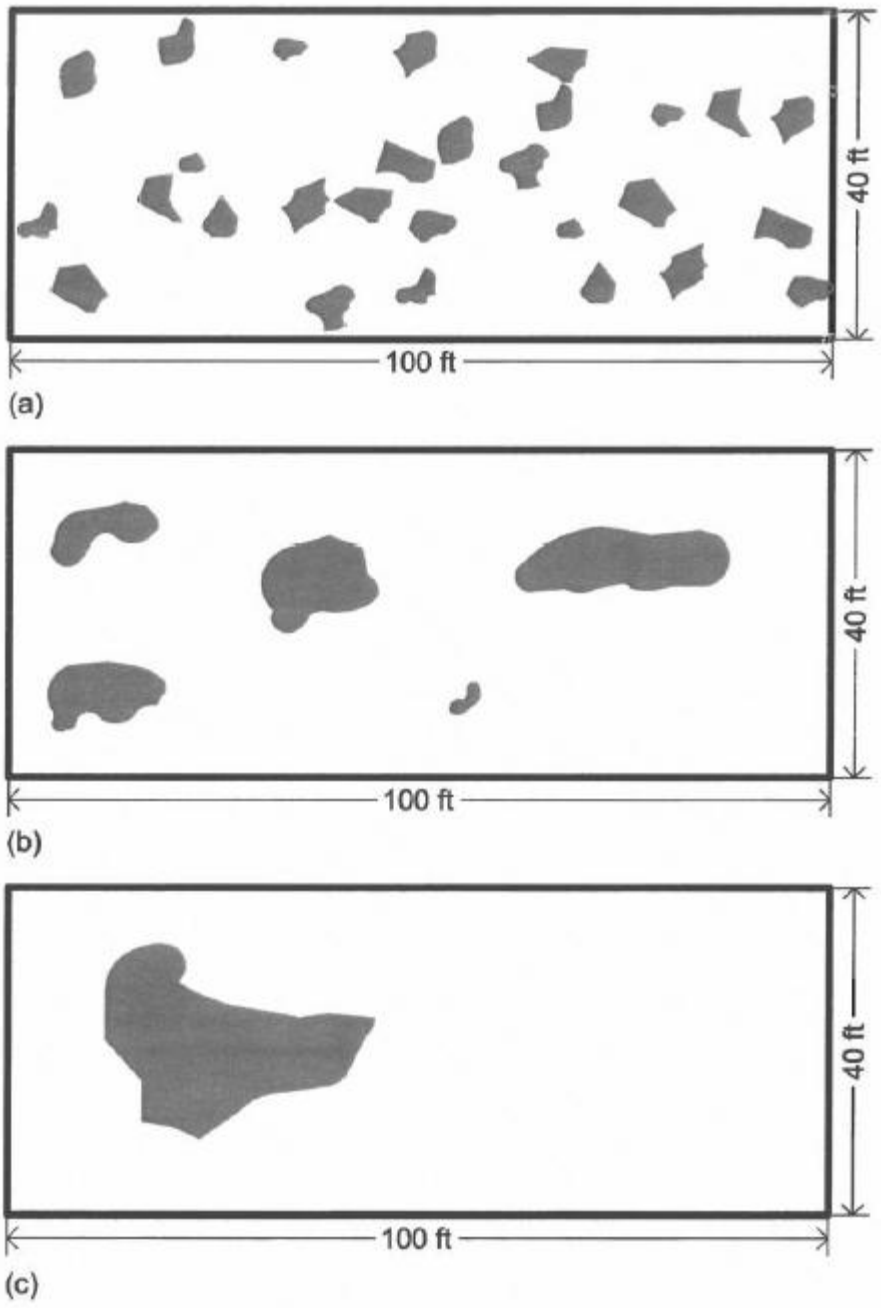


Figure 3.12-4. a), b) and c) area quantity estimate showing 10 percent of area damaged.

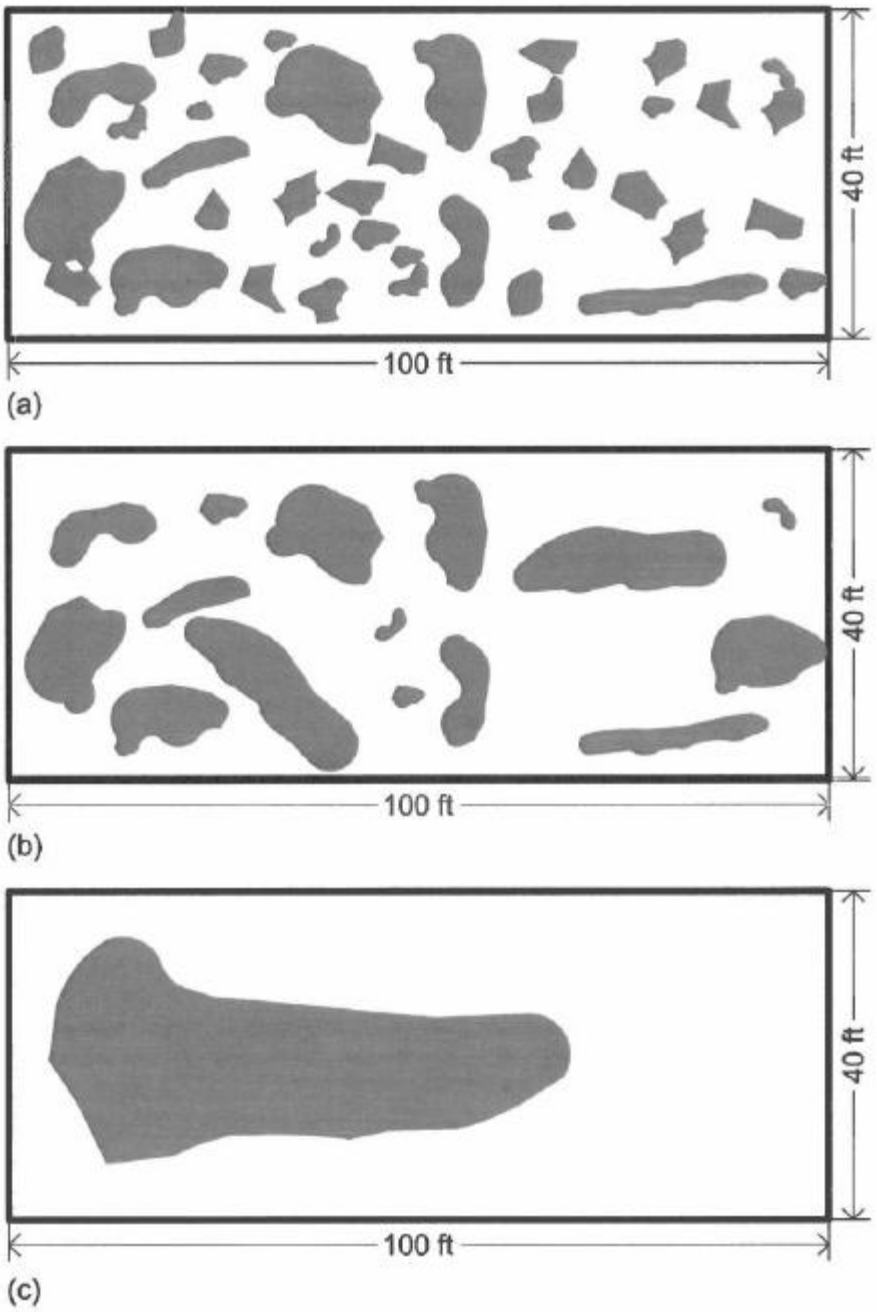


Figure 3.12-5. a), b), and c) area quantity estimate showing 25 percent of area damaged

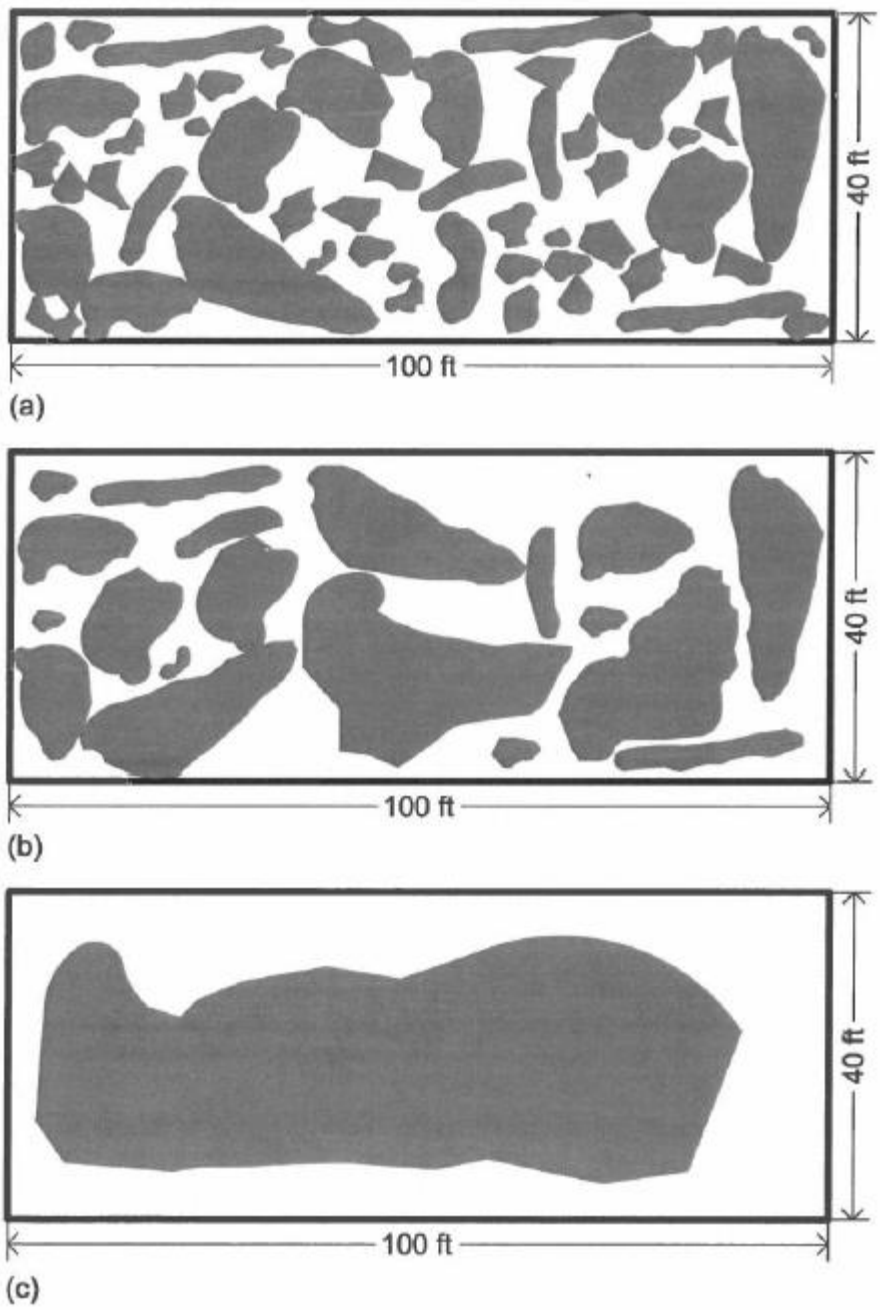


Figure 3.12-6. a), b), and c) area quantity estimate showing 50 percent of area damaged

3-EI.7.2 Area Estimate Illustrations – Cracking

[see MBE 3.12]

Figures 3.12-7 and 3.12-8 illustrate areas of moderate and heavy pattern cracking, respectively. The diagrams in Figures 3.12-7 and 3.12-8 illustrate pattern cracking quantities of 5 percent, 10 percent, and 25 percent of the total area. Figure 3.12-9 illustrates isolated cracking representing 1 percent, 5 percent, and 10 percent of the deck area. In this diagram, 1 ft of crack is assigned as 1 sq ft of damage.

Cracking in Reinforced and Prestressed Concrete Elements: The Inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the Inspector should consider width, spacing, location, orientation, and structural or nonstructural nature of the cracking. The Inspector should consider exposure and environment when evaluating crack width. Table 3.2.1.3-1 provides quantitative crack widths describing insignificant, moderate, and wide cracking.

Table 3.2.1.3-1 Crack width commentary for reinforced and prestressed concrete elements.

Material	Insignificant cracking, defect not warranted (in.)	Moderate cracking (in.)	Wide cracking (in.)
Reinforced Concrete	Less than 0.012 wide	0.012 to 0.05 wide	Greater than 0.05 wide
Prestressed Concrete	Less than 0.004 wide	0.004 to 0.009 wide	Greater than 0.009 wide

DRAFT

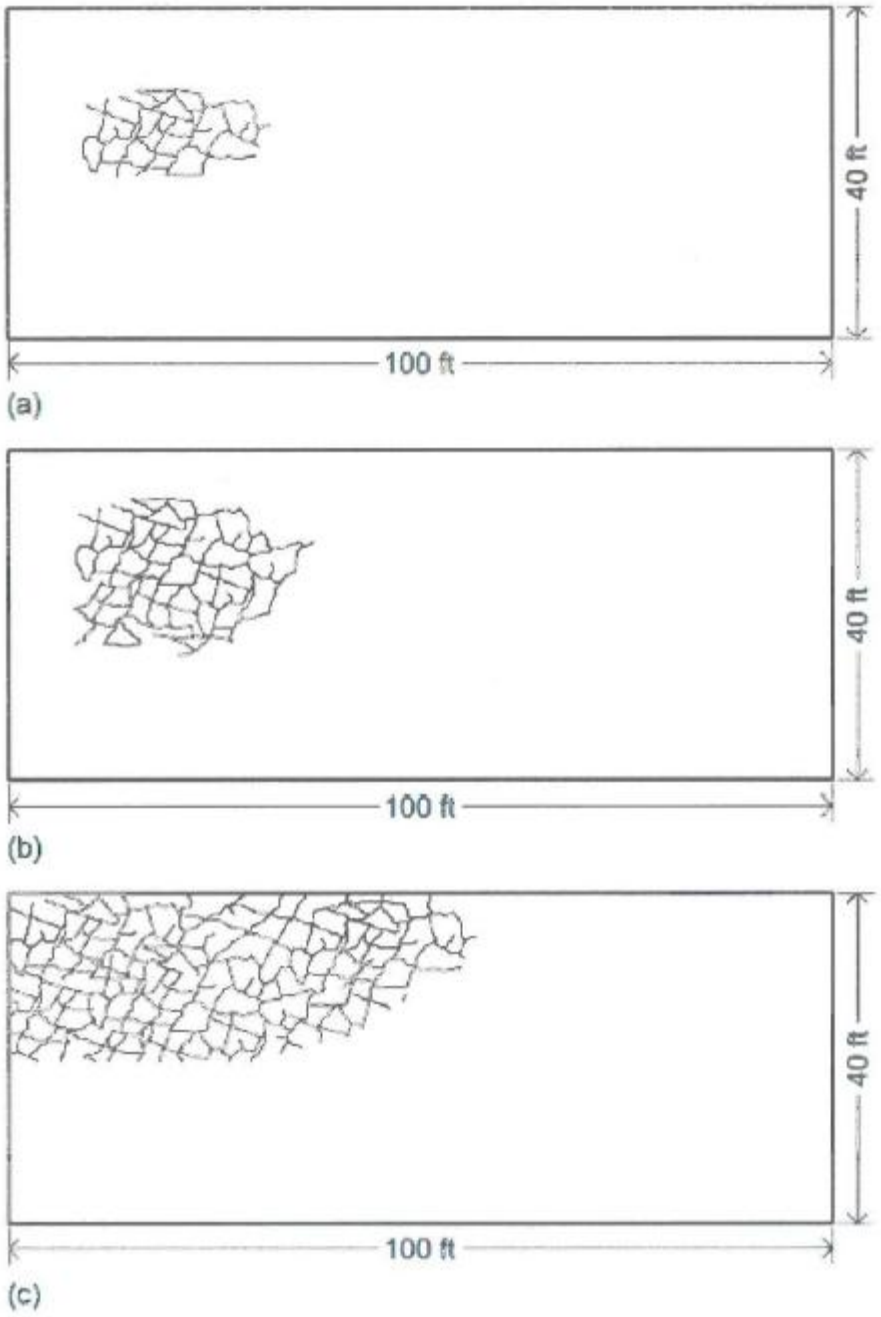


Figure 3.12-7. Moderate Pattern Cracking (Spacing between 1 and3 ft.) (a) 5 percent, (b) 10 percent, (c) 25 percent

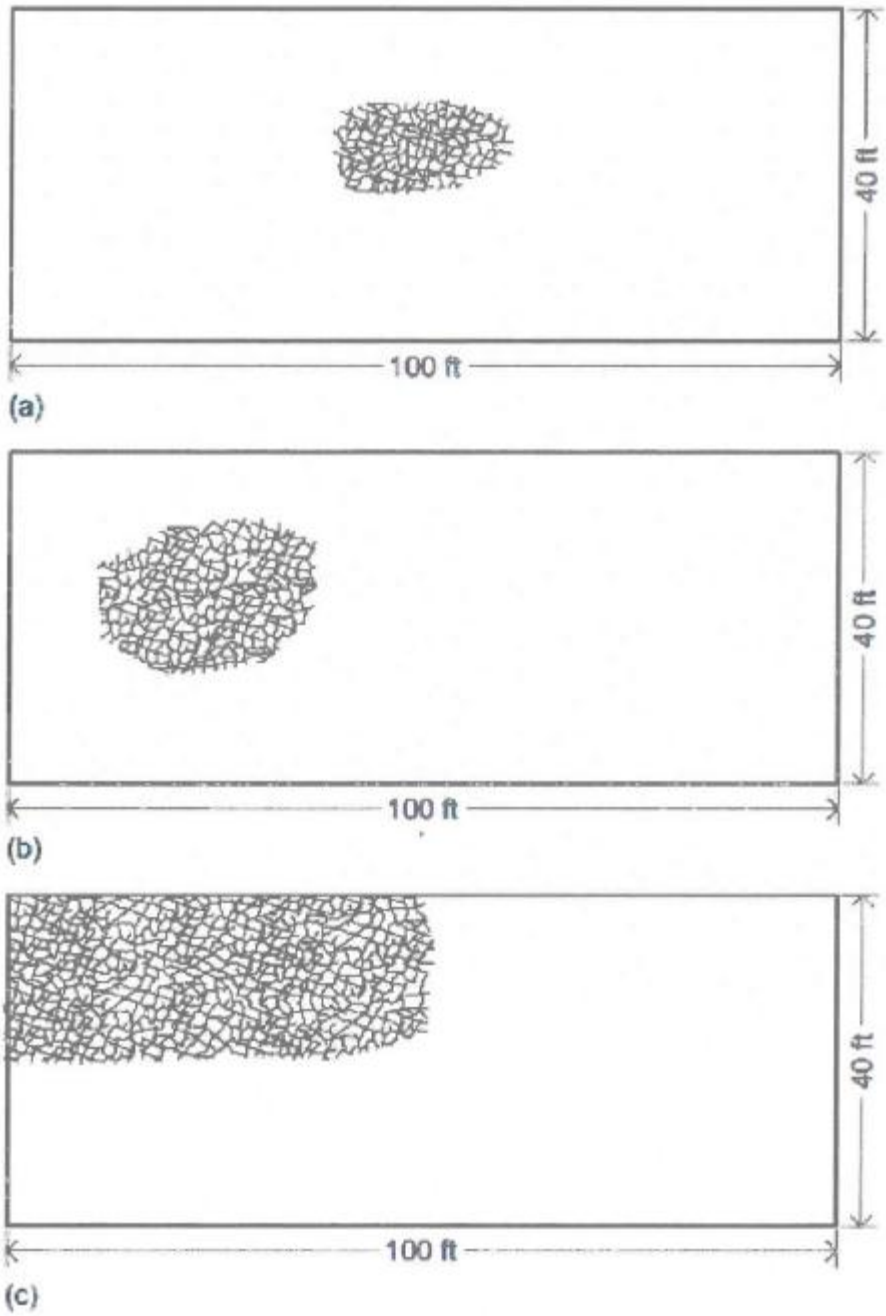


Figure 3.12-8. Heavy Pattern Cracking (spacing ≤ 1 ft.) (a) 5 percent, (b) 10 percent, (c) 25 percent

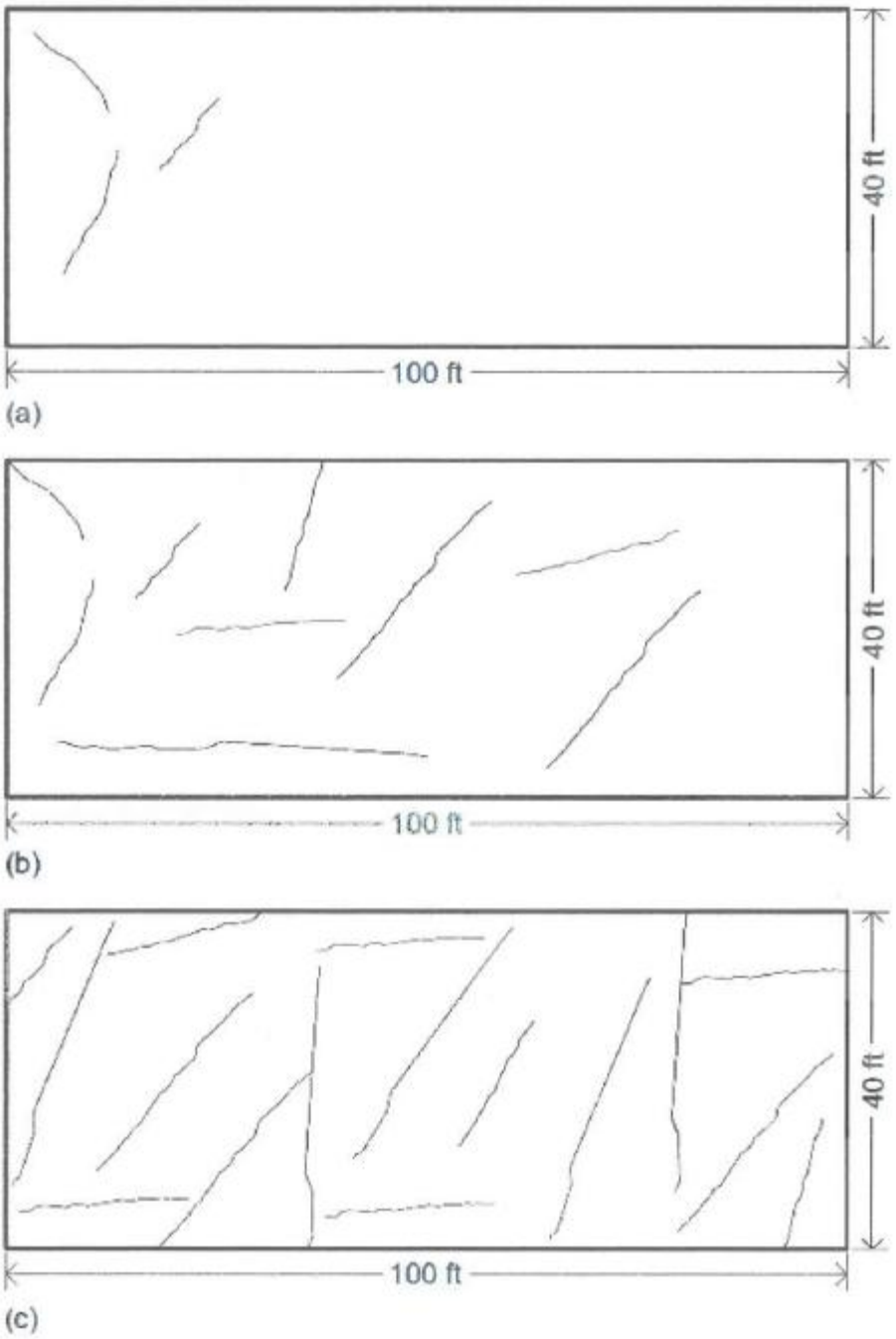


Figure 3.12-9. Isolated Cracking a) 1 percent, b) 5 percent, c) 10 percent.

3-EI.7.3 Linear Estimate Illustrations

[see MBE 3.12]

Figure 3.12-10 illustrates length quantity estimates for damage of 5 percent, 10 percent, 25 percent, and 50 percent of the total length.

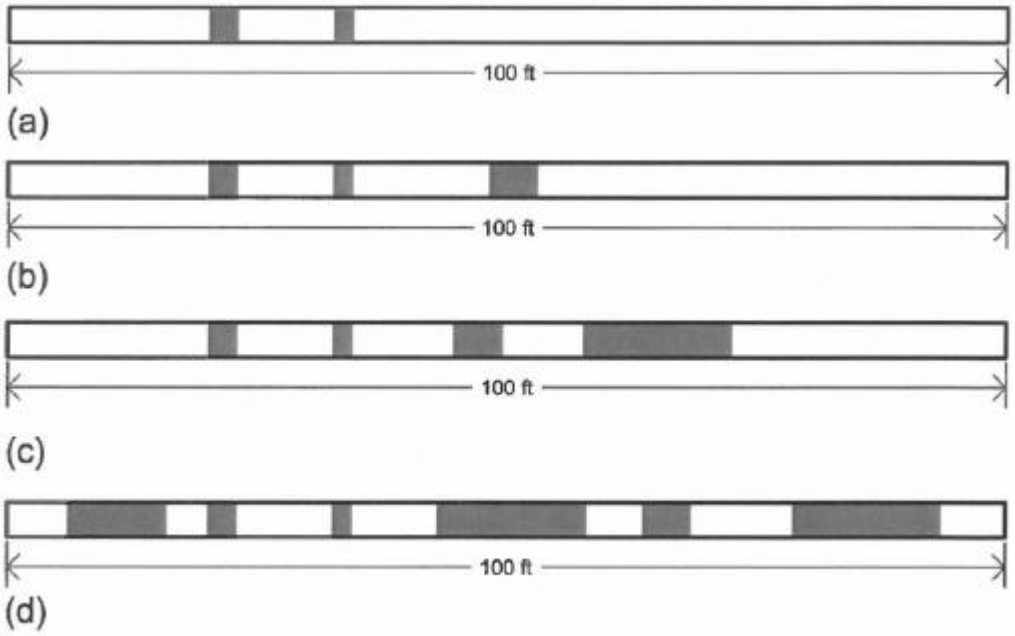


Figure 3.12-10. Linear quantity estimate a) 5 percent, b) 10 percent, c) 25 percent, d) 50 percent

3-EI.8 ELEMENT CONDITION LANGUAGE

Element numbers above 9000 are defined as NDOT specific elements. Element classification indicates whether the specific element is:

- NBE – AASHTO National Bridge Element.
- NDOT NBE – AASHTO National Bridge Element with NDOT Name and Number (element to be rolled into the parent NBE).
- BME – AASHTO Bridge Management Element.
- NDOT BME – NDOT Bridge Management Element (element to be rolled into the parent AASHTO BME if applicable).

As a direct result of the October 3, 2013 release of the FHWA publication "Specification for the National Bridge Inventory Bridge Elements", specific AASHTO Elements are required to be submitted to FHWA as part of their annual update. NDOT NBE and NDOT BME elements will be denoted under the "Element Classification" category below each appropriate element description throughout Chapter 3 – EI. These elements are Agency Defined Elements (ADEs) unique only to the NDOT Bridge Inspection Program. In addition, NDOT specific NBEs and BMEs that are associated with this FHWA specification will be required to be combined together into the specific AASHTO Elements. Those ADEs that are to be rolled into a parent element will be denoted as such under the "NBE Parent" or "BME Parent" category located under each appropriate element description throughout Chapter 3-EI Element Inspection Coding. Those NBEs and BMEs that are to be submitted to the FHWA include:

- NBE (elements that are designated as NBEs in the AASHTO *Bridge Element Inspection Manual*, First Edition 2013).
- Joints (Elements 300 through 306).
- Wearing Surfaces (Element 510).
- Steel Protective Coatings (Element 515).
- Concrete Protective Coatings (Element 521).

For the full list, see Table 22 of Chapter 3 SNBI.

Please note that the remaining NDOT BME elements will not be reported to FHWA but will be used to manage the NDOT bridge inventory.

3-EI.9 DECKS AND SLABS

3-EI.9.1 General

This does not include secondary deck elements such as joints, deck/slab protection systems, or wearing surfaces. All deck or slab elements may be supplemented with one or more associated protection systems or wearing surface elements.

The deck/top flange/slab evaluation is captured using the defined condition states and is three-dimensional in nature with the defects observed on the top surface, the bottom surface, or both. Deck/top flange/slab top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both the top and bottom surfaces are not visible, the condition shall be assessed based on destructive testing, nondestructive testing, or indicators in the materials covering the surfaces.

Quantity Calculation:
The quantity for this element includes the area of the deck/top flange/slab from the end of floor to end of floor length by the out to out deck width, including any median areas and accounting for any flares or ramps present.

Unit of Measure: Square Feet

3-EI.9.2 Reinforced Concrete

All elements are constructed of mild reinforced concrete regardless of the wearing surface or protective system used.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
			* 	
Cracking (RC and Other) (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

12 Reinforced Concrete Deck

Description:
This element defines all bridge decks.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

16 Reinforced Concrete Top Flange

Description:
This element defines all bridge girder top flanges where traffic rides directly on the structural element. These bridge types include tee-beams, box girders, and girders that require traffic to ride on the top flange.

Element Classification: NBE

NBE Parent: N/A

Commentary:
This quantity is for the top flange riding surface only. Girder web and bottom flange are to be evaluated by the appropriate girder element.

38 Reinforced Concrete Slab – Solid

Description:
This element defines all bridge slabs that have a solid cross section.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9038 Reinforced Concrete Slab – Voided

Description:
This element defines all bridge slabs that have a voided cross section.

Element Classification: NDOT NBE

NBE Parent: 38 Reinforced Concrete Slab – Solid

Commentary:
None.

3-EI.9.3 Prestressed Concrete

All elements are constructed of prestressed or post-tensioned concrete regardless of the wearing surface or protective system used.

Condition State Definitions:

<table>
<tr><th rowspan="3">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>GOOD</th><th>FAIR</th><th>POOR</th><th>SEVERE</th></tr>
<tr><td>Delamination/ Spall/ Patched Area (1080)</td><td>None.</td><td>Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.</td><td>Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.</td><td rowspan="6">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>Exposed Rebar (1090)</td><td>None.</td><td>Present without measurable section loss.</td><td>Present with measurable section loss but does not warrant structural review.</td></tr>
<tr><td>Exposed Prestressing (1100)</td><td>None.</td><td>Present without section loss.</td><td>Present with section loss but does not warrant structural review.</td></tr>
<tr><td>Cracking (PSC) (1110)</td><td>Width less than 0.004 in. or spacing greater than 3 ft.</td><td>Width 0.004 in. to 0.009 in. or spacing 1.0 ft. to 3.0 ft.</td><td>Width greater than 0.009 in. or spacing less than 1 ft.</td></tr>
<tr><td rowspan="2">Efflorescence/ Rust Staining (1120)</td><td>None.</td><td>Surface white without build-up or leaching without rust staining.</td><td>Heavy build-up with rust staining.</td></tr>
<tr><td colspan="3">*    </td></tr>
<tr><td>Abrasion/Wear (PSC/RC) (1190)</td><td>No abrasion or wearing.</td><td>Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.</td><td>Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.</td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

13 Prestressed Concrete Deck

Description:
This element defines all bridge decks.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

15 Prestressed Concrete Top Flange

Description:
This element defines all bridge girder top flanges where traffic rides directly on the structural element. These bridge types include bulb-tees, box girders and girders that require traffic to ride on the top flange.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

3-EI.9.4 Steel

All elements are constructed of steel regardless of the wearing surface or protective system used.

When the steel grid deck has concrete fill in the wheel tracks only, use Element 29 for the concrete filled portion and Element 28 for the unfilled portion of the deck.

Condition State Definitions:

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Corrosion (1000)</td><td>None.</td><td>Freckled rust. Corrosion of the steel has initiated.</td><td>Section loss is evident or pack rust is present but does not warrant structural review.</td><td rowspan="4">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>*</td><td colspan="3">  </td></tr>
<tr><td>Cracking (1010)</td><td>None.</td><td>Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.</td><td>Identified crack that is not arrested but does not warrant structural review.</td></tr>
<tr><td>Connection (1020)</td><td>Connection is in place and functioning as intended.</td><td>Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.</td><td>Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.</td></tr>
<tr><td>*</td><td colspan="3">  </td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

28 Steel Deck with Open Grid

Description:
This element defines all open grid bridge decks with no fill.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

29 Steel Deck with Concrete Filled Grid

Description:
This element defines bridge decks with concrete fill either in all of the openings or within the wheel tracks.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

30 Steel Deck Corrugated/Orthotropic/Etc.

Description:
This element defines those bridge decks constructed of corrugated metal filled with Portland cement, asphaltic concrete or other riding surfaces. Orthotropic steel decks are also included.

Element Classification: NBE

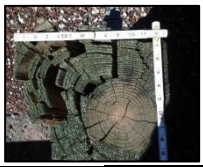
NBE Parent: N/A

Commentary:
None.

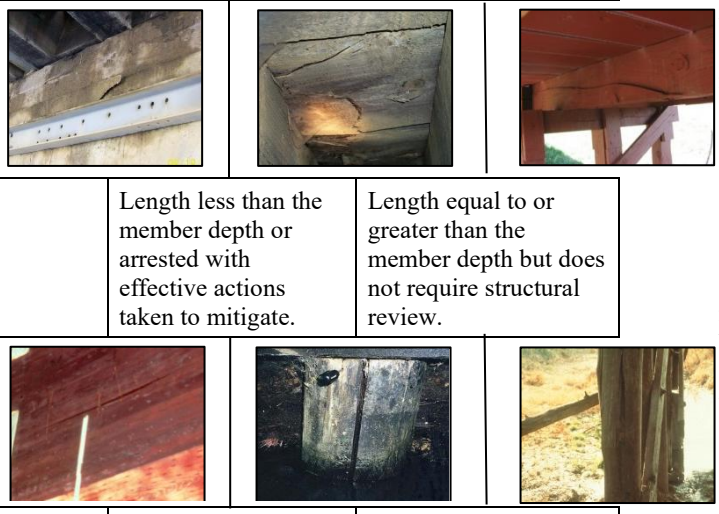
3-EI.9.5 Timber

All elements are constructed of timber regardless of the wearing surface or protective system used. Timber running planks shall be included under the wearing surface assessment.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Decay/ Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
	* 			
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
	* 			

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Crack (Timber) (1160)</td><td>None.</td><td>Crack that has been arrested through effective Measures.</td><td>Identified crack that is not arrested but does not require structural review.</td><td rowspan="3">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>Split/ Delamination (Timber) (1170)</td><td>None.</td><td>Length less than the member depth or arrested with effective actions taken to mitigate.</td><td>Length equal to or greater than the member depth but does not require structural review.</td></tr>
<tr><td>Abrasion/ Wear (Timber) (1180)</td><td>None or no measurable section loss.</td><td>Section loss less than 10% of the member thickness.</td><td>Section loss 10% or more of the member thickness but does not warrant structural review.</td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>



*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

31 Timber Deck

Description:
This element defines all bridge decks.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

54 Timber Slab

Description:
This element defines all bridge slabs.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

3-EI.9.6 Other

All elements are constructed of composite materials, or other materials, that cannot be classified using any other defined elements of other material types and regardless of the wearing surface or protective system used.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.	
Cracking (RC and Other) (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None.	Initiated breakdown or deterioration.	Significant deterioration or breakdown but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

60 Other Deck

Description:
This element defines all bridge decks not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

65 Other Slab

Description:
This element defines all slabs not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

3-EI.10 RAILINGS

3-EI.10.1 General

Consider only the condition of the bridge, transition, approach and terminal section. The evaluations of the rails that are to crash or design standard shall be coded with B.RH.01 (Bridge Railings) and B.RH.02 (Transitions).

Record the predominant rail element at the rail location. For example, if the:

- Concrete rail is 2 feet 6 inches tall and the metal rail is 1 foot tall, code only the concrete rail element and record the cumulative rail height in inches in the element's scale attribute (i.e. 3 feet 6 inches).
- Concrete rail is 1 foot tall and the metal rail is 2 feet 6 inches tall, code only the metal rail element and record the cumulative rail height in inches in the element's scale attribute (i.e. 3 feet 6 inches).

Bridge Rail
A bridge commonly has only two rows of rail, one on each side of the traveled way. But in some cases, a bridge may have more than two rows of rail when it has a center median or protected pedestrian/bicycle lanes.

Approach Rail
When the approach rail extends beyond 100 feet from the end of the bridge, consider only the first 100 feet.

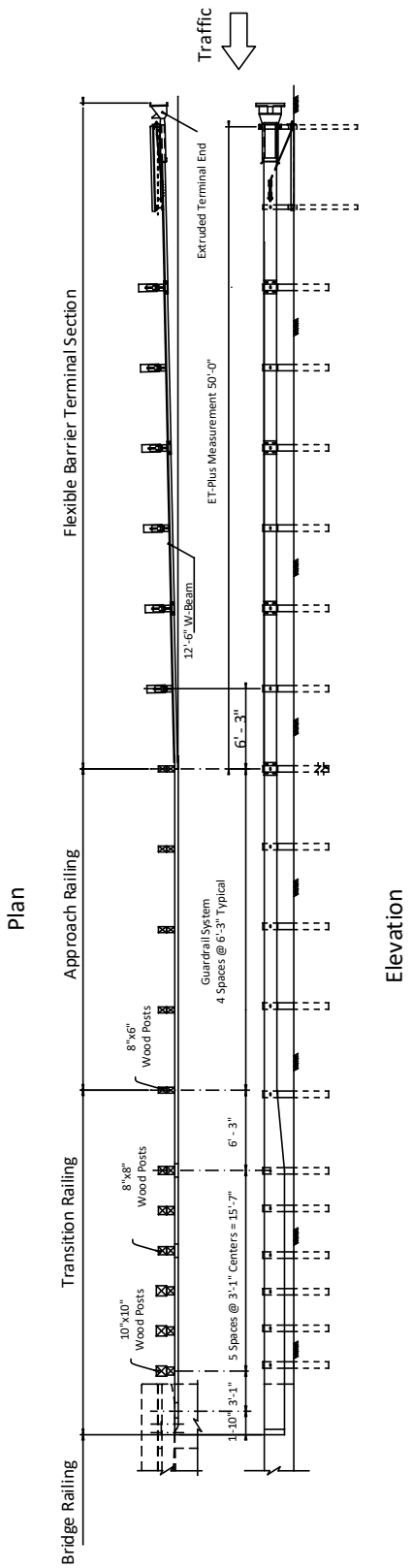
Quantity Calculation:

Bridge Rail
The quantity for this element is the sum of the number of rows of bridge rail times the length of the bridge and only includes the rail on the bridge. (See Sketch)

Approach Rail
The quantity for this element is the length of the rail approaching the bridge within the clear zone that is not a part of the transition rail or the end section attenuators. (See Sketch)

Transition Rail
The quantity for this element is the length of the transition rail between the bridge rail and the approach rail or end section attenuators that is within the clear zone that is not a part of the bridge rail or the end section attenuators. (See Sketch)

Unit of Measure: Feet



Element	Quantity
9343 Flexible Barrier Terminal Section	50 ft
9333 Metal Approach Railing	25 ft
9338 Metal Transition Railing	25 ft

3-EI.10.2 Metal Rail

All elements pertain to metal rail that is associated with the bridge. Refer to the other bridge rail material elements (concrete, timber, masonry, other) for specific defects for assessing the condition of posts, blocking and curbs that may be constructed of materials other than metal.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

330 Metal Bridge Railing

Description:
This element defines all types and shapes of metal bridge railing which includes steel, aluminum, metal beam, rolled shapes, etc. Also included in this element are the posts (i.e. metal, timber or concrete), blocking and curb.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9333 Metal Approach Railing

Description:
This element defines all types and shapes of metal approach railing which includes steel, aluminum, metal beam, rolled shapes, etc. Also included in this element are the posts (i.e. metal, timber or concrete), blocking and curb.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

9338 Metal Transition Railing

Description:
This element defines all types and shapes of metal transition railing which includes steel, aluminum, metal beam, rolled shapes, etc. Also included in this element are the posts (i.e. metal, timber or concrete), blocking and curb.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

9343 Flexible Barrier Terminal Section

Description:
This element defines flexible barrier terminal sections located on the shoulder of a roadway or in the median and its condition evaluation includes the terminal end, posts, guardrail and connection hardware. These types of terminal sections (i.e. ET-2000, ET-Plus, SKT-350 and similar products) absorb energy by coiling the attached guardrail.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
Quantity is the number of rows of end treatment that is connected to the approach or transition rail times the length. Typical lengths are 50 feet or 75 feet depending on the offset from the roadway. End sections that have one foot or less offset have a 75 foot length while offsets of 4 or more feet have a 50 foot length.

Terminal Types	Standard Lengths
BCT (Breakaway Cable Terminal)	37’ – 6”
MELT (Modified Eccentric Loader Terminal)	37’ – 6”
SRT (Slotted Rail Terminal) - Rural	37’ – 6”
SRT (Slotted Rail Terminal) - Urban	25’
BEST (Beam Eating Steal Terminal)	50’
ET-2000	50’ or 62’ – 6”
SKT-350 (Sequential Kinking Terminal)	50’



Breakaway Cable Terminal



Modified Eccentric Loader Terminal



Slotted Rail Terminal



Beam Eating Steel Terminal



ET-2000 Family



SKT-350

9344 Crash Cushions Terminal Section

Description:
This element defines terminal sections for blunt ends of rigid barriers and fixed objects located in the median or on the shoulder and utilizes internal self-contained energy absorption systems. Examples include “TRACC”, “CAT-350”, “ADIEM”, and “Universal TAU-II”.

Element Classification: NDOT BME

BME Parent: N/A

Quantity Calculation:
Quantity is the total length of the crash cushion and includes the transition plus the cushion. Typical lengths are 14, 21, 25 and 30 feet.

Commentary:
None.



TRACC Family



CAT-350



ADIEM



Universal TAU-II

3-EI.10.3 Reinforced Concrete Rail

All elements of the railing must be constructed of reinforced concrete regardless of the protective system used.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	* 			
Cracking (RC and Other) (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

331 Reinforced Concrete Bridge Railing – Closed

Description:
This element defines all closed types and shapes of bridge railing.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9331 Reinforced Concrete Bridge Railing – Open

Description:
This element defines all open types and shapes of bridge railing.

Element Classification: NDOT NBE

NBE Parent: 331 Reinforced Concrete Bridge Railing

Commentary:
None.

9334 Reinforced Concrete Approach Railing – Closed

Description:
This element defines all closed types and shapes of approach railing.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

9335 Reinforced Concrete Approach Railing – Open

Description:
This element defines all open types and shapes of approach railing.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

9336 Reinforced Concrete Approach Rail On Wingwall

Description:
This element defines all approach railing that is mounted directly to a wingwall.

Element Classification: NDOT NBE

NBE Parent: N/A

Commentary:
None.

9339 Reinforced Concrete Transition Railing – Closed

Description:
This element defines all closed types and shapes of transition railing.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

9340 Reinforced Concrete Transition Railing – Open

Description:
This element defines all open types and shapes of transition railing.

Element Classification: NDOT BME

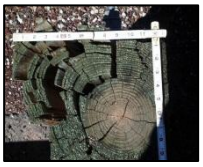
BME Parent: N/A

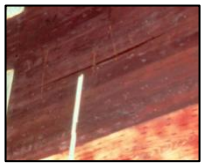
Commentary:
None.

3-EI.10.4 Timber Rail

All elements are for timber rail that is associated with the bridge. Refer to the other bridge rail material elements (concrete, timber, masonry, other) for specific defects for assessing the condition of posts, blocking and curbs that may be constructed of materials other than timber.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Decay/ Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
	* 			
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Crack (Timber) (1160)	None.	Crack that has been arrested through effective Measures.	Identified crack that is not arrested but does not require structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Split/ Delamination (Timber) (1170)	None.	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth but does not require structural review.	
	* 			
Abrasion/ Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness but does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

332 Timber Bridge Railing

Description:
This element defines all bridge railing.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9332 Timber Approach Railing

Description:
This element defines all approach railing.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

9341 Timber Transition Railing

Description:
This element defines all transition railing.

Element Classification: NDOT BME

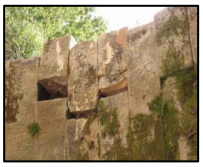
BME Parent: N/A

Commentary:
None.

3-EI.10.5 Masonry Rail

All elements of the railing must be constructed of masonry block or stone and are for all types and shapes of rail that is associated with the bridge.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Efflorescence /Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	* 			
Mortar Breakdown (Masonry) (1610)	None.	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the joints.	
Split/Spall (Masonry) (1620)	None.	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None.	Sound patch.	Unsound patch.	
Masonry Displacement (1640)	None.	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

334 Masonry Bridge Railing

Description:
This element defines all bridge railing.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9345 Masonry Approach Railing

Description:
This element defines all approach railing.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

3-EI.10.6 Other

All elements pertain to types and shapes of railing that are constructed of composite materials, or other materials, that cannot be classified using any other defined rail elements of other material types (i.e. metal, concrete, timber, or masonry).

Condition State Definitions:

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Corrosion (1000)</td><td>None.</td><td>Freckled rust. Corrosion of the steel has initiated.</td><td>Section loss is evident or pack rust is present but does not warrant structural review.</td><td rowspan="4">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td colspan="3">*
    </td></tr>
<tr><td>Cracking (1010)</td><td>None.</td><td>Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.</td><td>Identified crack that is not arrested but does not warrant structural review.</td></tr>
<tr><td>Connection (1020)</td><td>Connection is in place and functioning as intended.</td><td>Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.</td><td>Missing bolts rivets, broken welds, or fasteners, or pack rust with distortion but does not warrant a structural review.</td></tr>
<tr><td colspan="3">*
    </td></tr>
<tr><td>Delamination/ Spall/ Patched Area (1080)</td><td>None.</td><td>Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.</td><td>Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.</td><td></td></tr>
</table>

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Efflorescence/ Rust Staining (1120)</td><td>None.</td><td>Surface white without build-up or leaching without rust staining.</td><td>Heavy build-up with rust staining.</td><td rowspan="4">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Cracking (RC and Other) (1130)</td><td>Width less than 0.012 in. or spacing greater than 3.0 ft.</td><td>Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.</td><td>Width greater than 0.05 in. or spacing of less than 1 ft.</td></tr>
<tr><td>Deterioration (Other) (1220)</td><td>None.</td><td>Initiated breakdown or deterioration.</td><td>Significant deterioration or breakdown but does not warrant structural review.</td></tr>
<tr><td>Distortion (1900)</td><td>None.</td><td>Distortion not requiring mitigation or mitigated distortion.</td><td>Distortion that requires mitigation that has not been addressed but does not warrant structural review.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

333 Other Bridge Railing

Description:
This element defines all bridge railing not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9337 Other Approach Railing

Description:
This element defines all approach railing not otherwise defined.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

9342 Other Transition Railing

Description:
This element defines all transition railing not otherwise defined.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

3-EI.11 SUPERSTRUCTURE

3-EI.11.1 General

Condition evaluation of girder elements includes the web face along with the top and bottom faces of the flange. In addition, the box girder evaluation is three-dimensional in nature with the observed defects on both the interior and exterior surfaces being used to capture the condition states.

Observed distress pertaining to trusses and arches are located in the panel diagonals and vertical members (including spandrel columns) and are reported as measured length along the panel. These elements do not include the condition of the panel cross frame (Element 9152), floor beams (spandrel caps), and gusset plates (Element 162). But for filled arches, the arch quantity shall be measured from spring line to spring line with the length below the spring line being considered the substructure.

Record the web or panel height in the scale factor for the element.

The length of beams, girders, stringers and floor beams that are under a deck joint or a deck drain that outlets storm water onto these features is at the discretion of the inspector to determine the length that is being influenced by the Environment. These elements should follow the flowchart for Environment.

Quantity Calculation:

Girder/Stringer

Quantity for this element is the number of girders multiplied by the span length.

Box Sections

Quantity for this element is the number of visible web faces divided by two and multiplied by the appropriate length.

Truss and Arches

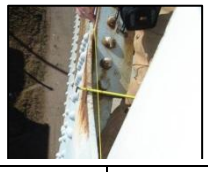
Quantity for this element is the sum of all of the lengths of each truss or arch panel measured longitudinally along the travel way.

Unit of Measure: Feet

3-EI.11.2 Steel

All elements are constructed of steel regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but do not warrant a structural review.	
	* 			
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
	* 			
Load Capacity (5000)	No reduction.	No reduction.	No reduction.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

102 Steel Closed Web/Box Girder

Description:
This element defines all box girders or closed web girders.

Element Classification: NBE

NBE Parent: N/A

Commentary:
Does not include girders that are constructed of high performance steel.

9102 High Performance Steel Closed Web/Box Girder

Description:
This element defines all box girders or closed web girders that were constructed with high performance steel or a combination of high performance and non-high performance steel.

Element Classification: NDOT NBE

NBE Parent: 102 Steel Closed Web/Box Girder

Commentary:
Record the strength of the high performance steel in the element description.

107 Steel Open Girder/Beam

Description:
This element defines all open girders.

Element Classification: NBE

NBE Parent: N/A

Commentary:
Does not include girders that have cover plates or are constructed of high performance steel.

9101 Steel Open Girder/Beam With Cover Plate

Description:
This element defines all open girders with cover plates.

Element Classification: NDOT NBE

NBE Parent: 107 Steel Open Girder/Beam

Commentary:
None.

9107 High Performance Steel Open Girder/Beam

Description:
This element defines all open girders that were constructed with high performance steel or a combination of high performance and non-high performance steel.

Element Classification: NDOT NBE

NBE Parent: 107 Steel Open Girder/Beam

Commentary:
Record the strength of the high performance steel in the element description.

113 Steel Stringer

Description:
This element defines all members that support the deck in a stringer floor beam system.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

120 Steel Truss

Description:
This element defines all truss elements including all tension and compression members for through and deck trusses.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

141 Steel Arch

Description:
This element defines all steel arches.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

152 Steel Floor Beam

Description:
This element defines all floor beams that typically support stringers.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9152 Cross Frame

Description:
This element defines all single member (floor beam) or built-up members (truss panel) such as sway frames on trusses, two girder systems that are not floor beams and diaphragms on multi-girder curve steel structures.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
For two girder systems and deck trusses, when the deck and/or the stringers are attached to the cross frame, floor beams should be used.

147 Steel Main Cables

Description:
This element defines all cable stay or main suspension cables not embedded in concrete.

Element Classification: NBE

NBE Parent: N/A

Quantity Calculation:
Quantity for this element is the sum of all of the lengths of each main cable measured longitudinally along the travel way.

Commentary:
Use for main cables in suspension bridges or main cable stays in cable stayed bridges. Suspender cables or other smaller cables shall be captured using the secondary cable element.

148 Secondary Steel Cables

Description:
This element defines all suspender cables not embedded in concrete.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the individual cable or cable groups carrying the load from the superstructure to the main cable/arch elements.

Commentary:
Use for suspender cables, other smaller cables or groups of cables in one location acting as a system to carry loads from the superstructure to the main cable/arch. Suspension bridge main cables or cable stays shall be captured using the steel main cable element.

161 Steel Pin and Pin & Hanger Assembly or Both

Description:
This element defines all pins and pin & hanger assemblies.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of pins, pin & hanger assemblies or both.

Commentary:
Distress observed on either the hanger assembly or plate should be considered in the condition assessment.

162 Steel Gusset Plate

Description:
This element defines only those gusset plate(s) connections that are on truss/arch panel(s). These connections can be constructed with one or more plates that may be bolted, riveted or welded.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of primary load path gusset plate assemblies. For multiple plate gusset connections at a single panel point, the quantity shall be one gusset plate regardless of the number of individual plates at the single connection point.

Commentary:
Gusset plates that are part of secondary elements such as cross frames are not considered.

For built-up gusset plates, distress observed on any plate should be considered in the condition assessment.



3-EI.11.3 Prestressed Concrete

All elements are constructed of prestressed or post-tensioned steel reinforced concrete regardless of the protective system.

Where traffic rides directly on the structural element regardless of the wearing surface, evaluation of the top flange above the fillet is considered with Element 15.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Exposed Prestressing (1100)	None.	Present without section loss.	Present with section loss but does not warrant structural review.	
Cracking (PSC) (1110)	Width less than 0.004 in. or spacing greater than 3 ft.	Width 0.004 in. to 0.009 in. or spacing 1.0 ft. to 3.0 ft.	Width greater than 0.009 in. or spacing less than 1 ft.	
Efflorescence/ Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	*   			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

104 Prestressed Concrete Closed Web/Box Girder

Description:
This element defines all closed web girders or box girders.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

109 Prestressed Concrete Open Girder/Beam

Description:
This element defines all open web girders.

Element Classification: NBE

NBE Parent: N/A

Commentary:
Code this element for all open web girders except for Inverted T (9104), NU (9106) and Double T (9109).

9104 Prestressed Concrete Inverted T Girder

Description:
This element defines all open web Inverted T Beams.

Element Classification: NDOT NBE

NBE Parent: 109 Presetrssed Concrete Open Girder/Beam

Commentary:
These elements do not have a top flange.

9106 Prestressed Concrete NU Girder

Description:
This element defines all open web NU Girders.

Element Classification: NDOT NBE

NBE Parent: 109 Presetrssed Concrete Open Girder/Beam

Commentary:
None.

9109 Prestressed Concrete Double T Beam

Description:
This element defines all open web Double T Beams.

Element Classification: NDOT NBE

NBE Parent: 109 Presetrssed Concrete Open Girder/Beam

Commentary:
If traffic rides directly on the top flange or on a non-structural wearing surface over the top flange, this element would be used to assess the girder web only of each Double T Beam. If a structural deck has been placed over the top flange, the girder web and top flange will be assessed as one unit. The girder count is both stems from longitudinal joint to longitudinal joint of each, not the individual stems.

115 Prestressed Concrete Stringer

Description:
This element defines all members that support the deck in a stringer floor beam system.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

143 Prestressed Concrete Arch

Description:
This element defines all prestressed concrete arches.

Element Classification: NBE

NBE Parent: N/A

Commentary:
For filled arches, the quantity shall be measured from spring line to spring line. The length below the spring line is considered substructure.

154 Prestressed Concrete Floor Beam

Description:
This element defines all floor beams that typically support stringers.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

3-EI.11.4 Reinforced Concrete

All elements are constructed of mild steel reinforced concrete regardless of the protective system.

Where traffic rides directly on the structural element regardless of the wearing surface, evaluation of the top flange above the fillet is considered with Element 16.

Condition State Definitions:

<table>
<tr><th rowspan="3">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>GOOD</th><th>FAIR</th><th>POOR</th><th>SEVERE</th></tr>
<tr><td>Delamination/ Spall/ Patched Area (1080)</td><td>None.</td><td>Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.</td><td>Spall greater than 1 in. deep or greater than6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.</td><td rowspan="4">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>Exposed Rebar (1090)</td><td>None.</td><td>Present without measurable section loss.</td><td>Present with measurable section loss but does not warrant structural review.</td></tr>
<tr><td rowspan="2">Efflorescence /Rust Staining (1120)</td><td>None.</td><td>Surface white without build-up or leaching without rust staining.</td><td>Heavy build-up with rust staining.</td></tr>
<tr><td colspan="3">*    </td></tr>
<tr><td>Cracking (RC and Other) (1130)</td><td>Width less than 0.012 in. or spacing greater than 3.0 ft.</td><td>Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.</td><td>Width greater than 0.05 in. or spacing of less than 1 ft.</td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

105 Reinforced Concrete Closed Web/Box Girder

Description:
This element defines all box girders or closed web girders.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

110 Reinforced Concrete Open Girder/Beam

Description:
This element defines all open web girders.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

116 Reinforced Concrete Stringer

Description:
This element defines all members that support the deck in a stringer floor beam system.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

144 Reinforced Concrete Arch

Description:
This element defines all reinforced concrete arches.

Element Classification: NBE

NBE Parent: N/A

Commentary:
For filled arches, the arch quantity shall be measured from spring line to spring line. The length below the spring line is considered substructure.

155 Reinforced Concrete Floor Beam

Description:
This element defines all floor beams that typically support stringers.

Element Classification: NBE

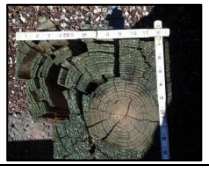
NBE Parent: N/A

Commentary:
None.

3-EI.11.5 Timber

All elements are constructed of timber regardless of the protective system and condition evaluation includes all of the timber surfaces.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Decay/ Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
	* 			
Check/ Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Crack (Timber) (1160)	None.	Crack that has been arrested through effective Measures.	Identified crack that is not arrested but does not require structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Split/ Delamination (Timber) (1170)	None.	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth but does not require structural review.	
	* 			
Abrasion/ Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness	Section loss 10% or more of the member thickness but does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

111 Timber Open Girder/Beam

Description:
This element defines all open girders.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

117 Timber Stringer

Description:
This element defines all members that support the deck in a stringer floor beam system.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

135 Timber Truss

Description:
This element defines all truss elements including all tension and compression members for through and deck trusses.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

146 Timber Arch

Description:
This element defines all timber arches.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

156 Timber Floor Beam

Description:
This element defines all floor beams that typically support stringers.

Element Classification: NBE

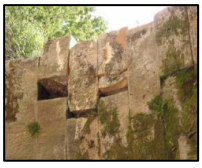
NBE Parent: N/A

Commentary:
None.

3-EI.11.6 Masonry

All elements are constructed of block or stone and may be placed with or without mortar regardless of the protective system.

Condition State Definitions:

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Efflorescence /Rust Staining (1120)</td><td>None.</td><td>Surface white without build-up or leaching without rust staining.</td><td>Heavy build-up with rust staining.</td><td rowspan="5">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>*</td><td colspan="3">    </td></tr>
<tr><td>Mortar Breakdown (Masonry) (1610)</td><td>None.</td><td>Cracking or voids in less than 10% of joints.</td><td>Cracking or voids in 10% or more of the joints.</td></tr>
<tr><td>Split/Spall (Masonry) (1620)</td><td>None.</td><td>Block or stone has split or spalled with no shifting.</td><td>Block or stone has split or spalled with shifting but does not warrant a structural review.</td></tr>
<tr><td>Patched Area (Masonry) (1630)</td><td>None.</td><td>Sound Patch.</td><td>Unsound Patch.</td></tr>
<tr><td>Masonry Displacement (1640)</td><td>None.</td><td>Block or stone has shifted slightly out of alignment.</td><td>Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.</td><td></td></tr>
<tr><td></td><td>*</td><td colspan="3">    </td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

145 Masonry Arch

Description:
This element defines all masonry arches.

Element Classification: NBE

NBE Parent: N/A

Commentary:
For filled arches, the arch quantity shall be measured from spring line to spring line. The length below the spring line is considered substructure.

3-EI.11.7 Other

All elements are constructed of composite materials, or other materials, that cannot be classified using any other defined elements of other material types regardless of the protective system.

Where traffic rides directly on the structural element regardless of the wearing surface, evaluation of the top flange above the fillet is considered with Element 15 or 16.

Condition State Definitions:

<table>
<tr><th rowspan="3">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>GOOD</th><th>FAIR</th><th>POOR</th><th>SEVERE</th></tr>
<tr><td>Corrosion (1000)</td><td>None.</td><td>Freckled rust. Corrosion of the steel has initiated.</td><td>Section loss is evident or pack rust is present but does not warrant structural review.</td><td rowspan="4">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td colspan="3">*    </td></tr>
<tr><td>Cracking (1010)</td><td>None.</td><td>Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.</td><td>Identified crack that is not arrested but does not warrant structural review.</td></tr>
<tr><td>Connection (1020)</td><td>Connection is in place and functioning as intended.</td><td>Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.</td><td>Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.</td></tr>
<tr><td colspan="3">*    </td></tr>
<tr><td>Delamination/ Spall/ Patched Area (1080)</td><td>None.</td><td>Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched Area that is sound.</td><td>Spall greater than 1 in. deep or greater than 6 in. diameter. Patched Area that is unsound or showing distress. Does not warrant structural review.</td><td></td></tr>
</table>

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Efflorescence /Rust Staining (1120)</td><td>None.</td><td>Surface white without build-up or leaching without rust staining.</td><td>Heavy build-up with rust staining.</td><td rowspan="5">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>*</td><td colspan="3">    </td></tr>
<tr><td>Cracking (RC and Other) (1130)</td><td>Width less than 0.012 in. or spacing greater than 3.0 ft.</td><td>Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.</td><td>Width greater than 0.05 in. or spacing of less than 1 ft.</td></tr>
<tr><td>Deterioration (Other) (1220)</td><td>None.</td><td>Initiated breakdown or deterioration.</td><td>Significant deterioration or breakdown but does not warrant structural review.</td></tr>
<tr><td>Distortion (1900)</td><td>None.</td><td>Distortion not requiring mitigation or mitigated distortion.</td><td>Distortion that requires mitigation that has not been addressed but does not warrant structural review.</td></tr>
<tr><td>*</td><td colspan="3">    </td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

106 Other Closed Web/Box Girder

Description:
This element defines all box girders or closed web girders not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

112 Other Open Girder/Beam

Description:
This element defines all open girders not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

118 Other Stringer

Description:
This element defines all stringers not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

136 Other Truss

Description:
This element defines all truss elements including all tension and compression members and through and deck trusses not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

142 Other Arch

Description:
This element defines all arches not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
For filled arches, the arch quantity shall be measured from spring line to spring line. The length below the spring line is considered substructure.

157 Other Floor Beam

Description:
This element defines all floor beams that typically support stringers not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

149 Other Secondary Cable

Description:
This element defines all suspender cables not embedded in concrete not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the individual cable or cable groups carrying the load from the superstructure to the main cable/arch elements.

Commentary:
Use for suspender cables, other smaller cables or groups of cables in one location acting as a system to carry loads from the superstructure to the main cable/arch. Suspension bridge main cables or cable stays shall be captured using the steel main cable element.

3-EI.12 BEARINGS

3-EI.12.1 General

Bearings that cannot be visibly inspected should not be collected.

Quantity Calculation:
Quantity for this element is the sum of each bearing.

Unit of Measure: Each

3-EI.12.2 Elastomeric Bearings

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
	* 			
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Bulging, Splitting, or Tearing (2230)	None.	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

310 Elastomeric Bearing

Description:
This element defines only those bridge bearings that are constructed primarily of elastomers with or without fabric or metal reinforcement.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.



3-EI.12.3 Movable Bearings

All elements define only those bridge bearings which provide for both rotation and longitudinal movement.

Condition State Definitions:

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Corrosion (1000)</td><td>None.</td><td>Freckled rust. Corrosion of the steel has initiated.</td><td>Section loss is evident or pack rust is present but does not warrant structural review.</td><td rowspan="3">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Connection (1020)</td><td>Connection is in place and functioning as intended.</td><td>Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.</td><td>Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Movement (2210)</td><td>Free to move.</td><td>Minor restriction.</td><td>Restricted but not warranting structural review.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
</table>

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Alignment (2220)</td><td>Lateral and vertical alignment is as expected for the temperature conditions.</td><td>Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.</td><td>Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.</td><td rowspan="2">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td rowspan="2">Loss of Bearing Area (2240)</td><td>None.</td><td>Less than 10%.</td><td>10% or more but does not warrant structural review.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

311 Movable Bearing

Description:
This element defines only those bridge bearings that provide movement by other mechanisms that are not covered in Rocker with Pin (9311), Roller (9312), or Sliding Plate (9313) bearings.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9311 Rocker With Pin Bearing

Description:
This element defines only those bridge bearings which provide movement by means of a rocker with pin mechanism.

Element Classification: NDOT NBE

NBE Parent: 311 Moveable Bearing

Commentary:
None.



9312 Roller Bearing

Description:
This element defines only those bridge bearings which provide movement by means of a roller mechanism.

Element Classification: NDOT NBE

NBE Parent: 311 Moveable Bearing

Commentary:
None.



9313 Sliding Plate Bearing

Description:
This element defines only those bridge bearings which provide movement by means of a sliding plate mechanism.

Element Classification: NDOT NBE

NBE Parent: 311 Moveable Bearing

Commentary:
None.



3-EI.12.4 Enclosed/Concealed Bearings

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
	* 			
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

312 Enclosed/Concealed Bearing

Description:
This element defines only those bridge bearings that are enclosed (i.e. not open for detailed inspection).

Element Classification: NBE

NBE Parent: N/A

Commentary:
Should be used for box girder hinges and in cases where the bearing material is not visible. The inspector shall assess the condition based on alignment, grade across the joint, persistence of debris or other indirect indicators of the condition.



3-EI.12.5 Fixed Bearings

All elements define only those bridge bearings which provide for rotation movement only (no longitudinal movement).

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

313 Fixed Bearing

Description:
This element defines only those bridge bearings that are not covered in the Fixed Pinned (9303) or Fixed Plate (9304) bearings.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9303 Fixed Pinned Bearing

Description:
This element defines only those bridge bearings that are pinned.

Element Classification: NDOT NBE

NBE Parent: 313 Fixed Bearings

Commentary:
None.



9304 Fixed Plate Bearing

Description:
This element defines only those bridge bearings that have a plate and bolt connection.

Element Classification: NDOT NBE

NBE Parent: 313 Fixed Bearings

Commentary:
None.



3-EI.12.6 Pot Bearings

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	
	* 			
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
	* 			
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the Bearing but does not warrant a structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Bulging, Splitting or Tearing (2230)	None.	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

314 Pot Bearing

Description:
This element defines all high load bearings with confined elastomer. This bearing may be fixed against horizontal movement, guided to allow sliding in one direction or floating to allow sliding in any direction.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.



3-EI.12.7 Disk Bearings

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

315 Disk Bearing

Description:
This element defines all high load bearings with a hard plastic disk. This bearing may be fixed against horizontal movement, guided to allow movement in one direction or floating to allow sliding in any direction.



Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

3-EI.12.8 Other Bearings

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	
	* 			
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
	* 			
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

316 Other Bearing

Description:
This element defines all other material bridge bearings regardless of translation or rotation constraints.

Element Classification: NBE

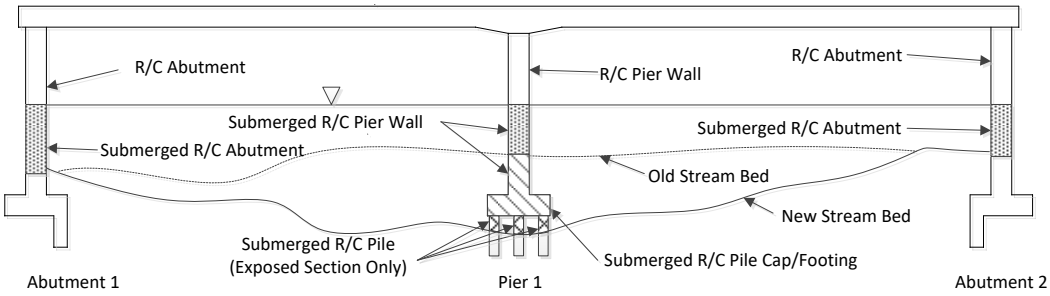
NBE Parent: N/A

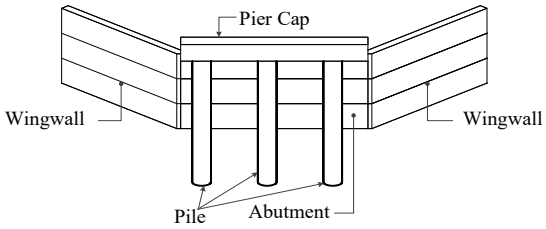
Commentary:
Intended for bearings constructed of materials that cannot be classified using any other defined bearing element.

3-EI.13 SUBSTRUCTURE

3-EI.13.1 General

Substructure elements are divided into two groups. The first group is the elements that are collected by the inspectors that are not associated with underwater or diving inspections and will be collected through the normal inspection process. The second group is the submerged elements which are to be collected during the underwater inspection process by divers or inspectors. The element condition reported will be comprised of both the above waterline and below waterline conditions.

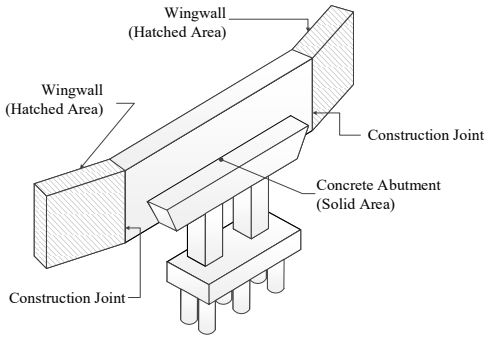




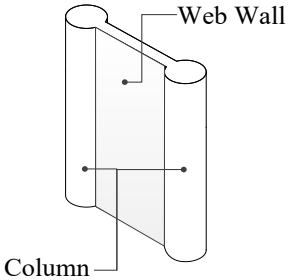
Elements for Steel, Timber and Other Abutments

Abutment assessment has two different groupings dependent on the type of material:

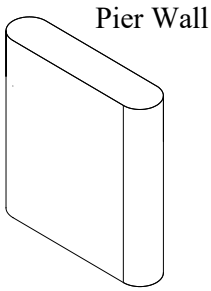
- Steel, timber, and other materials abutments shall be divided into abutment, wingwall (if appropriate), pile and pier cap elements.
- Concrete abutments will have only the abutment element and wingwall element (if appropriate).



Elements for Concrete Abutment



Columns and Web Wall



Pier Wall

Pier walls have a consistent size from the beginning to the end of the wall. When reviewing the substructure, columns that have an enclosed area that is smaller in size than the supporting columns consider the enclosed area a web wall and assess the columns only.

3-EI.13.2 Steel

All elements are constructed of steel regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

202 Steel Column

Description:
This element defines all visable columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns.

Commentary:
None.

9202 Submerged Steel Column

Description:
This element defines all submerged columns and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 202 Steel Column

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns below the waterline.

Commentary:
None.

207 Steel Tower

Description:
This element defines all built-up or framed tower supports.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the heights of the built-up or framed tower supports.

Commentary:
Intended to be used for truss framed tower supports or built-up steel towers in order to capture large supports and towers associated with suspension bridges, cable stayed bridges, moveable bridges or similar structural configurations.

9207 Submerged Steel Tower

Description:
This element defines all built-up or framed tower supports and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 207 Steel Tower

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the heights of the built-up or framed tower supports below the waterline.

Commentary:
Intended to be used for truss framed tower supports or built-up steel towers in order to capture large supports and towers associated with suspension bridges, cable stayed bridges, moveable bridges or similar structural configurations.

219 Steel Abutment

Description:
This element defines all abutments and includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions but does not include the supporting piles.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.

Commentary:
Monolithic wingwalls, up to the first construction joint (sheet pile joint, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

9219 Submerged Steel Abutment

Description:
This element defines all abutments, includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions but does not include the supporting piles and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 219 Steel Abutment

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle below the waterline.

Commentary:
Monolithic wingwalls, up to the first construction joint (sheet pile joint, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

9248 Steel Grade Beam Cap

Description:
This element defines all grade beam caps.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the length of the grade beam caps.

Commentary:
This element shall be inventoried for each bridge (if applicable) whether visible or buried. If buried, code the environmental state "0".

225 Steel Pile

Description:
This element defines all piles that are visible for inspection. Piles exposed from erosion or scour are included.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection.

Commentary:
None.

9225 Submerged Steel Pile

Description:
This element defines all piles that are visible for inspection and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 225 Steel Pile

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection below the waterline.

Commentary:
None.

9231 Steel Grade Beam Pile

Description:
This element defines all grade beam piles. Piles exposed from erosion or scour are included and will require evaluation.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles.

Commentary:
This element shall be inventoried for each bridge (if applicable) whether visible or buried. If buried, code the environmental state "0".

231 Steel Pier Cap

Description:
This element defines all pier caps that support girders and transfer load into piles or columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the cap lengths measured along the skew angle.

Commentary:
None.

9237 Steel Wingwall

Description:
This element defines all wingwalls inclusive of all pile and earth retaining systems.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is dependent upon whether it is:

- Abutment – the sum of the length of wingwalls measured from the abutment at the first construction joint (sheet pile joint, etc.) to the end of the wingwall.
- Culvert – the sum of the length of the wingwalls starting at the construction joint or the angle connecting the wingwall to the headwall.

Commentary:

For continuous wingwalls, record the length of the wingwall to the appropriate construction joint where the fill retained will not influence the bridge or approach roadway and the recorded length is the longer of the bridge paving unit length or 50 feet per wingwall.

9243 Steel Headwall

Description:
This element defines all headwalls and includes the sheet material retaining the embankment.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of all of the lengths of each headwall measured longitudinally along the travel way without wingwalls.

Commentary:
Used with culverts only. Monolithic headwalls, the angle connecting the wingwall to the headwall or up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment.

3-EI.13.3 Prestressed Concrete

All elements are constructed of prestressed or post-tensioned steel reinforced concrete regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Exposed Prestressing (1100)	None.	Present without section loss.	Present with section loss but does not warrant structural review.	
Cracking (PSC) (1110)	Width less than 0.004 in. or spacing greater than 3 ft.	Width 0.004 in. to 0.009 in. or spacing 1.0 ft. to 3.0 ft.	Width greater than 0.009 in. or spacing less than 1 ft.	
Efflorescence /Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	*   			
Abrasion/ Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

204 Prestressed Concrete Column

Description:
This element defines all visable columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns.

Commentary:
None.

9204 Submerged Prestressed Concrete Column

Description:
This element defines all submerged columns and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 204 Prestressed Concrete Column

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns below the waterline.

Commentary:
None.

226 Prestressed Concrete Pile

Description:
This element defines all piles that are visible for inspection. Piles exposed from erosion or scour are included.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection.

Commentary:
None.

9226 Submerged Prestressed Concrete Pile

Description:
This element defines all piles that are visible for inspection and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 226 Prestressed Concrete Pile

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection below the waterline.

Commentary:
None.

9232 Prestressed Concrete Grade Beam Pile

Description:
This element defines all grade beam piles. Piles exposed from erosion or scour are included and will require evaluation.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles.

Commentary:
This element shall be inventoried for each bridge (if applicable) whether visible or buried. If buried, code the environmental state "0".

233 Prestressed Concrete Pier Cap

Description:
This element defines all pier caps that support girders and transfer load into piles or columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the cap lengths measured along the skew angle.

Commentary:
None.

3-EI.13.4 Reinforced Concrete

All elements are constructed of mild reinforcing steel and concrete regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Efflorescence /Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	* 			
Cracking (RC and Other) (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
Abrasion/ Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

205 Reinforced Concrete Column

Description:
This element defines all visable columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns.

Commentary:
None.

9205 Submerged Reinforced Concrete Column

Description:
This element defines all submerged columns and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 205 Reinforced Concrete Column

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns below the waterline.

Commentary:
None.

210 Reinforced Concrete Pier Wall

Description:
This element defines all pier walls.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

9210 Submerged Reinforced Concrete Pier Wall

Description:
This element defines all submerged pier walls and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 210 Reinforced Concrete Pier Wall

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle below the waterline.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

215 Reinforced Concrete Abutment

Description:
This element defines all abutments and includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.

Commentary:
Monolithic wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

9215 Submerged Reinforced Concrete Abutment

Description:
This element defines all abutments, includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 215 Reinforced Concrete Abutment

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle below the waterline.

Commentary:
Monolithic wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

220 Reinforced Concrete Pile Cap/Footing

Description:
This element defines all pile caps/footings that are visible for inspection. Pile caps/footings exposed from erosion or scour are included and the exposure may be intentional or caused by erosion or scour.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the length of the footings or pile caps along the skew angle.

Commentary:
None.

9220 Submerged Reinforced Concrete Pile Cap/Footing

Description:
This element defines all pile caps/footings that are visible for inspection and is used for underwater inspections. Pile caps/footings exposed from erosion or scour are included and the exposure may be intentional or caused by erosion or scour.

Element Classification: NDOT NBE

NBE Parent: 220 Reinforced Concrete Pile Cap/Footing

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the length of footings or pile caps along the skew angle below the waterline.

Commentary:
None.

9230 Reinforced Concrete Grade Beam Cap

Description:
This element defines all grade beam caps.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the length of the grade beam caps.

Commentary:
This element shall be inventoried for each bridge (if applicable) whether visible or buried. If buried, code the environmental state "0".

227 Reinforced Concrete Pile

Description:
This element defines all piles that are visible for inspection. Piles exposed from erosion or scour are included.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection.

Commentary:
None.

9227 Submerged Reinforced Concrete Pile

Description:
This element defines all piles that are visible for inspection and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 227 Reinforced Concrete Pile

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection below the waterline.

Commentary:
None.

9234 Reinforced Concrete Grade Beam Pile

Description:
This element defines all grade beam piles. Piles exposed from erosion or scour are included and will require evaluation.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles.

Commentary:
This element shall be inventoried for each bridge (if applicable) whether visible or buried. If buried, code the environmental state "0".

234 Reinforced Concrete Pier Cap

Description:
This element defines all pier caps that support girders and transfer load into piles or columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the cap lengths measured along the skew angle.

Commentary:
None.

9238 Reinforced Concrete Wingwall

Description:
This element defines all wingwalls inclusive of all pile and earth retaining systems.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is dependent upon whether it is:

- Abutment – the sum of the length of wingwalls measured from the abutment at the first construction joint (cold joint, water stop, etc.) to the end of the wingwall.
- Culvert – the sum of the length of the wingwalls starting at the construction joint or the angle connecting the wingwall to the headwall.

Commentary:
For continuous wingwalls, record the length of the wingwall to the appropriate construction joint where the fill retained will not influence the bridge or approach roadway and the recorded length is the longer of the bridge paving unit length or 50 feet per wingwall.

9244 Reinforced Concrete Headwall

Description:
This element defines all headwalls and includes the sheet material retaining the embankment.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

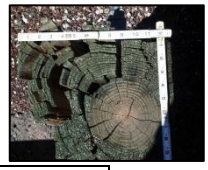
Quantity Calculation:
Quantity for this element is the sum of all of the lengths of each headwall measured longitudinally along the travel way without wingwalls.

Commentary:
Used with culverts only. Monolithic headwalls, the angle connecting the wingwall to the headwall or up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment.

3-EI.13.5 Timber

All elements are constructed of timber regardless of the protective system.

Condition State Definitions:

Defects	Condition States				
	1	2	3	4	
	GOOD	FAIR	POOR	SEVERE	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.		
	* 				
Decay/ Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.		The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 				
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.		
	* 				
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack that is not arrested but does not require structural review.		
	* 				

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Split/ Delamination (Timber) (1170)</td><td>None.</td><td>Length less than the member depth or arrested with effective actions taken to mitigate.</td><td>Length equal to or greater than the member depth but does not require structural review.</td><td rowspan="4">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>*</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Abrasion/ Wear (Timber) (1180)</td><td>None or no measurable section loss.</td><td>Section loss less than 10% of the member thickness.</td><td>Section loss 10% or more of the member thickness but does not warrant structural review.</td></tr>
<tr><td>Settlement (4000)</td><td>None.</td><td>Exists within tolerable limits or arrested with no observed structural distress.</td><td>Exceeds tolerable limits but does not warrant structural review.</td></tr>
<tr><td>Scour (6000)</td><td>None.</td><td>Exists within tolerable limits or has been arrested with effective countermeasures.</td><td>Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.</td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

206 Timber Column

Description:
This element defines all visable columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns.

Commentary:
None.

9206 Submerged Timber Column

Description:
This element defines all submerged columns and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 206 Timber Column

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns below the waterline.

Commentary:
None.

208 Timber Trestle

Description:
This element defines all built-up or framed tower supports.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the heights of the built-up or framed tower supports.

Commentary:
Intended to be used for truss framed trestle or tower supports in order to capture large supports and towers associated with large deck truss bridges.

9208 Submerged Timber Trestle

Description:
This element defines all built-up or framed tower supports and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 208 Timber Trestle

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the heights of the built-up or framed tower supports below the waterline.

Commentary:
Intended to be used for truss framed trestle or tower supports in order to capture large supports and towers associated with large deck truss bridges.

212 Timber Pier Wall

Description:
This element defines all pier walls that include pile, sheet material and filler.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

9212 Submerged Timber Pier Wall

Description:
This element defines all submerged pier walls that include pile, sheet material and filler and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 212 Timber Pier Wall

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle below the waterline.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

216 Timber Abutment

Description:
This element defines all abutments and includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions but does not include the supporting piles.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.

Commentary:
Monolithic wingwalls, up to the first construction joint (sheet material joint, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

9216 Submerged Timber Abutment

Description:
This element defines all abutments, includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions but does not include the supporting piles and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 216 Timber Abutment

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle below the waterline.

Commentary:
Monolithic wingwalls, up to the first construction joint (sheet material joint, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

228 Timber Pile

Description:
This element defines all piles that are visible for inspection. Piles exposed from erosion or scour are included.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection.

Commentary:
None.

9228 Submerged Timber Pile

Description:
This element defines all piles that are visible for inspection and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 228 Timber Pile

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection below the waterline.

Commentary:
None.

9235 Timber Grade Beam Pile

Description:
This element defines all grade beam piles. Piles exposed from erosion or scour are included and will require evaluation.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles.

Commentary:
This element shall be inventoried for each bridge (if applicable) whether visible or buried. If buried, code the environmental state "0".

235 Timber Pier Cap

Description:
This element defines all pier caps that support girders and transfer load into piles or columns.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the cap lengths measured along the skew angle.

Commentary:
None.

9240 Timber Wingwall

Description:
This element defines all wingwalls inclusive of all pile and earth retaining systems.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is dependent upon whether it is:

- Abutment – the sum of the length of wingwalls measured from the abutment at the first construction joint (sheet material joint, etc.) to the end of the wingwall.
- Culvert – the sum of the length of the wingwalls starting at the construction joint or the angle connecting the wingwall to the headwall.

Commentary:
For continuous wingwalls, record the length of the wingwall to the appropriate construction joint where the fill retained will not influence the bridge or approach roadway and the recorded length is the longer of the bridge paving unit length or 50 feet per wingwall.

9245 Timber Headwall

Description:
This element defines all headwalls and includes the sheet material retaining the embankment.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

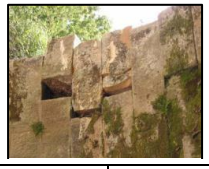
Quantity Calculation:
Quantity for this element is the sum of all of the lengths of each headwall measured longitudinally along the travel way without wingwalls.

Commentary:
Used with culverts only. Monolithic headwalls, the angle connecting the wingwall to the headwall or up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment.

3-EI.13.6 Masonry

All elements are constructed of block or stone and may be placed with or without mortar regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Efflorescence /Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	*   			
Mortar Breakdown (Masonry) (1610)	None.	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the joints.	
Split/Spall (Masonry) (1620)	None.	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None.	Sound patch.	Unsound patch.	
Masonry Displacement (1640)	None.	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
	*   			
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

213 Masonry Pier Wall

Description:
This element defines all pier walls.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

9213 Submerged Masonry Pier Wall

Description:
This element defines all submerged pier walls and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 213 Masonry Pier Wall

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle below the waterline.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

217 Masonry Abutment

Description:
This element defines all abutments and includes the material retaining the embankment, monolithic wingwalls and abutment extensions.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.

Commentary:
Monolithic wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

9217 Submerged Masonry Abutment

Description:
This element defines all abutments, includes the material retaining the embankment, monolithic wingwalls and abutment extensions and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 217 Masonry Abutment

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle below the waterline.

Commentary:
Monolithic wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

9261 Rectangular Mechanically Stabilized Earth Abutment

Description:
This element defines all abutments constructed of mechanically stabilized earth systems that are rectangular concrete panels including integral wingwalls and abutment extensions.

Element Classification: NDOT NBE

NBE Parent: 217 Masonry Abutment

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.

Commentary:
Integral wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not integral to the abutment shall not be included in the quantity or assessment of the abutment element.

9262 Cruciform Mechanically Stabilized Earth Abutment

Description:
This element defines all abutments constructed of mechanically stabilized earth systems that are cruciform concrete panels including integral wingwalls and abutment extensions.

Element Classification: NDOT NBE

NBE Parent: 217 Masonry Abutment

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.

Commentary:
Integral wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not integral to the abutment shall not be included in the quantity or assessment of the abutment element.

9263 Block Mechanically Stabilized Earth Abutment

Description:
This element defines all abutments constructed of mechanically stabilized earth systems that are modular block units including integral wingwalls and abutment extensions.

Element Classification: NDOT NBE

NBE Parent: 217 Masonry Abutment

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.

Commentary:
Integral wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not integral to the abutment shall not be included in the quantity or assessment of the abutment element.

9241 Masonry Wingwall

Description:
This element defines all wingwalls inclusive of all pile and earth retaining systems.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is dependent upon whether it is:

- Abutment – the sum of the length of wingwalls measured from the abutment at the first construction joint (cold joint, water stop, etc.) to the end of the wingwall.
- Culvert – the sum of the length of the wingwalls starting at the construction joint or the angle connecting the wingwall to the headwall.

Commentary:
For continuous wingwalls, record the length of the wingwall to the appropriate construction joint where the fill retained will not influence the bridge or approach roadway and the recorded length is the longer of the bridge paving unit length or 50 feet per wingwall.

9246 Masonry Headwall

Description:
This element defines all headwalls and includes the material retaining the embankment.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of all of the lengths of each headwall measured longitudinally along the travel way without wingwalls.

Commentary:
Used with culverts only. Integral headwalls, the angle connecting the wingwall to the headwall or up to the first construction joint (cold joint, water stop, etc.) shall be considered in the quantity and assessment.

3-EI.13.7 Other

All elements are constructed of composite materials, or other materials, that cannot be classified using any other defined elements of other material types regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence /Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	* 			

<table>
<tr><th rowspan="2">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1
GOOD</th><th>2
FAIR</th><th>3
POOR</th><th>4
SEVERE</th></tr>
<tr><td>Cracking (RC and Other) (1130)</td><td>Width less than 0.012 in. or spacing greater than 3.0 ft.</td><td>Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. 3.0 ft.</td><td>Width greater than 0.05 in. or spacing of less than 1 ft.</td><td rowspan="5">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>Deterioration (Other) (1220)</td><td>None.</td><td>Initiated breakdown or deterioration.</td><td>Significant deterioration or breakdown but does not warrant structural review.</td></tr>
<tr><td>Distortion (1900)</td><td>None.</td><td>Distortion not requiring mitigation or mitigated distortion.</td><td>Distortion that requires mitigation that has not been addressed but does not warrant structural review.</td></tr>
<tr><td></td><td>*  </td><td>  </td><td>  </td></tr>
<tr><td>Settlement (4000)</td><td>None.</td><td>Exists within tolerable limits or arrested with no observed structural distress.</td><td>Exceeds tolerable limits but does not warrant structural review.</td></tr>
<tr><td>Scour (6000)</td><td>None.</td><td>Exists within tolerable limits or has been arrested with effective countermeasures.</td><td>Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.</td><td></td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

203 Other Column

Description:
This element defines all visable columns not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns.

Commentary:
None.

9203 Submerged Other Column

Description:
This element defines all submerged columns not otherwise defined and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 203 Other Column

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of columns below the waterline.

Commentary:
None.

211 Other Pier Wall

Description:
This element defines all pier walls not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

9211 Submerged Other Pier Wall

Description:
This element defines all submerged pier walls not otherwise defined and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 211 Other Pier Wall

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the lengths of the pier walls measured along the skew angle below the waterline.

Commentary:
Extends from edge of deck to edge of deck along the skew angle and web walls are not included.

218 Other Abutments

Description:
This element defines all abutments and includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions not otherwise defined but does not include the supporting piles.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.

Commentary:
Monolithic wingwalls, up to the first construction joint (sheet pile joint, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

9218 Submerged Other Abutments

Description:
This element defines all abutments, includes the sheet material retaining the embankment, monolithic wingwalls and abutment extensions not otherwise defined but does not include the supporting piles and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 218 Other Abutments

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle below the waterline.

Commentary:
Monolithic wingwalls, up to the first construction joint (sheet pile joint, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic to the abutment shall not be included in the quantity or assessment of the abutment element.

229 Other Pile

Description:
This element defines all piles that are visible for inspection not otherwise defined. Piles exposed from erosion or scour are included.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection.

Commentary:
None.

9229 Submerged Other Pile

Description:
This element defines all piles that are visible for inspection not otherwise defined and is used for underwater inspections.

Element Classification: NDOT NBE

NBE Parent: 229 Other Pile

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles visible for inspection below the waterline.

Commentary:
None.

9236 Other Grade Beam Pile

Description:
This element defines all grade beam piles not otherwise defined. Piles exposed from erosion or scour are included and will require evaluation.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is the sum of the number of piles.

Commentary:
This element shall be inventoried for each bridge (if applicable) whether visible or buried. If buried, code the environmental state "0".

236 Other Pier Cap

Description:
This element defines all pier caps that support girders and transfer load into piles or columns not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the cap lengths measured along the skew angle.

Commentary:
None.

9242 Other Wingwall

Description:
This element defines all wingwalls inclusive of all pile and earth retaining systems not otherwise defined.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is dependent upon whether it is:

- Abutment – the sum of the length of wingwalls measured from the abutment at the first construction joint (sheet pile joint, etc.) to the end of the wingwall.
- Culvert – the sum of the length of the wingwalls starting at the construction joint or the angle connecting the wingwall to the headwall.

Commentary:

For continuous wingwalls, record the length of the wingwall to the appropriate construction joint where the fill retained will not influence the bridge or approach roadway and the recorded length is the longer of the bridge paving unit length or 50 feet per wingwall.

9247 Other Headwall

Description:
This element defines all headwalls and includes the sheet material retaining the embankment not otherwise defined.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of all of the lengths of each headwall measured longitudinally along the travel way without win walls.

Commentary:
Used with culverts only. Monolithic headwalls, the angle connecting the wingwall to the headwall or up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment.

3-EI.14 CULVERTS

3-EI.14.1 General

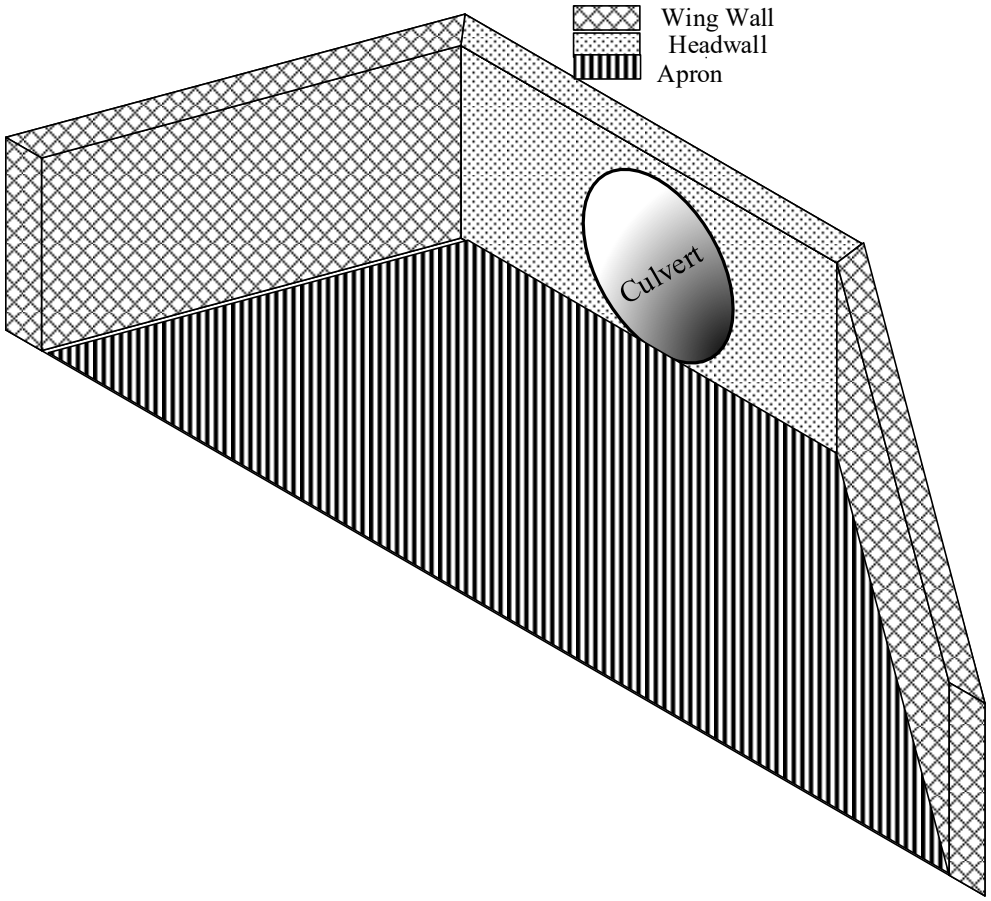
The distortion defect is contingent on a number of factors such as site, wall thickness, fill depth, etc. The inspector shall use such factors to assess the proper condition state.

Record the culvert size in the element description.

Record the number of culvert barrels in the scale field.

If the culvert has a headwall and associated wingwall(s), record the appropriate element. Types and descriptions are listed in the Substructure Element Section of this chapter.

Inspectors should also review guidance in Chapter 6 Scour. If there are further questions, consult the Owner's Hydraulic Engineer or NDOT BIP Bridge Hydraulics Manager.



Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the sum of the barrel flow line lengths.

3-EI.14.2 Steel

All elements are constructed of steel regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	
	*   			
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	*   			
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
	*   			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

240 Steel Culvert

Description:
This element defines all culverts that are arched, round or elliptical shaped.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9270 Steel Arpon

Description:
This element defines all aprons that are hardened surface placed at the invert of the culvert at either inlet or outlet to protect structure from scour/erosion damage and improve flow capacity.

Element Classification: NDOT BME

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the length of hardened suface along the flow line.

Commentary:
Used with culverts only. Aprons monolithic to head walls, the angle connecting the apron to the head wall or up to the first construction joint (cold joint, water stop, etc.) shall be considered in the quantity and assessment.

3-EI.14.3 Prestressed Concrete

All elements are constructed of prestressed or post-tensioned steel reinforced concrete regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Exposed Prestressing (1100)	None.	Present without section loss.	Present with section loss but does not warrant structural review.	
Cracking (PSC) (1110)	Width less than 0.004 in. or spacing greater than 3 ft.	Width 0.004 in. to 0.009 in. or spacing 1.0 ft. to 3.0 ft.	Width greater than 0.009 in. or spacing less than 1 ft.	
Efflorescence /Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	* 			
Abrasion/ Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

245 Prestressed Concrete Culvert

Description:
This element defines all culverts that are primarily box shaped.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

3-EI.14.4 Reinforced Concrete

All elements are constructed of mild steel reinforced concrete regardless of the protective system.

Condition State Definitions:

<table>
<tr><th rowspan="3">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>GOOD</th><th>FAIR</th><th>POOR</th><th>SEVERE</th></tr>
<tr><td>Delamination/ Spall/ Patched Area (1080)</td><td>None.</td><td>Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.</td><td>Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.</td><td rowspan="7">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td>Exposed Rebar (1090)</td><td>None.</td><td>Present without measurable section loss.</td><td>Present with measurable section loss but does not warrant structural review.</td></tr>
<tr><td rowspan="2">Efflorescence /Rust Staining (1120)</td><td>None.</td><td>Surface white without build-up or leaching without rust staining.</td><td>Heavy build-up with rust staining.</td></tr>
<tr><td colspan="3">*    </td></tr>
<tr><td>Cracking (RC and Other) (1130)</td><td>Width less than 0.012 in. or spacing greater than 3.0 ft.</td><td>Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.</td><td>Width greater than 0.05 in. or spacing of less than 1 ft.</td></tr>
<tr><td>Abrasion/ Wear (PSC/RC) (1190)</td><td>No abrasion or wearing.</td><td>Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.</td><td>Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.</td></tr>
<tr><td>Distortion (1900)</td><td>None.</td><td>Distortion not requiring mitigation or mitigated distortion.</td><td>Distortion that requires mitigation that has not been addressed but does not warrant structural review.</td></tr>
</table>

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

241 Reinforced Concrete Culvert

Description:
This element defines all culverts that are box, arched, round or elliptical shaped.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9271 Reinforced Concrete Apron

Description:
This element defines all aprons that are hardened surface placed at the invert of the culvert at either inlet or outlet to protect structure from scour/erosion damage and improve flow capacity.

Element Classification: NDOT BME

NBE Parent: N/A

Unit of Measure: Feet

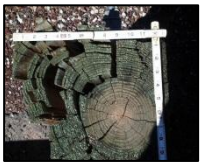
Quantity Calculation:
Quantity for this element is the length of hardened suface along the flow line.

Commentary:
Used with culverts only. Aprons monolithic to head walls, the angle connecting the apron to the head wall or up to the first construction joint (cold joint, water stop, etc.) shall be considered in the quantity and assessment.

3-EI.14.5 Timber

All elements are constructed of timber regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Decay/ Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
	* 			
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
	* 			
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack that is not arrested but does not require structural review.	
	* 			

<table>
<tr><th rowspan="3">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>GOOD</th><th>FAIR</th><th>POOR</th><th>SEVERE</th></tr>
<tr><td>Split/ Delamination (Timber) (1170)</td><td>None.</td><td>Length less than the member depth or arrested with effective actions taken to mitigate.</td><td>Length equal to or greater than the member depth but does not require structural review.</td><td rowspan="6">The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.</td></tr>
<tr><td colspan="3">*    </td></tr>
<tr><td>Abrasion/ Wear (Timber) (1180)</td><td>None or no measurable section loss.</td><td>Section loss less than 10% of the member thickness.</td><td>Section loss 10% or more of the member thickness but does not warrant structural review.</td></tr>
<tr><td>Distortion (1900)</td><td>None.</td><td>Distortion not requiring mitigation or mitigated distortion.</td><td>Distortion that requires mitigation that has not been addressed but does not warrant structural review.</td></tr>
<tr><td>Settlement (4000)</td><td>None.</td><td>Exists within tolerable limits or arrested with no observed structural distress.</td><td>Exceeds tolerable limits but does not warrant structural review.</td></tr>
<tr><td>Scour (6000)</td><td>None.</td><td>Exists within tolerable limits or has been arrested with effective countermeasures.</td><td>Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.</td></tr>
<tr><td>Damage (7000)</td><td>Not applicable.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

242 Timber Culvert

Description:
This element defines all culverts that are primarily box shaped.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9272 Timber Arpon

Description:
This element defines all aprons that are hardened surface placed at the invert of the culvert at either inlet or outlet to protect structure from scour/erosion damage and improve flow capacity.

Element Classification: NDOT BME

NBE Parent: N/A

Unit of Measure: Feet

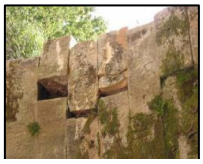
Quantity Calculation:
Quantity for this element is the length of hardened suface along the flow line.

Commentary:
Used with culverts only. Aprons monolithic to head walls, the angle connecting the apron to the head wall or up to the first construction joint (cold joint, water stop, etc.) shall be considered in the quantity and assessment.

3-EI.14.6 Masonry

All elements are constructed of block or stone and may be placed with or without mortar regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Efflorescence/ Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Mortar Breakdown (Masonry) (1610)	None.	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the joints.	
Split/Spall (Masonry) (1620)	None.	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None.	Sound patch.	Unsound patch.	
Masonry Displacement (1640)	None.	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
	* 			
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

244 Masonry Culvert

Description:
This element defines all culverts that are primarily box and arched shaped.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9273 Masonry Apron

Description:
This element defines all aprons that are hardened surface placed at the invert of the culvert at either inlet or outlet to protect structure from scour/erosion damage and improve flow capacity.

Element Classification: NDOT BME

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the length of hardened suface along the flow line.

Commentary:
Used with culverts only. Aprons monolithic to head walls, the angle connecting the apron to the head wall or up to the first construction joint (cold joint, water stop, etc.) shall be considered in the quantity and assessment.

3-EI.14.7 Other

All elements are constructed of composite materials, or other materials, that cannot be classified using any other defined elements of other material types regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
	* 			
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	
	* 			
Delamination /Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence /Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Cracking (RC and Other) (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Deterioration (Other) (1220)	None.	Initiated breakdown or deterioration.	Significant deterioration or breakdown but does not warrant structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
	* 			
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

243 Other Culvert

Description:
This element defines all culverts that are box, arched, round or elliptical shaped not otherwise defined.

Element Classification: NBE

NBE Parent: N/A

Commentary:
None.

9274 Other Apron

Description:
This element defines all aprons that are hardened surface placed at the invert of the culvert at either inlet or outlet to protect structure from scour/erosion damage and improve flow capacity not otherwise defined.

Element Classification: NDOT BME

NBE Parent: N/A

Unit of Measure: Feet

Quantity Calculation:
Quantity for this element is the length of hardened suface along the flow line.

Commentary:
Used with culverts only. Aprons monolithic to head walls, the angle connecting the apron to the head wall or up to the first construction joint (cold joint, water stop, etc.) shall be considered in the quantity and assessment.

3-EI.15 JOINTS

3-EI.15.1 General

Joint configurations consist of expansion, pourable, compression and assembly joints.

Unit of Measure: Feet

Quantity Calculation:
Quantity for these elements is the sum of the lengths of the joint measured along the skew angle.

3-EI.15.2 Strip Seal Joints

These elements define all expansion joint devices which utilize a waterproof gland with some type of metal extrusion or other system to anchor the gland.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
	* 			
Seal Adhesion (2320)	Fully adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Damage (2330)	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
	* 			
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
	* 			
Metal Deterioration or Damage (2370)	None.	Freckled rust, metal has no cracks, or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal, or impact damage but joint still functioning.	Metal cracking, section loss, damage, or connection failure that prevents the joint from functioning as intended.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

300 Strip Seal Expansion Joint

Description:
This element defines all joint devices which utilize a neoprene type waterproof gland.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

3-EI.15.3 Pourable Seal Joints

These elements define all joints that have a pourable sealer.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
	* 			
Seal Adhesion (2320)	Fully adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Damage (2330)	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
	* 			
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Adjacent Deck or Header (2360)	Sound. No spall, delamination, or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area, or loose joint anchor that prevents the joint from functioning as intended.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

301 Pourable Seal Joint

Description:
This element defines all joints with or without a backer.

Element Classification: BME

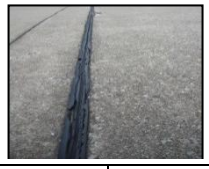
BME Parent: N/A

Commentary:
None.

3-EI.15.4 Compression Seal Joints

These elements define all joints filled with a preformed compression type seal and may or may not have an anchored system to confine the seal.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
	* 			
Seal Adhesion (2320)	Fully adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Damage (2330)	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
	* 			
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Adjacent Deck or Header (2360)	Sound. No spall, delamination, or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area, or loose joint anchor that prevents the joint from functioning as intended.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

302 Compression Seal Joint

Description:
This element defines all joints filled with a preformed compression type seal that are not preformed silicone.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

9401 Preformed Silicone Joint

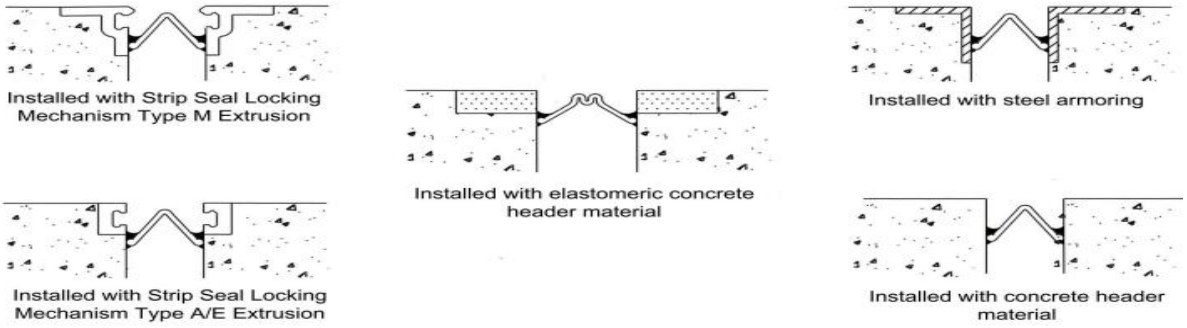
Description:
This element defines all joints that consist of a preformed silicone joint gland and will not have an anchored system to confine the seal.

Element Classification: NDOT BME

BME Parent: 302 Compression Seal Joint

Commentary:
None.

Typical Preformed Silicone Joint Application



3-EI.15.5 Assembly Joints

These elements define all joints that have an assembly mechanism that may or may not have a seal.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
	* 			
Seal Adhesion (2320)	Fully adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Damage (2330)	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
	* 			
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Adjacent Deck or Header (2360)	Sound. No spall, delamination, or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area, or loose joint anchor that prevents the joint from functioning as intended.
	* 			
Metal Deterioration or Damage (2370)	None.	Freckled rust, metal has no cracks, or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning.	Metal cracking, section loss, damage, or connection failure that prevents the joint from functioning as intended.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

303 Assembly Joint With Seal

Description:
This element defines all joints that have a seal.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

305 Assembly Joint Without Seal

Description:
This element defines all joints that are open, not sealed and include finger and sliding plate joints.

Element Classification: BME

BME Parent: N/A

Commentary:
Include open joints with or without a drainage trough below the joint.

3-EI.15.6 Open Joints

These elements define all joints that are designed as open joints but not those joints that were designed to have a seal that is currently missing.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
	* 			
Adjacent Deck or Header (2360)	Sound. No spall, delamination, or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area, or loose joint anchor that prevents the joint from functioning as intended.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

304 Open Expansion Joint

Description:
This element defines all joints that are open but not sealed.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

3-EI.15.7 Other Joints

These elements define all joints constructed of materials that cannot be classified using any other defined joint element.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
	* 			
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
	* 			
Adjacent Deck or Header (2360)	Sound. No spall, delamination, or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area, or loose joint anchor that prevents the joint from functioning as intended.
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Metal Deterioration or Damage (2370)	None.	Freckled rust, metal has no cracks, or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal, or impact damage but joint still functioning.	Metal cracking, section loss, damage, or connection failure that prevents the joint from functioning as intended.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

306 Other Joint

Description:
This element defines all joints that cannot be described by any other joint element category.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

3-EI.15.8 Joint Nosing

This element includes various types of liquid applied nosing material installed on one or both sides of an expansion joint. The nosing material is adhered to the concrete deck or sometimes to parts of existing steel joints. The nosing is most commonly used in conjunction with asphalt overlays but can be found on bare decks. The joint nosing system should be coded using a separate joint element.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination (3210)	None.	Some areas loose or sliding towards joint gap.	Some amount loose or broke out.	Sections completely missing or have been filled in with other material.
				
Damage (7000)	None.	Minor impact damage. Joint function not affected.	Some impact damage. Joint function affected locally.	Significant impact damage. Joint function is affected or lost.
				
Cracking (1130)	None.	Localized cracking along edge.	Localized crushing.	
				

9402 Joint Nosing

Description:
This element defines all polymer joint nosings that occur between the joint materials and the deck materials.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

3-EI.16 APROACH AND PAVING SLABS

3-EI.16.1 General

Bridge approach and paving slabs are structural sections between the abutment and the roadway pavement that are constructed with mild, prestressed or post-tensioned steel reinforcement and concrete. The approach section typically connects the end of the bridge to the grade beam and the paving section connects the grade beam to the roadway pavement. The presence of the approach section will require the Grade Beam Caps and Grade Beam Piles elements to be coded but may not be visible for inspection. Types and descriptions are listed in the Substructure Element Section of this chapter. Not every bridge has both an approach and paving slab.

Approach slabs are Bridge Management Elements (BMEs) and are not included in the standard set of National Bridge Elements (NBEs).

Unit of Measure: Square Feet

Quantity Calculation:
Quantity for this element is the area of the slab(s) from edge to edge including any median areas and accounting for any flares or ramps that are present.

3-EI.16.2 Prestressed Concrete

All elements are constructed of prestressed or post-tensioned steel reinforced concrete regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Exposed Prestressing (1100)	None.	Present without section loss.	Present with section loss but does not warrant structural review.	
Cracking (PSC) (1110)	Width less than 0.004 in. or spacing greater than 3 ft.	Width 0.004 in. to 0.009 in. or spacing 1.0 ft. to 3.0 ft.	Width greater than 0.009 in. or spacing less than 1 ft.	
Abrasion/ Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

320 Prestressed Concrete Paving Slab

Description:
This element defines all structural paving slab sections.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

3-EI.16.3 Reinforced Concrete

All elements are constructed of mild steel reinforced concrete regardless of the protective system.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
Cracking (RC and Other) (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
Abrasion/ Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

321 Reinforced Concrete Paving Slab

Description:
This element defines all structural paving slab sections.

Element Classification: BME

BME Parent: N/A

Commentary:
None.

3-EI.17 WEARING SURFACES

3-EI.17.1 General

Deck and slab wearing surfaces consist of asphalt, epoxy/polyester or cementitious materials. These systems will influence the deterioration and condition of the underlying structural element.

Unit of Measure: Square Feet

Quantity Calculation:
Quantity for these elements is the area of the deck/slab that is protected by the wearing surface.

3-EI.17.2 Asphalt Overlays

All elements define the wearing surfaces that consist of flexible asphaltic concrete.

Condition State Definitions:

<table>
<tr><th rowspan="3">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>GOOD</th><th>FAIR</th><th>POOR</th><th>SEVERE</th></tr>
<tr><td>Raveling (9905)</td><td>The aggregate and/or binder has started to wear away but has not progressed significantly. The pavement only appears slightly aged and slightly rough.</td><td>The aggregate and/or binder have worn away and the surface texture is moderately rough and pitted. Loose particles may be present, and fine aggregate is partially missing from the surface.</td><td>The aggregate and/or binder have worn away significantly, and the surface texture is deeply pitted and very rough. Fine aggregate is essentially missing from the surface, and pitting extends to a depth approaching one half the coarse aggregate size.</td><td rowspan="2">The wearing surface is no longer effective.</td></tr>
<tr><td colspan="3">*
    </td></tr>
<tr><td>Rutting (9906)</td><td>No rutting.</td><td>Rutting depth 0.25 in to 0.50 in.</td><td>Rutting depth 0.50 in. to 0.75 in.</td><td></td></tr>
</table>

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
	* 			
Cracking (AC) (9907)	No Cracking of Asphalt Surface.	The cracks have very little or no spalling along the edges and are less than 0.25 in. in width, Spacing 1 to 4 cracks per 100 ft.	The cracks have little or no spalling but they are greater than 0.25 in. in width. There may be a few randomly spaced low severity connecting cracks near the main crack or at the corners of intersecting cracks, Spacing 5 to 9 cracks per 100 ft.	The wearing surface is no longer effective.
	* 			
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leachate or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	The wearing surface is no longer effective.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9511 Asphalt Overlay

Description:
This element defines all decks/slabs that have a flexible material overlay but without a waterproof membrane.

Element Classification: NDOT BME

BME Parent: 510 Wearing Surfaces

Commentary:
None.

9512 Asphalt Overlay with Membrane

Description:
This element defines all decks/slabs that have a flexible material overlay with a waterproof membrane but may or may not have drain tubes.

Element Classification: NDOT BME

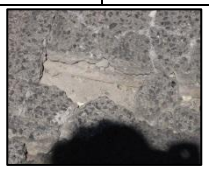
BME Parent: 510 Wearing Surfaces

Commentary:
None.

3-EI.17.3 Thin Lift Overlays

All elements define the wearing surfaces that consist of epoxy/polyester material.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination / Spall / Patched Area / Pothole (Wearing Surfaces) (3210)	None.	Delaminated. Spall less than 1 in. deep or less than 6 in. diameter. Patched Area that is sound. Partial depth pothole.	Spall 1 in. deep or greater or 6 in. diameter or greater. Patched Area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (Wearing Surface) (3220)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width of more than 0.05 in. or spacing of less than 1.0 ft.	The wearing surface is no longer effective.
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leachate or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	The wearing surface is no longer effective.
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9514 Multilayer-Polymer Overlay (Epoxy and/or Polyester)

Description:
This element defines all decks/slabs that have a multilayer epoxy and/or polyester material overlay with broadcast aggregate.

Element Classification: NDOT BME

BME Parent: 510 Wearing Surfaces

Commentary:
None.

3-EI.17.4 Thick Lift Overlays

All elements define the wearing surfaces that consist of cementitious material.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination / Spall / Patched Area / Pothole (Wearing Surfaces) (3210)	None.	Delaminated. Spall less than 1 in. deep or less than 6 in. diameter. Patched Area that is sound. Partial depth pothole.	Spall 1 in. deep or greater or 6 in. diameter or greater. Patched Area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (Wearing Surface) (3220)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width of more than 0.05 in. or spacing of less than 1.0 ft.	The wearing surface is no longer effective.
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leachate or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	The wearing surface is no longer effective.

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
	* 			
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9516 Concrete Overlay (HDLS)

Description:
This element defines all Portland cement low slump and cements without additives.

Element Classification: NDOT BME

BME Parent: 510 Wearing Surfaces

Commentary:
None.

9517 Latex Modified Overlay

Description:
This element defines all Portland cement overlays that contain latex additives.

Element Classification: NDOT BME

BME Parent: 510 Wearing Surfaces

Commentary:
None.

9518 Silica Fume Overlay

Description:
This element defines all Portland cement overlays that contain silica fume additives.

Element Classification: NDOT BME

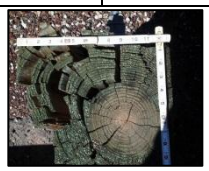
BME Parent: 510 Wearing Surfaces

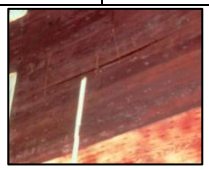
Commentary:
None.

3-EI.17.5 Timber Planks

All elements define the wearing surfaces that consist of timber material.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners, or pack rust with distortion but does not warrant a structural review.	The wearing surface is no longer effective.
	* 			
Decay/ Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	The wearing surface is no longer effective.
	* 			
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	The wearing surface is no longer effective.
	* 			
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack that is not arrested but does not require structural review.	The wearing surface is no longer effective.
	* 			

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Split/ Delamination (Timber) (1170)	None.	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth but does not require structural review.	The wearing surface is no longer effective.
	* 			
Abrasion/ Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness but does not warrant structural review.	The wearing surface is no longer effective.
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leachate or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	The wearing surface is no longer effective.
	* 			
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9519 Timber Running Planks

Description:
This element defines all decks/slabs that have timber running planks.

Element Classification: NDOT BME

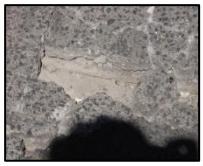
BME Parent: 510 Wearing Surfaces

Commentary:
None.

3-EI.17.6 Other Overlays

All elements define the wearing surfaces that consist of other overlays that are not covered in asphalt, epoxy/polyester or cementitious materials.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area/Pothole (Wearing Surfaces) (3210)	None.	Delaminated. Spall less than 1 in. deep or less than 6 in. diameter. Patched area that is sound. Partial depth pothole.	Spall 1 in. deep or greater or 6 in. diameter or greater. Patched area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (Wearing Surface) (3220)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 in. to 0.05 in. or spacing of 1.0 ft. to 3.0 ft.	Width of more than 0.05 in. or spacing of less than 1.0 ft.	The wearing surface is no longer effective.
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leachate or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	The wearing surface is no longer effective.
	* 			
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9515 Other Overlay

Description:
This element defines all other overlays not otherwise defined.

Element Classification: NDOT BME

BME Parent: 510 Wearing Surface

Commentary:
None.

3-EI.17.7 Stay-in-Place Form

All elements define the forms that remain-in-place after the deck has been placed and the bridge is open for service.

Condition State Definitions:

<table>
<tr><th rowspan="3">Defects</th><th colspan="4">Condition States</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>GOOD</th><th>FAIR</th><th>POOR</th><th>SEVERE</th></tr>
<tr><td>Corrosion (1000)</td><td>None.</td><td>Freckled Rust. Corrosion of the steel has initiated.</td><td>Section loss is evident or pack rust is present but does not warrant structural review.</td><td rowspan="3">The condition warrants a review to determine the effect on serviceability of the element or bridge. The condition is beyond the limits established in Condition State 3.</td></tr>
<tr><td colspan="3">    </td></tr>
<tr><td>Cracking (1010)</td><td>None.</td><td>Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.</td><td>Identified crack exists that is not arrested but does not warrant structural review.</td></tr>
<tr><td rowspan="2">Connection (1020)</td><td>Connection is in place and functioning as intended.</td><td>Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.</td><td>Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but do not warrant a structural review.</td><td rowspan="2"></td></tr>
<tr><td colspan="3">*    </td></tr>
<tr><td>Damage (7000)</td><td>Not applicable</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.</td><td>The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.</td></tr>
</table>

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9530 Steel Stay-in-Place Forms (SIP)

Description:
This element defines all soffit stay-in-place forms and does include the protective system of paint or galvanization.

Element Classification: NDOT BME

BME Parent: N/A

Quantity Calculation:
Quantity for this element includes the area between the girder lines only.

Commentary:
None.

3-EI.18 PROTECTIVE SYSTEMS

3-EI.18.1 General

Protective systems consist of materials that protect the parent element. These systems will influence the deterioration and condition of the parent element.

Unit of Measure: Square Feet

Quantity Calculation:
Quantity for these elements is the area of the entire protected parent element surface.

3-EI.18.2 Sealers / Water Proofers

All elements define the sealers/water proofers that are applied to concrete surfaces but the application is not limited to just the decks.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Textured Surface (9900)	Friction course intact.	Less than 10% has been worn off.	10% to 25% has been worn off.	More than 25% has been worn off.
Wear (Concrete Protective Coatings) (3510)	None.	Underlying concrete not exposed, coating shows wear from UV exposure, friction course missing.	Underlying concrete is not exposed; thickness of the coating is reduced.	Underlying concrete exposed. Protective coating no longer effective.
Effectiveness (Concrete Protective Coatings) (3540)	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

9521 Healer/Sealers

Description:
This element defines all concrete elements that have a crack healer/sealer applied to them such as High Molecular Weight Methacrylate (HMWM).

Element Classification: NDOT BME

BME Parent: 521 Concrete Protective Coating

Commentary:
None.

9522 Silane/Siloxane Water Proofers

Description:
This element defines all concrete elements that have a water proofer applied to them such as silane/siloxane.

Element Classification: NDOT BME

BME Parent: 521 Concrete Protective Coating

Commentary:
None.

3-EI.18.3 Steel Protective Coatings

All elements define steel protective coatings.

Unit of Measure: Square Feet

Quantity Calculation:
Quantity for these elements is the area of the entire protected steel element surface. The element quantity can be estimated utilizing the following methodology:

- Steel beams that are rolled or built-up sections: length (feet) X web height (feet) X 2.9.
- Trusses and arches: length (feet) X panel height (feet) X 0.6.
- Round culverts: length (feet) X 3.14 X diameter (feet).
- Oval culverts: length (feet) X 6.28 X $\sqrt{\frac{\left(\frac{\text{Diameter 1}}{2}\right)^2+\left(\frac{\text{Diameter 2}}{2}\right)^2}{2}}$.

Commentary:
Used on structural elements only such as deck, girders, trusses, columns, abutments and culverts but not applicable to traffic rails or other non-structural elements.

3-EI.18.4 Weathering Patina

All elements define the weathering steel protective coating.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Oxide Film Degradation Color / Texture Adherence (Steel Protective Coatings) (3430)	Yellow-orange or light brown for early development. Chocolate-brown to purple-brown for fully developed. Tightly adhered, capable of withstanding hammering or vigorous wire brushing.	Granular texture.	Small flakes, less than 0.50 in. diameter.	Dark black color. Large flakes, 0.50 in. diameter or greater or laminar sheets or nodules.
	* 			
Effectiveness (Steel Protective Coatings) (3440)	Fully effective.	Substantially effective.	Limited effectiveness.	Failed, no protection of the underlying metal.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9541 Weathering Steel Protective Coating

Description:
This element defines all steel elements that have a patina protective coating.

Element Classification: NDOT BME

BME Parent: 515 Steel Protective Coating

Commentary:
None.

3-EI.18.5 Other Steel Coatings

All elements define the protective paint systems that consist of single and multi-coat systems as well as organic and inorganic systems.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Chalking (Steel Protective Coatings) (3410)	None.	Surface dulling.	Loss of pigment.	Not applicable.
Peeling / Bubbling / Cracking (Steel Protective Coatings) (3420)	None.	Finish coats only.	Finish and primer coats.	Exposure of bare metal.
	* 			
Effectiveness (Steel Protective Coatings) (3440)	Fully effective.	Substantially effective.	Limited effectiveness.	Failed, no protection of the underlying metal.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Note: Photos approximate the boundary condition between Good/Fair, Fair/Poor and Poor/Severe.

9540 Steel Paint Protective Coating

Description:
This element defines all steel elements that have a paint protective coating.

Element Classification: NDOT BME

BME Parent: 515 Steel Protective Coating

Commentary:
None.

9542 Galvanized Steel Protective Coating

Description:
This element defines all steel elements that have a galvanized protective coating.

Element Classification: NDOT BME

BME Parent: 515 Steel Protective Coating

Commentary:
None.

9543 Other Steel Protective Coating

Description:
This element defines all steel elements that have other top coat steel corrosion inhibitors that are not paint or galvanized.

Element Classification: NDOT BME

BME Parent: 515 Steel Protective Coating

Commentary:
None.

3-EI.18.6 Concrete Reinforcing Steel Protective Systems

All elements define situations where the concrete element may be expected to deteriorate at a rate that is slower than an unprotected situation. Protective systems include rebar coatings, cathodic protection or other similar protective methods.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Effectiveness - Protective System (e.g. cathodic) (3600)	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

520 Concrete Reinforcing Steel Protective System

Description:

This element defines all concrete reinforcing steel corrosion protective systems.

Element Classification: BME

BME Parent: N/A

Commentary:
Do not use if a wearing surface but address the wearing surface utilizing the appropriate wearing surface element.

3-EI.19 COUNTERMEASURES

3-EI.19.1 General

Countermeasures consist of various types of slope protection that includes riprap, A-Jack, spur dikes, gabions, articulating blocks and concrete slope protection and need to be assessed based on their effectiveness.

Unit of Measure: Feet

Quantity Calculation:
Quantity for these elements is the sum of the length along the channel.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Effectiveness (Countermeasures) (9901)	Countermeasure shows no signs of deterioration. There are signs of scour repair and installation of the countermeasure. Scour has been stabilized.	Countermeasure has some signs of deterioration, minor shifting, and/or movement of the countermeasure, but there are no signs of additional scour at the countermeasure location. Scour is stabilized.	The countermeasure shows signs of deterioration. The installed countermeasure has been compromised and there are signs of new or recurring scour.	The countermeasure is no longer effective. There is little or no sign of the countermeasure. There are signs that scour is affecting the substructure elements of the bridge. Damage is significant enough to warrant analysis of the bridge.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

9250 Riprap

Description:
This element defines all placed material of broken stone/concrete to protect the foundations and/or revetments of embankments.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.



9251 A-Jack

Description:
This element defines all precast geometric shapes that are interlocked with each other to protect the substructure element.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.



9252 Spur Dikes

Description:
This element defines all placed material in a jetty for guiding overbank flow through the adjacent structure.

Element Classification: NDOT BME

BME Parent: N/A

Quantity Calculation:
Quantity for this element is the sum of the length along the jetty.

Commentary:
None.



9253 Gabions

Description:
This element defines all wire baskets filled with non-erosive material.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.



9254 Articulating Blocks

Description:
This element defines all tied and/or interlocking precast blocks.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.



9255 Concrete Slope Protection

Description:
This element defines all poured concrete placed armoring around substructure elements.

Element Classification: NDOT BME

BME Parent: N/A

Quantity Calculation:
Quantity for this element is the sum of the length along the abutment.

Commentary:
None.



9256 Other Slope Protection

Description:
This element defines all other slope protection that is not covered in other countermeasure elements.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

3-EI.20 OTHER CONDITION ASSESSMENT MARKERS

3-EI.20.1 General

The purpose of "Other Condition Assessment Markers" is to enhance the assessment of the parent element and can be utilized in other project level activities but not within the deterioration models.

3-EI.20.2 Chloride Contamination

All elements define the chloride contamination data that will be populated based on a deck survey. As part of the element notes, record the date and concentration of the in-depth deck evaluation.

Unit of Measure: Square Feet

Quantity Calculation:
Quantity for this element is the area of the deck from edge to edge including any median areas and accounting for any flares or ramps present.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Chloride Concentration (9902)	0 to 0.5 lbs./cu.yd.	0.5 to 1 lbs./cu.yd.	1 to 2 lbs./cu.yd.	Greater than 2 lbs./cu.yd.

9550 Deck Chlorides at Reinforcement Level

Description:
This element defines all deck chloride concentrations at the rebar level from in-depth deck testing and investigation. The supporting data for this element shall be documented in the deck survey results.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

3-EI.20.3 Electrical Potentiality

All elements define the electrical potential data that will be populated based on a deck survey. As part of the element notes, record the date and electrical potential of the in-depth deck evaluation.

Unit of Measure: Square Feet

Quantity Calculation:
Quantity for these elements include the area of the deck from edge to edge including any median areas and accounting for any flares or ramps present.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Half-Cell Potential (CSE - Copper-Copper Sulfate Electrode) (9903)	-0.00 to -0.20 V CSE.	-0.20 to -0.35 V CSE.	-0.35 to -0.40 V CSE.	Greater than -0.40 V CSE.

9551 Electrical Potential at Reinforcement Level

Description:
This element defines all deck electrical potential at the rebar level from in-depth deck testing and investigation. The supporting data for this element shall be documented in the deck survey results.

Element Classification: NDOT BME

BME Parent: N/A

Commentary:
None.

3-EI.20.4 Flow Restrictions

All elements define the flow restrictions applicable to both bridges and culverts.

Condition State Definitions:

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Debris/Silt Blocking Flow on Hydraulic Structure (9904)	No significant debris/silt lodged against structure.	Debris/silt has started building but has not restricted flow <10%.	Debris/silt has built-up and has started to restrict flow <50%.	Debris/silt has blocked flow through the structure ≥50%.

9552 Debris Blocking Flow

Description:
This element defines the aproximate amount of debris that is accumulating in the stream at a structure.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Each

Quantity Calculation:
Quantity for this element is "Each" and only one element per span group is allowed.

Commentary:
Do not code until debris level has reached Condition State 2 (Fair).





9553 Silt in Culvert Barrel

Description:
This element defines the aproximate amount of silt that is accumulating in the culvert barrel.

Element Classification: NDOT BME

BME Parent: N/A

Unit of Measure: Each

Calculation:
Quantity for this element is "Each" and only one element per span group is allowed.

Commentary:
Do not code until silt level has reached Condition State 2 (Fair).





3-EI.21 QUALITY CONTROL

The NBIS defines Quality Control (QC) as "procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level."

Quality Control is defined for NDOT's program as a system of routine technical activities, to measure and control the quality of the bridge inventory data or report as it is being developed. The QC system is designed to include general methods such as accuracy checks on data acquisition and calculations, and the use of approved standardized procedures for measurement, calculation, recording information and reporting. QC activities include:

- Documents, data, or calculations signed by a PE, must have QC completed by an individual of equivalent or better qualifications than the originator (this is typically documented when the QC individual signs or initials the documents).
- See that the technical activity has followed procedures set by NDOT.
- Providing routine and consistent checks for data integrity, correctness and completeness.
- Identifying and addressing errors and/or omissions.
- Documenting inventory data.
- Recording all QC activities.

Quality Control for this program is the responsibility of the consultant or agency actually conducting the activity. Quality Control checks are conducted on every product of a program operation, and thus at a much higher frequency than quality assurance checks. When the QC on a program product is complete, it is finished and deliverable to the Bridge Owner for their records.

Consultants providing professional services to Bridge Owners must submit a Quality Control plan to the Bridge Owner for review and approval. QC must be done on the deliverables prior to submittal to the Bridge Owner.

NDOT completes QC on data that has been entered into the BrM database on a continual basis.

3-EI.22 QUALITY ASSURANCE

Quality Assurance (QA) of all load rating data in the Bridge Inventory will be performed by NDOT or their selected agent. The QA program activities are described in Chapter 1 of this Manual.

3-EI.23 REVISION HISTORY

Rev	Date	Description
0	2014 May 16	Initial Issue of Chapter
1		
2		
3	2015 March 15	Revision 3
4	2016 March 11	Revision 4
5	2017 March 16	Revision 5
6	2018 March	Revision 6
7	2020 March	Revision 7
8	2025 July	Revision 8 – SNBI Compliance

3-EI.24 FORMS

Forms used in completing inspections that are mentioned in this Chapter are listed below. Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOT Bridge Inspection Program website https://dot.nebraska.gov/business-center/bridge for the current list of applicable forms and the most recent versions of each form.

Name	DR Form
Structural Inventory and Appraisal	N/A

3-NE.1 GENERAL 4
3-NE.2 REFERENCES 4
3-NE.3 NE ITEMS IN NUMERICAL ORDER 5
3-NE.4 CONDITION RATINGS (SNBI) 10
3-NE.5 NE DATA ITEMS – GENERAL 11
Item 200 – Bridge Footage Allocation 11
Item 202 – Owner's Bridge Number – This item has been removed, superseded by Item B.ID.02 Bridge Name 11
Item 203 – Posted Weight Limit – This item has been removed, superseded by Item B.EP.04 (Posting Value) 12
Item 204 – Nebraska County Code 13
Item 205 – Nebraska City Code 13
Item 206 – Federal Aid Route Number 13
Item 207 – Highway Route Number 13
Item 208 – State Classification of Inventory Route 13
Item 209 – Under Facility Name – This item has been removed, superseded by Item B.F.03 (Feature Name) 14
Item 210 – Transporter-Erector Route Bridges 14
Item 211 – Priority Commercial System Bridges 14
Item 212 – Bridge Rail 14
Item 217 – Direction of Increasing Reference Post 14
Item 218 – Date Opened to Traffic 15
3-NE.6 NE DATA ITEMS – BRIDGE DECK AND APPROACHES 16
Item 301 – Percent of Defective Deck 16
Item 303 – Roadway Fixed and Expansion Devices (Condition) – This item has been removed, superseded by Item B.C.08 (Bridge Joints Condition Rating) 16
Item 306 – Asphalt and/or Gravel on Deck 16
3-NE.7 NE DATA ITEMS – SUPERSTRUCTURE 17
Item 311 – Bearing Devices (Condition) – This item has been removed, superseded by Item B.C.07 (Bridge Bearings Condition Rating) 17
Item 312 – Pin and Hanger (Condition) 20
3-NE.8 NE DATA ITEMS – SUBSTRUCTURE 21
Item 316 – Condition of Abutments – This item has been removed 21
Item 317 – Condition of Piers – This item has been removed 21
Item 320 – Condition of Piling – This item has been removed 21
Item 321 – Piling Type – This item has been removed, superseded by B.SB.06 (Foundation Type) 22
3-NE.9 NE DATA ITEMS – CULVERT ITEMS 23
Item 324 – Culvert Ends 26
Item 325 – Debris at Inlet – This Item has been removed, covered by Item B.C.09 (Channel Condition Rating) 28
Item 326 – Embankment Erosion 30
Item 327 – Alignment with Structure – This Item has been removed, use Item 355 33

DRAFT

Item 328 – Flowline Drop at Culvert Inlet 34
Item 329 – Flowline Drop at Culvert Outlet..... 35
Item 330 Code – Silt in Barrel..... 36
Item 335 – Inspectors Opinion on Culvert Adequacy – This Item has been removed, use Item 358..... 37
Item 359 – Size of Culvert and Other Data 38

3-NE.10 NE DATA ITEMS – MISCELLANEOUS ITEMS 39

Item 342 – Total Number of Pins 39
Item 343 – Snooper Bridge – This item has been removed, superseded by B.IE.12 (Inspection Equipment)..... 39

3-NE.11 NE DATA ITEMS – BRIDGE SCOUR RELATED 40

Item 344A – Approach Settles/Washes out – This Item has been removed..... 43
Item 345 – Structure Crosses a Canal..... 44
Item 346 – Is Stream Bed Degraded – This item has been removed..... 45
Item 347 – Noticeable Contraction of Stream 47
Item 348 – Local Scour at Piers/Abutments 48
Item 349 – Banks Eroding/Unstable – This Item has been removed, covered by Item Item B.C.09 (Channel Condition Rating) 50
Item 350 – Stream Shifted from Center – This item has been removed..... 52
Item 351 – Floodwater Reaches Low Superstructure – This Item has been removed. 53
Item 351A – Low Road Elevation Above Low Superstructure – This Item has been removed 55
Item 352 – Floodwater Over Bridge Deck or Roadway – This Item has been removed56
Item 353 – Potential Debris Upstream – This item has been removed 57
Item 354 – Bents/Piers in Channel – This item has been removed 58
Item 354A – Flow Against Abutment 59
Item 355 – Structure Alignment with Flow..... 60
Item 356 – Debris Blocking Channel at Bridge – This Item has been removed, covered by Item B.C.09 (Channel Condition Rating). 61
Item 357 – Drop from Upstream Deck to Flowline..... 62
Item 357B – Drop from Upstream Deck to Ground at Abutment No. 2 62
Item 358 – Is There a Scour Problem – This item has been removed, superseded by B.AP.03 (Scour Vulnerability). 63
Item 358A – Significant Flood in the Last Two Years – This Item has been removed64
Item 358B – Scour Increased in the Last Two Years – This item has been removed . 64
Item 358C – Scour Plan of Action Effective Date 64

3-NE.12 NE DATA ITEMS – UNDERWATER INSPECTION 65

Item 360 – Piling 65
Item 361 – Bracing and Connectors 65
Item 362 – Columns and Wall..... 65
Item 363 – Footing 65
Item 364 – Scour - This Item has been removed, superseded by B.C.11 (Scour Condition Rating) 65
Item 365 – Debris 65

3-NE.13 NE DATA ITEMS – MAINTENANCE AND FOLLOW-UP 66

Item 377 – Maintenance Problem – This item has been removed..... 66
Item 378 – Date Maintenance Flagged – This item has been removed..... 66

Item 379 – Recommendations – This item has been removed 66
Item 380 – Critical Finding Outstanding – This item has been removed 66

3-NE.14 NE DATA ITEMS – LOAD RATING 66

Item 380 – Percent of Stress Reduction – This item has been removed..... 66
Item 381 – Load Rating Program Used – This item has been removed 67
Item 385 – HS Operating Rating – This item has been removed, superseded by B.LR.06 (Operating Load Rating Factor) 68
Item 386 – Calculated Load Rating for Nebraska Legal Trucks 68
Item LOD_RAT_D – Load Rating Date – This item has been removed, superseded by Item B.LR.03 (Load Rating Date) 68
Item LOD_RAT_N – Load Rating Engineer ID – This item has been removed..... 68

3-NE.15 NE DATA ITEMS – INSPECTION STAFF 69

3-NE.16 QUALITY CONTROL 70

3-NE.17 QUALITY ASSURANCE 70

3-NE.18 REVISION HISTORY 71

3-NE.19 FORMS 71

DRAFT

3-NE.1 GENERAL

The Specifications for the National Bridge Inventory data items with accompanying definitions, descriptions, and guidance for use are in Chapter 3 SNBI of the BIP Manual.

The NE Items contained in this chapter are custom data fields used by NDOT and are not submitted to the FHWA. These items do not print on the SI&A report. These were developed by the NDOT Bridge Division and are used for bridge maintenance and bridge management purposes. The assignment of a particular rating or code to any item will only indicate that action is required or desired but will not imply that action will be taken or is pending.

3-NE.2 REFERENCES

The information in this Bridge Inspection Program Manual supplements requirements, and procedures and information in documents by:

- The American Association of State Highway and Transportation Officials (AASHTO)
- The U.S. Department of Transportation, Federal Highway Administration (FHWA)
- The National Cooperative Highway Research Program (NCHRP).

The References list of applicable documents is included in the Manual Appendix. The National Bridge Inspection Standards are also included in the Manual.
People involved with the Nebraska Bridge Inspection Program and the bridge inventory must be knowledgeable of the requirements in National Bridge Inspection Standards, the *AASHTO Manual for Bridge Evaluation*, and FHWA publications, technical advisories and publications related to the NBIS.

3-NE.3 NE ITEMS IN NUMERICAL ORDER

The following table includes the list of Nebraska Data Items shown in numerical order. Responsibility for entry into the NE database is shown as guidance of participants but can vary for each structure. A detailed description for coding of each follows. Several items have been removed from NE coding in numerous Revisions. Those items have been stricken through.

NEBRASKA ITEMS IN NUMERICAL ORDER

I = Initial – recorded initially and updated, when necessary, but would not typically change from inspection to inspection
EI = Each Inspection – verified and/or updated by the inspector during each inspection
C = calculated – automatically calculated and stored by FHWA and not recorded during inspections or reported to FHWA
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into BrM when changed
P = provides data

Item No.	Description	Category	Code Length /Type	Frequency	PM Staff	TL	HE	LRE
200	Bridge Footage Allocation	General Bridge Information	20/N	I	I			
201	Federal-Aid Project Number	General Bridge Information	30/N	I	I			
~~202~~	~~Owner's Bridge Number~~	~~General Bridge Information~~	~~20/AN~~	~~I~~	~~I~~	~~V~~		
~~203~~	~~Posted Weight Limit~~	~~General Bridge Information~~	~~30/N~~	~~EI~~		~~E*~~		
204	NE County Code	General Bridge Information	3/N	I	I			
205	NE City Code	General Bridge Information	5/N	I	I			
206	F.A. Route Number	General Bridge Information	4/N	I	I			
207	Highway Route Number	General Bridge Information	4/N	I	I			
208	State Classification of Inventory Route	General Bridge Information	1/N	I	I			
209	Under Facility Name	General Bridge Information	25/AN	I	I			
210	Transporter-Erector Route Bridges	General Bridge Information	1/A	I	I			
211	Priority Commercial System Bridges	General Bridge Information	1/A	I	I			
212	Bridge Rail Type	General Bridge Information	2/N	I	I			
~~213~~	~~Bridge Name~~	~~General Bridge Information~~		~~I~~	~~I~~	~~V~~		
214	School Bus Route	General Bridge		I	I	V		

DRAFT

NEBRASKA ITEMS IN NUMERICAL ORDER

I = Initial – recorded initially and updated, when necessary, but would not typically change from inspection to inspection
EI = Each Inspection – verified and/or updated by the inspector during each inspection
C = calculated – automatically calculated and stored by FHWA and not recorded during inspections or reported to FHWA
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into BrM when changed
P = provides data

Item No.	Description	Category	Code Length /Type	Frequency	PM Staff	TL	HE	LRE
		Information						
215	Transit Bus Route	General Bridge Information		I	I	V		
~~216~~	~~Emergency Route~~	~~General Bridge Information~~		~~I~~	~~I~~	~~V~~		
217	Direction of Increasing Station	General bridge Information		I		V		
218	Date Open to Traffic	Initial Inspection	10/AN	S		E		
301	% of Defective Deck	Bridge Deck and Approaches	2/N	EI		E		
303	Roadway Fixed and Expansion Devices	Bridge Deck and Approaches	1/N	EI		E		
306	Asphalt and/or Gravel on Deck	Bridge Deck and Approaches	3/AN	EI		E		
~~311~~	~~Bearing Devices~~	~~Superstructure~~	~~1/N~~	~~EI~~		~~E~~		
312	Pin and Hanger Condition	Superstructure	1/N	EI		E		
~~316~~	~~Condition of Abutments~~	~~Substructure~~	~~1/N~~	~~EI~~		~~E~~		
~~317~~	~~Condition of Piers~~	~~Substructure~~	~~1/N~~	~~EI~~		~~E~~		
~~320~~	~~Condition of Piling~~	~~Substructure~~	~~1/N~~	~~EI~~		~~E~~		
~~321~~	~~Piling Type~~	~~Substructure~~	~~1/A~~	~~I~~	~~I~~			
322	Mechanically Stabilized Earth Walls	Substructure	1/A	I	I			
~~323~~	~~Culvert Barrel~~	~~Culvert~~	~~1/N~~	~~EI~~		~~E~~		
324	Culvert Ends	Culvert	1/N	EI		E		
~~325~~	~~Debris at Inlet~~	~~Culvert~~	~~1/N~~	~~EI~~		~~E~~		
326	Embankment Erosion	Culvert	1/N	EI		E		
~~327~~	~~Alignment with Structure~~	~~Culvert~~	~~1/N~~	~~EI~~		~~E~~		
328	F.L. Drop at Culvert Inlet	Culvert	2/N	EI		E		
329	F.L. Drop at Culvert Outlet	Culvert	2/N	EI		E		
330	Silt in Barrel	Culvert	2/N	EI		E		
~~335~~	~~Inspectors Opinion on Culvert Adequacy~~	~~Culvert~~	~~1/N~~	~~EI~~		~~E~~		
342	Total Number of Pins	Miscellaneous	2/N	I		V		

NEBRASKA ITEMS IN NUMERICAL ORDER

I = Initial – recorded initially and updated, when necessary, but would not typically change from inspection to inspection
EI = Each Inspection – verified and/or updated by the inspector during each inspection
C = calculated – automatically calculated and stored by FHWA and not recorded during inspections or reported to FHWA
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into BrM when changed
P = provides data

Item No.	Description	Category	Code Length /Type	Frequency	PM Staff	TL	HE	LRE
~~343~~	~~Snooper Bridge~~	~~Miscellaneous~~	~~1/A~~	~~I~~		~~V~~		
344	Abutment walls undermined	Scour Related Routine Inspection	1/A	EI		E		
~~344A~~	~~Approach Settles/Washes Out~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~		
345	Bridge Crossing a Canal	Scour Related Routine Inspection	1/A	I		E		
~~346~~	~~Is Stream Bed Degraded~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	V**	
347	Noticeable Contraction of Stream	Scour Related Routine Inspection	1/A	EI		E	V**	
348	Local Scour at Piers/Abutments	Scour Related Routine Inspection	1/A	EI		E	V**	
~~349~~	~~Banks Eroding/Unstable~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~350~~	~~Stream Shifted from Bridge Center~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~351~~	~~Floodwater Reaches Low Superstructure~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~351A~~	~~Low Road Elevation Above Low Superstructure~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~352~~	~~Floodwater Over Bridge Deck or Roadway~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~353~~	~~Potential Debris Upstream~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~354~~	~~Bents/Piers in Channel~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
354A	Flow Against Abutment	Scour Related Routine Inspection	1/A	EI		E	V**	
355	Bridge Alignment with Flow	Scour Related Routine Inspection	1/AN	EI		E	V**	
~~356~~	~~Debris Blocking Channel at Bridge~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
357	Drop from Upstream Deck to Flowline	Scour Related Routine Inspection	2/N	EI		E	V**	
357A	Drop from Upstream	Scour Related Routine	2/N	EI		E	V**	

DRAFT

NEBRASKA ITEMS IN NUMERICAL ORDER

I = Initial – recorded initially and updated, when necessary, but would not typically change from inspection to inspection
EI = Each Inspection – verified and/or updated by the inspector during each inspection
C = calculated – automatically calculated and stored by FHWA and not recorded during inspections or reported to FHWA
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into BrM when changed
P = provides data

Item No.	Description	Category	Code Length /Type	Frequency	PM Staff	TL	HE	LRE
	Deck to Ground at Abut 1	Inspection						
357B	Drop from Upstream Deck to Ground at Abut 2	Scour Related Routine Inspection	2/N	EI		E	V**	
~~358~~	~~Is There a Scour Problem~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~358A~~	~~Significant Flood in Last Two Years~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
~~358B~~	~~Scour Increased in Last two Years~~	~~Scour Related Routine Inspection~~	~~1/A~~	~~EI~~		~~E~~	~~V**~~	
358C	Scour Plan of Action Effective Date	Scour Related Routine Inspection	10/AN	I		V		
~~359A~~	~~Type of culvert~~	~~Culvert~~	~~1/A~~	~~I~~		~~V~~		
~~359B~~	~~Number of barrels/pipes~~	~~Culvert~~	~~1/N~~	~~I~~		~~V~~		
359C	Culvert Barrel Length	Culvert	2/N	I		V		
359D	Height of Culvert	Culvert	2/N	I		V		
359E	Depth of Fill	Culvert	2/N	EI		E		
360	Piling	Underwater Inspection	1/N	EI		E		
361	Bracing and Connectors	Underwater Inspection	1/N	EI		E		
362	Columns and Wall	Underwater Inspection	1/N	EI		E		
363	Footing	Underwater Inspection	1/N	EI		E		
~~364~~	~~Scour~~	~~Underwater Inspection~~	~~1/N~~	~~EI~~		~~E~~		
365	Debris	Underwater Inspection	1/N	EI		E		
~~377~~	~~Maintenance Problem~~	~~Maintenance and Follow-up~~	~~1/N~~	~~EI~~		~~E~~		
~~378~~	~~Date Maintenance Flagged~~	~~Maintenance and Follow-up~~	~~10/AN~~	~~EI~~		~~E~~		
~~379~~	~~Recommendations~~	~~Maintenance and Follow-up~~	~~1/N~~	~~EI~~		~~E~~		
~~380~~	~~Critical Finding Outstanding~~	~~Maintenance and Follow-up~~	~~1/AN~~	~~EI~~	~~E~~			
~~381~~	~~Rating Program Used~~	~~Load Rating~~	~~1/N~~	~~EI~~				~~E~~
~~384~~	~~HS Inventory Rating~~	~~Load Rating~~	~~1/N~~	~~EI~~				~~E~~
~~385~~	~~HS Operating Rating~~	~~Load Rating~~	~~1/N~~	~~EI~~				~~E~~
386	Office Calculated Posting	Load Rating	1/N	EI				E

NEBRASKA ITEMS IN NUMERICAL ORDER

I = Initial – recorded initially and updated, when necessary, but would not typically change from inspection to inspection
EI = Each Inspection – verified and/or updated by the inspector during each inspection
C = calculated – automatically calculated and stored by FHWA and not recorded during inspections or reported to FHWA
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into BrM when changed
P = provides data

Item No.	Description	Category	Code Length /Type	Frequency	PM Staff	TL	HE	LRE
~~na~~	~~Inspection Team Leader ID~~	~~Program~~	~~/AN~~	~~EI~~		~~E~~		
400A	Asst. Inspector ID, 1	Program	/AN	EI		E		
400B	Asst. Inspector ID, 2	Program	/AN	EI		E		
400C	Asst. Inspector ID, 3	Program	/AN	EI		E		
400D	Asst. Inspector ID, 4	Program	/AN	EI		E		
~~na~~	~~Load Rating Engineer ID~~	~~Program~~	~~/AN~~	~~EI~~	~~E~~			~~P~~
~~na~~	~~Load Rating Date~~	~~Program~~	~~/AN~~	~~EI~~	~~E~~			~~P~~

* TL codes posting as found on inspection.
** Hydraulic Engineers record their opinion on these items on scour assessment forms. The BIPPM should be notified if different than values shown in the NE database.

DRAFT

3-NE.4 CONDITION RATINGS (SNBI)

The SNBI Condition ratings are used to describe the existing, in place bridge as compared to the as built condition. They are used for some of the NE Items. The table is repeated here for the convenience of the Manual users.

Table 1. Codes and descriptions for component condition ratings.

Code	Condition	Description
N	NOT APPLICABLE	Components do not exist.
9	EXCELLENT	Isolated inherent defects.
8	VERY GOOD	Some inherent defects.
7	GOOD	Some minor defects.
6	SATISFACTORY	Widespread minor or isolated moderate defects.
5	FAIR	Some moderate defects; strength and performance of the component are not affected.
4	POOR	Widespread moderate or isolated major defects; strength and/or performance of the component is affected.
3	SERIOUS	Major defects: strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	CRITICAL	Major defects: component is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions in order to keep the bridge open.
1	IMMINENT FAILURE	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.
0	FAILED	Bridge is closed due to component condition and is beyond corrective action. Replacement is required to restore service.

3-NE.5 NE DATA ITEMS – GENERAL

Item 200 – Bridge Footage Allocation

20 digits

Nebraska Highway Trust Fund allocations are affected by the lineal feet of bridge in a political subdivision. This item is used to indicate the political subdivisions that share in the total bridge footage of a structure. Code a two- or four-digit number for the political subdivision and a two-digit number indicating the percentage of the total length allocated. For the list of political subdivision in Nebraska, see the Manual Appendix.

Item	Character / digits	Code
200A	2 digits	Border Bridge County
200B	2 digits	Percent Allocated
200C	2 digits	Border Bridge County
200D	2 digits	Percent Allocated
200E	4 digits	Border Bridge City
200F	2 digits	Percent Allocated
200G	4 digits	Border Bridge City
200H	2 digits	Percent Allocated

Item 201 – Federal-Aid Project Number

30 digits

If Federal funds have been used for construction or reconstruction of this structure, the Federal-Aid project number of the most recent project should be recorded, if available. (The most recent project or plan number whether it be Federal, State or county should be coded.)

Item 202 – Owner's Bridge Number – This item has been removed, superseded by Item B.ID.02 Bridge Name

20/AN characters

This field can be used by counties and cities for their unique bridge numbers or identification, or any other data they would like on the SI&A sheet.

DRAFT

Item 203 – Posted Weight Limit – This item has been removed, superseded by Item B.EP.04 (Posting Value)

306 digits

This item is determined by the Inspection Team Leader during Routine Inspections and entered into BrM. The Inspection Team Leader must check the posted loads against the most current Load Rating Summary Sheet. Check to see that all signs required to show restricted weight limit, reduced speed limit, or impaired vertical clearance are in place per the requirements of the MUTCD.

Nebraska requires weight limits to be posted for the three legal trucks in Nebraska. (See Chapter 5, Load Rating for more information on load posting.)

If the structure is posted with a three-truck sign, code the sign weight limits in tons as shown in the table, as a six-digit number, left justified. Some single weight limit signs may still be in place on local roads. If the structure is posted with a single weight limit sign, code the weight limit as a two-digit or six-digit number, left justified, that shows the sign capacity in tons. If the bridge is not posted, code all six digits of this item with zeroes.

Condition Found	Item 203A (2 digits)	Item 203B (2 digits)	Item 203C (2 digits)
~~Three-truck sign~~	~~Truck 1, first weight limit on sign~~	~~Truck 2, second weight limit on sign~~	~~Truck 3, third weight limit on sign~~
~~Single-truck sign~~	~~Weight limit shown on the sign~~	~~Code two zeroes~~	~~Code two zeroes~~
~~No Load Posting~~	~~Code two zeroes~~	~~Code two zeroes~~	~~Code two zeroes~~

Capacity plates found on Nebraska structures are not to be coded as weight limits for this item.

Item 204 – Nebraska County Code

2 digits

In the NE Inventory database, this is the Nebraska county number. This is a two-digit numerical code taken from the NE Local Public Agency Codes list that is in the Manual Appendix.
(Note: The FHWA records this information as Item B.L.02 (County Code) in their Inventory database, which numerically equals the NE code multiplied by 2 minus 1.)

Item 205 – Nebraska City Code

4 digits

In the NE Inventory database, this is the Nebraska city or municipality number. This is a four-digit numerical code taken from the NE Local Public Agency Codes list that is in the Manual Appendix
(Note: The FHWA records this information as Item B.L.03 (Place Code) in their Inventory database.)

Item 206 – Federal Aid Route Number

4 digits

This is a code used in recording the federal-aid route number, prefixing with zeroes as applicable. If the route is not on the F.A. System, this field will be blank.

Item 207 – Highway Route Number

4 digits on F.A. system, 3 digits off F.A. system

This is a code used in recording route numbers contained in the IHI master file. These route numbers are used to automatically update Item B.H.09 (Annual Average Daily Traffic). If the route is not on the IHI master file, this field will be blank.

Item 208 – State Classification of Inventory Route

1 digit

This is a one-digit code used to indicate the state classification of the inventory route.

Code	Description
1	Interstate
2	Expressway
3	Major Arterial – Principal
4	Major Arterial – Intermediate
5	Major Arterial – Non-Continuous
6	Major Arterial – Scenic Recreation
7	Other Arterials
8	Collectors
9	Local Minimum Maintenance Under Construction

DRAFT

Item 209 – Under Facility Name – This item has been removed, superseded by Item B.F.03 (Feature Name)

25/AN characters

This is a 25-character field used to code the name of the facility for which the "under" structure measurements were taken.

Item 210 – Transporter-Erector Route Bridges

1 character

Record if the Transporter-Erector route is carried by the bridge or is a feature under the bridge at grade separations.
Code = M when the route is carried by the bridge or
Code = U when the route is running under the bridge. Leave this item blank when the bridge is not on the Transporter-Erector Route system.

Item 211 – Priority Commercial System Bridges

1 character

Code = Y if the route carried by the bridge is on the Priority Commercial System network.
Leave this item blank if the route carried is not on the network.

Item 212 – Bridge Rail

2 digits

Code	Description
01	New Jersey
02	Modified New Jersey
03	Concrete
04	Safety Curb – Aluminum Rail
05	Safety Curb – Steel Rail
06	Concrete Block
07	Two-Step Curb – Steel Rail
08	Guard Rail
09	Other
00	None

Item 217 – Direction of Increasing Reference Post

2 characters

NDOT requests that inspectors provide the direction of increasing reference post for all structures, using the codes provided below.

Code	Description
N	North
S	South
E	East
W	West
NE	Northeast
NW	Northwest
SE	Southeast
SW	Southwest

At the time of the next inspection, the direction shall be indicated in BrM on the **NDOT Inventory & Appraisal** page (BrM > Bridges > Inventory & Appraisal > NDOT Inventory & Appraisal).

For structures with plans, inspectors shall indicate the direction of increasing reference post as shown on bridge plans.

If plans are unavailable, use the primary direction of the roadway and code with the assumption that reference posts increase from west to east and south to north.

Implementation Guidance:
This item is intended to provide consistent references for bridge components (which end has Abutment 1 vs Abutment 2, for example).

Examples for situations when plans are not available:

- Structure on a road aligned in a west-east orientation, code this item "east".
    - Abutment 1 would be to the west and abutment 2 would be to the east.
- Structure on a road that runs southwest to northeast, code this item as "northeast".
    - Abutment 1 would be to the southwest and abutment 2 would be to the northeast.

Girders, if present should be referred to as labelled in the plans. If plans are not available, they should be referred to alphabetically, with Girder "A" as the left-most girder when facing in the direction of increasing reference post.

This guidance will also be included within the BrM FAQ section.

Item 218 – Date Opened to Traffic

See description

NDOT Requests that Bridge Owners ensure the date the structure was opened to traffic in the format mm/dd/yyyy. This data item will assist in completing timely Initial Inspections.

DRAFT

3-NE.6 NE DATA ITEMS – BRIDGE DECK AND APPROACHES

These Items that apply to a bridge must be coded by inspection Team Leaders on every Routine Inspection.

Item 301 – Percent of Defective Deck

2 digits

Code = the percentage of the curb-to-curb area of deck that is defective.
Concrete decks: Determine the percentage of the total deck area that is spalled and/or delaminated by chain dragging or sounding the deck area.
Timber decks: Determine the percentage of the total deck area that has loose or damaged planks.
Asphalt overlay or dirt/gravel cover: If the deck has been covered with asphalt, dirt or gravel so that the deck is not accessible for evaluations, the percent defective is to remain the same (not coded zero) regardless of the smoothness of the driving surface.
Concrete overlay: Determine the percentage of the total deck area that is spalled and/or delaminated by chain dragging or sounding the deck area.

Item 303 – Roadway Fixed and Expansion Devices (Condition) – This item has been removed, superseded by Item B.C.08 (Bridge Joints Condition Rating)

1 digit

~~Code this item using the FHWA Condition Ratings Table codes. Bridge joints are found at the ends of the decks or at the grade beams. These joints can deteriorate to the point where storm water can cause extensive damage on the superstructure and substructure elements below the deck or create erosion or pressure on the abutment walls. The joint does not require a metal device to be considered a bridge joint. Any break in the riding surface that allows rotation or translation of the deck/slab is considered a bridge joint. Construction joints that are not permitted to move or rotate are not included in this item~~.

Item 306 – Asphalt and/or Gravel on Deck

3/AN characters

Record the average depth of asphalt and/or dirt on the deck in inches. A change in gravel or asphalt depth changes the load capacity. An increase can substantially decrease the available load capacity, and a revised load rating is required. Note Item 306A has been superseded by Item B.SP.10 (Wearing Surface).

Item	Character / digits	Code
306	2 digits	Average depth of asphalt and/or dirt on the deck in inches
~~306A~~	~~1 character~~	~~A = asphalt G = gravel~~

3-NE.7 NE DATA ITEMS – SUPERSTRUCTURE

Item 311 – Bearing Devices (Condition) – This item has been removed, superseded by Item B.C.07 (Bridge Bearings Condition Rating)

1 digit

Bearings devices are a separate structural device that transmit loads from the superstructure to the substructure. Bearing devices accommodate physical movement and/or thermal expansion and contraction of the superstructure. These devices also accommodate rotation of the superstructure caused by loads on the superstructure in the spans adjacent to the substructure. A superstructure stringer (steel or timber) setting on a pile cap does not have a bearing, though a steel-to-steel connection may be welded.
Photos guidance is provided for some common situations in Nebraska.
Inspectors should review the BIRM for complete descriptions of bearing types.
Coding is based on the FHWA Condition Ratings codes and records the overall condition. Some examples are given.

Code	Condition	Comments
~~N~~	~~NOT APPLICABLE~~	~~For example: steel plates, bearing on pile cap.~~
~~9~~	~~EXCELLENT CONDITION~~	~~Functioning as intended.~~ ~~Alignment within design limits and appropriate for current conditions.~~ ~~Free of debris.~~
~~5~~	~~FAIR CONDITION~~	~~Functioning slightly restricted~~ ~~Alignment at or near design limits.~~ ~~Extensive corrosion/covered with debris~~
~~3~~	~~POOR CONDITION~~	~~No longer functioning as intended. In need of repair.~~ ~~Alignment beyond design limits.~~ ~~Primary bearing components have severe section loss.~~

Inspection notes should include information on the condition such as:
The relative horizontal position between the superstructure and the substructure of bearing device and the ambient temperature at the time of the measurements.
The condition of anchor bolts, such as rust, distortion or being sheared off.
Any evidence that the bearing device has frozen and is not allowing deflection and rotation.

DRAFT



Item 311 Code: N not applicable
Description: Steel plates here are shims, not a bearing device



Item 311 Code: N not applicable
Description: Stringer is welded to cap. There is no bearing device



Item 311 Code: 5 FAIR
Description: Bearing has sole plate on cap and rocker plate under beam.



Item 311 Code: 6 SATISFACTORY CONDITION
Description: Pad appears to be functioning properly, concrete spall and bent anchor bolt appears to be due to slot being too short

DRAFT



Item 311 Code: 4 POOR
Description: Rocker has been pushed off sole plate, is off of center, and likely not functioning correctly, minor rust

Item 312 – Pin and Hanger (Condition)

1 digit

Code this item using the FHWA Condition Rating codes with NDOT guidance for Item B.C.02 (Superstructure Condition Rating).

3-NE.8 NE DATA ITEMS – SUBSTRUCTURE

Item 316 – Condition of Abutments – <u>This item has been removed</u>

1 digit

Code this item using the FHWA Condition Ratings codes with NDOT guidance for Item B.C.03 (Substructure Condition Rating).
Abutments older than ten years may, but typically won't, be coded 9, especially if cracking in concrete is found.

Item 317 – Condition of Piers – <u>This item has been removed</u>

1 digit

Code this item using the FHWA Condition Ratings codes with NDOT guidance for Item B.C.03 (Substructure Condition Rating).
Piers older than ten years may, but typically won't, be coded 9, especially if cracking in concrete is found.

Item 320 – Condition of Piling – <u>This item has been removed</u>

1 digit

Code this item using the FHWA Condition Ratings codes with NDOT guidance for Item B.C.03 (Substructure Condition Rating).
If the pile is not visible, code this item "N".
If the pile condition warrants a Condition Rating of 2, this is a Critical Finding, and a Critical Finding Report must be filed and the bridge closed.
Pile condition can dramatically affect the calculated load rating for a bridge thus this item is also reported on the Load Rating Summary Sheet.

DRAFT

Item 321 – Piling Type – This item has been removed, superseded by B.SB.06 (Foundation Type)

1 character

This item typically is coded in office from the plans, and not during a field inspection. Typically, in Nebraska, piles are used to transfer loads from the bridge structure to the geological elements below. Some structures may have more than a single type of pile; in this case code the pile type for the longest span.

Code	Material Type	Comments
~~C~~	~~Concrete~~	~~Types of concrete pile used in Nebraska include prestressed pile and auger cast pile.~~
~~D~~	~~Drilled Shaft~~	~~Bridge is built on drilled shafts, typically founded on bedrock.~~
~~S~~	~~Steel~~	~~Some steel pile are encased in concrete and the steel portion will not be visible. This is determined from bridge plans.~~
~~T~~	~~Timber~~	
~~N~~	~~None~~	~~Bridge is built on spread footings which typically are founded on bedrock.~~

Item 322 – Mechanically Stabilized Earth Walls

1 character

Code = B for wall constructed with rectangular concrete panels.
Code = P for wall constructed with cruciform concrete panels.
Code = M for wall constructed with modular block units.
Code = N if no MSE walls are used on this structure.

3-NE.9 NE DATA ITEMS – CULVERT ITEMS

Inspectors should also review guidance in Chapter 6 Scour. If there are further questions, consult the Owner's Hydraulic Engineer or NDOT Bridge Hydraulics Manager.
The following list is a summary of items related to culverts. See the detailed description for each item.

Several items have been removed from NE Culvert coding in Revision 3. Those items have been stricken through.

Item No.	Description	Code
~~323~~	~~Culvert Barrel~~	~~0-9~~
324	Culvert Ends	0-9
~~325~~	~~Debris at Inlet~~	~~0-9~~
326	Embankment Erosion	0-9
~~327~~	~~Alignment with Structure~~	~~0-9~~
328	Flowline Drop at Culvert Inlet	Ft
329	Flowline Drop at Culvert Outlet	Ft
330	Silt in Barrel	Ft
~~335~~	~~Inspectors Opinion on Culvert Adequacy~~	~~Y,N~~
345	Structure Crosses a Canal	Y,N
346	Is Stream Bed Degraded	Y,N
347	Noticeable Contraction of Stream	Y,N
350	Stream Shifted from Center	Y,N
353	Potential Debris Upstream	Y,N
355	Structure Alignment with Flow	0-9
~~358~~	~~Is there a Scour (Hydraulic) Problem?~~	~~Y,N~~

DRAFT

Item 323 – Culvert Barrel – This Item has been removed, covered by Item B.C.04 (Culvert Condition Rating)

1 digit

Code this item using the FHWA Condition Ratings codes and Item B.C.04 (Culvert Condition Rating) coding descriptions for hydraulic observations of the barrel portion.



Item 323 Code: 9 EXCELLENT CONDITION
Description: No deficiencies



Item 323 Code: 7 GOOD CONDITION
Description: Minor cracking, Light Scaling



Item 323 Code: 5 FAIR CONDITION
Description: Distortion in the far upper left end section of culvert



Item 323 Code: 4 POOR CONDITION
Description: Wide Crack

DRAFT

Item 324 – Culvert Ends

1 digit

Culvert ends include the wing walls, headwalls and aprons. Code this item using the FHWA Condition Ratings codes and Item B.C.04 (Culvert Condition Rating) coding descriptions for structural observations in culvert ends, wings, and aprons.



Item 324 Code: 9 EXCELLENT CONDITION
Description: No deficiencies



Item 324 Code: 4 POOR CONDITION
Description: Large spall, Exposed Rebar



Item 324 Code: 3 SERIOUS CONDITION
Description: Settlement of wing footing and undermining



Item 324 Code: 3 SERIOUS CONDITION
Description: Wingwall nearly severed

DRAFT

Item 325 – Debris at Inlet – This Item has been removed, covered by Item B.C.09 (Channel Condition Rating)

1 digit

Code this item using the FHWA Condition Ratings codes and Item B.C.09 (Channel Condition Rating) coding descriptions for hydraulic observations for debris blocking the channel.



Item 325 Code: 8 VERY GOOD CONDITION
Description: Good open channel approach, No debris



Item 325 Code: 8 VERY GOOD CONDITION
Description: Barrels open to full flow



Item 325 Code: 5 FAIR CONDITION
Description: Trees and brush restrict the channel



Item 325 Code: 4 POOR CONDITION
Description: Large deposits of debris in the waterway blocking inlet

DRAFT

Item 326 – Embankment Erosion

1 digit

Code this item using these coding descriptions for erosion on the roadway embankment and around the wings. Erosion is caused by runoff around the structure, not by stream action.

Code	Description
N	Not applicable. Use when structure is not over waterway
9	There are no noteworthy deficiencies which affect the condition of the structure
8	Minor erosion adjacent to the structure
7	Minor erosion at wings
6	Embankment beginning to slump
5	Severe erosion at the wings
4	Shoulder compromised
3	Erosion at the roadway edge
2	Roadway compromised (Not severe)
1*	Structure closed – correct deficiencies
0*	Structure closed/failed - replace

*Requires Critical Finding



Item 326 Code: 9 EXCELLENT CONDITION
Description: No noticeable roadway embankment issues



Item 326 Code: 6 SATISFACTORY CONDITION
Description: Embankment is beginning to slump, protection is strained

DRAFT



Item 326 Code: 4 POOR CONDITION
Description: Shoulder compromised, roadway embankment is being eroded



Item 326 Code: 4 POOR CONDITION
Description: Shoulder compromised, roadway embankment is being eroded

Item 327 – Alignment with Structure – This Item has been removed, use Item 355

1 digit

Code this item using the FHWA Condition Ratings codes and Item 355. Inspectors should also review guidance in Chapter 6 Scour.



Item 327 Code: 9 EXCELLENT CONDITION
Description: Channel perpendicular to roadway



Item 327 Code: 3 SERIOUS CONDITION
Description: Poor alignment even with skewed barrels

DRAFT

Item 328 – Flowline Drop at Culvert Inlet

2 digits

Record the depth of drop in feet, right justified. Measure the deepest drop from the barrel floor to ground at the upstream edge of the culvert (to the nearest foot).



Item 327 Code: 5
Description: Tape shows close to 5 feet drop at inlet



Item 327 Code: 0
Description: Smooth entrance into culvert, Drop less than 6 inches

Item 329 – Flowline Drop at Culvert Outlet

2 digits

Record the depth of drop in feet, right justified. Measure the deepest drop from the barrel floor to ground at the downstream end of the culvert (to the nearest foot).



Item 329 Code: 4
Description: 4 feet drop at outlet



Item 329 Code: 0
Description: Smooth transition out of culvert, No drop at outlet

DRAFT

Item 330 Code – Silt in Barrel

2 digits

Record the average depth of silt in feet, right justified.



Item 330 Code: 5
Description: 5 feet average opening height in a 10 feet high box



Item 330 Code: 0
Description: Both barrels are clean

Item 335 – Inspectors Opinion on Culvert Adequacy – <u>This Item has been removed, use Item 358</u>

1 digit

This item is intended to indicate when a culvert needs a more in-depth hydraulic assessment. Code this item using the FHWA Condition Ratings codes and Item B.C.04 (Culvert Condition Rating) coding descriptions for hydraulic observations. Inspectors' opinion – Are there hydraulic issues?





Item 335 Code: Y
Description: Culvert ends are undermined, Stream flowing under the culvert



Item 335 Code: N
Description: No major issues evident

Item 359 – Size of Culvert and Other Data

8/AN characters

This is an eight-digit code made up of the following:

Item	Character / digits	Code
~~Item 359A~~	~~1 character~~	~~Code = B if structure is a box culvert. Code = P if structure is steel or concrete pipes. Code = F if structure is a frame-type culvert.~~
~~Item 359B~~	~~1 digit~~	~~Number of barrels or pipes.~~
Item 359C	2 digits	Length of culvert measured through the barrel or pipe. ~~Span length measured perpendicular to culvert walls in feet of one box or pipe~~
Item 359D	2 digits	Height of box/pipe in feet
Item 359E	2 digits	This is the depth between the roadway surface and the top of the culvert's top slab. Record the depth of fill over the culvert which would represent the worst-case condition for load rating the culvert, typically where the depth of fill is the **least** under the travelled way of the roadway surface, for example, at the edge of the travelled way. Each site is unique; inspectors should consider the slope of the top of the culvert and the cross slope of the roadway surface when recording the depth for this Item.

3-NE.10 NE DATA ITEMS – MISCELLANEOUS ITEMS

Item 342 – Total Number of Pins

2 digits

Record the total number of pins on the structure. All pins should be included, such as:

- Pins of pin-connected trusses
- Pins at both fixed and expansion bearing devices
- Pins in pin and hanger bridges

Item 343 – Snooper Bridge – This item has been removed, superseded by B.IE.12 (Inspection Equipment)

1 character

Code = Y if snooper truck is needed for complete bridge inspection.
Code = N if inspection can be performed without the use of snooper.

DRAFT

3-NE.11 NE DATA ITEMS – BRIDGE SCOUR RELATED

The following list is a summary of items related to bridge scour. Inspectors should also review guidance in Chapter 6 Scour. If there are further questions, consult the Owner's Hydraulic Engineer or NDOT Bridge Hydraulics Manager.
See the detailed description for each item.

Several items have been removed from NE Bridge Scour. Those items have been stricken through.

Item No.	Description	Code
326	Embankment Erosion	0 – 9
344	Abutment Walls Undermined	Y, N
~~344A~~	~~Approach Settles/Washes Out~~	~~Y, N~~
345	Structure Crosses a Canal	Y, N
346	Is Stream Bed Degraded	Y, N
347	Noticeable Contraction of Stream	Y, N
348	Local Scour at Piers/Abutments	See detail
~~349~~	~~Banks Eroding/Unstable~~	~~Y, N~~
350	Stream Shifted from Bridge Center	Y, N
~~351~~	~~Floodwater Reaches Low Superstructure~~	~~Y, N~~
~~351A~~	~~Low Road Elevation Above Low Superstructure~~	~~Y, N~~
~~352~~	~~Floodwater Over Bridge Deck or Roadway~~	~~Y, N~~
353	Potential Debris Upstream	Y, N
354	Bents/Piers in Channel	Y, N
354A	Flow Against Abutment	Y, N
355	Structure Alignment with Flow	0 – 9
~~356~~	~~Debris Blocking Channel at Bridge~~	~~Y, N~~
357	Drop from Upstream Deck to Flowline	Ft.
357A	Drop from Upstream Deck to Ground at Abutment 1	Ft.
357B	Drop from Upstream Deck to Ground at Abutment 2	Ft.
~~358~~	~~Is there a Scour Problem~~	~~Y, N~~
~~358A~~	~~Significant Flood in Last Two Years~~	~~See detail~~
~~358B~~	~~Scour Increased in Last Two Years~~	~~See detail~~
358C	Scour Plan of Action Effective Date	See detail

Item 344 – Abutment Walls Undermined

1 character

Code = Y if embankment has been scoured out from under the abutment or the wingwalls.
Code = N if there is no evidence of undermining present.



Item 344 Code: Y
Description: The bottom of the abutment wall is exposed.



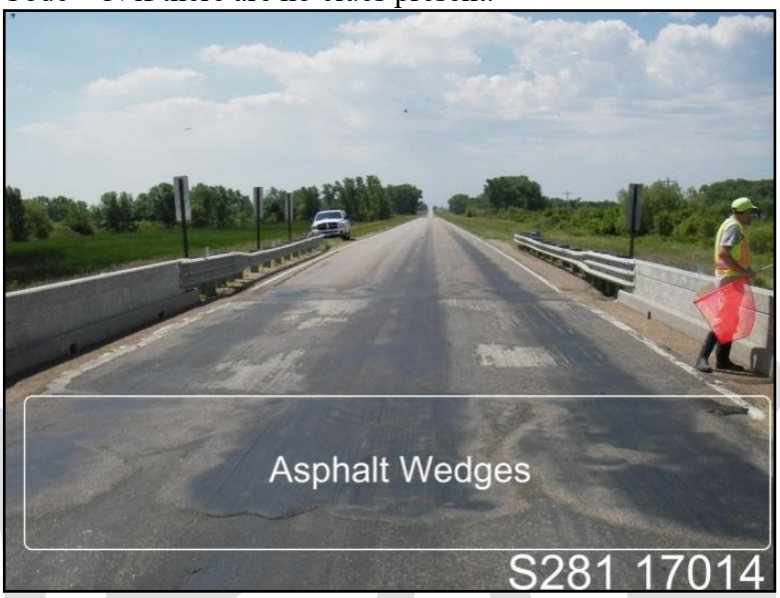


Item 344 Code: N
Description: The bottom of the abutment is not exposed.

Item 344A – Approach Settles/Washes out – <u>This Item has been removed</u>

1 character

Code = Y if there is evidence observed that the approach embankment has settled or appears to have washed out due to stream flow.
Code = N if there are no clues present.



Item 344A Code: Y
Description: The approach is settled, or asphalt wedge indicates past settlement.



Item 344A Code: Y
Description: Evidence the abutment wall has washed out from a past flood.

DRAFT

Item 345 – Structure Crosses a Canal

1 character

This item is included to separate waterways with controlled stream flow from natural rivers and streams which can have uncontrolled, variable flow. In Nebraska canals are used for power generation and for irrigation.
Code = Y if the bridge crosses a canal.
Code = N if not.



Item 345 Code: Y
Description: The bridge is over a canal.



Item 345 Code: N
Description: The bridge is over a natural channel.

Item 346 – Is Stream Bed Degraded – <u>This item has been removed</u>

1 character

This item may be completed by comparing field measurements to dimensions on plans, or by noting past soil marks on substructure. Stream degradation is common on streams where the channel has been straightened. Streambed degradation that is localized in nature is better coded with B.C.11 (Scour Condition Rating).
Code = Y if stream bed degradation is noticeable.
Code = N if there are no clues present.





Item 346 Code: Y
Description: The channel has degraded. Degraded channels typically have a secondary berm below the high bank, channel banks have sloughed, the trunks of trees are not vertical due to bank sloughing and channel head cutting may be evident.



Item 346 Code: N
Description: The channel has not degraded. Typically, natural channels only have the capacity for a 2-year flood.

Item 347 – Noticeable Contraction of Stream

1 character

Bridges should span over the channel with abutments above the high bank of the stream. It is common that the distance between abutments is less than the top width of typical channel. When stream flow contracts to flow through an opening, berms below the abutment typically are washed out.
Code = Y if bridge constricts channel flood flows.
Code = N if bridge length is greater than top of channel width



Item 347 Code: Y
Description: Bridge is shorter than the top of the channel with no berms at abutments.



Item 347 Code: N
Description: Bridge is longer than the top of channel. Note: Channel shifted into an abutment is **not** an indication the bridge is too short. A typical bridge spans the berms and channel.

DRAFT

Item 348 – Local Scour at Piers/Abutments

1 character

Note if local scour hole(s) is/are observed near any of the substructures.
Code = A if berm scour is present at either abutment.
Code = B if scour holes are present at bents or piers.
Code = C if scour holes are present at both locations.
Code = N if no is evident.



Item 348 Code: A
Description: Berm scouring is evident at an abutment.



Item 348 Code: B
Description: Scour holes are evident at the bents/piers.



Item 348 Code: C
Description: Scour is evident at an abutment and bent/pier.



Item 348 Code: N
Description: No evidence of Scour. Note: Channel degradation is not considered Local/Contraction Scour.

DRAFT

Item 349 – Banks Eroding/Unstable – This Item has been removed, covered by Item Item B.C.09 (Channel Condition Rating)

1 character

Code = Y if the banks are eroding or unstable.
Code = N if banks are stable and vegetated.





Item 349 Code: Y
Description: The channel's bank is eroding and unstable.



Item 349 Code: N
Description: The channel's bank is stable and vegetated.

DRAFT

Item 350 – Stream Shifted from Center – <u>This item has been removed</u>

1 character

Code = Y if the main channel is not centered with the bridge
Code = N if the main channel is centered with the bridge.



Item 350 Code: Y
Description: There is a significant shift of the channel from the bridge center.



Item 350 Code: N
Description: The channel is aligned with the center of the bridge.

Item 351 – Floodwater Reaches Low Superstructure – <u>This Item has been removed</u>

1 character

Code = Y if there is evidence of floodwater reaching superstructure.
Code = N if no evidence flood water reaching superstructure.





Item 351 Code: Y
Description: Evidence of debris in the superstructure and/or the low superstructure is below the channel high bank elevation. Indicating floodwater can get to and above low superstructure.



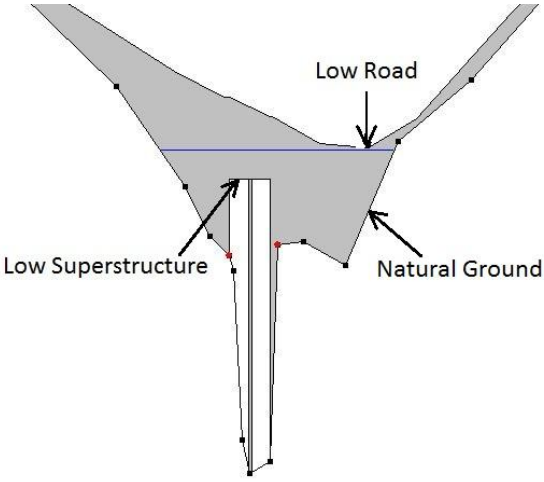
Item 351 Code: N
Description: No evidence floodwater reaches low superstructure.

Item 351A – Low Road Elevation Above Low Superstructure – <u>This Item has been removed</u>

1 character

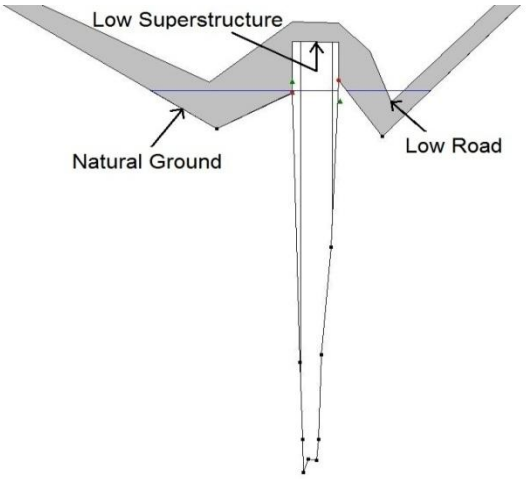
Code = Y if low road grade, within floodplain, is above low superstructure elevation.
Code = N if low road grade, within floodplain, is below low superstructure elevation.





Item 351A Code: Y
Description: Low Road (within floodplain) is at a higher elevation than the low superstructure. Indicating floodwater can reach the superstructure should road overflow occur. Floodwater reaches the low superstructure before road overflow occurs; this creates pressure flow through the bridge opening and increases the scour until road overflow occurs.





Item 351A Code: N
Description: Low Road sag elevation is below the low superstructure elevation. Adjacent roadway is below the low superstructure allowing flood relief and minimizing scour.

Item 352 – Floodwater Over Bridge Deck or Roadway – <u>This Item has been removed</u>

1 character

Code = Y if there is evidence of flood water over road.
Code = N if there is no evidence of flood water over road.





Item 352 Code: Y
Description: Floodwater can go over the roadway at any location.



Item 352 Code: N
Description: Floodwater does not go over the roadway at any location.

Item 353 – Potential Debris Upstream – <u>This item has been removed</u>

1 character

Code = Y if there are established trees, bushes or other woody debris in the upstream channel.
Code = N if there is no evidence of significant debris upstream



Item 353 Code: Y
Description: Upstream view indicates significant debris in and along channel bank can wash down during a flood and restricting flow through the bridge opening.



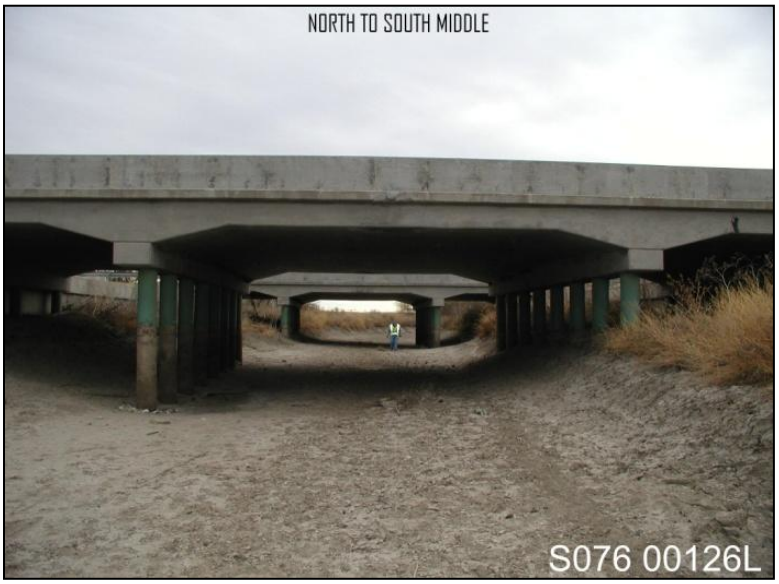
Item 353 Code: N
Description: Upstream view indicates minimal amounts of debris along channel bank and restricting flow through the bridge opening is unlikely.

DRAFT

Item 354 – Bents/Piers in Channel – <u>This item has been removed</u>

1 character

Code = Y if piers or bents are located in the main channel. At high water conditions this may create a scour problem.
Code = N if piers and bents are outside of the main channel and clear of the water.



Item 354 Code: Y
Description: Bents/piers are located within the main channel banks.



Item 354 Code: N
Description: Bents/piers are not located within the main channel banks

Item 354A – Flow Against Abutment

1 character

Code = Y if the stream flows against one or both abutments. This creates a problem for inspection and may also be hiding evidence of undermining. If the depth of the abutment wall is unknown, then it may need to be coded Scour Critical.
Code = N if the stream does not flow against either abutment.



Item 354A Code: Y
Description: The stream flows against one or both abutments.



Item 354A Code: N
Description: The stream flow is away from both abutments.

DRAFT

Item 355 – Structure Alignment with Flow

1/AN character

Observe and record the direction of the approaching stream flow during high water relative to the substructure of the bridge. Note that the direction of the approaching stream may be different during high water than during normal flow. Flow parallel to the substructure will cause minimal local scour. As the approach angle of flow increases, the amount of local scour increases. Code this item from 0 to 9 based on the approach angle of stream flow during high water relative to substructure.
Code = 9 when stream flow is parallel to substructure. Stream flow approach angle is 0°.
Code = 0 when stream flow is perpendicular to substructure. Stream flow approach angle is 90° (typically impossible).

Code	Stream approach angle relative to substructure
9	0°
8	5°
7	10°
6	15°
5	20°
4	30°
3	45°
2	60°
1	70°
0	90°
N	Not applicable





Item 355 Code: 4
Description: Direction of approaching stream flow relative to the piers of the bridge is approximately 30 degrees.

Item 356 – Debris Blocking Channel at Bridge – This Item has been removed, covered by Item B.C.09 (Channel Condition Rating).

1/AN character

Code = Y if a significant amount of debris is lodged against structure.
Code = N if no significant debris lodged against structure.





Item 356 Code: Y
Description: Significant amount of debris is lodge under bridge.

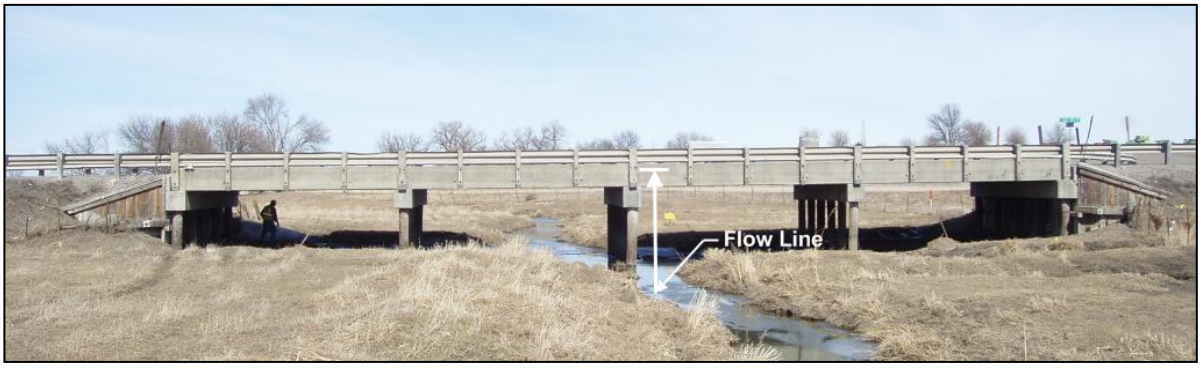




Code	Description
N	No Significant debris is lodged under bridge.

Item 357 – Drop from Upstream Deck to Flowline

2 digits



Item 357 Code: Distance in feet.

Item 357A – Drop from Upstream Deck to Ground at Abutment No. 1

2 digits



Item 357A Code: Distance in feet.

Item 357B – Drop from Upstream Deck to Ground at Abutment No. 2

2 digits



Item 357B Code: Distance in feet.

Item 358 – Is There a Scour Problem – This item has been removed, superseded by B.AP.03 (Scour Vulnerability).

1 character

Code = Y if it appears a scour problem exists
Code = N if scour problem does not exist

The following questions should be reviewed by the inspector:
Does the stream flow against only one abutment?
Does the stream flow against both abutments?
Does the stream have a sharp bend just upstream?
Is the bottom of the abutment wall visible?
Has the channel degraded (lowered) significantly?
Does it appear that riprap has been installed for more than a single event?
Does debris build up upstream redirect flow toward an abutment?





Item 358 Code: Y

Description: When there is a visual indication, the substructure is in danger of washing out. This includes but is not limited to channel shift against abutments, berm washed out and abutment undermined.

Item 358 Code: N (No Picture Shown.)

Description: When there is visual indication, the substructure will remain stable during large floods. This includes but not limited to channel centered through bridge, stable berms, and counter measures in place.

Item 358A – Significant Flood in the Last Two Years – <u>This Item has been removed</u>

1 character

Code = A if there was significant flood with flow over road. This includes but is not limited to high water marks above road and flood reports from the public.
Code = B if there was a significant flood without flow over road. This includes but is not limited to high water marks below road and flood reports from the public.
Code = N if there is no evidence of significant flood. This includes but is not limited to high water marks below road and no flood reports from the public.

Item 358B – Scour Increased in the Last Two Years – <u>This item has been removed</u>

1 character

Code = Y if scour conditions under the bridge are worse than conditions at the last inspection
Code = N if scour conditions are not worse





Item Code: Y
Description: There is evidence that the bridge waterway area has scoured from a flood within the last two years. Compare with photos from previous inspection.

Item Code: N (No Picture Shown.)
Description: The waterway area has not changed within the last two years. Compare with photos from previous inspection.

Item 358C – Scour Plan of Action Effective Date

See description

Record the effective date of the most current Scour Plan of Action. The format is mm/dd/yyyy.

If B.A.P.04 Scour Plan of Action is coded as "Y", then Item 358C should be coded with the date that the Scour Plan of Action went into effect.

3-NE.12 NE DATA ITEMS – UNDERWATER INSPECTION

Rate the condition of the underwater items using the SNBI condition ratings.

Item 360 – Piling

1 digit

All piling should be inspected for signs of distress including evidence of cracking, checking, splitting, section loss, settlement, misalignment, scour, collision damage, abrasion and corrosion.

Item 361 – Bracing and Connectors

1 digit

All bracing and connectors should be inspected for signs of distress. The inspector should note missing, bent or corroded connectors, as well as any loss of section in the connector due to corrosion, decay or deterioration.

Item 362 – Columns and Wall

1 digit

Concrete columns and walls should be inspected for signs of misalignment, cracking, scaling, spalling, abrasion or chemical attack.

Item 363 – Footing

1 digit

Footings should be inspected for signs of misalignment, cracking, scaling, spalling, abrasion and scour.

Item 364 – Scour - This Item has been removed, superseded by B.C.11 (Scour Condition Rating)

1 digit

Rating for scour should include the type of material on the bottom of the waterway, its relative density, and the presence and condition of riprap.

Item 365 – Debris

1 digit

Channel bottom should be inspected for any material that will cause physical damage to the integrity of the structure.

DRAFT

3-NE.13 NE DATA ITEMS – MAINTENANCE AND FOLLOW-UP

Item 377 – Maintenance Problem – <u>This item has been removed</u>

25 digits

This item is used to flag problems found during inspection. This can be minor maintenance to major repair. It is up to the bridge owner to determine the type of problems to be flagged. Note that missing posting signs or closure barricades are a critical finding.

Item 378 – Date Maintenance Flagged – <u>This item has been removed</u>

4 digits

Record as a series of 4-digit code segments, the month and year, (MMYY), that the maintenance problem was flagged. The number of the month should be coded in the first 2 digits with leading zeros as required and the last 2 digits of the year coded as the third and fourth digits of the field.

Item 379 – Recommendations – <u>This item has been removed</u>

25/AN characters

This item is used to record recommendations for the maintenance flag. Examples are "do nothing" or "replace structure." Notes should be as specific as possible.

Item 380 – Critical Finding Outstanding – <u>This item has been removed</u>

1/AN character

This item is used by NDOT to track the status of Critical Findings.
Code = Y if there is a reported Critical Findings that is still outstanding and awaiting closure.
Code = N if prior known Critical Finding is closed.

3-NE.14 NE DATA ITEMS – LOAD RATING

Item 380 – Percent of Stress Reduction – <u>This item has been removed</u>

2 digits

This item is not used. This item is shown in this section only to inform Manual users that this item is no longer used in the Nebraska Bridge Inventory. Historically, this was the amount the stresses have been reduced due to superstructure damage or deterioration.

Item 381 – Load Rating Program Used – <u>This item has been removed</u>

1 digit

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered in BrM by the Program Manager Staff. Record the rating method used to determine Inventory and Operating Ratings.

Code	Program Used	Load Rating Method
~~01~~	~~BARS P.C.~~	~~Load Factor~~
~~02~~	~~BARS Mainframe~~	~~Load Factor~~
~~03~~	~~BRASS~~	~~Load Factor~~
~~04~~	~~VIRTIS~~	~~Load Factor~~
~~05~~	~~Hand Calculation~~	~~Load Factor~~
~~06~~	~~BARS P.C.~~	~~Working Stress~~
~~07~~	~~BARS Mainframe~~	~~Working Stress~~
~~08~~	~~BRASS~~	~~Working Stress~~
~~09~~	~~VIRTIS~~	~~Working Stress~~
~~10~~	~~NDOT Timber Program~~	~~Working Stress~~
~~11~~	~~NDOT Steel Program~~	~~Working Stress~~
~~12~~	~~Consultant Program~~	~~Working Stress~~
~~13~~	~~Hand Calculation~~	~~Working Stress~~
~~14~~	~~Not used~~	
~~15~~	~~LARS~~	~~Load Factor~~
~~16~~	~~LARS~~	~~Load & Resistance Factor Rating~~
~~36~~	~~NDOT internal use only~~	~~Assigned Rating~~
~~37~~	~~na~~	~~NDOT Policy~~
~~38~~	~~na~~	~~Engineering Judgment~~
~~99~~		

DRAFT

Item 384 – HS Inventory Rating – This item has been removed, superseded by B.LR.05 (Inventory Load Rating Factor)

This item is not used. This item is shown in this section only to inform Manual users that this item is no longer used in the Nebraska Bridge Inventory.

Item 385 – HS Operating Rating – This item has been removed, superseded by B.LR.06 (Operating Load Rating Factor)

This item is not used. This item is shown in this section only to inform Manual users that this item is no longer used in the Nebraska Bridge Inventory.

Item 386 – Calculated Load Rating for Nebraska Legal Trucks

6 digits

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered in BrM by the Program Manager Staff. If these calculated tonnage values are less than the Gross Legal Weight for any of these trucks, then the bridge must be load posted. The load posting values recommended by the LRE shall be used on the posting sign. This is a six-digit code made up of the following:

Item	Truck	Gross Legal Weight	Character / digits	Item 386 Code
386A	Type 3	25 Tons	2 digits	LRE recommended tonnage
	SU4	27 Tons		
	SU5	31 Tons		
	SU6	34.75 Tons		
	SU7	38.75 Tons		
386B	Type 3S2	37 Tons	2 digits	LRE recommended tonnage
386C	Type 3-3	43 Tons	2 digits	LRE recommended tonnage

Item LOD_RAT_D – Load Rating Date – This item has been removed, superseded by Item B.LR.03 (Load Rating Date)

6/AN characters

This date is gathered by BIP Staff from the Load Rating Summary Sheet.

Item LOD_RAT_N – Load Rating Engineer ID – <u>This item has been removed</u>

6 digits

The Load Rating Engineer inputs their own NE Professional Engineer License number (excluding the "E" shown at the beginning of a NE engineering license number) in the Load Rating Summary Sheet. This data is gathered by BIP Staff from the Load Rating Summary sheet.

3-NE.15 NE DATA ITEMS – INSPECTION STAFF

Item	Description	Code Length /Type
B.IE.04	Inspection Team Leader ID	6 A/N characters
400A	Assistant Inspector 1 ID	6 A/N characters
400B	Assistant Inspector 2 ID	6 A/N characters
400C	Assistant Inspector 3 ID	6 A/N characters
400D	Assistant Inspector 4 ID	6 A/N characters

A Team Leader or Assistant Inspector ID consists of the person's initials from their first and last names followed by a four-digit number.

B.IE.04 is an SNBI Item and not an NE Item but is included in the table above for clarification.

All Team Leaders are required to have an inspector ID prior to completing any inspections in Nebraska. An inspector ID is recommended for Assistant Inspectors but is not required.

DRAFT

3-NE.16 QUALITY CONTROL

The NBIS defines Quality Control (QC) as "procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level."
Quality Control is defined for NDOT's program as a system of routine technical activities, to measure and control the quality of the bridge inventory data or report as it is being developed. The QC system is designed to include general methods such as accuracy checks on data acquisition and calculations, and the use of approved standardized procedures for measurement, calculation, recording information and reporting. QC activities include:

- Documents, data, or calculations signed by a PE, must have QC completed by an individual of equivalent or better qualifications than the originator (this is typically documented when the QC individual signs or initials the documents).
- See that the technical activity has followed procedures set by NDOT.
- Providing routine and consistent checks for data integrity, correctness and completeness.
- Identifying and addressing errors and/or omissions.
- Documenting inventory data.
- Recording all QC activities.

Quality Control for this program is the responsibility of the consultant or agency actually conducting the activity. Quality Control checks are conducted on every product of a program operation, and thus at a much higher frequency than quality assurance checks. When the QC on a program product is complete, it is finished and deliverable to the Bridge Owner for their records.
Consultants providing professional services to Bridge Owners must submit a Quality Control plan to the Bridge Owner for review and approval. QC must be done on the deliverables prior to submittal to the Bridge Owner.
NDOT completes QC on data that has been entered into the BrM database on a continual basis.

3-NE.17 QUALITY ASSURANCE

Quality Assurance (QA) of all load rating data in the bridge inventory will be performed by NDOT or their selected agent. The QA program activities are described in Chapter 1 of this Manual.

3-NE.18 REVISION HISTORY

Rev	Date	Description
0	2010 January 25	Initial Issue of Chapter
1	2011 November 01	Revision 1
2	2013 March 04	Revision 2
3	2015 March 15	Revision 3
4	2016 March 11	Revision 4
5	2017 March 16	Revision 5
6	2018 March	Revision 6
7	2020 March	Revision 7
0	2025 July	Revision 8 – SNBI Compliance

3-NE.19 FORMS

Forms used in completing inspections that are mentioned in this Chapter are listed below. Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOT Bridge Inspection Program website at http://dot.nebraska.gov/business-center/bridge/ for the current list of applicable forms and the most recent versions of each form.

Name	DR Form
Structural Inventory and Appraisal	N/A

DRAFT

This page intentionally left blank.

4.1 GENERAL 4
4.2 REFERENCES....4
4.3 BRIDGE INSPECTION RESPONSIBILITIES 4
4.3.1 Nebraska Department of Transportation 4
4.3.2 Local Owners.... 5
4.3.3 Tribal Owners.... 5
4.3.4 Border Bridges.... 5
4.3.5 Engineering Consultants.... 6
4.4 QUALIFICATIONS 6
4.5 INSPECTION PROCEDURES 6
4.5.1 General.... 6
4.5.2 Planning the Inspection 7
4.5.3 Preparing for the Inspection.... 7
4.5.3.1 Office Preparation.... 7
4.5.3.2 Field Preparation.... 9
4.5.4 Safety.... 12
4.5.5 Traffic Control Procedures 14
4.5.6 Material Considerations.... 14
4.5.7 Bridges Over Waterways.... 15
4.5.7.1 Channel Behavior and Scour.... 15
4.5.7.2 Scour Critical Structures Plan of Action.... 15
4.5.7.3 Inspection and Reporting for Bridges Over Waterways 15
4.5.8 Complex Feature Bridges 17
4.5.9 Report Preparation.... 18
4.5.9.1 Reporting.... 18
4.5.9.2 Photographs.... 19
4.5.9.3 BrM Input.... 22
4.5.9.4 Repair and Maintenance.... 22
4.5.10 Critical Findings 24
4.5.10.1 Critical Findings Definition 24
4.5.10.2 Responsibilities for Critical Findings Reporting.... 25
4.5.10.3 Critical Findings Procedures.... 26
4.5.10.4 Critical Finding Corrective Action Procedures.... 27
4.5.11 FHWA Compliance Review.... 30
4.5.12 Posting/Closures 30
4.5.13 Load Rating Reviews.... 30
4.6 INSPECTION TYPES 31
4.6.1 Initial Inspection.... 33
4.6.1.1 Description.... 33
4.6.1.2 Inspection Interval 34
4.6.1.3 Inspector Requirements.... 34
4.6.1.4 Inspection Process/Requirements 34

DRAFT

4.6.1.5 Reporting 35
4.6.2 Routine Inspection 35
4.6.2.1 Description 35
4.6.2.2 Inspection Interval 37
4.6.2.3 Inspection Interval Assignment 38
4.6.2.4 Inspector Requirements 39
4.6.2.5 Inspection Process/Requirements 39
4.6.2.6 Reporting 41
4.6.3 Underwater Inspection 41
4.6.3.1 Description 41
4.6.3.2 Inspection Interval 42
4.6.3.3 Inspector Requirements 42
4.6.3.4 Inspection Process/Requirements 43
4.6.3.5 Reporting 45
4.6.4 NSTM Inspection 46
4.6.4.1 Description 46
4.6.4.2 Inspection Interval 48
4.6.4.3 Inspector Requirements 48
4.6.4.4 Inspection Process/Requirements 49
4.6.4.5 Reporting 49
4.6.5 Damage Inspection 52
4.6.5.1 Description 52
4.6.5.2 Inspection Interval 53
4.6.5.3 Inspector Requirements 53
4.6.5.4 Inspection Process/Requirements 53
4.6.5.5 Reporting 54
4.6.6 In-Depth Inspection 55
4.6.6.1 Description 55
4.6.6.2 Inspection Interval and Equipment 55
4.6.6.3 Inspector Requirements 55
4.6.6.4 Inspection Process/Requirements 55
4.6.6.5 Reporting 56
4.6.7 Special Inspection 57
4.6.7.1 Description 57
4.6.7.2 Inspection Interval 57
4.6.7.3 Inspector Requirements 58
4.6.7.4 Inspection Process/Requirements 58
4.6.7.5 Reporting 59
4.6.8 Service Inspection 59
4.6.8.1 Description 59
4.6.9 Scour Monitoring Inspection 60
4.6.9.1 Description 60
4.6.9.2 Inspection Interval 60

DRAFT

4.6.9.3 Inspector Requirements..... 60
4.6.9.4 Inspection Process/Requirements 60
4.6.9.5 Reporting..... 61
4.7 INVENTORY SUBMITTAL REQUIREMENTS.....61
4.8 QUALITY CONTROL 63
4.9 QUALITY ASSURANCE 65
4.10 REVISION HISTORY.....65
4.11 FORMS 66

DRAFT

4.1 GENERAL

The purpose of this chapter of the NDOT Bridge Inspection Program Manual is to set policy and provide guidance to Bridge Owners and their inspectors on inspection procedures and reporting.

County line bridges should be inspected and reported by the county that, by mutual agreement, has assumed responsibility for them.

4.2 REFERENCES

The information in this Bridge Inspection Program Manual supplements requirements, and procedures and information in documents by:

- The American Association of State Highway and Transportation Officials (AASHTO)
- The U.S. Department of Transportation, Federal Highway Administration (FHWA)
- The National Cooperative Highway Research Program (NCHRP)

Persons involved with the Nebraska Bridge Inspection Program and the bridge inventory must be knowledgeable of the requirements in National Bridge Inspection Standards, the *AASHTO Manual for Bridge Evaluation*, and FHWA publications, technical advisories and publications related to the NBIS.

4.3 BRIDGE INSPECTION RESPONSIBILITIES

4.3.1 Nebraska Department of Transportation

NDOT is responsible for:

- Providing access to BrM for Bridge Owners and their consultants for data entry
- Assigning inventory structure numbers
- Maintaining the Nebraska Bridge Inventory database
- Submitting Nebraska Bridge Inventory data to the FHWA for inclusion in the National Bridge Inventory database
- Maintaining the master lists of the following in the Nebraska Bridge Inventory:
    - Nonredundant Steel Tension Member (NSTM) bridges
    - Bridges requiring underwater inspection
    - Scour critical bridges
    - Complex bridges
    - Bridges with critical findings
- Developing and maintaining forms to be used in the Bridge Inspection Program for Inspection, Load Rating and other activities.

- Completing Quality Assurance (QA) on the data and reports provided for the Bridge Inventory by the Bridge Owners for compliance with Federal regulations.

4.3.2 Local Owners

NDOT has delegated specific tasks as the responsibility of the local Bridge Owners for the bridges under their authority. This is supported by agreements between NDOT and the local Bridge Owners and includes the following.

- Bridge Inspections – (NDOT, as of the date of this revision, completes the Underwater Inspections only)
- Bridge Load Ratings
- Bridge Hydraulic Assessments (Continuing the assessment of the hydraulic 300 series items during the routine SNBI inspections)
- Monitoring bridges according to their Scour Plans of Action
- Addressing critical findings and non-critical findings
- Maintaining bridge files and records at their headquarters
- Cooperating with NDOT in its implementation of the NBIS guidelines

Local Bridge Owners may delegate these responsibilities to other parties, including engineering consultants, but the Bridge Owners are ultimately responsible for ensuring that all the NBIS and Nebraska Bridge Inspection Program requirements are met.

4.3.3 Tribal Owners

Per the NBIS, each Tribal government, in consultation with the Bureau of Indian Affairs (BIA) or FHWA, must perform, or cause to be performed, the proper inspection and evaluation of all highway bridges that are fully or partially located within the respective Tribal government's responsibility or jurisdiction. They must include a bridge inspection organization responsible for the items listed in Chapter 1.7 and must have a program manager with the qualifications defined in 23 CFR §650.309 (a) and reiterated in Chapter 1.7.2.

4.3.4 Border Bridges

Per the NBIS, when a bridge crosses a border between the State Transportation Department, Local entities, Federal agency, or Tribal government jurisdiction, all entities must determine through a joint written agreement the responsibilities of each entity for that bridge, including the designated lead state for reporting SNBI data. The designated lead state will be responsible for submitting a full bridge record, while the neighboring state will submit an abbreviated bridge record. It is recommended that the written agreement includes not only inspection responsibilities, but all aspects that are involved with the bridge- such as maintenance and financing.

4.3.5 Engineering Consultants

NDOT and other Local Bridge Owners often use Engineering Consultants to assist with their NBIS responsibilities. Such responsibilities include:

- Educating the members of the firm in NBIS regulations and requirements.
- Providing the inspection Team Leaders with the training and experience required by NBIS and NDOT. This includes providing NDOT with current email addresses and phone numbers for staff on the NDOT Team Leader List.
- Completing bridge load ratings under the direct supervision of and the signing of the Load Rating Report by a Nebraska professional engineer in accordance with the Nebraska Engineers and Architects Regulation Act.
- Completing bridge scour assessments under the direct supervision of and the signing of the Hydraulic Analysis Report by a Nebraska professional engineer in accordance with the Nebraska Engineers and Architects Regulation Act.
- Completing Quality Control on inspections completed for Bridge Owners.
- Completing work for Bridge Owners in a timely manner to allow the Bridge Owners sufficient time for data review prior to submittal to NDOT.
- Ensuring inventory inspections follow the stipulations of the Programmatic Agreement between FHWA-NE Division and NDOT for Visual Statewide Bridge Inspections.

4.4 QUALIFICATIONS

The NBIS qualification requirements and NDOT qualification requirements are described in Chapter 1 of this Manual. Specific qualifications are required for certain types of inspections including fracture critical inspection, underwater inspection and scour assessment inspection. NDOT qualifications are more stringent than those of the NBIS for some items.

NDOT and the NBIS require that a Team Leader be present at the bridge site and actively involved at all times during any inspection. Team Leaders are critical participants in the Program and should be aware of the responsibilities of Owners, NDOT and, if applicable, their Consultant employers.

4.5 INSPECTION PROCEDURES

4.5.1 General

This section describes general procedures that apply to all types of inspections. Inspectors should also review the FHWA's Bridge Inspector's Reference Manual (BIRM), particularly Chapter 2 "Inspection Fundamentals." Unique tasks that apply to specific types of inspections, such as NSTM inspections, can be found in other sections of this Chapter. General planning and preparation include, but may not be limited to, the following:

- Reviewing the bridge file.
- Identifying the components and elements (if applicable).
- Developing an inspection sequence for each bridge.
- Preparing and organizing notes, forms, and sketches.
- Arranging for temporary traffic control.
- Arranging staging areas and access locations.
- Reviewing safety precautions.
- Organizing tools and equipment.
- Arranging for subcontracting special activities.
- Accounting for other special considerations.

4.5.2 Planning the Inspection

Planning is important to ensure a safe and thorough inspection is fully completed. Proper planning can save time in the field and office, as well as add cost benefits.

Basic planning may include:

- Determination of the type of inspection.
- Selection of the inspection team, which includes a qualified team leader on site for all Initial, Routine, In-Depth, NSTM, Underwater, and Special inspections (as outlined in 23 CFR § 650.313). Although not required by the NBIS, NDOT recommends a team leader for Damage, Scour Monitoring, and Service inspections. Though complex feature inspections are not considered a separate inspection type, a team leader must be on-site during all inspection activities, including mechanical and electrical.
- Evaluation of needs for access equipment; nondestructive evaluation; traffic control, including the use of flaggers; utilities; confined spaces; permits; railroad coordination; and hazardous materials such as pigeon droppings, lead paint and asbestos removal, etc.
- Creating a schedule that includes the inspection length.
- Creating an efficient way between inspection sites.

4.5.3 Preparing for the Inspection

4.5.3.1 Office Preparation

Before an inspection assignment, inspectors should review the FHWA BIRM Chapter 2.1.5 "Preparing for Inspection" for detailed information on recommended requirements. Below are tasks that can be done to prepare for an inspection in the office.

Review of the Bridge File
Inspectors should review the available sources of information about the bridge from the Bridge Owner's bridge file, such as:

- Plans, including construction plans, shop and working drawings, and as-built drawings
- Specifications
- Correspondence
- Photographs
- Materials and tests, including material certification, material test data, and load test data
- Maintenance and repair history
- Accident records
- Load rating records
- Load posting
- Permit loads
- Flood, scour, and channel cross-section data
- Traffic data
- Inspection history
- Inspection procedures

Identify Components and Elements

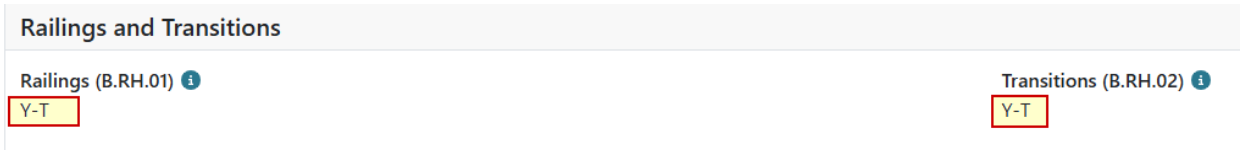
Bridges generally have four major components and can have many elements. The major components include deck, superstructure, substructure, and culvert, if applicable. The FHWA SNBI also includes joints, bearings, and roadside hardware (bridge railing and guardrail transitions) as separate components. Inspectors should refer to Chapter 3 for further guidance on components and their condition rating criteria.

Elements and associated defects should be reviewed prior to inspections for bridges that are on the NHS or State system. Inspectors should review Chapter 3 EI for further definitions and examples.

Refer to NE Item 217 Direction of Increasing Reference Post for guidance on structure orientation.

Review Temporary Codes

Some SNBI items have been populated from previous NBI items but require confirmation. These items are indicated with temporary codes with the form Code-T. An example for Railings and Transitions is shown below. Temporary codes must be reviewed and replaced with permanent codes by January 2028. The NDOT SNBI Data report shows a summary of all SNBI data items including temporary and missing items that need to be provided.



Develop an Inspection Sequence

Factors that should be considered when planning a sequence of inspection for a bridge include:

- Type of bridge
- Condition of the bridge components
- Overall condition
- Size and complexity of the bridge
- Accessibility
- Traffic conditions
- Weather conditions
- Water level

Notes, Forms, and Sketches

Preparing notes, forms, and sketches before the on-site inspection reduces work in the field. Copies of Nebraska's standard inspection forms can be found on the NDOT Bridge Division website. An electronic or hard copy of the previous notes, forms and sketches should be obtained from the Bridge Owner's files, BrM or the FTP for use in recordkeeping and as a checklist to ensure that all information is acquired during the inspection. Check that all electronic inspection data collection software and equipment are in working condition before the inspection. Any sketches should be created from previous inspection reports so that deficiencies previously documented can be updated.

If previous inspection sketches or design drawings are not available, then generic sketch template found on NDOT Bridge Division website may be used for repetitive features or members.

Permits

There are several instances where a permit will need to be obtained to gain access for a bridge inspection. When the bridge crosses a railroad, inspectors should obtain an access permit and coordinate with the railroad to obtain flagging personnel before proceeding with the field inspection. Permits are also necessary for inspections on bridges passing over navigable waterways. A Programmatic Agreement (PA) between FHWA and NDOT for visual bridge inspections is agreed upon annually for environmental permits and permits to work around endangered species. The current agreement may be requested from the NDOT Bridge Division. All questions related to visual bridge inspection and biological resources should be directed to NDOT Bridge Division.

Some Bridge Owners also require a permit or other advance notice to close traffic lanes. Coordination for any of these permits can take up to six months or more to procure; therefore, contact with the railroad and/or the Bridge Owner should be made well in advance of the scheduled inspection.

4.5.3.2 Field Preparation

Before an inspection assignment, inspectors should review the FHWA BIRM Chapters 2.4 "Inspection Equipment" and 2.5 "Methods of Access" for thorough coverage of

recommended requirements. Below are ways inspectors should prepare in the field for the inspection.

Tools
Inspectors should have the following basic tools at a minimum:

- Pocket tape
- Chipping hammer
- Scraper
- Calipers
- Straight edge
- 100-foot tape
- Camera
- Flashlight
- Wire brush
- Ice pick
- Level
- Mirror
- Paint Markers
- Lumber Crayons
- Pit Gage
- Tablet or Laptop (if necessary)
- Dropline with weight attached
- Rod for scour undermining

Special equipment, such as an unmanned aerial vehicle (UAV), a snooper truck or bucket truck, may be needed for some structures. Inspectors should consult the prior inspection report to determine the correct equipment needed for a given structure.

Safety Equipment
Safety equipment or Personal Protective Equipment (PPE) is designed to prevent injury. Agency or OSHA regulations should be followed for approved types and appropriate usage (OSHA 1926.954).

The following are some common pieces of PPE:

- Hard Hat
- Reflective Safety Apparel
- Protective Eyewear
- Gloves
- Proper Footwear
- Personal Floatation Device
- Dust Mask/ Respirator
- Health Monitors
- Safety Harness and Lanyard

DRAFT

Special Equipment and Access Methods

Special equipment and access methods are usually not necessary for a Routine inspection. However, inspectors should review the prior inspection report to determine the correct equipment needed for a given structure. Use access equipment and/or vehicles to inspect difficult areas of a bridge. See the table below for access requirements.

Special Equipment may include:

- Survey Equipment
- Nondestructive Evaluation Equipment
- Underwater Inspection Equipment
- Air-water jet equipment - used to clean surfaces of dirt and debris
- Sand or shot blasting equipment - used to clean steel surfaces to bare metal
- Burning, drilling, and grinding equipment

Special Access methods may include:

- Ladders
- Rigging
- Lift
- Scissor Lift
- Bucket Truck
- Under Bridge Inspection Vehicle
- Boats or Barges
- Bucket Boats
- Crawler
- Floats
- Bosun (or Boatswain) Chairs/Rappelling
- Rope Access
- UAVs
- Remotely Operated Vehicle
- Permanent Inspection Structures (Catwalk, Traveler, and Handrails)

DRAFT

Refer to Item B.IE.12 in Chapter 3 SNBI for more guidance on Inspection Equipment.

Access Requirements for Pin and Hangers
In general, pin and hangers coded in fair condition or worse will require arms-length inspection, as indicated by the table below. Also, direct line-of-sight observations of pin and hangers that may be approaching poor condition are required to determine if an arms-length inspection is necessary. UAVs may be used to determine if closer inspection is warranted. Record inspection results on form BR47.

Pin and Hangers

Pin and Hanger Condition (NE Item 312)	Equipment and Inspection Notes	Documentation
9, 8, 7	No special equipment required.	Inspection Notes
6 or 5	Tap assembly lightly with hammer for sounding.	Inspection Notes
4 or less	Tap assembly lightly with hammer for sounding. Measure and record locations of any section loss.	Inspection Notes. NDOT 321: Structure Repair Report (State Structures)

Weather
Adverse weather conditions may play a significant role in the inspection process. During inclement weather, inspectors should avoid climbing on the bridge structure, using equipment that may be struck by lightning, and performing other bridge inspection activities that may affect traffic. During seasons of poor weather, a less aggressive schedule than that of the mild weather months should be considered. Nebraska's mild weather months are generally April – October.

4.5.4 Safety

Before an inspection assignment, inspectors should review the FHWA BIRM Chapter 2.2 "Safety Fundamentals for Bridge Inspectors" for thorough coverage of recommended requirements. Inspectors should also review the MBE for safeguarding personnel conducting the inspections as well as the safety of the public.

Ultimately, bridge inspectors are responsible for their own safety and should always know their physical limitations and the correct safety policies. However, Team Leaders and Supervisors should contribute to maintaining and enforcing proper safety policies and procedures.

Inspections shall be conducted in groups of at least 2 people.

Different precautions should be taken for each unique safety situation in the field. Some of those may include:

- Mechanical Equipment
- Ladders
- Catwalks
- Confined Spaces
- Vegetation
- Wildlife
- Night Work
- Working Around Water
- Working Around Traffic

All equipment should be thoroughly inspected before use. For further safety guidance for inspections such as underwater, refer to Section 4.6

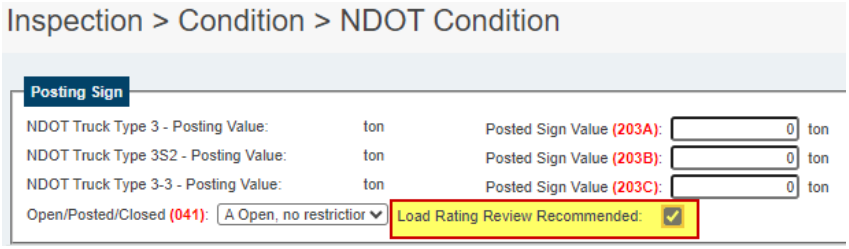
Load Rating Reviews

Accurate and current load ratings for in-service bridges are necessary to ensure bridges can carry legal loads or are appropriately posted if weight restrictions are required.

NDOT has an automated process to indicate the need for a load rating review of bridges based on inspector reported condition code changes that meet the criteria in Section 5.8 of the BIP manual. NDOT will notify the owner within 10 working days if changes to condition require an updated load rating review.

Should other circumstances, in the judgement of the inspector, warrant an assessment by a load rating engineer, inspectors should follow the steps below.

1. Select the Load Rating Review Recommended box in BrM > Inspection > Condition > NDOT Condition as shown in the screenshot below.



2. Provide a thorough note explaining why the Load Rating review is requested in the BrM > Inspection > Condition > NBI/Elem Condition > Inspection Notes.

INSPECTION TYPES.

4.5.5 Traffic Control Procedures

Bridge inspection traffic closures are relatively short-term. Bridge inspections, like construction and maintenance activities on bridges, often present motorists with unexpected and unusual situations. Nebraska follows the Manual for Uniform Traffic Control Devices (MUTCD). Inspectors should coordinate with the Bridge Owner for traffic control procedures.

Procedures that have been shown to enhance the safety of all traveling in areas that require traffic control include the following:

- Informing the Motorists
- Controlling the Motorists
- Providing a Clearly Marked Path
- Some special traffic control needs inspectors may want to consider when planning:
    - Flaggers
    - Truck Mounted Attenuators
    - Police Assistance
    - Specialized Traffic Crews

Inspectors should also review the FHWA BIRM Chapter 2.3 "Temporary Traffic Control" for further traffic control procedures.

4.5.6 Material Considerations

The Load Rating Engineer (LRE) requires detailed information (type, size and location) on the remaining section at certain locations on the bridge for various load effects (bending moment, shear, compression, and tension). The lists below are general in nature and not comprehensive. The inspection staff, while in the field, should contact the LRE if there are any questions to ensure key measurements are obtained in the field.

Steel
Corrosion and section loss can adversely affect the load capacity of a bridge, review 4.6.6 In-Depth Inspections.

For additional guidance on pin and hanger inspections, review form Pin and Hanger on the NDOT's Bridge Division's website.

Timber
Timber structures can, over time, exhibit deterioration and section loss. Often, they are damaged due to a vehicle load that exceeded the load capacity of the structure.

DRAFT

Concrete
Delamination normally indicates active corrosion of the reinforcing steel. A spall in the deck surface is the visible result of delamination at the level of reinforcing steel.

Additional tests- such as electrical potential or chloride content - are not part of routine inspections. The Bridge Owner will determine if additional testing is necessary for part of an inventory using a special or in-depth inspection.

Prestressed Concrete
Prestressed concrete has been used in Nebraska since the 1960s. Over time, design codes have evolved and been amended. Some older concrete girder bridges may have been designed under codes that included less stringent shear requirements. Prestressed concrete members deteriorate in a similar fashion to conventionally reinforced concrete members.

4.5.7 Bridges Over Waterways

Bridges over waterways are of particular concern for Owners. Scour can occur in stream crossings where debris or erodible soils are present. Scour is more likely if a structure's length and its waterway opening restricts the natural waterway of the stream resulting in high stream velocities during storm events. Some bridges have scour countermeasures that must be monitored.

4.5.7.1 Channel Behavior and Scour

Inspectors must be familiar with stream behavior, the stages of evolution, and the factors that contribute to scour. A summary of these is provided in Chapter 6 Bridge Scour.

4.5.7.2 Scour Critical Structures Plan of Action

A Plan of Action (POA) is a written document prepared by the Bridge Owner (or a Consultant) setting out specific instructions for management of a scour critical structure to protect public safety. Inspection preparation should include a review of the POA. Changes to the condition of the bridge and/or the bridge site that are noted by a bridge inspector during a routine inspection are to be documented on the POA Monitoring Log and may trigger a revision to the POA.

4.5.7.3 Inspection and Reporting for Bridges Over Waterways

Routine (NBI) inspections include inspection of the structure and the site. The Team Leader makes observations to monitor and document changes to the conditions related to stream behavior. Changes noted by a Team Leader on a routine inspection may trigger a hydraulic assessment or a revision to the POA.

DRAFT

Inspection preparation shall include a review of past inspection reports and the current POA (if the structure has one), the hydraulic analysis report and scour assessment, and countermeasure records.

The inspection will include the following:

- Identification of scour holes, soil voids and undermining of the substructures and/or approaches. Sounding and probing may be required, especially immediately upstream of the piers or bents. Document in the inspection report the depth, width and length of scour holes and undermining. Use sketches to clearly describe.
- Documentation of hydraulic observations with photos, preferably from the same location as from prior inspections. Photos need to be taken at every inspection for historical documentation. See Section 4.5.9.2 for photo locations.

The Team Leader records observations using the NE scour-related 300 Item series which cover evidence of scour and flood events as well as factors that can potentially contribute to scour during flood events. See Chapter 3 NE for the complete list of the NE scour-related 300 Item series and guidance on coding these items.

If B.C.09 (Channel Condition), B.C.10 (Channel Protection) B.C.11 (Scour Condition) or B.C.15 (Underwater Condition) change as shown in the table below.

Additionally, if any of the following is coded as "YES" by the inspector, the structure may need to be flagged for consideration for a scour assessment:

- Item 347 - Noticeable Contraction of Stream
- Item 348 - Noticeable Local Scour at Piers/Abutments

All bridges over waterways shall have at least two cross sections on record. A cross section is required for every Underwater Inspection. The following table applies for additional cross sections based on the channel condition, scour condition, and scour vulnerability. Note the inspector may complete cross sections more frequently, at their discretion.

Bridges with out-to-out width (B.G.05) less than 30 feet or length (B.G.02) greater than 300 feet, require cross sections on only the downstream side. All other bridges require cross sections on both the upstream and downstream sides.

DRAFT

Channel Condition (B.C.09) or Scour Condition (B.C.11)	Scour Vulnerability (B.AP.03)	Maximum Cross Section Interval	Commentary
6 to 9	0, A or B	NA	Bridge does not require UW Inspection. An initial cross-section is required. No additional cross sections are required unless B.C.09 or B.C.11 decrease, then a cross section is required during the inspection when the change is observed. If B.AP.03 worsens, a cross section is required at the next inspection.
5	0, A, B or E	48	
4	0, E or U	24	At each routine and special inspection.
Any	C, D or U	24	At each routine and special inspection as per the hydraulic POA

The Team Leader should file a Critical Findings Report if the condition of the bridge warrants a Substructure Condition Rating (Item B.C.03) of 2 or less.

Refer to NDOT Cross Section Guidance on the NDOT Bridge Division webpage for guidance on completing cross sections and inputting into BrM.

4.5.8 Complex Feature Bridges

The NBIS defines a Complex feature 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 movable spans and cable-related members of suspension and cable-stayed superstructures.

Complex bridges require a unique and specific inspection procedure for each bridge. The unique or unusual structural design feature(s) of a bridge shall be identified during the bridge design stage, and the designer should prepare a draft of inspection procedures and submit it to the Owner.

Complex feature bridges will be designated as such by the State Bridge Engineer or the Assistant Bridge Engineers in the initial design stage. Non-State Bridge Owners shall

contact the Bridge Inspection Program Manager if they have any bridges under their authority that are of unusual design for bridges in Nebraska.

Nebraska has three examples of complex feature bridges:

- S002 50816, Nebraska City, Concrete Continuous Segmental Box Girder
- S030 37847, Columbus, Columbus Viaduct, Steel Arch-Thru
- S068 00044, Ravenna, Ravenna Viaduct, Steel Arch-Thru

4.5.9 Report Preparation

4.5.9.1 Reporting

The field inspection of a bridge should be conducted in a systematic and organized way that will be efficient and minimize the possibility of any bridge item being overlooked. The field data documentation shall be completed as specified in AASHTO MBE and the FHWA BIRM.

An inspector may discover critical findings during an inspection. Reporting of critical findings is covered in Section 4.5.10 Critical Findings.

An inspector may discover non-critical findings that may warrant a load rating review, repair, or maintenance. For guidance on load rating review recommendations, see Section 4.5.13 Load Rating Reviews. Report repair or maintenance recommendations using NDOT forms 321 and 321a, in the inspection report and directly to the Bridge Owner.

Inspection reports should be clear and use sketches and photographs to document the findings. Inspector's notes should reflect the overall condition of the bridge, as well as each individual component and element.

It is good practice for inspectors to make typical notes even for bridge elements and components that are in overall good condition, so that the deterioration of the bridge can easily be updated and tracked.

At a minimum, inspection reports should include the following:

- All noteworthy findings such as:
  - Any bridge component in fair (5) condition or element in CS3 or worse with photos and notes clearly describing the location, severity, and extent of the defect or deterioration.
  - Any item in need of repair or maintenance with photos.
  - Any evidence of a change in channel, and/or scour condition.
- Report repairs to the structure that alter any previously recorded data.

4.5.9.2 Photographs

A minimum of 10 site photos are required at the initial inspection. See the illustration below of Standard Photo Locations for guidance on taking site photos and the captions associated with each. Regular updating of site photos can show slowly occurring changes at the site that may not be apparent otherwise, such as lateral stream migration.

Inspection photos document particular inspection findings. The quantity of inspection photos must be sufficient to accurately document the finding(s).

At each inspection, photos are required for:

- Bridge components in fair (5) or worse condition
- Elements with a CS3 or greater quantity
- Items requiring repair or maintenance
- Change in scour condition
- Posting signs, if in place
- Upstream & downstream taken from the roadway surface
- Any feature that requires close monitoring

Hydraulic photos shall be taken, preferably from the same location as those from the prior inspection or current POA inspection of the following:

- Recent high-water marks.
- Bridge deck relative to low road grade.
- Upstream and downstream stream cross-sections.
- Bridge side profile showing waterway area.
- Stream profiles.
- Wings.
- Abutment back walls.
- Piers or bents.
- Berms.
- Natural banks.
- Scour countermeasures (rip rap, slope protection, wing dikes, etc.).
- Scour related problems.
- Roadway embankment at the wings

Photographs should, in general, show the overall condition and have a measuring device of some sort depicting the measurement that was taken (ex. tape measure). In some cases, an up-close photo may be needed in addition to an overall photo to fully show the element and/or component deficiencies. Additionally, each photograph should have an associated caption in the area designated for this in BrM. Each caption should have the location, defect, and size.

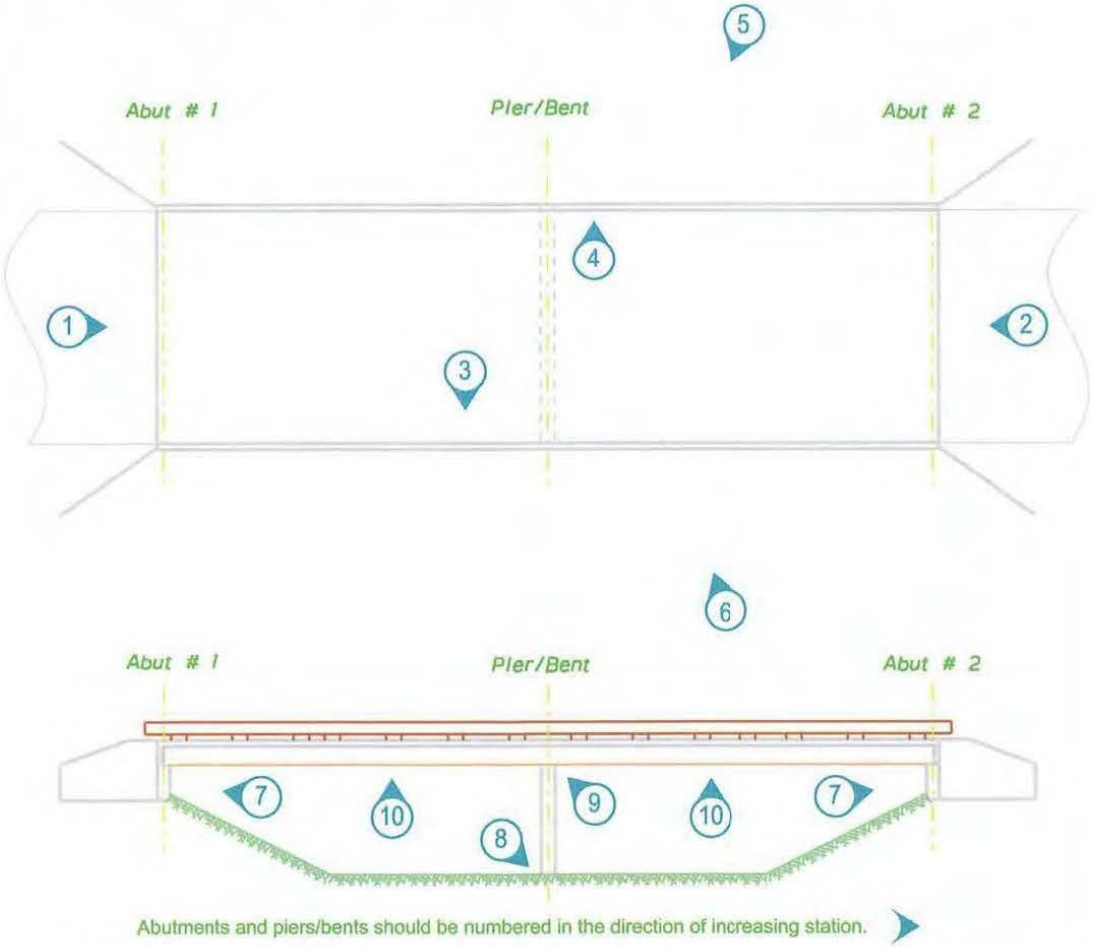
DRAFT

Photographs should have the date and time printed on them. NDOT recommends labeling with a filename that includes the structure ID followed by a sequence number or other unique identifier for that photo.

NDOT and Bridge Owners store photographs electronically. Large quantities of high-resolution photos consume much network storage space. Photos should preferably be approximately 1 MB in size and in JPG format. There are situations where a particular feature may require high resolution photography at the discretion of the Inspector.

DRAFT

Standard Bridge Photo Locations / Descriptions



Abutments and piers/bents should be numbered in the direction of increasing station.

(1) (2) Looking up and down station along the bridge deck, showing deck and roadway beyond. Photo should clearly show the entire deck from each direction. If not too far back, include posting limit sign, if posted.

(3) (4) Looking up stream and down stream from bridge.

(5) (6) Looking at the bridge from both sides. Photos should be taken from far enough away to see the entire bridge and at an angle as perpindicular to the bridge as possible.

(7) Looking at the abutments. Photos should show the entire abutment.

(8) Looking at the piers/bents. Photos should be taken of each pier/bent and should show the entire pier/bent.

(9) Looking at the pier/bent cap(s). Photos should show the entire cap and the girders.

(10) Looking at the underside of the bridge in each span. If possible, the photos should be taken to show the entire width of the bridge and all of the girders in a single photo for each span.

4.5.9.3 BrM Input

BrM is used for inspection reporting in the State of Nebraska. BrM access is available for certified inspectors, their representatives, and agency bridge managers. For guidance on inputting inspections in BrM, see Manual Appendix. To request a BrM account contact NDOT.

4.5.9.4 Repair and Maintenance

Non-critical findings include items of repair or maintenance. See Chapter 1.3.3 for definitions used for repair, maintenance, and reconstruction. The SNBI gives additional guidance on coding repair, maintenance, and reconstruction in Item B.W.03 (Work Performed). Nebraska Local Bridge Owners should use the Work Candidates page in BrM to document and track repair and maintenance items and use NDOT forms below:

4.5.9.4.1 Structure Maintenance Checklist Form DR 27

The Structure Maintenance Checklist includes a listing of typical maintenance work done on bridges. Examples of maintenance include washing the bridge, sweeping the deck, cleaning dirt off bearings, or cleaning debris from deck expansion devices.

The Checklist is prepared by the Owner's staff or a bridge inspector who notes the need for maintenance.

On the Checklist, the Owner records the date and details of the corrective action taken and files the Checklist in the Bridge File.

4.5.9.4.2 Structure Repair Report Form DR 321

The Structure Repair Report, DR 321, is used to document repair to a bridge that does not require closure and is NOT a critical finding.

A Structure Repair Report is prepared by the inspector or other party that may have discovered the damage or condition needing repair. The Report alerts the Bridge Owner so that repairs can be planned and completed in a timely manner and documented for future reference. Examples of damage that require reporting include vehicular impact to traffic safety devices, serious concrete deck spalling, shoulder erosion, and damage to substructure from debris.

The Structure Repair Report includes individual sections for specific actions.

The originator of the report, typically an inspector, records the structure information and the description and the cause of the damage.

DRAFT

The originator sends the Report to the Bridge Owner.

The Bridge Owner assesses the reported conditions and makes an initial determination whether the corrective action will need the involvement of a Bridge Engineer and plans to complete the repairs, or if the repairs can be made by Owner's maintenance personnel. (See Chapter 1 for guidance on situations that require the involvement of a PE.)

The Owner records on the Structure Repair Report the date and details of the corrective action taken and files the Report in the Bridge File.

4.5.9.4.3 BrM Work Candidates

As mentioned, inspectors should record recommended work in the BrM Work Candidates page. For state structures, a designated oversight committee at NDOT will review Work Candidates after they are created. Local owners may likewise assign a person or persons to an oversight committee to review inspector recommended work. Below is the recommended workflow developed to document the process pertaining to the initial findings, progress update and closeout action:

Inspector Initiates Work

The inspector initiates the work from the inspection and records the following:

- A brief title of the work in the Name field.
- Action Type
- Recommended Action.
- Structure Unit where the defect was located.
- Priority should be set to Low, Medium, or High, at the inspector's discretion.
- Date Recommended.
- The Inspector should select their own name in the Contact/User field.
- Number of Locations.
- Date Reviewed should be left blank, it will be filled by the designated contact at NDOT for state structures and the designated person for locally owned structures.
- Target Year should be left as-is – it will auto populate with the current year.
- Assigned should initially be set to "No".
- Work Assignment should initially be set to "Agency".
- Status should be set to "Unknown" initially.
- Source should be set to "Inspector Recommended".
- Description of the corrective action. Notes will be prefixed with an "I".

Work Under Review and Assignment (Progress)

The work candidate will be reviewed by the appropriate oversight committee for action and, if approved, will be assigned as either a District Maintenance action or a Project Development action, which will require an update to its status in the workflow process. It should be noted that if a proposed project already exists that will address the assigned corrective action, the corresponding project identification will be required to be placed in both the Name and Description fields.

In addition, the work candidate's Date Reviewed and Status shall be updated accordingly, along with Action, Target Year, Assigned, Work Assignment, and Estimated Quantity and Cost, if applicable. Any information added to the Description field will be prefaced with a "P".

Work candidates that were reviewed and Not Approved or were Withdrawn will be marked as such in the Status field along with updating the Date Completed field with the date that the action was withdrawn/not approved and making sure Work Assigned is set to "No".

Project Completed

When a project has been completed and the improvement has been confirmed by inspection, the Bridge Owner or their representative shall update the Status, Date Completed, and Final Cost of the project and insert any additional relevant comments into the Description field. All comments added at this step will be prefaced with a "C".

DRAFT

4.5.10 Critical Findings

4.5.10.1 Critical Findings Definition

The purpose of the Critical Finding Report is to ensure that bridges with debilitating damage or defects are repaired in a proper and timely manner and that the damage and repairs are well documented for future reference. The NBIS requires that certain critical findings on the National Highway System (NHS) be reported within 24 hours of discovery to the FHWA. NDOT requires the use of DR 320 Critical Findings Report for reporting the Critical Finding, for Owners to determine their action plan and document its completion, and for notification to NDOT that the Critical Finding is closed. BrM has been updated to accept critical findings, and Owners are encouraged to utilize this tool to record and track their Critical Findings.

The NBIS defines a critical finding as "a structural or safety related deficiency that requires immediate action to ensure public safety."

Parties performing bridge inspections should use their training and sound judgment to assess a structure for conditions that are unsafe for the traveling public. Critical findings may be

due to scour, damage, corrosion, section loss, settlement, cracking, deflection, distortion, delamination, or loss of bearing.

Conditions that constitute a critical finding include, but are not limited to the following (as defined by NDOT):

Condition of Critical Finding	Typically found by
A partial or complete collapse of the bridge	Inspection
Structural or other defects that pose a definite and immediate public safety hazard	Inspection, POA inspection
A load rating of less than 3 Tons	Load Rating
Missing load restriction signs	Inspection
Load posting greater than those shown on the most current LRSS	Inspection
Bridge not completely closed but closure is required	Inspection
Bridge closed due to a hydraulic issue	Inspection
A condition rating of 2 or less for any of the following Items: Deck, Item B.C.01 Superstructure, Item B.C.02 Substructure, Item B.C.03 Culvert, Item B.C.04 Channel, Item B.C.09 Scour, Item B.C.10	Inspection

4.5.10.2 Responsibilities for Critical Findings Reporting

Critical Finding discovery, immediate actions taken, actual work performed, and follow-up must be recorded. The process is described below and shown in the flowchart on page 35.

4.5.10.2.1 Discovering Party

The party discovering the Critical Finding should immediately notify the Owner. Critical Findings may be discovered by inspection Team Leaders, Bridge Owner's staff, Load Rating Engineers or Hydraulic Engineers. The discovering party should complete the appropriate sections of the Critical Finding Report (CFR) and take the required measures given on the CFR. These actions include required notifications to the Bridge Owner, NDOT Program Manager and others. The CFR must be completed and submitted to the Bridge Owner within 48 hours of the discovery of the finding.

4.5.10.2.2 Bridge Owners

Bridge Owners have the ultimate responsibility for management of their structures for public safety. Owners must:

- Report to NDOT any Critical Findings. The Bridge Owner may have a consultant complete portions of the Critical Findings Report. However, it is the responsibility of the Bridge Owner to report to the Program Manager.

- Report periodically to NDOT the current status of the resolution of the critical finding (e.g. status of repair plans, expected date of completion, status of decision to remove). For structures with an open Critical Finding Report that are awaiting funding to replace or repair bridge, Owners should send NDOT CFR updates every 6 months and notify the Program Manager when the action to address the find is completed.

4.5.10.2.3 Nebraska Department of Transportation

NDOT's Bridge Inspection Program Manager must report to FHWA periodically, or as requested by FHWA, all Critical Findings and the corrective action for the finding.

4.5.10.2.4 Consultants

It is the responsibility of the Consultants performing services for Bridge Owners to be familiar with NDOT and FHWA policies, and to follow procedures related to notifications and preparation of the report as described herein.

4.5.10.3 Critical Findings Procedures

4.5.10.3.1 Critical Findings Requiring Closures

Any finding, whether structural or safety related, that requires a full or partial closure of bridge is considered a critical finding. If the Owner wishes to open the bridge, then a bridge engineer will review the structure (typically, an inspector is not a bridge engineer). After the review, the bridge can be opened if the structural review and analysis allows, or the engineer's opinion is that the bridge can be opened.

4.5.10.3.2 NSTM

The NBIS states that any NSTM that is rated in serious (3) or worse condition requires a critical finding to be issued.

A critical finding for a NSTM may be issued if a steel member has areas of deterioration that have failed in buckling, crippling, etc., or deterioration that would cause failure likely, or in the near future.

4.5.10.3.3 Bridge Component Condition Critical Findings

When certain components of the bridge are lowered to a condition rating of two (2), NBIS and NDOT require that a critical finding is issued. Those include:

- Deck, Item B.C.01
- Superstructure, Item B.C.02

- Substructure, Item B.C.03
- Culvert, Item B.C.04
- NE Item No. 320 Piling

NDOT also **requires** that the structure be closed, pending a review of the structure by a bridge engineer.

4.5.10.3.4 Channel & Scour Condition Rating Critical Findings

When the Channel Condition (Item B.C.09) and/or Scour Condition (Item B.C.11) ratings are a 2 the NBIS requires that a critical finding is issued.

4.5.10.3.5 Immediate Load Restriction, Posting, Repair Work, or Shoring

Temporary action may be taken at the time the critical finding is discovered to safeguard the public until proper repairs can be completed. In some cases, these actions may be permanent.

These actions may include:

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

4.5.10.4 Critical Finding Corrective Action Procedures

Per the NBIS, State transportation departments, Federal agencies, and Tribal governments must inform the FHWA within 24 hours of discovery of all critical findings and actions taken, underway, or planned for bridges on the National Highway System (NHS).

NDOT will provide monthly, or as requested, written status reports for each critical finding.

The report will contain:

- Owner
- NBI Structure Number
- Date of finding
- Description and photos (if available) of critical finding
- Description of completed, temporary and/or planned corrective actions to address critical finding
- Status of corrective actions: Active/Completed

DRAFT

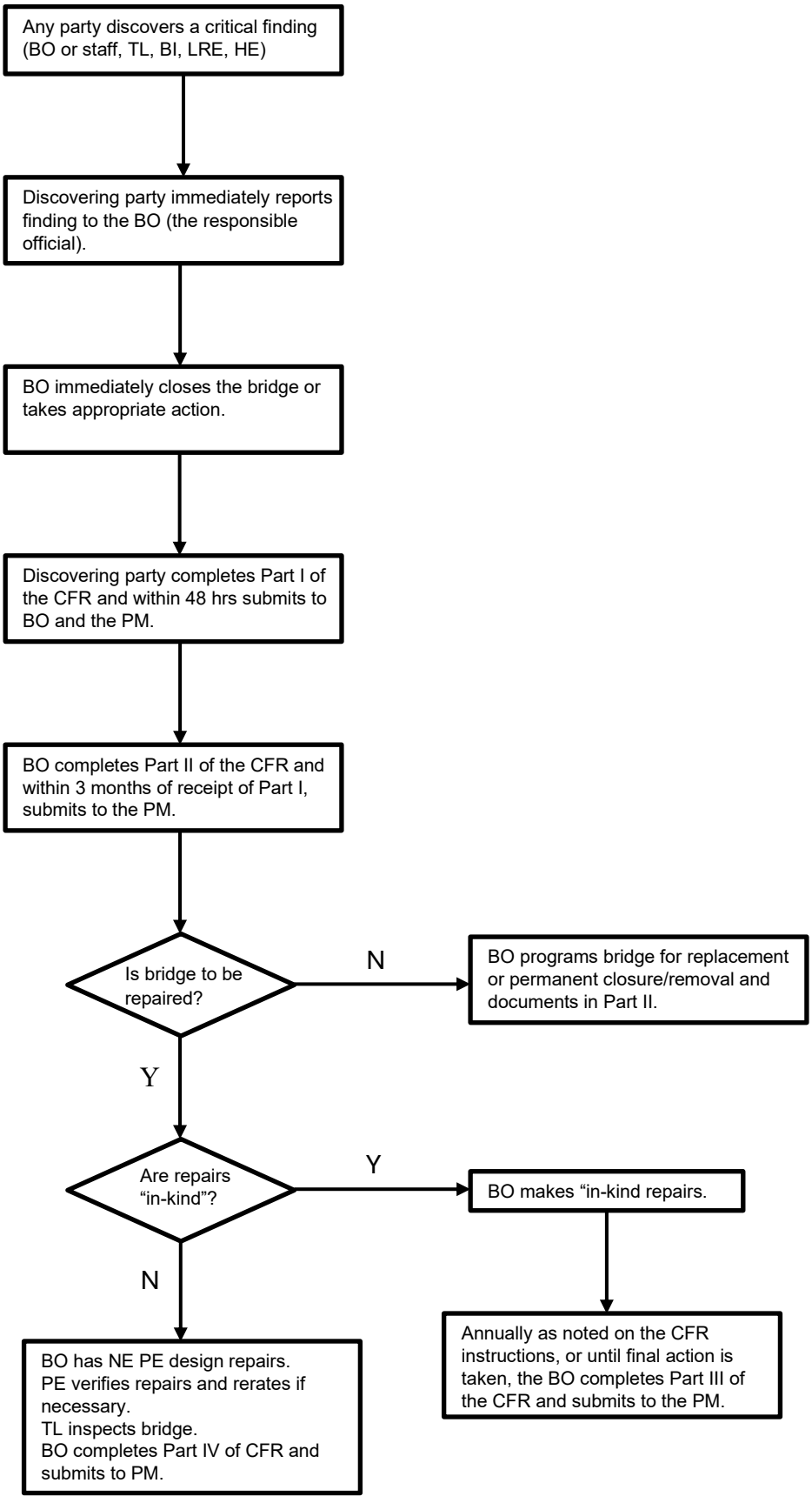
- Estimated date of completion if corrective actions are active
- Date of completion if corrective actions are completed.

Critical Finding Report Form DR 320 and the instructions for completing it, DR 320i, are available from the State Bridge Office or may be downloaded from the NDOT web site. This form and instruction are revised periodically. DR Form 320 includes individual parts for unique action from the discovering party and the Bridge Owner along with timeframes for completion of each part.

- Part I documents the Critical Finding and data pertinent to the finding. It is to be completed by the individual who discovers the critical finding, usually a Team Leader or a Load Rating Engineer, but may be another party who represents the Bridge Owner, such as maintenance staff. This part is to be completed within 48 hours of the finding.
- Part II documents the anticipated plan to address the finding and data pertinent to this plan. It is to be completed by a responsible official for the Bridge Owner. This part is to be completed within 3 months of the finding.
- Part III documents the action taken to address the finding and data pertinent to the final action. It is to be completed by a responsible official for the Bridge Owner. This part is to be completed within 12 months of the finding.
- Part IV documents data related to structural repairs made to correct the finding. To be completed by the bridge owner or their agent at the time of initial inspection.

Critical Finding discovery, immediate actions taken, actual work performed, and follow-up must be recorded. The process is shown in the following flowchart.

DRAFT


Any party discovers a critical finding (BO or staff, TL, BI, LRE, HE)
Discovering party immediately reports finding to the BO (the responsible official).
BO immediately closes the bridge or takes appropriate action.
Discovering party completes Part I of the CFR and within 48 hrs submits to BO and the PM.
BO completes Part II of the CFR and within 3 months of receipt of Part I, submits to the PM.
Is bridge to be repaired?
N
BO programs bridge for replacement or permanent closure/removal and documents in Part II.
Y
Are repairs "in-kind"?
Y
BO makes "in-kind repairs.
N
Annually as noted on the CFR instructions, or until final action is taken, the BO completes Part III of the CFR and submits to the PM.
BO has NE PE design repairs.
PE verifies repairs and rerates if necessary.
TL inspects bridge.
BO completes Part IV of CFR and submits to PM.

4.5.11 FHWA Compliance Review

As stated in the NBIP Compliance Review Manual "The FHWA Compliance Review provides an annual assessment of State's compliance with the NBIS regulations. This is accomplished using a series of metrics that directly measure adherence to the requirements of the NBIS. This annual process allows FHWA to assess each State's bridge inspection program degree of compliance with the NBIS, and to implement any corrective actions for metrics which are not in full compliance in a nationally consistent manner. The NBIP reviews are completed on a 5-year cycle. During years 1, 2, 3, 4, and 5, the Divisions perform the annual reviews and reassess metric risks each year based on knowledge gained from each review."

Ultimately, it is the NDOT's responsibility to oversee all Bridge Owners and their compliance with the FHWA metrics. Team leaders should be aware of the minimum expectations set by the FHWA to assist NDOT and Bridge Owners to maintain standards.

4.5.12 Posting/Closures

Proper installation of bridge restrictions is a matter of public safety and a major concern of FHWA and NDOT. NDOT requires inspection Team Leaders to check the installations in the field against the most current Load Rating Summary Sheet (LRSS). Photos should be taken of the signs and closure barricades. A sign should be in place on both ends of the bridge, and at locations on either side of a posted bridge that allows traffic to turn and use alternate routes. Posting values shall not exceed the values from the LRSS.

Owners often can address a posting or closure issue the same day it is discovered. In this case, the discovering party should verify the Owner has completed the required actions on the day of discovery and document this for their own and the Owner's records and documented with updates to SNBI Items for Posting Status and Posting Status Change Date (B.PS.01-02). If the required action is not complete, the discovering party should file a Critical Findings Report and deliver it to the Owner.

In cases where it is possible that the bridge might be used safely at a lower posted load limit, a load rating must be completed. Prior to the completion of the revised load rating, the inspector should close the bridge in this case. Load posting without a revised load rating for the critical finding is not an option. The results of the load rating determine whether the bridge may be opened again.

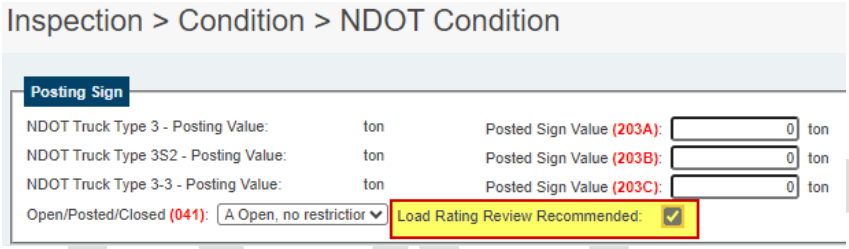
4.5.13 Load Rating Reviews

Accurate and current load ratings for in-service bridges are necessary to ensure bridges can carry legal loads or are appropriately posted if weight restrictions are required.

NDOT has an automated process to indicate the need for a load rating review of bridges based on inspector reported condition code changes that meet the criteria in Section 5.8 of the BIP manual. NDOT will notify the owner within 10 working days if changes to condition require an updated load rating review.

Should other circumstances, in the judgement of the inspector, warrant an assessment by a load rating engineer, inspectors should follow the steps below.

3. Select the Load Rating Review Recommended box in BrM > Inspection > Condition > NDOT Condition as shown in the screenshot below.



4. Provide a thorough note explaining why the Load Rating review is requested in the BrM > Inspection > Condition > NBI/Elem Condition > Inspection Notes.

4.6 INSPECTION TYPES

The NBIS definition of types of inspections and NDOT commentary on the definitions are included herein to ensure all parties involved in the Nebraska Bridge Inspection Program are clear on the extent and nature of inspection types. NDOT expectations for inspection procedures are described herein. A table comparing the types of inspections is shown below.

Type (listed in SNBI)	Purpose	BrM Input	Timing	Inspection By
Initial	1) Provide/verify all data for the SI&A 2) Determine baseline structural conditions 3) Identifies members needing NSTM or Underwater Inspection 4) Establishes intervals for other inspection types 5) Provide structure notes	Initial Inspection	Within 3 months of a new, replaced, rehabilitated, or temporary bridge opening to traffic	Team Leader
Routine	1) Determine the physical and functional condition of the bridge 2) Identify any changes from “Initial” or	Routine Inspection	Scheduled	Team Leader

	previously recorded conditions 3) Ensure that the structure continues to satisfy present service requirements			
Underwater	Monitor structure features obscured by normal water elevations	Underwater Inspection	Scheduled	Team Leader who is a certified commercial diver
NSTM	Inspection of NSTM members with appropriate methods, testing and tools. Always "hands-on" – a very detailed, within arm's length visual inspection	NSTM Inspections. Scheduled Special Inspections of NSTM bridges shall be recorded as Special Inspections. Initial Inspections of NSTM bridges shall be recorded as Initial Inspections.	Scheduled	Team Leader
Damage*	Assess structural damage from environmental or human factors; possible emergency load restriction, lane closure, or bridge closure	Damage Inspections	Event-driven	Team Leader
In-Depth	A close-up, detailed inspection of one or more bridge members located above or below water, using visual or nondestructive evaluation techniques to identify any deficiencies not detectable using routine inspection procedures. "Hands-on" inspection may be necessary at some locations	In-Depth Inspections	Schedule or Event-driven	Team Leader
Special	An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency, or to monitor special details or unusual characteristics of a bridge that does not necessarily have defects	Special Inspections. Special – Scheduled: Used between the Routine Inspections due to a condition-driven circumstance.	Scheduled	Team Leader

DRAFT

		Special – Other: Use when no other category applies. Include a note in BrM detailing why the inspection was done.		
Service	An inspection to identify major deficiencies and safety issues	Service Inspection	Between routine inspections on extended intervals	Competent personnel with general knowledge of bridges or Team Leader
Scour Monitoring	An inspection performed as required by a Scour Plan of Action (POA)	Scour Monitoring Inspection	Event-driven	a certified commercial diver

*Damage Inspection Notes:
Initial assessment may be done by person authorized by the BO.
If the structure is to be left in service, TL must inspect and record condition ratings changes, if any, as a Special Inspection.
If critical finding issued, TL will inspect after CF is addressed and record changes, if any, as a Special Inspection.

DRAFT

4.6.1 Initial Inspection

4.6.1.1 Description

"The first inspection of a new, replaced, or rehabilitated bridge. This inspection serves to record required bridge inventory data, establish baseline conditions, and establish the intervals for other inspection types." (23 CFR § 650.305)

Initial inspections are typically accompanied by both a load rating and an initial bridge scour evaluation as necessary. Other inspection types such as Underwater and NSTM, if necessary, are typically completed concurrently to thoroughly establish a baseline, but can be completed soon after if the need is identified during the Initial inspection. (BIRM)

Bridges that have been reconstructed, (changed in configuration e.g. widening, lengthening, supplemental bents) or bridges that were repaired and reopened to public traffic must have an initial inspection prior to opening to traffic to verify or provide all data for the SI&A. This is the baseline for the structure's new condition.

4.6.1.2 Inspection Interval

Initial inspections should be performed in accordance with Section 4.2, AASHTO Manual (incorporated by reference, see 23 CFR § 650.317) for each new, replaced, rehabilitated, and temporary bridge as soon as practical, but within 3 months of the bridge opening to traffic.

4.6.1.3 At the time of the Initial Inspection, the next inspection date should be established to coincide with the preferred Routine Inspection schedule of no more than 24 months in the future. Inspector Requirements

Initial inspections must be completed by at least one team leader at the bridge who meets the minimum qualifications stated in 23 CFR § 650.309 and actively participates in the inspection at all times.

4.6.1.4 Inspection Process/Requirements

4.6.1.4.1 General

An initial inspection should follow the same basic procedures as those used for a routine inspection (See Section 4.6.2.5 Inspection Process/Requirements). The need for an Underwater and/or NSTM inspection should be determined or verified during or before the initial inspection.

NDOT requires that new bridges, replaced bridges, existing bridges that have been significantly altered by widening/lengthening, temporary bridges, bridges rehabilitated after a Critical Finding, or bridges with a change in ownership receive an initial inspection prior to opening to traffic to verify or provide all data for the SI&A. Coordinates of the location should be sent to NDOT along with a request for a new structure number.

If design or as-built plans are available, the inspector should compare the dimensions of the bridge with those presented on the plans.

4.6.1.4.2 Bridges Over Waterways

An assessment of Scour Vulnerability (B.AP.03), Scour Condition Rating (B.C.11), and a need for an Underwater Inspection should be performed for bridges over water. If a need for an Underwater Inspection is verified, it should be completed within 12 months of a new or rehabilitated structure being open to traffic.

Bridges over water require hydraulic cross sections. For guidance, see Section 4.5.7.3.

4.6.1.5 Reporting

4.6.1.5.1 General Requirements

An initial inspection report should include documentation of the full inspection of primary members of the bridge. This inspection is essentially the first routine inspection and sets the baseline for future inspections. For bridges on the State System and the National Highway System (NHS), elements are identified and quantified. For all bridges, notes should be made for each component within the inspection notes.

4.6.1.5.2 Photographs

Initial inspections should include all 10 initial site photos required by NDOT discussed in Section 4.5.9.2 Photographs. Inspection photos are also required when a bridge component (Items B.C.01 through B.C.11) falls to a condition of 5 (fair) or lower. For bridges on the State System and the NHS, a photo is required for each bridge element that has a CS3 or greater quantity. Every initial inspection should also have photos of any items requiring repair or maintenance, and any feature that requires close monitoring.

4.6.2 Routine Inspection

4.6.2.1 Description

"Regularly scheduled comprehensive inspection consisting of observations and measurements needed to determine the physical and functional condition of the bridge and identify changes from previously recorded conditions." (23 CFR § 650.305)

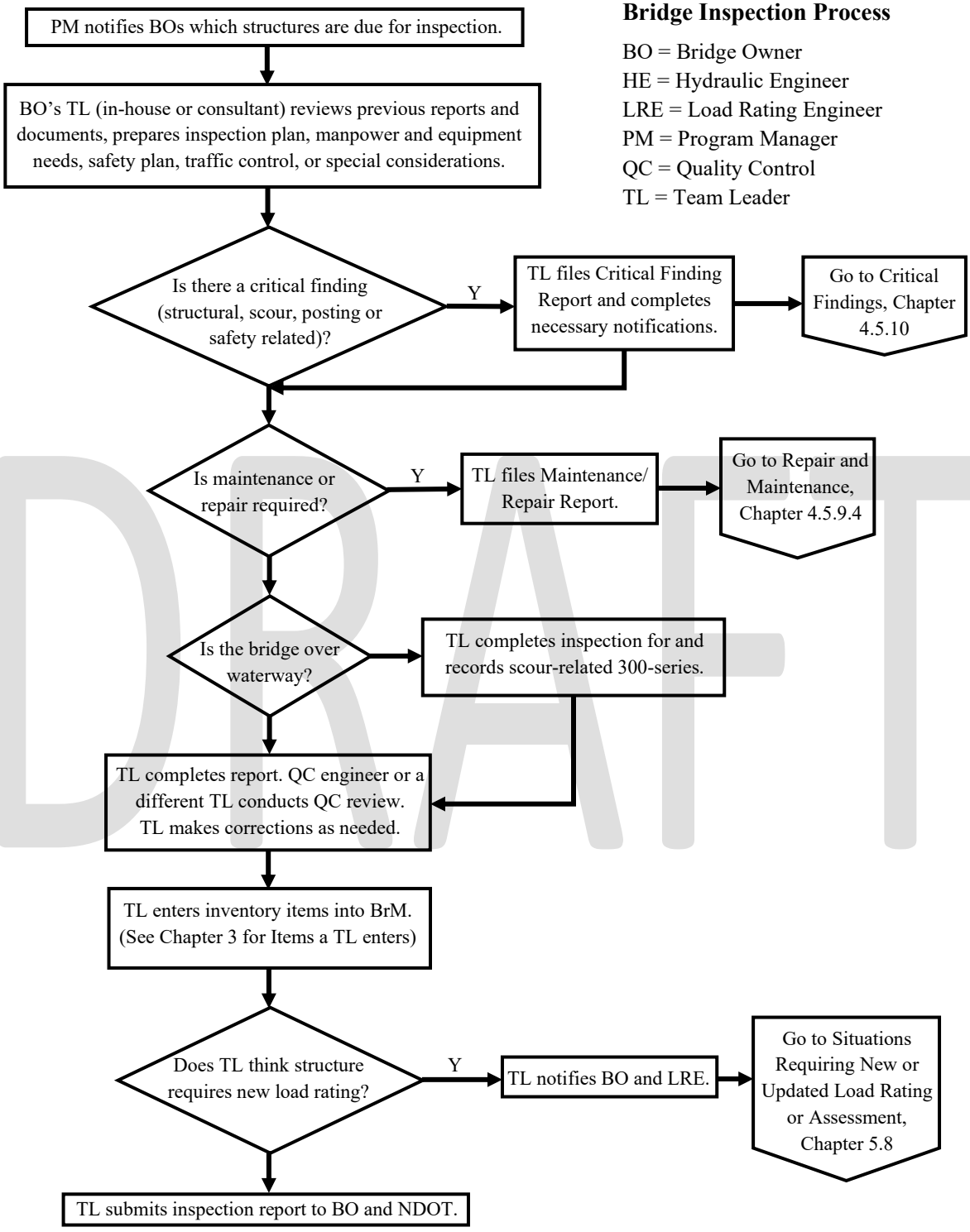
A "drive-by" or "walk-through" inspection is common vernacular for a review of the structure for general condition or to spot check a major issue or concern. This does NOT constitute a routine inspection of a bridge, nor does this provide the level of detail required for compliance with NBIS and NDOT Bridge Inspection Program requirements.

The following flowchart provides a general process for routine inspections of structures.

DRAFT

Bridge Inspection Process

BO = Bridge Owner
HE = Hydraulic Engineer
LRE = Load Rating Engineer
PM = Program Manager
QC = Quality Control
TL = Team Leader



DRAFT

4.6.2.2 Inspection Interval

The following criteria provide risk-based inspection interval guidance from 23 CFR Part § 650.311 and Method 1 therein.

(a) Routine Inspections

(1.) Method 1 per 23 CFR Part § 650.311(a)(1) is utilized.

(i.) Each bridge must be inspected at regular intervals not to exceed 24 months, except as noted below.

(ii.) A reduced inspection interval, not to exceed 12 months is required when the following conditions are met:

- One or more of the following has a condition rating of 3 or less:
  - Item B.C.01 Deck
  - Item B.C.02 Superstructure
  - Item B.C.03 Substructure
  - Item B.C.04 Culvert
  - Item B.C.11 Scour Condition Rating

- One or more of the following has a condition rating of 4 or less and the structure is restricted for legal loads (posted):
  - Item B.C.01 Deck
  - Item B.C.02 Superstructure
  - Item B.C.03 Substructure
  - Item B.C.04 Culvert

- Where these condition ratings are due to localized deficiencies, a special inspection limited to those deficiencies can be used to meet this requirement in lieu of a routine inspection.

(iii.) Bridges meeting all of the following criteria may be inspected at intervals not to exceed 48 months. These criteria apply to both main spans and approach spans, if present.

- The condition ratings are coded 6 or greater for the following:
  - Item B.C.01 Deck
  - Item B.C.02 Superstructure

DRAFT

  - Item B.C.03 Substructure
  - Item B.C.04 Culvert
  - Item B.C.09 Channel Condition
  - Item B.C.10 Channel Protection Condition

- Item B.LR.05 Inventory Load Rating Factor ≥ 1.0
- Item B.LR.08 Routine Permit Loads is A or N
- Item B.IR.02 Fatigue Details is coded N
- Item B.H.13 Highway Minimum Vertical Clearance is greater than or equal to 14.0'.
- Item B.SP.04 Span Material is coded one of the following:
  - C01-C05
  - S01-S05
- Item B.SP.06 Span Type is one of the following:
  - A01
  - B02-B03
  - F01-F02
  - G01-G08
  - S01-S02
  - P01-P02
- Item B.AP.03 Scour Vulnerability is coded A or B
- Item B.C.11 Scour Condition Rating is coded 6 or greater.

4.6.2.3 Inspection Interval Assignment

NDOT will conduct reviews of NBIS data and notify bridge owners of the required maximum inspection interval on a quarterly basis or more frequently if the matter is urgent. Bridges that no longer meet extended interval requirements will be transitioned to routine intervals by NDOT on a quarterly basis and as described below.

Bridge inspection intervals will be provided both on the upcoming bridge inspection reports and on the NDOT website in the Upcoming Bridge Inspection Map.

NDOT will conduct reviews of SNBI data and notify bridge owners of the required maximum inspection interval on a quarterly basis.

DRAFT

4.6.2.4 Inspector Requirements

Routine Inspections must be completed by at least one team leader at the bridge who meets the minimum qualifications stated in 23 CFR § 650.309 and actively participates in the inspection at all times.

4.6.2.5 Inspection Process/Requirements

4.6.2.5.1 General

Routine Inspections should be performed in accordance with the NBIS. These inspections are generally done from the deck, ground level and/or water level, and from permanent work platforms and walkways present. Special access may be used for routine inspections when it provides the only practical means of access. Routine inspectors should determine all condition ratings and bridge element quantities following the FHWA and AASHTO guides and manuals.

During Routine Inspections, all height and weight postings at the bridge should be confirmed to match the values in the previous report.

4.6.2.5.2 Bridges Over Waterways

Inspectors must be familiar with stream behavior, the stages of evolution, and the factors that contribute to scour. A summary of these is provided in Chapter 6 Bridge Scour.

Routine Inspections include inspection of the structure and the site. The Team Leader makes observations to monitor and document changes to the conditions related to stream behavior. Changes to B.C.09 Channel Condition Rating or B.C.11 Scour Condition Rating noted by a Team Leader on a routine inspection may warrant a hydraulic assessment or a revision to an existing POA. A Plan of Action (POA) is a written document prepared by the Bridge Owner (or their Consultant) setting out specific instructions for management of a scour critical structure to protect public safety.

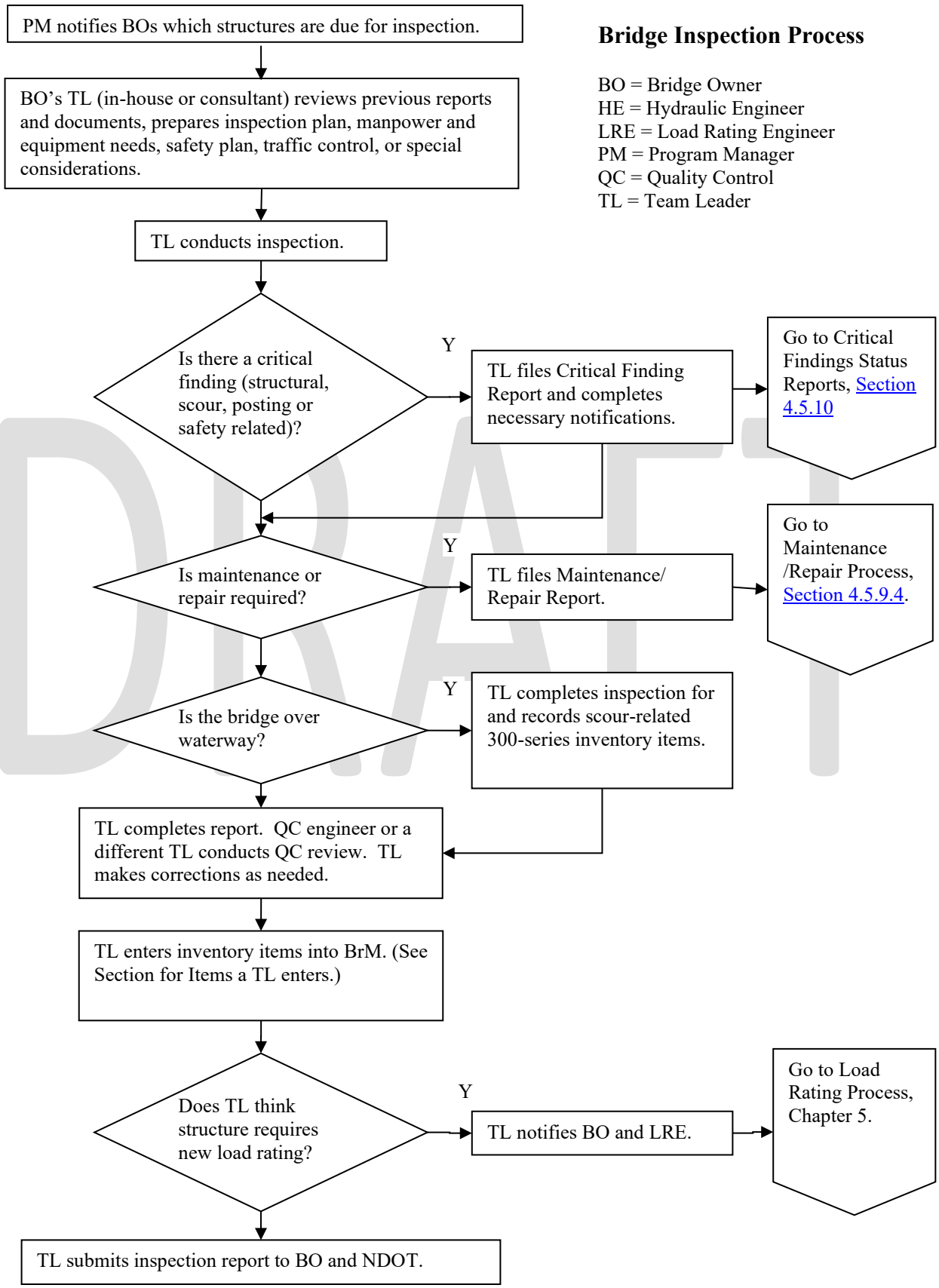
The inspection of a bridge over a waterway will include the following:

- Identification of scour holes, soil voids and undermining of the substructures and/or approaches. Sounding and probing may be required, especially immediately upstream of the piers or bents. Document in the inspection notes the depth, width and length of scour holes and undermining. Use sketches or photographs to clearly identify the type, size, and location of scour effects.
- Complete hydraulic cross section as indicated in the inspection schedule.

DRAFT

Bridge Inspection Process

BO = Bridge Owner
HE = Hydraulic Engineer
LRE = Load Rating Engineer
PM = Program Manager
QC = Quality Control
TL = Team Leader



DRAFT

4.6.2.6 Reporting

4.6.2.6.1 General Requirements

All routine inspection reports will be submitted in BrM within 30 days of the inspection. Inspectors for bridges on the State System and the National Highway System (NHS) input quantities of each element in the condition state noted during inspection. Element Inspection comments are required for any element rated in Condition State CS3 or CS4. These comments shall be recorded as element level comments on the elements grid of the BrM. Each defect note should have the location, defect, and size. Additionally, all non-static items should be thoroughly checked and changed in BrM as needed during every inspection.

4.6.2.6.2 Photographs

All photos for routine inspections are to be submitted and uploaded in BrM. Confirm the 10 inventory site photos mentioned previously in Section 4.5.9.2 Photographs are contained in the bridge file. The quantity of inspection photos must be sufficient to accurately document the finding(s). Refer to Section 4.5.9.2 for guidance on photos required at each inspection.

4.6.3 Underwater Inspection

4.6.3.1 Description

"Inspection of the underwater portion of a bridge substructure and the surrounding channel, which cannot be inspected visually at low water or by wading or probing and generally requiring diving or other appropriate techniques." (23 CFR § 650.305)

An Underwater (UW) Inspection is typically required for structures with substructure units that are submerged in greater than 4 feet of water. Bridge substructures that are in less than 4 feet of water may still require an UW Inspection if the surrounding channel depths render the substructure otherwise inaccessible.

The UW Inspection should determine the integrity and soundness of the substructure elements and assess surrounding channel for scour. The inspection of foundation elements and determination of its ongoing resistance to scour is the objective of an Underwater Inspection.

In Nebraska, NDOT manages and conducts all UW Inspections. The Bridge Owner must have the report in the bridge record.

Some bridges cross irrigation canals but often are dry and allow inspection without diving.

Power canal bridges that are drained during maintenance periods should be inspected by the Bridge Owners using NDOT approved Team Leaders without a need for diving. These types of waterways typically have controlled and nearly constant stream velocities. These inspections shall be identified as UW inspections in BrM, as the maintenance schedule may not correspond with the UW inspection or routine inspection schedules.

4.6.3.2 Inspection Interval

This section applies to bridges over waterways with underwater portions of the bridge substructure that cannot be inspected visually at low water or by wading or probing and generally require diving or other appropriate techniques.

(2.) Method 1 per 23 CFR Part § 650.311(b)(1) is utilized.

(i.) Each bridge that requires an UW Inspection must receive an Underwater Inspection at regular intervals of 60 months, except as noted below.

(ii.) A reduced UW Inspection interval, not to exceed 24 months, is required when any of the following conditions are met:

- The following items are coded 3 or less:
  - Item B.C.15 Underwater Inspection Condition
  - Item B.C.09 Channel Condition
  - Item B.C.10 Channel Protection Condition
  - Item B.C.11 Scour Condition Rating

- Where these condition ratings are due to localized deficiencies, a special inspection limited to those deficiencies can be used to meet this requirement in lieu of a complete UW Inspection.

(iii.) Extended inspection intervals are not permitted for UW Inspections.

4.6.3.3 Inspector Requirements

At least one qualified Team Leader must be present on site during all UW Inspections. OSHA 29 CFR Part 1910, Subpart T, *Commercial Diving Operations*, shall govern the inspections that require diving. The dive team shall consist of a minimum of three team members, but more may be required if warranted by safety considerations or site conditions.

Team member positions will include:

- Main diver who is responsible for the tactile and visual inspection of the structure and reporting the information.
- The Diving Supervisor (DS), who is designated by the employer in writing. The DS should be physically present at the dive location and oversees all diving operations (29 CFR 1910.410). The DS can serve as a diver on the team if they are a qualified diver and another member of the team can perform the DS functions when the supervisor is in the water. It is common for the DS on an underwater bridge inspection team also to be a qualified NBIS inspection team leader, but this is not a requirement.
- A standby diver or tender continually line tends the diver in the water during SCUBA or surface supplied diving operations. A tender is required to have a basic understanding of the breathing air system, operating and emergency procedures, and knowledge of the care and use of equipment per 29 CFR 1910.430. The tender also serves as the standby diver when qualified as a diver. The standby diver must be ready to enter the water and assist the diver in a timely manner if required, which means they must be dressed and equipped to enter the water at a moment's notice.

The inspection dive team leader must complete the following:

- Schedule the inspection in a timely manner.
- Verify the qualifications of all members of the dive team.
- Review the previous inspection report, dive log, the SI&A sheet, and preliminary data.
- Hold the predive meeting with the dive team.
- Verify the completeness and quality of inspection (See Section 4.7.2.5.1.1 Post-dive Meeting and Report).

DRAFT

4.6.3.4 Inspection Process/Requirements

4.6.3.4.1 General

An UW Inspection includes locating the channel bottom, probing to determine deterioration and losses at the foundation, and diving to visually and/or tactilely inspect and measure bridge components. UW Inspection reports the current waterway cross-sections, profiles and soundings in contrast to past data.

UW inspections are complex technical assignments requiring specialized diving skills and experience. All inspections must be conducted in a safe and thorough manner. UW Inspections are often performed in poor visibility, fast moving rivers or canals in potentially hazardous surroundings. Individually, inspectors must be competent and skilled divers.

Structures requiring underwater inspection shall have individual procedures for conducting the dive. Additionally, individual procedures are required for the actual inspection. Procedures shall be included in the UW Inspection Report to benefit future inspections.

For bridges requiring In-Depth UW Inspections, see Section 4.6.6.4.2.

4.6.3.4.2 Predive Meeting

A predive meeting will be held to review both the dive procedure and the UW Inspection procedures for the particular bridge. The meeting will address the following prior to the inspection of each structure:

- Review the structure's established dive procedure.
- Determine the mode of underwater communication.
- Determine team member responsibilities.
- Detail where the dive will begin; what needs to be inspected; the method of inspection; and when, where, and how the dive will proceed and be terminated.
- Emergency aid
    - A list shall be kept at the dive location and should have information detailing the location of the nearest hospital.
    - The equipment manager is responsible for the emergency communication system, using either a cellular phone or the NDOT radio.
    - A First Aid kit appropriate for diving operations, oxygen bottle with mask and an American Red Cross handbook or equivalent, must be available at the dive location. All dive team members must be trained in supplying oxygen in case of a dive emergency.
- Safety and Health
    - Address the existing conditions above and below the water such as weather, accessibility, visibility, current, debris, etc.
    - To minimize hazards, all diving operations must be coordinated with other activities in the vicinity likely to interfere with the diving operation such as traffic, boating, adjustable current due to power plant operations, etc.
    - Review and check all diving gear to be used: regulators, masks, buoyancy compensators, tanks and fins. Also check any special equipment, communication systems, boats and their operation, thermal and pollution protective gear, etc.
    - Review and check inspection equipment: hand tools, power tools, nondestructive testing and/or boring equipment and procedures, cleaning equipment, vehicles and access equipment, cameras, etc.

4.6.3.4.3 Minimum Inspection Expectations

Scour
Probe the streambed to determine the condition and composition of the material that surrounds the substructure member. The presence of riprap should be noted as well as any debris that constricts the flow of the stream and is promoting scour.

DRAFT

Concrete
Note the length, width, location and orientation of cracks. Note the spalling and deterioration of the concrete members.

Steel
Check for corrosion on all structural members, noting any loss in section, its location, and document the remaining section. Check all bolts and interlocks on sheet piling, noting any missing elements, cracks in welds, corrosion and bent or missing members.

Timber
Timber members that are subject to cycles of wetting and drying are highly susceptible to deterioration. All timber pile shall be checked for areas of deterioration or section loss and note the location of the deficiency. The presence or absence of creosote on all members and the cut ends of cross bracing shall be checked. Note the location of any cracking, splitting or deterioration. Note severity and extent of deterioration or defects and remaining section.

Sounding / Channel Cross-Section
For most small inland bridges, a simple channel cross section as established by NDOT is sufficient. For wide bridges and Missouri River bridges, sounding of the channel bottom at several locations upstream and downstream is customary.

DRAFT

4.6.3.5 Reporting

4.6.3.5.1 General Requirements

The UW Inspection Report is an integral part of the bridge record and provides information on elements not visible and/or inaccessible during a Routine Inspection. NDOT hires a consultant to complete all UW Inspections for all Owners in Nebraska. NDOT has developed a standard report format for UW Inspections that consists of written descriptions of the current condition and any damage to the structure. Sketches and photographs are included as necessary to document the existing condition of the bridge.

The UW Inspection Report shall have a QC review prior to submittal. The results shall be discussed with the Team Leader for corrections, improvements and uniformity in the reports.

4.6.3.5.1.1 Post-dive Meeting and Report

The DS will conduct a post-dive meeting with the dive team members and should address the following points:

- Review the UW Inspection of the structure and discuss the conditions that currently exist.
- Complete the UW Bridge Inspection Preliminary Report and the Record of Dive.

- Discuss any potential safety problems with the bridge inspection or actions that should be taken to create a safer environment for the divers in the future.

4.6.3.5.1.2 Preliminary Underwater Inspection Report

A preliminary UW Inspection Report will be updated immediately following the inspection so that if additional information is needed, the dive can be continued. The completed Report should be submitted to the Bridge Owner and NDOT. Both PDF and Word format shall be submitted following the proper naming convention as defined in the Manual Appendix.

4.6.3.5.1.3 Record of Dive

A Record of Dive (also known as a Dive Log) will be completed in accordance with Code of Federal Regulations, 29 CFR 1910: Subpart T – *Commercial Diving Operations,* and shall be submitted as an appendix in the UW Inspection Report. This Record of Dive will be completed onsite immediately following a dive, and shall contain the following information:

- Names of the dive-team members, including the DS
- Date
- Time
- Location of dive
- Dive mode used
- Description of work performed
- Underwater and surface conditions
- Maximum depth and bottom time for each diver

4.6.3.5.1.4 Submittal to NDOT and Other Owners

UW Inspection Reports shall be submitted electronically via the ftp site to NDOT within 90 calendar days of the inspection date.

BrM data shall be updated within 30 calendar days of the inspection date. Photos, in accordance with Section 4.5.9.2, are submitted through BrM in addition to inclusion in the body of the report. A Cross Section shall be entered in BrM in accordance with the NDOT Cross Section Guidance.

Additionally, at the completion of all bridge inspections in a county, the reports shall be directly submitted to the local bridge owners (Counties, Cities and Municipals) in a format that has been agreed upon.

4.6.4 NSTM Inspection

4.6.4.1 Description

"A hands-on inspection of a nonredundant steel tension member." (23 CFR § 650.305)

A hands-on inspection is defined as an "Inspection within arm's length of the member. Inspection uses visual techniques that may be supplemented by nondestructive evaluation techniques." (23 CFR § 650.305)

A Nonredundant Steel Tension Member (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." (23 CFR § 650.305)

Collapse is defined in the AASHTO LRFD Specifications as a "a major change in geometry of the bridge rendering it unfit for use."

According to NCHRP Synthesis 354, *Inspection and Management of Bridges with Fracture-Critical Details*, a fracture is "the rupture in tension or rapid extension of a crack leading to gross deformation, loss of function or serviceability, or complete separation of the component."

A list of common NSTM structure types and members is shown below.

- One- or two-girder systems, including single box girders with two webs
- Suspended spans with two girders and/or two eye bar components
    - Eye bar chain
    - Hanger rods
    - Floor beams spaced more than 14-ft apart
    - Cable
    - Cable stayed
- Two-truss systems
    - Eye bar members
    - Lower chord
    - Counters
    - Floor beams spaced more than 14-ft apart
    - Gusset plates
    - Pins
    - Brackets holding up floor beams
- Tied arches
- Steel pier caps and cross girders with two or less supports
- Pin and hanger connections on two- or three- girder systems
    - Hanger plates
    - Pin and pin plates connecting pins to girders
        - Girder pin and hanger
        - Fixed pin and girder
        - Truss pin and hanger

DRAFT

- Steel pier caps without load path redundancy

4.6.4.2 Inspection Interval

NSTMs must be inspected at intervals not to exceed 24 months, in accordance with the NBIS, but may be on a shorter inspection interval. NDOT urges all Bridge Owners to repair or retrofit structures that have been placed on a cycle of less than 24 months so that these structures can be placed back on a 24-month cycle.

NSTM Inspections are typically done along with Routine Inspections. The date of this inspection is recorded in BrM as NSTM inspection date and Routine inspection date.

Note that NDOT's policy is that NSTM bridges with non-NSTM elements requiring inspection between the Routine and NSTM inspection interval shall be recorded as a Scheduled Special Inspection (see Section 4.6.7). The date of this inspection is recorded in BrM as the Special Inspection date only (and **not** a Routine or NSTM Inspection).

(a) NSTM Inspections

(1.) Method 1 per 23 CFR Part § 650.311(c)(1) is utilized.

(i.) Each NSTM must be inspected at a regular not to exceed 24 months, except as noted below.

- When Item B.C.14 *NSTM Inspection Condition* is coded 4 or less, each NSTM must be inspected at an interval not to exceed 12 months. This inspection will be recorded as an NSTM Inspection.

(ii.) Extended inspection intervals are not permitted for NSTM Inspections.

4.6.4.3 Inspector Requirements

NSTM Inspections must be completed by at least one Team Leader at the bridge who meets the minimum qualifications stated in 23 CFR § 650.309 and actively participates in the inspection at all times.

DRAFT

4.6.4.4 Inspection Process/Requirements

4.6.4.4.1 General

Inspections shall be performed in accordance with the AASHTO MBE and FHWA Report No. FHWA-IP-86-26, *Inspection of Fracture Critical Bridge Members*.

Each NSTM bridge shall have an inspection procedure prepared by an engineer that identifies each non-redundant steel tension member, as well as each fatigue detail and fracture-prone detail and describes the inspection methods to be used and equipment and procedures for accessing them. Problematic details and the corresponding AASHTO categories shall be determined before the field inspection begins. If a procedure is not in the bridge file, an engineer must prepare a procedure for that structure.

NSTM Inspection procedures, once prepared, will likely be used for many inspections. Procedures will likely need revision if NSTM conditions or methods of inspection change. This will be documented in the inspection report as well as in BrM.

A NSTM Inspection procedure shall include the following elements:

- Location of NSTMs as described in writing or shown on sketches or photos.
- Method of access to NSTM elements (i.e., ladder, platform, boat, snooper, etc.).
- Inspection method(s) to be performed on each NSTM element. A hands-on visual inspection is required. Other methods may include:
- Bang of the hammer/sounding
- Magnetic-particle testing (MT)
- Dye-penetrant testing (PT)
- Ultrasonic testing (UT)
- Eddy current
- Tools necessary for inspection, including any special equipment such as non-destructive testing devices.

4.6.4.5 Reporting

4.6.4.5.1 General

The Team Leader needs to record the beginning and ending date of the NSTM Inspection in BrM.

The inspector needs to record the status of all NSTM members, regardless of their condition. When a crack is found, it is likely that similar details may also be cracked; inspection of all similar details is mandatory. The inspector must report all cracks to the Bridge Owner and the Program Manager immediately. The inspector must also prepare and submit a Critical Findings Report if a critical finding is discovered.

The NSTM Inspection Report must include the NDOT NSTM inspection forms as well as a report narrative.

4.6.4.5.2 Narrative

The NSTM Report shall have a narrative including these components:

- Purpose
    - Provide clear, concise backup of the field documentation
    - Provide insight about observed defects and potential problem areas
- Methodology
    - Introduction
        - Inventory data relevant to fatigue
        - Reference information
        - Site conditions
        - Inspection crew information
    - Identify NSTMs
        - Include NSTM Inspection plans
            - Inventory of the NSTMs
            - Identify fatigue prone details
            - Quality control tool
        - Systematic procedure for efficient inspection
    - Inspection Procedures
        - NSTM Inspection plan
            - General statement indicating that a hands-on visual assessment of the NSTMs was performed
            - Method of access is described
            - Use of any NDT equipment is identified
    - Condition Description: This is one of the most important parts of the narrative. It supports the load rating analysis and is used to evaluate the need for repairs, retrofits, or replacement. Include:
        - What
            - Type of detail
            - Type of defect
            - Extent of defect
            - Reference to sketches and photos
        - Where
            - Location of cross-section
            - Location on member

DRAFT

- Reference to a detailed sketch or photo

- Why
  - Observed reason
- Summary and Conclusions
  - Overall condition of the NSTMs
  - How individual defects affect each member as a whole
  - All defects listed and priorities for each NSTM
  - Address change in condition of NSTMs from the previous inspection
  - Identify any negative trends that may be developing

4.6.4.5.3 Supporting Documentation

NSTM Inspections should include the following files:

1. Inspection Reports (BR293). This form includes the following parts:

BR 293 Cover - NSTM Inspection Report - *Cover Page and table of contents*
BR 293a - NSTM Inspection Report - *Introduction*
BR 293g - NSTM Inspection Report - *Summary & Conclusions*
BR 293b - NSTM Inspection Report - *Bridge Orientation/Layout*
BR 293c - NSTM Inspection Report - *Identification of All NSTM Members/Details*
BR 293d - NSTM Procedural Report
BR 293e - NSTM Inspection Report - *SNBI Condition Rating*
BR 293f - NSTM Inspection Report - *Reference Photos/Sketches*
BR 293h - NSTM Inspection Report - *Follow-up Procedure and Appendix table of content*
Attachments (See paragraph 4 below)

   Note: All BR293 series forms have been combined into a single report and shall be submitted in electronic (.pdf and .docx) formats.

2. Inspection Photos

   Note: All photos shall be submitted in electronic (.jpg) format in BrM

3. BrM online submittal

4. NSTM Inspection report attachment MAY include any of the following files:
   a. Channel cross-section field measurements and plot of current and past cross sections superimposed on one plot.
   b. DR27 – Structure Maintenance Checklist if needed in .pdf format
   c. DR320 – Critical Finding Report in .pdf and .docx formats

d. DR321 – Structure Repair Report in .pdf format
e. Intelligent PDF Form
f. Latest Load Rating Summary Sheet (LRSS)
g. Plans or Measurements

Note: Items e, f and g shall be submitted in electronic (pdf) format. All other formats, including Word (doc) format, will NOT be accepted.

4.6.4.5.4 Recommendations

Inspectors should make non-critical recommendations using NDOT form DR 321. See the prior section of this Chapter. Also, inspectors should check the previous report recommendations to compare what work was recommended and the priority of such items.

Recommendations can include items for:

- Further inspection
- Maintenance
- Repairs
- Posting
- Rehabilitation

The report should also include recommendations for a new load rating analysis when maintenance or improvement work, change in strength of members, or dead load has altered the condition or capacity of the structure. (BIRM)

DRAFT

4.6.5 Damage Inspection

4.6.5.1 Description

"An unscheduled inspection to assess structural damage resulting from environmental factors or human actions." (23 CFR § 650.305)

Damage inspections are event-driven. Events that trigger a Damage Inspection include:

- Vehicular impact to the bridge that affects the load carrying capacity of any member or element of a bridge.
- Vehicular impact to the bridge that damages its traffic safety elements.
- Storm water events that adversely affect the integrity and effectiveness of scour countermeasures, or the structural stability of any substructure, or the roadway approach. Damage may be discovered on an inspection required by a Scour Plan of Action.

4.6.5.2 Inspection Interval

Damage Inspections are event-driven (unscheduled) inspections.

4.6.5.3 Inspector Requirements

NDOT requires that anyone performing Damage Inspections must, at a minimum:

- Meet the requirements of a Team Leader as mentioned in Chapter 1.7.2.2; or
- If the bridge has non-redundant steel tension members, meet the requirements of an NSTM Team Leader as mentioned in Chapter 1.7.2.2; or
- If the member is underwater, meet the requirements of an Underwater Bridge Inspection Diver as mentioned in Chapter 1.7.2.5.

4.6.5.4 Inspection Process/Requirements

4.6.5.4.1 General

Damage Inspection is an event-driven inspection to assess structural damage resulting from environmental or human-inflicted causes.

Bridge Owners may need to engage a consultant to assist the Bridge Owner with the Damage Inspection and to assess the immediate action needed; this may include both a qualified Team Leader and/or a Bridge Engineer if the Team Leader is not a Bridge Engineer.

The scope of inspection must be sufficient to determine the need for emergency load restrictions or closure of the bridge to traffic and to assess the level of effort necessary to affect a repair.

The amount of effort expended on this type of inspection will vary depending upon the extent of the damage. If major damage has occurred, inspectors must evaluate fractured members and section loss, take measurements for misalignment of members, and check for any loss of foundation support. Field measurements and calculations, and perhaps a more refined analysis to establish or adjust interim load restrictions may be necessary.

The Damage Inspection may be supplemented by a timely In-Depth Inspection to document the extent of damage and the urgency and magnitude of repairs.

DRAFT

4.6.5.5 Reporting

4.6.5.5.1 General Requirements

A Damage Inspection report should be made by the Bridge Owner to include in the Bridge Record, in addition to BrM documentation. The format and extent of this report will be dependent on the extent of the damage. The Program Manager may request this report. A particular awareness of the potential for litigation must be exercised in the documentation of Damage Inspections.

4.6.5.5.2 Photographs

Photographs should be included in both the report and the BrM inspection record and should document the size and location of any damage. For additional guidance, refer to Section 4.5.9.2 Photographs.

4.6.5.5.3 Corrective Action

Damage Inspection Reporting	
Situation	**Report**
Damage to the structure requires corrective action to safeguard public safety or to protect the integrity of the asset, **and** Closure of the bridge is required.	Critical Findings Report with Bridge Damage Inspection Report
Damage to the structure requires corrective action to safeguard public safety or to protect the integrity of the asset. Closure of the bridge is **not** required.	Structure Repair Report or Structure Maintenance Check List (NDOT) Maintenance work order (non-state)

NDOT utilizes a Structure Repair Report, DR 321, to document needed repairs. The Maintenance Check List, DR 27, is used to document minor work that is typically completed by District maintenance personnel.

Non-state Bridge Owners have maintenance work order systems that they use to report, document and affect the work. They may also use the DR forms for this purpose.

All Bridge Owners are to keep a maintenance history for each bridge in the Bridge Record. Repair and maintenance work orders or reports should also be filed with the Bridge Record.

DRAFT

4.6.6 In-Depth Inspection

4.6.6.1 Description

"A close-up, detailed inspection of one or more bridge members located above or below water, using visual or nondestructive evaluation techniques as required to identify any deficiencies not readily detectable using routine inspection procedures. Hands-on inspection may be necessary at some locations. In-depth inspections may occur more or less frequently than routine inspections, as outlined in bridge specific inspection procedures." (23 CFR § 650.305)

4.6.6.2 Inspection Interval and Equipment

4.6.6.3 In-Depth Inspections may occur at intervals more or less frequent than Routine Inspections, as necessary for a particular bridge (BIRM). Inspector Requirements

In-Depth Inspections must be completed by at least one Team Leader at the bridge who meets the minimum qualifications stated in 23 CFR § 650.309 and actively participates in the inspection at all times.

4.6.6.4 Inspection Process/Requirements

4.6.6.4.1 General

When deficiencies are suspected, or the full severity or extent of deficiencies cannot be determined using routine methods, then an In-Depth or Special Inspection should be completed, and hands-on methods may be required. (BIRM)

The locations that receive an In-Depth Inspection are to be clearly documented in the bridge files. Inspectors should document the remaining thickness and the locations of any section loss with drawings and photos that show the distance of the defects from a nearby support. Inspectors need to clearly identify specific portions of the bridge receiving in-depth inspection in the notes, as well as the procedures utilized during the inspection.

A common example of an In-Depth Inspection is a hands-on inspection of a pin and hanger system, utilizing NDE testing procedures. In-Depth Inspections that involve Ultra-sonic Testing or equipment used for measurement of section loss should be reported using form

BR46, Ultrasonic Inspection Report of Pins, to document the procedures, scope, and results of the inspection.

4.6.6.4.2 Bridges Over Waterways

The FHWA BIRM gives guidance on In-Depth UW Inspections. An In-Depth UW Inspection is a close-up, hands-on inspection of one or more members below the water level to detect any deficiencies not readily apparent using standard UW Inspection procedures. When appropriate or necessary to fully ascertain the existence of or the extent of any deficiencies, Level III, nondestructive tests should be performed.

The In-Depth UW Inspection typically includes Level II inspection over extensive areas and Level III inspection of limited areas. Nondestructive testing is typically performed, and the inspection may include other testing methods, such as extracting samples for laboratory analysis and testing, boring, and probing. One or more of the following conditions may dictate the need for an In-Depth UW Inspection:

- Inconclusive results from a Routine inspection.
- Critical structures, whose loss would have significant impact on life or property.
- Unique structures, whose structural performance is uncertain.
- Prior evidence of distress.
- Consideration of reuse of an existing substructure to support a new superstructure or planned major rehabilitation of the superstructure.

The distinction between Routine and In-Depth UW Inspections is not always clearly defined. For some bridges, such as steel pile supported structures in an actively corrosive environment, it may be necessary to include Level III, nondestructive testing inspection techniques as part of Routine UW Inspections.

4.6.6.5 Reporting

4.6.6.5.1 General Requirements

An In-Depth Inspection report typically includes supplementary data, as compared to a Routine Inspection Report. The report should extensively identify the members and elements inspected, procedures used, observations and findings, condition rating determinations, and recommendations. The condition ratings and load ratings controlled by the findings of the inspection are reflected in BrM.

4.6.6.5.2 Photographs

Photographs and/or sonar imagery should be included in both the report and the BrM inspection record and should document the size and location of any damage. For additional guidance, refer to section 4.5.9.2 Photographs.

4.6.7 Special Inspection

4.6.7.1 Description

"An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency, or to monitor special details or unusual characteristics of a bridge that does not necessarily have defects." (23 CFR § 650.305)

Special Inspections may be scheduled or event driven.

A Scheduled Special Inspection is done on a specified date or within an interval of time to closely monitor the defect for adverse changes in its condition. It may or may not coincide with a routine bridge inspection.

An Event-driven Special Inspection is done as needed to include changes to the inventory.

4.6.7.2 Inspection Interval

Scheduled Special Inspections are to be done between the Routine Inspections at an interval equal to half the routine inspection interval or less (as determined by the Owner), depending on the condition being monitored. For instance, if the Routine Inspection is completed in May of odd years and is on a 24-month schedule, the Special Inspection should be conducted in May of even years and also set to a 24-month schedule. If the Routine Inspection is set to a 12-month frequency, the Scheduled Special Inspection should be completed 6 months after the Routine and set to a 12-month schedule.

NDOT recommends that Owners keep a master list of their bridges that are subject to Special Inspection. NDOT has determined certain conditions or cases that require a Special Inspection which are shown in the following table. The purpose of the inspection is to verify the condition and the condition codes of the item requiring the Special Inspection, not to complete an entire Routine Inspection.

Scheduled Special Inspections Required by NDOT to verify Condition Rating	
Case	**Inspection By**
Bridges with load restriction **and** A condition rating of 4 or less for any of the following:	Team Leader

Item B.C.02 Superstructure Item B.C.03 Substructure Item B.C.04 Culvert **and either** of the following: Item B.H.09 AADT of 400 or more Item 208 State Classification of Route of 6 or less (arterial or higher level).	
Bridges with a condition rating of 3 or less for any of the following: Item B.C.02 Superstructure Item B.C.03 Substructure Item B.C.04 Culvert	Team Leader
A condition rating of 3 or less for Item B.C.14 NSTM Inspection Condition.	NSTM Team Leader

A Bridge Owner or their Engineer (licensed NE PE) may recommend an inspection interval shorter than a normal routine inspection interval (24 months). Factors that pose higher risk include, but are not limited to:

- Age of structure
- Traffic Characteristics (AADT and AADTT)
- Bridge condition or presence of known deficiencies
- Fatigue prone details.

Scheduled Special Inspection Examples	
Case	**Inspection By**
Inspection of a foundation settlement	Team Leader
Inspection of a member whose condition is of concern	Team Leader
Inspection of a load-posted bridge subject to heavy traffic	Team Leader

4.6.7.3 Inspector Requirements

Special Inspections must be completed by at least one team leader at the bridge who meets the minimum qualifications stated in 23 CFR § 650.309 and actively participates in the inspection at all times.

4.6.7.4 Inspection Process/Requirements

4.6.7.4.1 General

Bridges shall be placed on a special inspections list when, in the opinion of the Program Manager, Bridge Owner, or Inspector, a non-critical defect is discovered that warrants short-term monitoring to ensure the condition remains stable or that repairs or replacement are

completed before the defect becomes critical. The purpose of the Scheduled Special Inspection is to monitor and report on these defects.

The scheduling, interval and procedures of a Special Inspection shall be determined based on the judgment of a qualified engineer or Team Leader on a case-by-case basis.

Bridges shall be removed from the special inspections list when the defect is repaired or removed, or when it has been determined by the responsible party that the condition is stable and does not warrant additional Scheduled Special Inspections.

4.6.7.4.2 Bridges Over Waterways

A Special Underwater Inspection is used to monitor a particular known or suspected deficiency such as foundation settlement or undermining.

When Item B.C.15 Under Water Inspection Condition is three (3) or less as a result of localized deficiencies, a Special Inspection, as described in 23 § CFR 650.313(h), limited to the deficient underwater portions of the structure may take place at the reduced interval in lieu of a complete Underwater Inspection. A complete Underwater Inspection must still be completed at regular 60-month intervals (23 § CFR 650.311 (b)(1)(ii)(C)).

4.6.7.5 Reporting

4.6.7.5.1 General Requirements

An inspection report will include information specifying the exact location of the defect requiring the special inspection, an explanation of the purpose of the special inspection, the frequency and the date of the next inspection, and space for inspector comments.

The Special Inspection report must be added to the Owner's Bridge Record. NDOT has provided form DR 7 to assist in logging documentation of changes in condition observed for bridges with this type of inspection.

4.6.7.5.2 Photographs

At a minimum, photos should sufficiently document each defect inspected during a Special Inspection. For additional guidance, refer to Section 4.5.9.2 Photographs.

4.6.8 Service Inspection

4.6.8.1 Description

"An inspection to identify major deficiencies and safety issues, performed by personnel with general knowledge of bridge maintenance or bridge inspection." (23 CFR § 650.305)

NDOT does not perform Service Inspections. Service Inspections are available for agencies that use Method 2 for SNBI Item B.IR.07 Risk-Based Inspection Interval.

4.6.9 Scour Monitoring Inspection

4.6.9.1 Description

"An inspection performed during or after a triggering storm event as required by a Scour Plan of Action (POA), by personnel with qualifications required by the agency." (SNBI)

This may include periodic remote electronic readings of streambed changes, when necessary, in the POA. For more information on POAs, see Section 4.5.7.2.

4.6.9.2 Inspection Interval

Scour Monitoring Inspections are performed on an as-needed basis, with no regular interval.

Documentation completed during the Scour Monitoring Inspection should be retained by the Bridge Owner in the bridge file as part of the flood history for the bridge.

4.6.9.3 Inspector Requirements

Scour Monitoring Inspections should be performed by personnel meeting the requirements for an Underwater Inspection Team Leader or Team Leader (as outlined in 650.313 (h)) (23 CFR 650.313(j)).

4.6.9.4 Inspection Process/Requirements

Underwater Inspection portions of a Scour Monitoring Inspection should be completed after a triggering storm event, wherever possible, for the safety of the inspection team. After the storm event, UW Inspection may be necessary to monitor suspected scour issues and to record any changes in condition.

The FHWA BIRM says situations that may warrant a Scour Monitoring UW Inspection include:

- Unusual floods
- Unusual ice flows
- Adverse environmental conditions
- Floating and build-up of debris
- Evidence of deterioration or movement above the waterline

Bridge members should be inspected after floods. Bridge members situated in streams, rivers, and other waterways with known or suspected scour potential after every major

runoff event should be inspected to the extent necessary to ensure bridge foundation integrity.

Unusual ice flows can damage substructure members, and accumulations of ice on the members can cause scouring currents or increase the depth of scour.

Rapid and severe deterioration of substructure materials may be caused by environmental conditions such as brackish water, polluted water, and water with high concentrations of chemicals. Some waterways may promote microbial induced corrosion (MIC) on submerged steel substructure members.

4.6.9.5 Reporting

4.6.9.5.1 General Requirements

At a minimum, the inspection report should contain the date, scope, and results of any inspection or monitoring activity. Any updates to the Scour Condition Rating as a result of this inspection should be reported. (BIRM)

4.6.9.5.2 Photographs

Scour Monitoring Inspections should include all relevant photos as discussed in Section 4.5.9.2 Photographs. Any conditions that effect Scour Condition coding of B.C. 11 should be documented.

If an Underwater Inspection is performed, special techniques for photography may be necessary such as the use of a clear water box. If any acoustic imaging methods are utilized during the inspection, the methodologies and findings should be reported. An Underwater Inspection report should also include a water depth soundings log. Inspection notes and sketches should focus on the bridge substructure and waterway details.

4.7 INVENTORY SUBMITTAL REQUIREMENTS

NDOT continually updates the state inventory as data is received from Bridge Owners. This procedure allows data collected in a calendar year to be reviewed and entered into the database prior to the April 1 deadline for inventory submittal to FHWA. NDOT and FHWA monitor compliance with the BIP submittal requirements.

If a bridge is removed without the intention to replace it the owner must notify the Bridge Division in writing. NDOT will update Item B.C.01 (NBIS Bridge Length) to indicate removal, Item B.PS.01 (Load Posting Status) will be set to “Closed” and Bridge Status will be set to “Closed”.

If a bridge is replaced with a structure less than 20 ft. in length, NDOT will update Item B.C.01 (NBIS Bridge Length) to indicate “too short”, Item B.PS.01 (Load Posting Status) will be set to PO (Open, Permanent) and Bridge Status will be set to “active”. Structures less than 20 ft. are not required to be reported to FHWA, are not required to have inspections performed per NBIS guidelines and won’t appear on inspection reports.

When replacing a structure with another bridge-sized structure, the inspector must conduct an initial inspection and document the findings in BrM. Inspection photos should be included in BrM. Certain fields must be updated by NDOT and should be submitted to the Bridge Office, if applicable. These fields include:

- Item B.C.11 – Scour Condition Rating
- Item B.W.01 – Year Built
- Item B.SP.04 – Span Material
- Item B.SP.06 – Span Type
- Item B.G.02 – Total Bridge Length
- Item B.G.03 – Maximum Span Length
- Item B.G.04 – Minimum Span Length
- Item B.IR.03 – Underwater Inspection Required
- NE Item 218 – Date Opened to Traffic
- Hydraulic Cross Section

Other documentation to submit includes bridge plans, a load rating summary sheet, and a hydrology data sheet (where applicable).

When a bridge sized structure is constructed on a new alignment or replaces a non-bridge sized structure, a new structure number must be generated. Coordinates of the location should be sent to NDOT along with a request for a new structure number. The same documents and information will be needed when replacing a bridge.

Bridge Inspection Program Requirements for Bridge Plans, Load Rating Report, Hydraulic Design and Analysis Report submittal requirements are described in chapters 1, 5, and 6.

DRAFT

4.8 QUALITY CONTROL

The NBIS defines Quality Control (QC) as "procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level."

Quality Control is defined for NDOT's program as a system of routine technical activities, to measure and control the quality of the bridge inventory data or report as it is being developed. The QC system is designed to include general methods such as accuracy checks on data acquisition and calculations, and the use of approved standardized procedures for measurement, calculation, recording information and reporting. QC activities include:

- Documents, data, or calculations signed by a PE, must have QC completed by an individual of equivalent or better qualifications than the originator (this is typically documented when the QC individual signs or initials the documents).
- See that the technical activity has followed procedures set by NDOT.
- Providing routine and consistent checks for data integrity, correctness and completeness.
- Identifying and addressing errors and/or omissions.
- Documenting inventory data.
- Recording all QC activities.

Quality Control for this program is the responsibility of the consultant or agency conducting the activity. Quality Control checks are conducted on every product of a program operation, and thus at a much higher frequency than quality assurance checks. When the QC on a program product is complete, it is finished and deliverable to the Bridge Owner for their records. Consultants providing professional services to Bridge Owners must submit a Quality Control plan to the Bridge Owner for review and approval. QC must be done on the deliverables prior to submittal to the Bridge Owner.

NDOT has implemented a new Quality Control Review process through BrM as of June 12, 2024. Per the Code of Federal Regulations (CFR), Title 23, Chapter 1 Subchapter G, Part 650, Subpart C, Paragraph 650.313, Quality control and quality assurance.

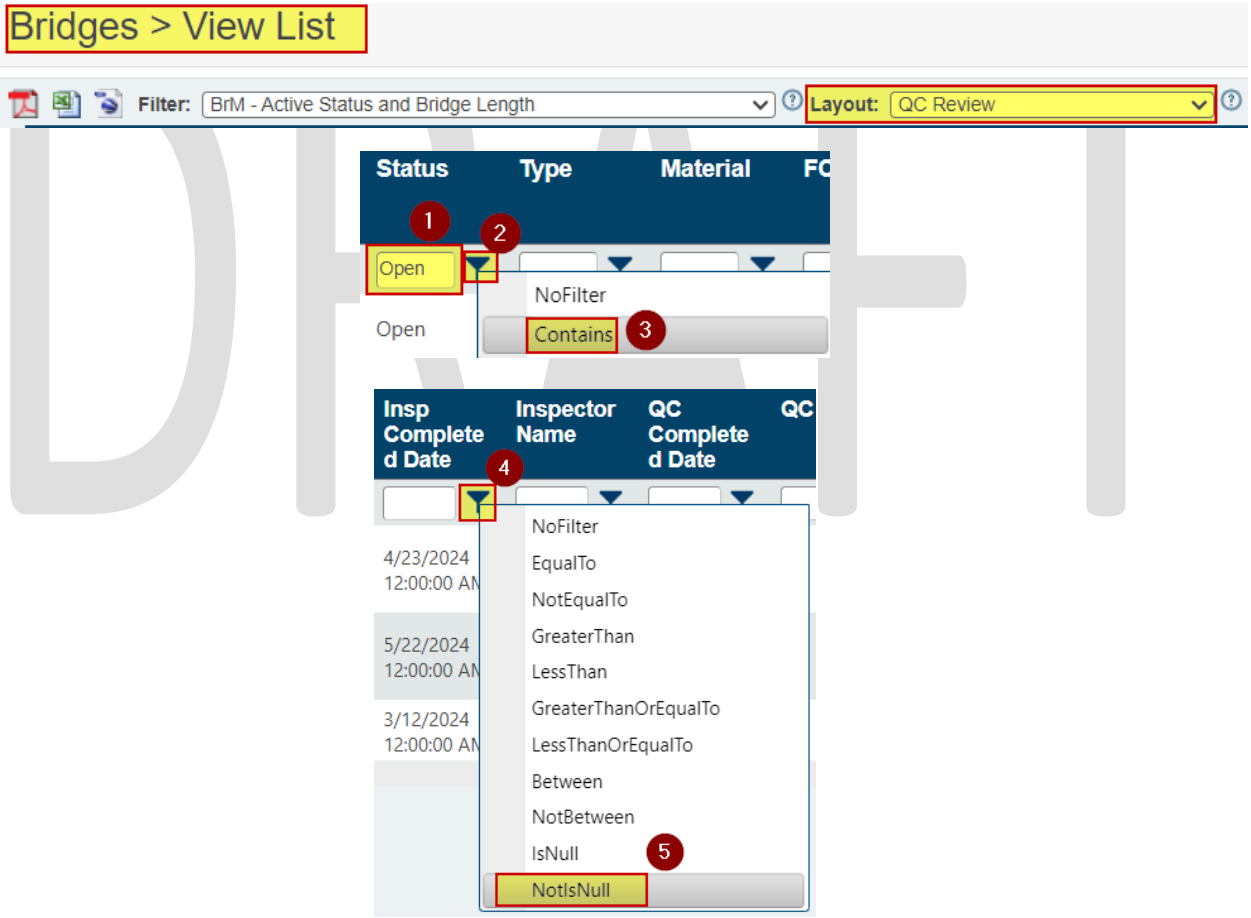
1) Assure systematic QC and QA procedures identified in Section 1.4, AASHTO Manual (incorporated by reference, *see* § 650.317) are used to maintain a high degree of accuracy and consistency in the inspection program.
2) **Document the extent, interval, and responsible party for the review of inspection** teams in the field, inspection reports, NBI data, and computations, including scour appraisal and load ratings. QC and QA reviews are to be performed by personnel other than the individual who completed the original report or calculations.

Implementation

NDOT has made changes to BrM so the inspector can indicate that a bridge inspection record is ready for review and the person who is doing the quality control review (QC) of inspection reports can document that the review has been completed.

Steps to complete a bridge inspection QC review.

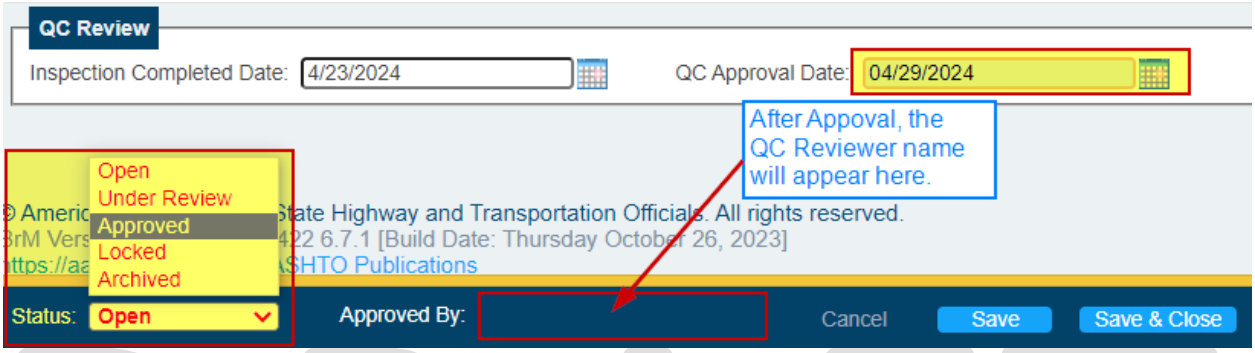
1) **For the Inspector:** When an inspector completes an inspection, they will add the inspection completion date to BrM > Inspection > Condition > NBI/Elem Condition. This will indicate that to the best of the inspector's knowledge, all bridge appraisal items have been completed, and the inspection report is ready for QC review.
   a) If inspectors have not provided an inspection completion date within 45 days of an inspection date, they will receive an automated notification from NDOT.
      i) These notifications will continue every 15 days until the inspection is completed, and the inspection completion date is provided.
2) **For the Quality Control Reviewer:** To locate inspection records in need of QC review, the reviewer can use the BrM > Bridges > View List page with the Layout called "QC Review" and apply filters for Status and Inspection Completion Date as shown in the screenshots below.



1) To conduct a QC review, follow the guidance in the NDOT Bridge Inspection Program Manual (BIP Manual) section 1.9.1 and NDOT Bulletins 24.01 – 24.03. QC reviewers should also ensure that any error codes that were in the most recent NDOT Quarterly Upcoming Inspection Report have been addressed.
   a) If the reviewer finds problems with the inspection that must be corrected prior to acceptance, then the reviewer will do the following.

i) Delete the inspection completed date in BrM
ii) Contact the inspector to request updates to the record

b) If the QC reviewer finds the inspection report is acceptable then the reviewer provides a QC Approval Date and changes the review Status from "Open" to "Approved" as shown in the screenshot below. Remember to Save your work.



Pro tip – Open more than one browser tab to allow the filters to be retained on the bridge list page and use the other tab for conducting the QC review.



QC Reviewer Qualifications

As per the BIP Manual 1.7.2.7, "NDOT requires that an individual completing Quality Control (QC) must have experience that is equal to or better than the individual that originates the program product (inspection report, load rating, etc.)"

To obtain BrM QC account credentials contact Jeff Handeland at jeff.handeland@nebraska.gov.

4.9 QUALITY ASSURANCE

Quality Assurance (QA) of all activities of the Bridge Inventory will be performed by NDOT or their selected agent. The QA program activities are described in Chapter 1 of this Manual.

4.10 REVISION HISTORY

Rev	Date	Description
0	2010 January 25	Initial Issue of Chapter
1	2011 November 01	Revision 1
2	2013 March 04	Revision 2
3	2015 March 15	Revision 3
4	2016 March 11	Revision 4
5	2017 March 16	Revision 5
6	2018 March	Revision 6

7	2020 March	Revision 7
8	2025 July	Revision 8 – SNBI Compliance

4.11 FORMS

Forms used in completing inspections that are mentioned in this Chapter are listed below. Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOT Bridge Inspection Program website for the current list of applicable forms and the most recent versions of each form. Bridge Forms - NDOT (nebraska.gov)

Name	DR Form
Scheduled Special Inspection – Bridge Report	7
Structure Maintenance Checklist	27
Complex Feature - Unusual Feature Inspection List	29
NSTM Inspection Report	293
NSTM Report Contents	293i
Bridge Inspection Field Sketch Template	319
Critical Finding Report	320
Instructions – Critical Finding Report	320i
Structure Repair Report (State Structures)	321
Structure Repair Report (Non-State Structures)	321a

DRAFT

This page intentionally left blank

DRAFT

5.1 GENERAL 3
5.2 REFERENCES 3
5.3 ROLES AND RESPONSIBILITIES 4
5.3.1 Bridge Owners 4
5.3.2 Nebraska Department of Transportation 5
5.3.3 Load Rating Engineer 5
5.3.4 Consultants Performing Ratings for Bridge Owners 6
5.4 DEADLINES FOR LOAD POSTING/CLOSURE AND SUBMITTAL REQUIREMENTS FOR LOAD RATINGS 6
5.4.1 Deadline for Posting Bridge Weight Limit Signs 6
5.4.2 Deadline for Bridge Closures 6
5.4.3 Submittal of Load Rating Reports to NDOT 7
5.5 BRIDGE PLAN INFORMATION FOR LOAD RATING 7
5.6 NEBRASKA LEGAL TRUCKS 8
5.7 BRIDGE LOAD POSTING 11
5.7.1 General 11
5.7.2 Bridge Weight Limit Signs 12
5.7.3 Data from the Load Rating Summary Sheet 13
5.8 SITUATIONS REQUIRING NEW OR UPDATED LOAD RATING OR ASSESSMENT 15
5.8.1 New Bridges 15
5.8.2 Reconstructed Bridges 15
5.8.3 Repaired Bridges 15
5.8.4 Change in Condition Found During Inspection 16
5.8.5 Change in Overburden Dead Load 17
5.9 INVENTORY ITEMS RELATED TO DESIGN LOAD, RATING AND POSTING 19
5.10 LOAD RATING VEHICLES 20
5.11 LOAD RATING DOCUMENTATION AND REPORT 22
5.11.1 Load Rating Report Contents 22
5.11.2 Load Rating Summary Sheet 23
5.11.2.1 Heading Information Section 24
5.11.2.2 Structure Identification Section 24
5.11.2.3 Description Section 24
5.11.2.4 Ratings and Loads Section 25
5.11.2.5 Documentation Section 26
5.11.2.6 Additional Comments Section 26
5.11.3 Load Rating Computational Means – General Guidance 27
5.11.4 Load Rating with Software 28
5.11.5 Load Rating Methods 28
5.11.5.1 Allowable Stress Rating (ASR) 28
5.11.5.2 Load Factor Rating (LFR) 29

DRAFT

5.11.5.3 Load and Resistance Factor Rating (LRFR) 29
5.11.6 Load Rating Levels 29
5.11.6.1 Inventory Level 29
5.11.6.2 Operating Level 29
5.11.6.3 Posting Level 30
5.11.7 Analysis Considerations 30
5.11.7.1 Span lengths 30
5.11.7.2 Bridge Cross Section and Roadway Width 30
5.11.7.3 Load and Distribution Factors 30
5.11.7.4 Dead Load 30
5.11.7.5 Strength / Resistance 30
5.11.7.6 Deck Load Rating 31
5.11.8 Material-Specific Considerations - Steel 31
5.11.8.1 Strength / Resistance 31
5.11.8.2 Nonredundant Steel Tension Member (NSTM) Structures 31
5.11.8.3 Steel Thru-girders 31
5.11.8.4 Plate Girder Shear Capacity 31
5.11.8.5 Members from Elements 31
5.11.8.6 Steel Truss Members 32
5.11.8.7 Gusset Plates 32
5.11.8.8 Policy for Bracing by Deck – Expired, 2012 32
5.11.8.9 Corrugated Metal Pipe (CMP) Structures 32
5.11.9 Material-Specific Considerations - Concrete 33
5.11.10 Material-Specific Considerations - Timber 33
5.11.10.1 Elements to be Load Rated 33
5.11.10.2 Timber Unit Weight 33
5.11.10.3 Impact 34
5.11.10.4 Design Stress Values 34
5.11.10.5 Timber Decks 34
5.11.10.6 Lateral Bracing 35
5.11.10.7 Variable Stringer Spacing 35
5.11.10.8 Variable Material Strengths 35
5.11.10.9 Stringer Condition and Capacity Calculation 36
5.11.11 Material Specific Considerations - Other 40
5.11.12 Load Ratings for Bridges without Plans 40
5.11.12.1 General 40
5.11.12.2 Load Rating Based on Load Testing 40
5.11.12.3 Load Rating Based on Engineering Judgment 40
5.11.12.4 Concrete Decks on Steel Beams 40
5.11.12.5 Concrete Bridges 41
5.12 QUALITY CONTROL 42
5.13 QUALITY ASSURANCE 42
5.14 REVISION HISTORY 43
5.15 FORMS 43

DRAFT

5.1 GENERAL

The intent of these procedures is to provide guidance on documentation, proper load rating, and load posting of bridges.

The load rating will be an evaluation of the load carrying capacity of the entire structure, including the superstructure, deck, substructure, and their connections. Bridge conditions change over time and so will the load rating. The load rating will be finalized by a professional engineer and determined by calculations, engineering judgment and/or load testing of the bridge.

Bridge Owners must have a valid, current load rating in the form of the Load Rating Summary Sheet (LRSS) in the Bridge File. A valid load rating must be prepared by a Nebraska Professional Engineer, be based on documented condition codes at the time of the load rating and must be supported by calculations.

Owners must install load posting signs for load restrictions shown on the LRSS.

All bridges with a load rating less than 3 tons for any legal Nebraska truck at operating level shall be closed and barricaded to all traffic. A detail for permanent closure is in the Manual Appendix.

NOTE:

AASHTOWare Bridge Rating analytical software (AASHTOWare BrR) is a software program developed by AASHTO that allows a user to load rate a bridge superstructure in accordance with the AASHTO Manual for Condition Evaluation of Bridges, AASHTO Manual for Bridge Evaluation, AASHTO Standard Specification and AASHTO LRFD Specification.

NDOT policy requires that all load ratings for structures in Nebraska must be completed using AASHTOWare BrR, if applicable, starting January 2017.

5.2 REFERENCES

The information in this Bridge Inspection Program Manual supplements requirements, procedures and information in documents by:

- The American Association of State Highway and Transportation Officials (AASHTO)
- The U.S. Department of Transportation, Federal Highway Administration (FHWA)
- The National Cooperative Highway Research Program (NCHRP)

The References list of applicable documents is included in the Manual Appendix. The National Bridge Inspection Standards are also included in the Manual.

DRAFT

Persons involved with the Nebraska Bridge Inspection Program and the bridge inventory must be knowledgeable of the requirements in National Bridge Inspection Standards, the AASHTO *Manual for Bridge Evaluation*, and FHWA publications, technical advisories and publications related to the NBIS.

Persons involved with load rating of structures must be knowledgeable of these references. The information in this Bridge Inspection Program Manual supplements the information in these references.

AASHTO Manual *for Bridge Evaluation*, 3rd edition with Interim Revisions (MBE)

AASHTO *Standard Specifications for Highway Bridges*, 17th Edition

AASHTO *LRFD Bridge Design Specifications*, 10th Edition

DRAFT

5.3 ROLES AND RESPONSIBILITIES

5.3.1 Bridge Owners

Bridge Owners in Nebraska include the Nebraska Department of Transportation, cities, municipalities, counties, and private owners of bridges being used by the public.

Bridge Owners are responsible for:

- Ensuring bridges under their authority have a current bridge load rating and a current Load Rating Summary Sheet (LRSS) in the Bridge Record.
- The Owner shall submit a copy of the signed and sealed Load Rating Summary Sheet to NDOT and retain the original signed by the LRE in the Individual Bridge Record.
- Having the bridge properly posted, if posting is required, as specified in this Chapter.
- Providing documentation of revised load posting to NDOT, as specified in this Chapter.
- Ensuring new bridges are placed into the Bridge Inventory and that the bridge data and load rating are submitted to NDOT as required in this Manual.
- Maintaining a complete Bridge File with complete Individual Bridge Records in their local office (See Chapter 2, Bridge Inspection Program, Records).
- Completing, or ensuring completion (consultant, etc.), of Quality Control (QC) of the load ratings completed for bridges under their authority.
- Closing their bridges for critical findings and maintaining the bridge closure barricades.

DRAFT

5.3.2 Nebraska Department of Transportation

NDOT is responsible for:

- Ensuring Bridge Owners are in compliance with the National Bridge Inspection Standards as given in Title 23 CFR Part 650 Subpart C.
- Setting policy for bridge posting/closure.
- Setting policy for bridge load rating.
- Completing Quality Assurance (QA) on the data provided for the National Bridge Inventory by the Bridge Owners for compliance with Federal regulations.

The NDOT ftp site is a repository of bridge data including bridge plans, pictures and other records. This repository does not constitute the Bridge Owner's official Bridge File. Bridge Owners must maintain the official Bridge File on site (See Chapter 2, Bridge Inspection Program Records).

5.3.3 Load Rating Engineer

The Load Rating Engineer (LRE) may be an employee of the Bridge Owner's organization or may be an engineer from a consultant firm. LRE qualifications are described in the Chapter 1, Bridge Inspection Program. The LRE should use sound engineering judgment when completing load ratings and when using the provisions of this Manual.

The LRE is responsible for the data that is submitted to NDOT for the National Bridge Inventory and seals and signs the original LRSS with their NE Professional Engineers seal. The LRE is responsible for delivering the completed LRSS to the Owner. The LRE of record is responsible for ensuring that an engineer of equal or better qualifications than the Analyst completes QC on the load rating calculations and the LRSS prior to submittal to the Owner.

5.3.4 Consultants Performing Ratings for Bridge Owners

Consultants are responsible for being familiar with NDOT Bridge Inspection Program policies and procedures. Consultants performing load ratings for Bridge Owners are responsible for Quality Control on their work for accuracy and completeness.

5.4 DEADLINES FOR LOAD POSTING/CLOSURE AND SUBMITTAL REQUIREMENTS FOR LOAD RATINGS

5.4.1 Deadline for Posting Bridge Weight Limit Signs

Bridge Owners must **install weight limit signs as soon as possible**, but **no later than 30 days** of receipt of the Load Rating Summary Sheet from the LRE. This is very important since load postings typically drop due to deterioration or damage to the structure.

Bridge Owners must **provide documentation** of revised load postings or bridge closures to NDOT **no later than 30 days** after the load posting signs or barricades are installed. This documentation is typically in the form of photos from each end of the bridge showing the in-place load posting signs.

Advanced warning signs should be placed at locations or road intersections where prohibited vehicles can either detour or turn around per the MUTCD.

5.4.2 Deadline for Bridge Closures

Bridge Owner must install permanent closure barricades immediately upon notification of the need to close.

Bridge Owner must provide documentation of Closure to NDOT within 3 days of barricade installation. This documentation is typically in the form of photos from each end of the bridge showing the barricades in place.

Refer to Section 4.5.12 for guidance on bridge posting and closure requirements.

DRAFT

5.4.3 Submittal of Load Rating Reports to NDOT

Load Rating Reports for new or reconstructed bridges must be submitted to NDOT prior to opening the bridge to traffic.

Bridge Owners and their LRE are responsible for determining when a bridge must be re-rated, typically after a Routine or Damage Inspection.

Load ratings required due to damage or deterioration shall be performed within 30 days of the date of bridge inspection.

NDOT requires that participants generating data and supporting reports submit them to NDOT as soon as QC has been completed, but no later than 90 days of any change in inventory data. Load Rating Reports that result in a change to any inventory data must be submitted to NDOT after they are completed.

5.5 BRIDGE PLAN INFORMATION FOR LOAD RATING

Bridge Owners must keep information needed for load rating and structural analysis for their bridges under their jurisdiction. For bridges without plans, field measurements and a field measurement form must be kept on file. See Chapter 2, Bridge Inspection Program Records covering Owner's records.

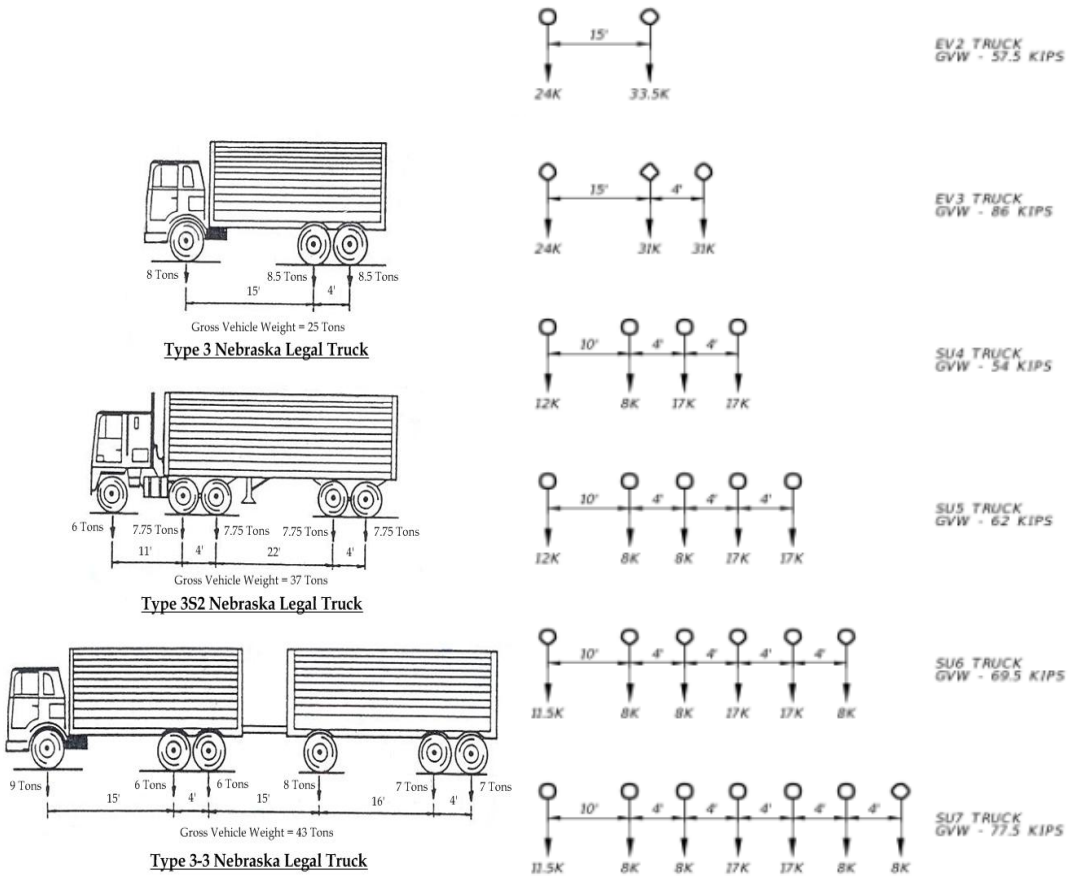
NDOT has developed a Bridge Document Management System (BDMS) that is an archive of data and plans that have been compiled from information available from a variety of sources for both state and non-state bridges. The BDMS contains plans, measurements, shop plans, inspection reports, inspection photos and load rating information. NDOT can only accept plans in electronic format for inclusion in the archive.

This ftp site is available for Bridge Owners, FHWA and consultants via password. Bridge Owners may use the ftp site as a location for backup of their documents. Bridge Owners must still maintain the official Bridge File on site (See Chapter 2, Bridge Inspection Program Records).

DRAFT

5.6 NEBRASKA LEGAL TRUCKS

Load ratings are completed for seven types of legal trucks as well as for design loading as required by AASHTO. Type 3 and Special Hauling Vehicles (SHVs) SU4, SU5, SU6, and SU7 are all single units. Load rating vehicles are representative of trucks typically using roads in the United States.



Nebraska Legal Trucks



- Single Unit Truck: Type 3 and SU4, SU5, SU6, and SU7
- Type 3S2
- Type 3-3

Typical Truck Configurations for Posting Sign

These photos generally depict the configuration of each legal truck.



NE Type 3



NE Type 3S2



NE Type 3-3

DRAFT

These photos generally depict the configuration of SHVs.



SU4



SU5



SU6



SU7

DRAFT



EV2



EV3

DRAFT

EV load rating and posting bridges provision only apply to the Interstate highways and routes within reasonable access to the interstate or within at least one-road mile distance from entrance to interstate.

5.7 BRIDGE LOAD POSTING

5.7.1 General

The Bridge Owner must have a current load rating in the Individual Bridge Record at the Owner's office. The load rating shall be prepared by a LRE and documented on the Load Rating Summary Sheet which shall be accessible to determine load capacities and postings.

Bridges capable of carrying Nebraska legal truck loads do not require posting. A bridge shall be load posted at the Recommended Posting from the LRE shown on the LRSS for the Nebraska legal trucks. All bridges requiring posting shall be posted at the operating level or below.

The LRE notifies the Bridge Owners if a structure's load rating indicates load posting is required or if the bridge should be closed due to the load rating.

All bridges with a load rating less than 3 Tons at the operating level for any legal truck shall be closed and barricaded to all traffic.

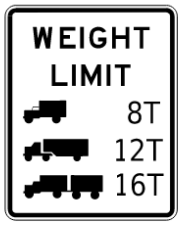
NDOT does not issue load permits on bridges that are posted or Recommended Posting. Permit load rating should be used only if the bridge has a rating factor greater than 1.0 when evaluated for NE legal loads.

See Section 5.4, Deadlines for this work in this Chapter.

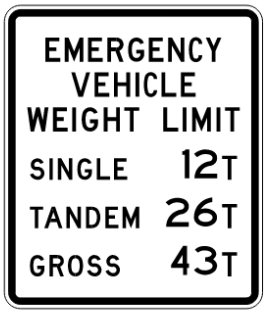
5.7.2 Bridge Weight Limit Signs



R12-1
24"x30"
White with black letters.



R12-5
30"X36"
White with black letters.



R12-7
Two lane highway size: 30"x36". Place approximately 200'-300' in advance of bridge.
Expressway/freeway size: 48"x60". Place approximately 500' in advance of bridge.

The weight limit sign shall be used to indicate restrictions pertaining to total vehicle weight including cargo.

The R12-5 three-truck sign shall be used on all Arterial and Collector Roads as classified by the NE Board of Public Roads Classifications and Standards. The R12-5 sign shall also be used on roads classified as Local Roads when the local road experiences heavy vehicles that support a site-specific operation, such as a feed lot.

NDOT recommends that Bridge Owners use the R12-5 sign showing three truck-posting for **all** structures that require load posting. Note that on the R12-5 sign, the top line showing the Type Single Unit (TSU) tonnage is governed by the lowest of Nebraska Type 3, SU4, SU5, SU6 or SU7 that has a rating factor less than 1.0. The R12-1 single limit sign, which would show the lowest tonnage truck, unnecessarily limits the use of the structure.

For examples of vehicles governed by a given truck and their legal maximum load limits see Section 5.6, Nebraska Legal Trucks.

Weight limit signs should be installed in accordance with the MUTCD. NDOT also recommends that advance notice signs be installed at the intersections closest to the load posted bridge.

5.7.3 Data from the Load Rating Summary Sheet

For reference, a full Load Rating Summary Sheet (LRSS) example can be found in Section 5.10.2.

In the "Ratings and Loads" section, the "Legal" column contains the values **calculated** by the LRE for each of the Nebraska legal trucks.

The Owner shall not load post a bridge higher than values shown in the LRSS.

If any values shown in the LRSS are less than the gross vehicle weight (GVW) for the Nebraska trucks, then the bridge must be load posted.

If any values shown in the LRSS are **more** than the gross vehicle weight for the Nebraska trucks, no load posting is required for that vehicle.

A value of "N/A" indicates that posting is not required for that specific truck.

See the example that follows.

DRAFT

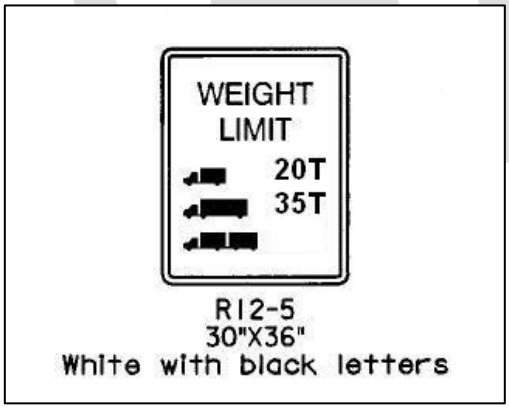
The LRSS shows these values.

Ratings and Loads

Deck (058) : 8 Very Good
Superstructure (059) : 7 Good
Substru
Design Load (031) : 4 M 18 (H 20)
Operating Type (063) : 1 LF Load Factor
Inventory Type (065) : 1 LF Load Factor
Wearing Surf

Truck	Inventory Rating		Operating Rating		Legal		Posting Value (tons)
	Rating Factor	Tons	Rating Factor	Tons	Rating Factor	Tons	
HS-20	0.58	11.6					N/A
HS-20			0.71	25.5			N/A
SU4					0.84	20.1	-
SU5					0.76	23.5	-
SU6					0.68	23.6	-
SU7					0.64	24.8	-
NE Type 3					0.94	23.5	20
NE Type 3S2					0.97	35.8	35
NE Type 3-3					1.04	44.7	43
EV2					0.49	14.00	14
EV3					0.35	15.13	15

The three-truck posting sign would look like the following. Note the Type Single Unit is controlled by the SU4 loading and this value is placed in the "Recommended Posting" location for the Type 3 vehicle. Also, since the capacity of the bridge for the Type 3-3 vehicle exceeds the vehicle's weight, the legal load is blank on the sign.



The single-truck posting sign would look like the following. Note that NDOT recommends using the three-truck sign for all roads. An Owner may use the single-truck signs, but only on local roads.

DRAFT



For additional information, see Chapter 3 SNBI Items B.EP.03 (Posting Type) and B.EP.04 (Posting Value).

5.8 SITUATIONS REQUIRING NEW OR UPDATED LOAD RATING OR ASSESSMENT

There are certain situations where a new or revised load rating is required. There are other cases where an LRE assessment of the structure is required, and the LRE determines the need for a load rating. These cases are described in this Section.

5.8.1 New Bridges

All new bridges shall be load rated prior to opening to public traffic.

5.8.2 Reconstructed Bridges

Bridges that have been reconstructed as per BIP 1.3.3.2.3 may require a load rating if the work has altered the structural or geometric capacity.

5.8.3 Repaired Bridges

Repair, in general, is work to bring the bridge back to its prior condition. Repairs are often made due to deterioration (typically section loss) for a Critical Finding found during inspection. There usually is no need for a Professional Engineer (PE) to develop plans for this work; however, repair often corrects a deficiency that, when repaired, increases load capacity and likely the load rating. In these cases, a LRE must assess the structure to determine if a load rating needs to be completed.

Examples include:

- Girder end repairs
- Emergency repair consists of any repair or alteration of a damaged element (e.g. girder stuck by over-height vehicle)
- Repair to address a critical finding or another finding

5.8.4 Change in Condition Found During Inspection

Existing bridges that are found during inspection to have additional member section loss or damage affecting section properties observed as compared to the prior inspection shall be assessed by a LRE for possible rerating.

The following situations for Item B.C.01 (Deck Condition Rating), Item B.C.02 (Superstructure Condition Rating), Item B.C.03 (Substructure Condition Rating), or Item B.C.04 (Culvert Condition Rating) may also trigger an assessment by a LRE for possible rerating:

- Condition rating drops to 4, Poor Condition; or 3, Serious Condition
- In the judgment of the inspector the condition is significantly different relative to that shown on the LRSS
- Changes in configuration (due to widening of the bridge, bridges made continuous, etc.)
- Changes in dead loads (due to overlay application, barrier changes, utility attachments, etc.)
- Cracking in primary members
- Losses at critical connections
- Bridge rehabilitation that affects structural components, structural or non-structural weight
- Structural damage resulting from a bridge hit, ice damage, flood damage, fire damage, or another cause
- Rotated or displaced beams
- Steel section loss
- Broken welds or missing bolts
- Exposed reinforcing or prestressing steel in the critical locations
- Splitting, cracking, or rotting of timber members

Note that the above list is not all inclusive and items may overlap with others.

When a bridge inspection results in the condition rating (Item B.C.01 (Deck Condition Rating), Item B.C.02 (Superstructure Condition Rating), Item B.C.03 (Substructure

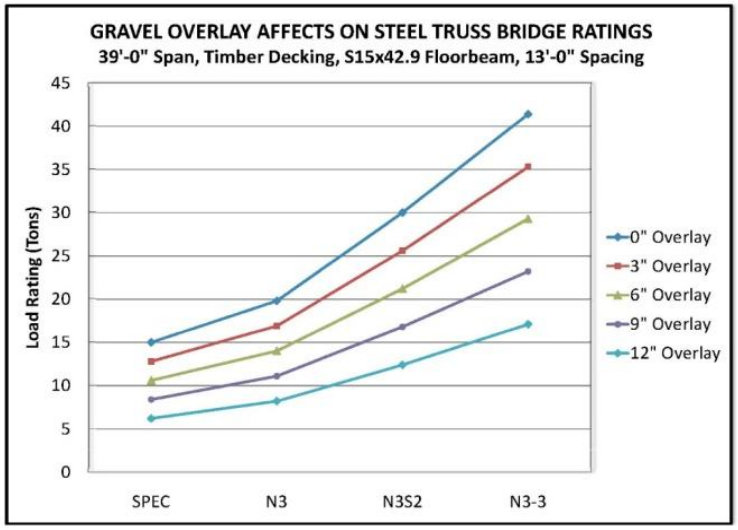
DRAFT

Condition Rating), or Item B.C.04 (Culvert Condition Rating) of 2 or less, the structure should be closed to traffic.

5.8.5 Change in Overburden Dead Load

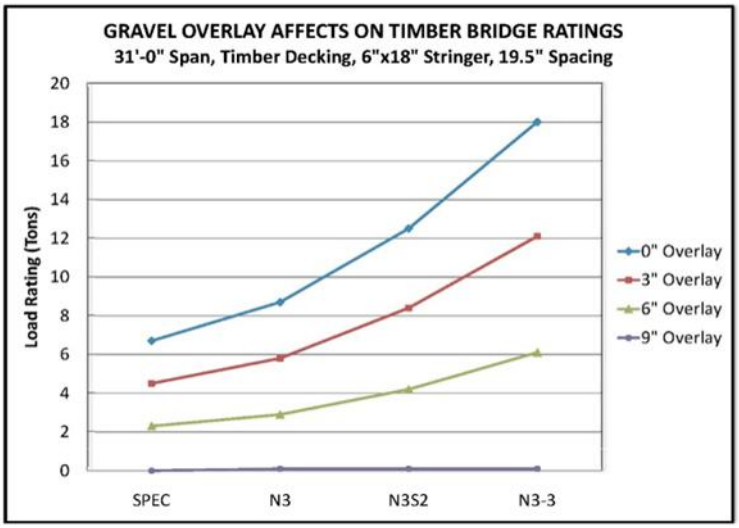
Existing bridges that are found during inspection to be supporting increased dead load, such as a thicker layer of gravel, or having received an overlay of an existing deck, shall be assessed by a LRE to determine if it will be rerated. Similarly, bridges that have been cleaned of gravel should be load rated for the new conditions.

Excessive overburden of gravel significantly affects the available load capacity. The following graphs, for illustrative purposes only, show the dramatic reduction in available capacity with increasing thickness of gravel overburden for various Nebraska legal truck types and for two structure types that are typical in rural Nebraska. The Special Vehicle shown in the following graphs is a typical modern tractor pulling a grain wagon with a single 25 Ton axle.



Floor Beams of a Three-Panel Pony Truss

DRAFT



Timber Stringer Bridge

DRAFT

5.9 INVENTORY ITEMS RELATED TO DESIGN LOAD, RATING AND POSTING

The LRE determines the values shown in the following table.

SNBI and NE Inventory Items related to Design Load, Load Rating and Load Posting

I = Initial – recorded initially and updated, when necessary, but would not typically change from inspection to inspection
EI = Each Inspection – verified and/or updated by the inspector during each inspection
C = calculated – automatically calculated and stored by FHWA and not recorded during inspections or reported to FHWA
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into BrM when changed
P = prepared by

Item No.	Item Name	Frequency	PM Staff	TL	LRE	Coding (See Chapter 3 SNBI or NE for complete detail.)
B.LR.01	Design Load	I	I			
B.LR.02	Design Method	I	E		P	
B.LR.03	Load Rating Date					
B.LR.06	Operating Load Rating Factor	I	E		P	
B.LR.04	Load Rating Method	I	E		P	
B.LR.05	Inventory Load Rating Factor	I	E		P	
B.LR.07	Controlling Legal Load Rating Factor	I				
B.LR.08	Routine Permit Loads	I				
B.PS.01	Load Posting Status	EI	I	E		See Chapter 3 SNBI Table 15
B.PS.02	Posting Status Change Date	EI				
B.EP.01	Legal Load Configuration	I				
B.EP.02	Legal Load Rating Factor	I				
B.EP.03	Posting Type	EI	I			
B.EP.04	Posting Value	EI	I			
~~203A~~	~~Posted Weight Limit Truck 1*~~	~~EI~~		~~E~~		~~As found by the TL. Superseded.~~
~~203B~~	~~Posted Weight Limit Truck 2~~	~~EI~~		~~E~~		~~As found by the TL. Superseded.~~
~~203C~~	~~Posted Weight Limit Truck 3~~	~~EI~~		~~E~~		~~As found by the TL. Superseded.~~
~~380~~	~~Percent of Stress Reduction~~					~~Void~~
381	Rating Program Used		E		P	
~~384~~	~~HS Inventory Rating~~					~~No longer used in the NE Inventory~~
~~385~~	~~HS Operating Rating~~					~~No longer used in the NE Inventory~~
386A	Load Rating for NE Legal truck, Type 3, SU4, SU5, SU6 or SU7	EI	E		P	Recommended for current bridge condition
386B	Load Rating for NE Legal truck, Type 3S2	EI	E		P	Recommended for current bridge condition
386C	Load Rating for NE Legal truck, Type 3-3	EI	E		P	Recommended for current bridge condition

~~* This is the governing weight limit of the following vehicles: NE Legal Truck Type 3 and SHVs SU4, SU5, SU6, and SU7~~

DRAFT

Load Rating Engineers should be familiar with FHWA Memorandum *Bridge Load Ratings for the National Bridge Inventory*, October 30, 2006. Coding methods first were revised in 2004 to allow reporting of rating factors for all rating methods (Load and Resistance Factor, Load Factor and Allowable Stress). In 2012, NDOT began reporting rating factors to FHWA. As of the 2022 SNBI, FHWA requires reporting in rating factors, versus Tons, for all structures.

5.10 LOAD RATING VEHICLES

Illustrations of the Nebraska legal trucks (including SHVs) are shown previously in Section 5.6. These illustrations show the axle spacing and axle loads. The following table summarizes these trucks.

Vehicle Type	Type	NE ID for load rating	AASHTO Weight	Nebraska Legal Weight	Max Wheel Load (half axle)
H20	Design		20 Tons	n/a	16,000 lbs
HS20	Design		36 Tons	n/a	16,000 lbs
H12.5	Design			12.5 Tons	10,000 lbs
HS12.5	Design			22.5 Tons	10,000 lbs
Type 3	Load Rtg	3*	25 Tons	25 Tons**	8,500 lbs
Type 3S2	Load Rtg	N3S2	36 Tons	37 Tons**	7,750 lbs
Type 3-3	Load Rtg	N3-3	40 Tons	43 Tons**	9,000 lbs
SHV SU4	Load Rtg	SU4	27 Tons	27 Tons**	8,500 lbs
SHV SU5	Load Rtg	SU5	31 Tons	31 Tons**	8,500 lbs
SHV SU6	Load Rtg	SU6	34.75 Tons	34.75 Tons**	8,500 lbs
SHV SU7	Load Rtg	SU7	38.75 Tons	38.75 Tons**	8,500 lbs
EV EV2	Load Rtg	EV2*	28.75 Tons	28.75 Tons**	16,750 lbs
EV EV3	Load Rtg	EV3*	43 Tons	43 Tons**	15,500 lbs
HL-93	Design		36 Tons***	n/a	16,000 lbs

*	AASHTO Type 3 and Nebraska Type 3 have the same axle weight and
**	spacing.
***	Nebraska Rating Vehicles
	Truck Only. Consult the AASHTO MBE for lane live loads and for loading in spans greater than 200 feet.

SNBI Inventory and Operating Rating Factors (Items B.LR.05 and B.LR.06) must be calculated for the applicable AASHTO design truck for multiple lanes (where applicable) and impact.

Inventory (see Section 5.11.6.1) and Operating (see Section 5.11.6.2) load ratings must be calculated for the Nebraska legal trucks Type 3, Type N3S2, Type N3-3, SU4, SU5, SU6, and SU7 for multiple lanes (where applicable) and impact. Wheel loads for analysis shall be equal to half of the axle load for a given truck.

DRAFT

5.11 LOAD RATING DOCUMENTATION AND REPORT

It is important that the documentation of the load rating for each bridge is a complete record of the load rating. It should reference the inspection report and the inspection date that are the basis of the load rating. This will ensure that concise and complete data is available in the future should the structure need to be rerated due to structure modification or condition deterioration.

The Load Rating Report will include all load rating documentation and include the electronic file(s) used to perform the analysis. The Report will be sealed, signed and dated by the LRE, in accordance with the Nebraska Engineers and Architects Regulation Act.

5.11.1 Load Rating Report Contents

The Load Rating Report at a minimum shall include the following:

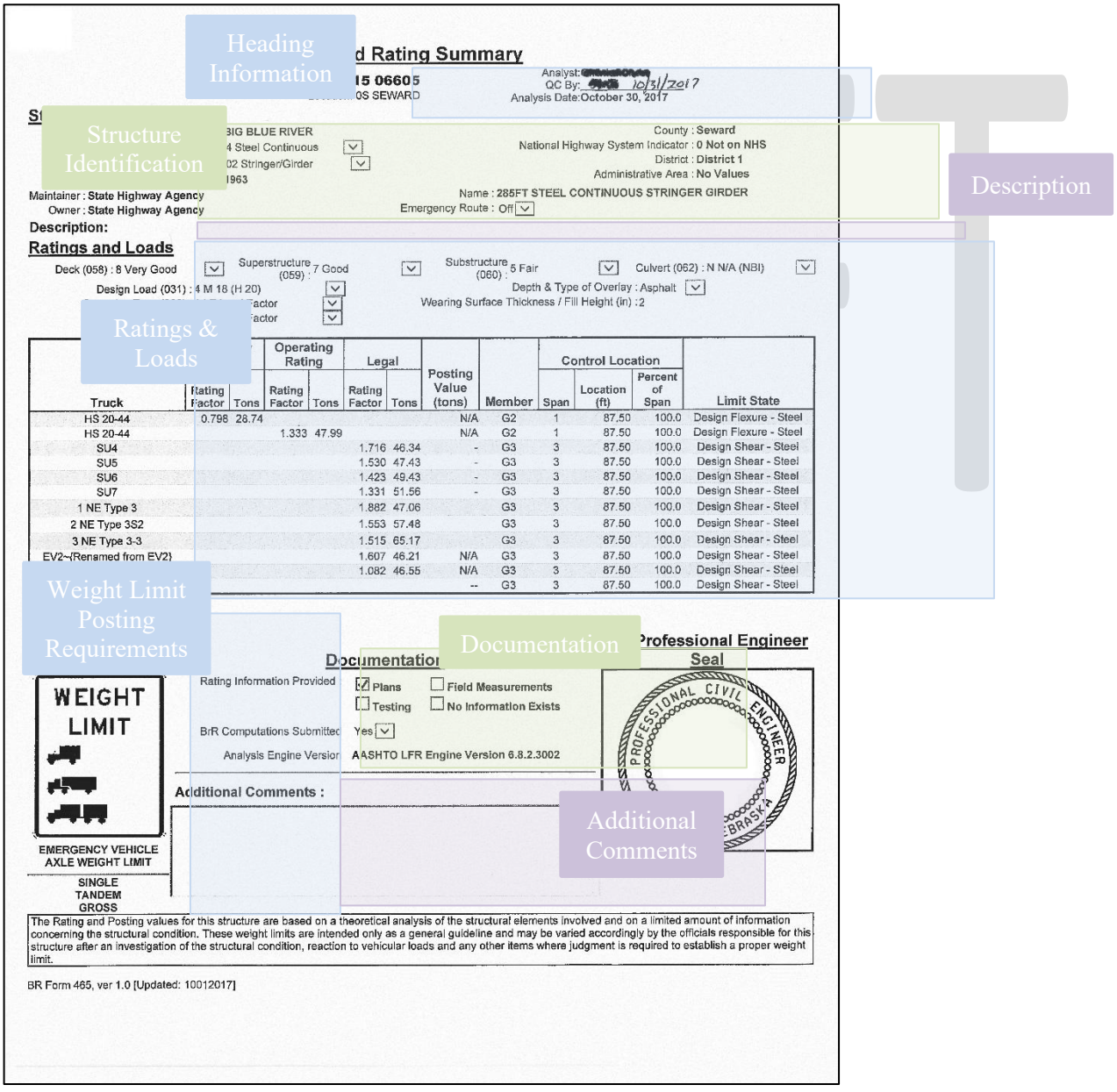
- Load Rating Summary Sheet: It is recommended that the LRSS be placed as the first page of the report.
- AASHTOWare BrR model in .xml format.
- Any additional calculations required beyond the BrR model.
- Load rating method or program(s) used
- List of references used in the load rating analysis
- Assumptions
- Limit states
- Rating factors and load capacity for each applicable legal and routine permit vehicle
- Geometric and material summary of the bridge
- The inspection report showing the inspection date and the condition that generated the need for rerating.
- Documentation of section reduction for members including sketches or photographs, if taken.
- Controlling member and location
- Changes in dead load force effects
- Purpose for load rating (e.g.: initial, deterioration change, loading condition change, etc.)
- Safe posting load, as necessary, for each applicable legal and routine permit vehicle
- Summary of bridge ratings
- The person completing the QC shall initial and date all pages of the Report. An electronic copy of the Report shall be submitted to NDOT. See Section 5.4, Deadlines in this Chapter. A copy must be furnished to NDOT either by the Owner or, at the direction of the Owner, by the LRE.

DRAFT

5.11.2 Load Rating Summary Sheet

All Nebraska bridges in the Bridge Inventory that are reported to FHWA will have a Load Rating Summary Sheet (LRSS). The LRSS includes a summary of the load rating results for AASHTO load, Nebraska legal trucks, and other general results and comments on the load rating. The LRSS summarizes key information related to the load rating and the life of the bridge. Instructions for completing the LRSS are provided with the form; additional guidance is given in this section.

The Bridge Owner retains the sealed, signed and dated LRSS by the Load Rating Engineer in the Bridge Owner's Bridge Record.



5.11.2.1 Heading Information Section

- **Structure ID**: Enter the structure identification number.
- **Location**: Enter the bridge location.
- **Analyst**: This shall be the engineer performing the load rating. The Analyst can be the same as the Engineer of Record (the LRE) for the load rating. Enter the Analyst using the first initial and last name. For example, F. Last.
- **QC By**: This shall be an individual of equivalent or better qualifications than the analyst who has performed quality control of the load rating. Enter the QC individual using the first initial and last name. For example, F. Last. For more information on Quality Control see Section 5.12.
- **Analysis Date**: Enter the date that the load rating was performed in Month Day, Year format. For example, February 22, 2017. If there are multiple days, use the latest date.

5.11.2.2 Structure Identification Section

- **Feature Intersected:** Enter the name of the major feature intersected by the structure.
- **Material Main Span:** Select the appropriate option from the dropdown menu.
- **Design for Main Span:** Select the appropriate option from the dropdown menu.
- **Year Built:** Enter the 4-digit year that the structure was built. If the year built is unknown, enter "Unknown" in the field.
- **Maintainer:** Select the appropriate option from the dropdown menu.
- **Owner:** Select the appropriate option from the dropdown menu.
- **County:** Select the appropriate option from the dropdown menu.
- **National Highway System Indicator:** Select the appropriate option from the dropdown menu.
- **District:** Select the appropriate option from the dropdown menu.
- **Administrative Area:** Select the appropriate option from the dropdown menu.
- **Name:** Enter the structure name, if applicable.
- **Emergency Route:** Select the appropriate option from the dropdown menu.

5.11.2.3 Description Section

This field should contain a brief description of the structure type and basic geometric layout. Enter information such as span lengths, continuous or simple spans, deck material and thickness, overlay material and thickness, and skew.

DRAFT

5.11.2.4 Ratings and Loads Section

- **Deck Interaction (B.SP.08):** Select the appropriate option from the dropdown menu.
- **Design Load (B.LR.01):** Select the appropriate option from the dropdown menu.
- **Design Method (B.LR.02):** Select the appropriate option from the dropdown menu.
- **Load Rating Method (B.LR.04):** Select the appropriate option from the dropdown menu.
- **Fatigue Detail (B.IR.02):** Select the appropriate option from the dropdown menu.
- **Deck Condition Rating (B.C.01):** Select the appropriate condition rating from the dropdown menu.
- **Superstructure Condition Rating (B.C.02):** Select the appropriate condition rating from the dropdown menu.
- **Substructure Condition Rating (B.C.03):** Select the appropriate condition rating from the dropdown menu.
- **Culvert Condition Rating (B.C.04):** Select the appropriate condition rating from the dropdown menu.
- **Depth & Type of Overlay:** Enter the overlay material type. If there is no overlay, enter "None".
- **Wearing Surface Thickness/Fill Height (in):** Enter the thickness/height of the wearing surface or overlay in inches in decimal format. If there is no overlay, enter "None".
- Rating Table:
    - **Truck column:** Four fields are available to the user to input AASHTO and NDOT trucks evaluated during the load rating.
    - **Inventory Rating and Operating Rating columns:** These columns correspond to the AASHTO trucks. Enter the rating factor and the corresponding tonnage with two decimal places into the available fields. Note that Inventory Rating is the first line and Operating Rating is the second line.
    - **Legal column:** This column corresponds to the Nebraska Legal trucks, including Special Hauling Vehicles and Emergency Vehicles if required. Enter the rating factor with two decimal places. The corresponding tonnage will be calculated.

DRAFT

- **Posting Value (P.EP.04)** column: Since weight limit postings are based on the legal trucks and emergency vehicles (if required) the only editable fields are those associated with NE Type 3, NE Type 3S2, NE Type 3-3, EV2, and EV3. Enter the recommended posting in tons as the Legal tonnage rating rounded down to the nearest whole number. The reported posting value shall be the Type Single Unit (TSU) tonnage which is governed by the lowest tonnage of Nebraska Type 3, SU4, SU5, SU6 or SU7 that has a rating factor less than 1.0.
- **Member column:** Enter the name of the member that controls the rating for the associated truck.
- **Control Location columns:** Enter the span number, the distance in feet from the start of the span, and percentage along the span at which the controlling location occurs for each truck.
- **Limit State column:** Enter the limit state which controls the rating for each associated truck.
- **Weight Limit Posting Requirements:** Enter the tonnages from the Recommended Posting (tons) column into the sign diagram as appropriate. For more information about load posting see Sections 5.6 and 5.7.

5.11.2.5 Documentation Section

- **Rating information provided:** Select the appropriate documentation available for the structure. More than one option may be selected.
- **BrR Computations Submitted:** Select the appropriate option from the dropdown menu.
- **Analysis Engine Version:** Enter the version of the software utilized to perform the load rating.

5.11.2.6 Additional Comments Section

The purpose of the Additional Comments section of the LRSS is to provide a complete summary of the condition of the structure and is meant to convey key information needed by Highway Superintendents and their maintenance staff as well as engineers who might be rerating the bridge in the future. The comments should include the following:

Statement of instructions to the Bridge Owner if posting sign revision is needed (see following examples)

Date of inspection report documenting the condition that generated the need for rerating

Documentation of critical findings and/or maintenance issues

DRAFT

Recommendation to improve the load rating

Bracing conditions considered in the load rating of timber stringers. For example, if planks are nailed into the top of the stringer or are encased in a concrete deck

The effect of gusset plates in the structure on the load rating, especially if they govern the load rating

The names of AASHTOWare BrR files for the load rating

Major assumptions used in the analysis

Examples of comments would include these types of statements:

- "This structure is currently posted at XX Tons."
- "This structure is currently posted at XX, XX and XX Tons for truck TSU (type single unit), Type N3S2, and Type N3-3, respectively."
- "The structure load rating is shown above, and is greater than the legal limits for Nebraska legal trucks; load posting is not required."
- "The structure load rating is shown above, and is lower than the legal limits for Nebraska legal trucks; load posting is required."
- "The structure load rating is shown above, and is lower than the current posting of XX Tons. Load posting must be adjusted accordingly."
- "This structure is currently not posted. The structure load rating is shown above and the structure needs to be load posted accordingly."
- "This structure has no existing plans. Based on the inspected condition of the structural elements, this structure is deemed to safely support loads in accordance with the NDOT Bridge Rating Table for Concrete Bridges with No Existing Plans."

5.11.3 Load Rating Computational Means – General Guidance

The following table is a summary of computational means generally used by NDOT for load rating of bridges and is provided as guidance for those performing load ratings. The Load Rating Engineer for any bridge is responsible for using good engineering judgment in the selection of the appropriate computational means.

General Guidance on Load Rating Computational Means	
Superstructure Element	
Concrete slab, simple and continuous	AASHTOWare BrR
Concrete girder, CIP, simple and continuous	AASHTOWare BrR
PS Concrete slab, continuous	Structural analysis software or other custom tools
PS Concrete NU or AASHTO girder, simple and continuous	AASHTOWare BrR

PS Concrete IT girder, simple and continuous	AASHTOWare BrR
PS Concrete double tee beam	AASHTOWare BrR
PS Concrete, hollow core slab	AASHTOWare BrR
Steel, rolled beam stringer, simple or continuous	AASHTOWare BrR
Steel, plate girder, simple or continuous	AASHTOWare BrR
Steel, truss	AASHTOWare BrR
Timber, stringer	AASHTOWare BrR
Steel culverts	AASHTOWare BrR
Concrete culverts	AASHTOWare BrR
Secondary superstructure element	
Concrete, deck	Structural analysis software or other custom tools
Timber, deck	Structural analysis software or other custom tools
Steel, floor beams transverse to traffic	AASHTOWare BrR
Concrete floor beams transverse to traffic	Structural analysis software or other custom tools
Substructure elements	Structural analysis software or other custom tools

5.11.4 Load Rating with Software

NDOT uses AASHTOWare BrR software for bridge ratings on state bridges. NDOT requires that other Bridge Owners and their Consultants use AASHTOWare BrR software to maintain the uniformity of the Nebraska Bridge Inventory database.

Load ratings completed with software must be completely and permanently documented. Permanent records should be the electronic AASHTOWare BrR model in .xml format.

5.11.5 Load Rating Methods

The following is a summary of load rating methods. See FHWA Memorandum *Bridge Load Ratings for the National Bridge Inventory*, October 30, 2006, for additional information on methods to be used for a given bridge.

5.11.5.1 Allowable Stress Rating (ASR)

Allowable Stress Rating method compares unfactored load effects and stresses to an allowable stress for a given material in accordance with the MBE. NDOT's policy is to use the ASR method only on timber and masonry elements.

5.11.5.2 Load Factor Rating (LFR)

Load Factor Rating method compares factored load effects and stresses to the strength of a member of a given material, which typically is less than a material's strength limit. NDOT's policy is to use LFR for steel and concrete elements.

5.11.5.3 Load and Resistance Factor Rating (LRFR)

Load and Resistance Factor Rating method compares factored load effects to the resistance of a member of a given material in accordance with the MBE LRFR. FHWA requires that bridges and total replacement bridges designed after October 1, 2010 be designed by LRFD Specifications using HL-93 design load. Load rating values are to be computed and reported to the NBI as a Rating Factor based on LRFR methods using HL-93 loading.

5.11.6 Load Rating Levels

Load rating levels are defined in the MBE and are briefly summarized in this section.

5.11.6.1 Inventory Level

The AASHTO MBE states that "Inventory rating level generally corresponds to the design level of stresses but reflects the existing bridge and material conditions with regard to deterioration and loss of section. "Load ratings based on the Inventory level allow comparisons with the capacity for new structures and, therefore, results in a live load which can safely utilize an existing structure for an indefinite period of time."

"Inventory Level corresponds to the design level capacity with consideration of member condition and loss of section. Load effects are compared to the calculated Inventory Level capacity."

5.11.6.2 Operating Level

The AASHTO MBE states that "Operating rating level generally describes the maximum permissible live load to which the structure may be subjected. Allowing unlimited numbers of vehicles to use the bridge at Operating level may shorten the life of the bridge."

"Operating Level corresponds to the maximum permissible level of load capacity with consideration of a member condition and loss of section. Load effects are compared to the calculated Operating Level capacity."

DRAFT

5.11.6.3 Posting Level

Posting Level corresponds to a load capacity selected by the governing state agency for load posting bridge structures. NDOT's policy is that a bridge will need posting if the load effects exceed the maximum permissible level of load capacity, i.e. Operating Level. It should be noted by consultants completing load ratings for bridges in Nebraska that other states' posting policies can vary and may be at a level between Inventory and Operating Level.

5.11.7 Analysis Considerations

See the Material-Specific Considerations Sections 5.11.8 (steel), 5.11.9 (concrete), 5.11.10 (timber) and 0 (other) for additional information.

5.11.7.1 Span lengths

The distance between the centerlines of bearing is used for the span length for analysis purposes.

5.11.7.2 Bridge Cross Section and Roadway Width

A bridge with a sidewalk/shoulder without an accepted or approved crash tested barrier on the traffic side will be analyzed as though the entire bridge width were available for traffic to occupy.

5.11.7.3 Load and Distribution Factors

Parameters such as load factors and distribution factors shall be determined by the LRE using the latest applicable AASHTO Manuals.

Distribution factors for corrugated metal decks with asphalt or gravel fill should use S/3.75 for stringers in multi-stringer bridges.

5.11.7.4 Dead Load

For supplementary dead load components on truss bridges, an increase as a percentage of the component dead load should be included. This percentage is to be based on the engineering judgment of the LRE, but no less than 5% of the dead load of the primary members.

5.11.7.5 Strength / Resistance

The evaluation of a deteriorated bridge member must use the "section remaining" to resist the load in determining the most critical primary structural element.

DRAFT

5.11.7.6 Deck Load Rating

Wheel loads to be used for deck load rating shall be the maximum wheel load for the rating vehicles. The load rating of a deck can governs the overall rating of a bridge. If it does, this needs to be noted in the LRSS. See more information in the sections of this Chapter on Material-Specific Considerations.

5.11.8 Material-Specific Considerations - Steel

5.11.8.1 Strength / Resistance

Operating and Inventory strength and resistance shall be determined by the engineer using the latest applicable AASHTO Manuals.

When bridge plans are nonexistent, data collection, inspection and field measurements will be required.

For steel structures with an unknown date of construction, yield stress should be based on best available information. In the absence of other data, it should be assumed that the structure was built prior to 1905 (see MBE LRFR Table 6-11).

5.11.8.2 Nonredundant Steel Tension Member (NSTM) Structures

Steel fracture critical structures with fatigue prone connection details (pins, gusset plates, welds on NSTM members in tension, etc.), require connections to be rated if the connection shows any sign of deterioration, or if the dead load supported by the structure has increased over that originally imposed on the bridge. The LRE should evaluate the fatigue of the detail with due consideration of the AADTT.

5.11.8.3 Steel Thru-girders

Compression flanges of thru girders shall be assumed to be braced if knee bracing is present and floor beams are attached to vertical transverse stiffeners that are attached to the compression flange.

5.11.8.4 Plate Girder Shear Capacity

Stiffeners should be included in the determination of the shear capacity. Bridge records and inspection reports should indicate stiffener size, weld size and spacing.

5.11.8.5 Members from Elements

Girders that have been fabricated from plates, angles and channels may be modeled as plate girders. Channels may be modeled as plate girders.

DRAFT

5.11.8.6 Steel Truss Members

If trusses have eye bars that are loose, cracked or gapped, they shall not be considered effective when calculating a load rating. Eye bars with forged seams should be noted on the LRSS Additional Comments, but the member may be considered effective when calculating a load rating.

5.11.8.7 Gusset Plates

Bridge owners are required to check the capacity of gusset plates as part of the load rating calculations conducted to reflect changes in condition or dead load, to make permit or posting decisions, or to account for structural modifications or other alterations that result in significant changes in stress levels.

5.11.8.8 Policy for Bracing by Deck – Expired, 2012

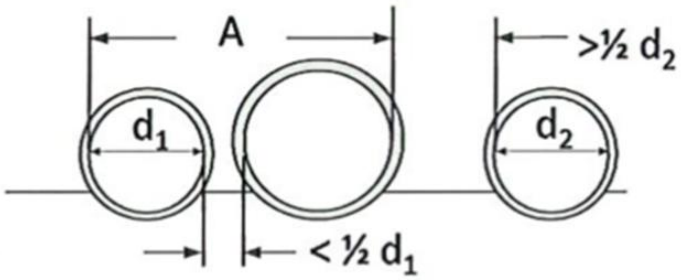
NDOT had established a policy for load rating bridges with longitudinal simple span steel beams supporting a concrete or timber deck with no or unknown lateral bracing. This policy expired January 1, 2012. NDOT continues to document and monitor those bridges that had invoked this policy in the load rating of the structure.

5.11.8.9 Corrugated Metal Pipe (CMP) Structures

Steel and aluminum CMPs should be load rated following the methodology in AASHTO LRFD Bridge Design Specifications. NDOT recommends load rating CMPs using BrR.

CMP Geometry

- Bridge Length = A (A>=20Ft)
- A is measured along the roadway centerline from inside faces of exterior walls.



Default soil properties

- Default soil unit = 120 pcf
- Saturated soil unit load =125 pcf
- At rest lateral earth pressure coefficient (LRFR) = 0.5
- Active lateral earth pressure coefficient (LRFR) = 0.33

5.11.9 Material-Specific Considerations - Concrete

Load ratings for concrete structures typically can be accomplished with software for the various types of beam/girder and slab bridges on Nebraska Roads. For concrete bridges without plans, see the subsequent section.

NDOT started to use prestressed bridges in the late 1950's. Concrete girder types on Nebraska bridges would include prestressed concrete AASHTO girders, NU girders, IT girders and double tee girders. There are some monolithically cast concrete girders in use. Slab type bridges include continuous concrete slabs, pre-cast non-prestressed slabs, hollow core slabs, and continuous post-tensioned slabs.

Concrete decks shall be rated according to a punching shear analysis. The rating shall be for the remaining sound concrete. The deck may be assumed to be unreinforced, unless the amount and condition of deck steel can be field verified. The LRE can assume temperature and shrinkage reinforcement, as defined by AASHTO Design Codes, as a maximum amount of steel present based on their engineering judgment.

5.11.10 Material-Specific Considerations - Timber

Timber is a frequently used material in floor systems of steel truss type bridges as well as in traditional longitudinal stringer bridges and on substructures on low volume roads. Evaluation of the load capacity of these existing timber members requires knowledge of the species and grade of the timber as well as consideration of the effects of any deterioration.

When bridge plans are nonexistent, data collection, inspection and field measurements will be required. NDOT has established the following definitions, policies, guidelines and procedures in order to establish uniformity in the evaluation of this material.

5.11.10.1 Elements to be Load Rated

Timber decks and stringers must be evaluated for load capacity and will be load rated.

Critical connections of timber bridges shall be evaluated if the connections are shown to have deterioration or signs of distress.

Timber substructures shall be evaluated if the structural elements are shown to have deterioration or signs of distress.

5.11.10.2 Timber Unit Weight

The unit weight for timber should be taken as 50 lbs per cubic foot.

DRAFT

5.11.10.3 Impact

Impact allowances should follow AASHTO methods and specifications.

5.11.10.4 Design Stress Values

Design stress values shall be based on species and grade as specified in the MBE when known or can be readily established. In the absence of this information the following values, including all adjustment factors except for the beam stability factor C_L, may be assumed according to the following:

Rough Sawn or finished lumber		
Allowable Stress	**Inventory**	**Operating**
Bending, F_b	1,050 psi	1,450 psi
Shear, F_v	65 psi	90 psi

Glulam Girders		
Allowable Stress	**Inventory**	**Operating**
Bending, F_b	1,600 psi	2,200 psi
Shear, F_v	120 psi	165 psi

No adjustment in the allowable stresses for timber is necessary for reasons of aging alone.

5.11.10.5 Timber Decks

Timber decks shall be rated according to an allowable bending moment capacity analysis and shear analysis based on the remaining sound timber and the assumed allowable stresses. The LRE and the inspection Team Leader should assess each deck for the need of re-load rating.

DRAFT

5.11.10.6 Lateral Bracing

The engineer performing the structural evaluation shall check the bracing conditions according to the AASHTO Standard Specifications for Highway Bridges, 17th Edition except when superseded by the policy below:

If lateral bracing is not present at the points of bearing but at least two intermediate diaphragms are present, lu shall be assumed to be equal to maximum of:

- The distance between the point of bearing and the first adjacent intermediate diaphragm; or
- The diaphragm spacing.

If the Deck Condition Rating (B.C.01) is greater than 4, the stringers may be considered laterally braced by:

- The embedment of the stringer into the concrete; or
- The continuous nailing of timber planks into the stringer.

For purposes of lateral stability analysis E = E' (as defined by AASHTO) = 1,000,000 psi may be assumed for use in the computation of wood stiffness, beam stability factor, CL, and the allowable compression in solid timber columns (both round and square) according to the AASHTO *Standard Specifications for Highway Bridges*.

In no case shall the value of CL be taken to be greater than 1.0.

CL shall be computed at inventory level using Fb* = 1,050 psi. Bending capacity at operating level shall be calculated by multiplying the final adjusted inventory capacity by 1.33.

5.11.10.7 Variable Stringer Spacing

In spans with variable stringer spacing, the live load distribution factors shall be computed based on the maximum of the stringer spacing.

5.11.10.8 Variable Material Strengths

In spans with stringers of variable material strengths (i.e. timber and steel), live load distribution factors shall be proportioned according to the relative stiffness of the applicable material types.

DRAFT

5.11.10.9 Stringer Condition and Capacity Calculation

Modeling the effective section capable of contributing to the resistance of applied loads within BrR will often be a matter of sound engineering judgment.

5.11.10.9.1 Broken Stringers

See Figure A, Broken Stringer that follows. If the separation extends a distance greater than one fourth the depth of the stringer, the stringer shall be considered **broken**. All **broken stringers** shall be assumed to have no contribution to capacity. Live load distribution factors of adjacent interior stringers shall be computed based on the maximum average of the stringer spacing on either side.

5.11.10.9.2 Cracked Stringers

See Figure B, Cracked Stringer that follows. A crack shall be defined as a complete separation of the wood across the grain; however, the separation must not extend vertically more than one-fourth the depth of the stringer.

Shear and bending strength will be determined based on the section remaining (i.e. according to the effective section depth). Shear increase factors shall **not** be applied.

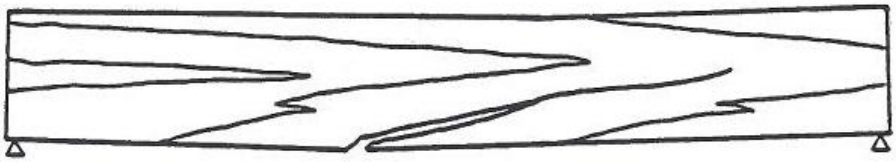
5.11.10.9.3 Split Stringers

See Figure C, Split Stringer that follows. A split shall be defined as a complete separation of the wood fibers parallel to the grain direction.

Splits extending **less than ¾ the length of the stringer shall not** be considered to affect member capacity and may be ignored. Splits extending **greater than ¾ the length of the stringer shall** be considered to affect member capacity and shall be analyzed using the section remaining. The section remaining used for rating shall be on the side of the split with the larger depth. Shear increase factors shall **not** be applied.

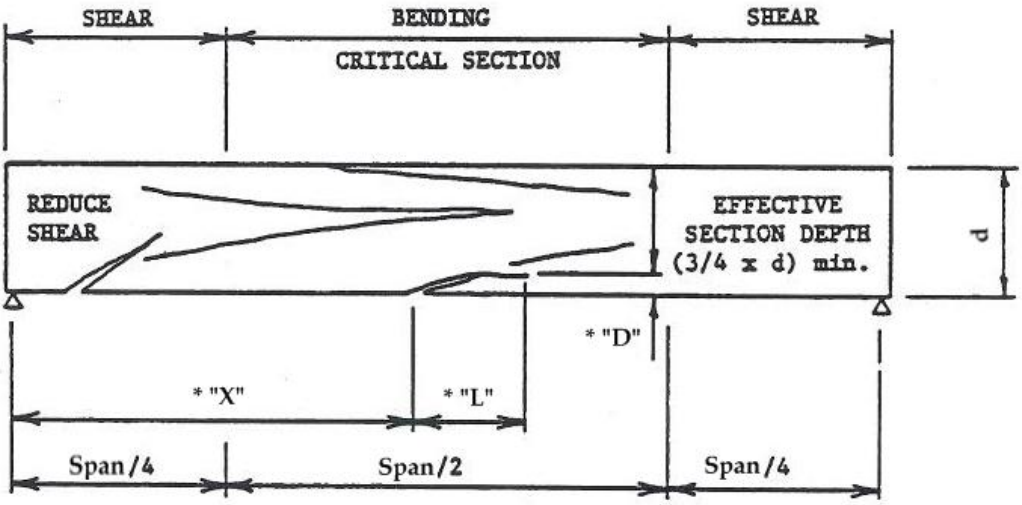
DRAFT

EVALUATING CONDITION OF TIMBER MEMBERS



BROKEN STRINGER

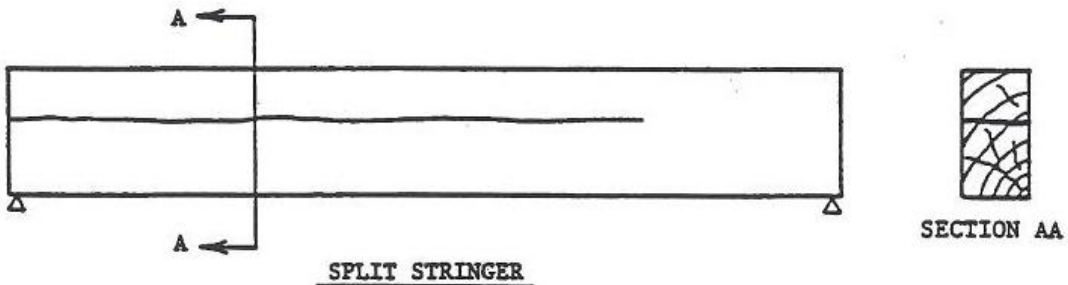
Figure A



* REQUIRES DIMENSION

CRACKED STRINGER

Figure B



SPLIT STRINGER

Figure C

5.11.10.9.4 Checked Stringers

See Figure D, Checked Stringer that follows. A check shall be defined as a separation of the wood fibers parallel to the grain direction resulting from stresses set up in wood during seasoning and usually extends across the annual growth rings.

Checks in a stringer may be on one or both sides. Checks need not be considered to affect member capacity and may be ignored.

5.11.10.9.5 Shaked Stringers

See Figure E, Shaked Stringer. A shake shall be defined as a separation of the wood fibers parallel to the grain which occurs between the annual growth rings as a result of the growth in the tree.

Shakes shall **not** be considered to affect member capacity and may be ignored.

DRAFT

5.11.10.9.6 Decayed Stringers

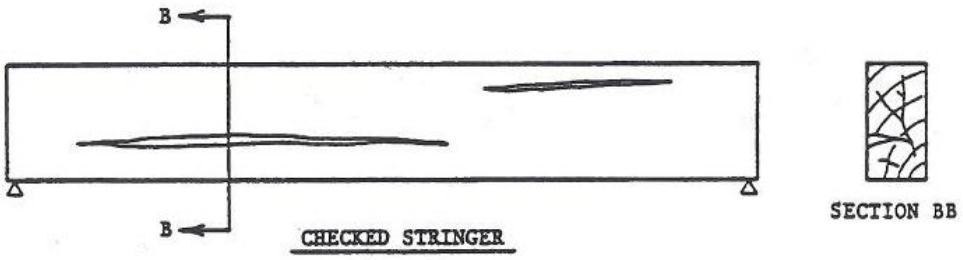
See Figure F, Decayed Stringer. Shear and bending strength will be rated based on the section remaining.

5.11.10.9.7 Knots in Stringers

A knot shall be defined as a separation of the wood fibers due to an inner-grown limb and associated grain deviation.

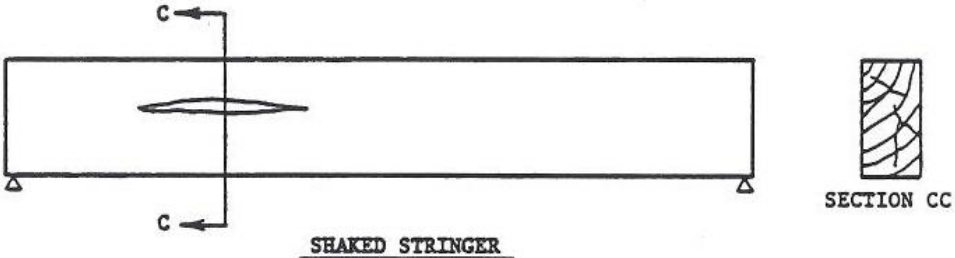
Knots located in high tensile stress areas (the middle half of simple spans) affect member bending capacity and will be determined based on the section remaining (i.e. exclude the knot from the effective section depth).

EVALUATING CONDITION OF TIMBER MEMBERS



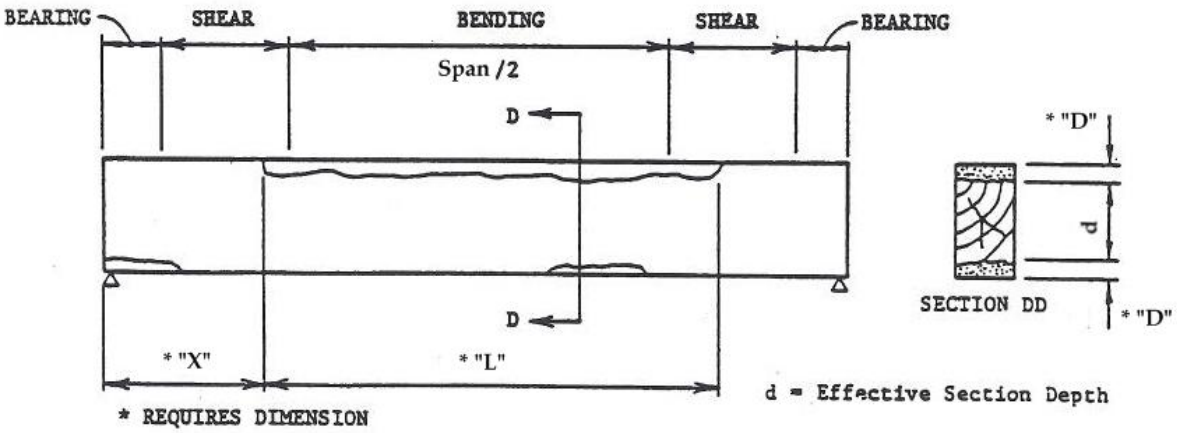
CHECKED STRINGER

Figure D



SHAKED STRINGER

Figure E



DECAYED STRINGER

Figure F

5.11.11 Material Specific Considerations - Other

There are a few bridges in Nebraska with atypical materials, including masonry and aluminum culverts. LREs are to consult with the NDOT Bridge Inspection Program Manager for load rating these structures.

5.11.12 Load Ratings for Bridges without Plans

5.11.12.1 General

Load rating should be determined by calculations based on plans and current conditions found in inspection reports. Steel and timber bridges without plans must be field measured to provide the LRE with the dimensional data necessary to complete the load rating. Field measurement forms are included in the Manual Appendix.

5.11.12.2 Load Rating Based on Load Testing

There are circumstances when load rating an individual structure by load test is needed. The Bridge Owner should make this decision on a case-by-case basis in consultation with their LRE. NDOT, however, believes that it is not advisable to perform load tests on concrete bridges with no plans.

5.11.12.3 Load Rating Based on Engineering Judgment

There may be cases where a load rating for a structure must be made with engineering judgment based on data available and the condition of the structure. The circumstances of the individual structure should be considered by the Bridge Owner in consultation with their LRE.

5.11.12.4 Concrete Decks on Steel Beams

Steel beam bridges with concrete decks that have no plans shall be rated as though there is no composite action between the steel girders and the deck.

DRAFT

5.11.12.5 Concrete Bridges

The load rating will be an evaluation based on the current inspection of the structural elements, the following table for concrete structures without plans, and the LRE's engineering judgment.

The Load Rating Summary Sheet Additional Comments section shall include a statement by the LRE. See Section 5.11.2 above.

NDOT Bridge Load Rating Table for Concrete Bridges without Plans
(Values shown in Tons. This table is subject to revision at NDOT discretion.)

Struc - ture	Condition Rating	HS Operating	HS Inventory	NE Type 3	NE Type 3S2	NE Type 3-3	SU4	SU5	SU6	SU7
CIP Slab	Good/Fair (Code > 4)	36	26	32	47	55	34	39	44	49
	Poor (Code = 4)	28	20	25	37	43	27	31	34	38
	Serious, Critical (Code < 4)	Evaluate*	Evaluate*	< 25	< 37	< 43	<27	<31	<34	<38
CIP Box Culvert	Good/Fair (Code > 4)	36	26	32	47	55	34	39	44	49
	Poor (Code = 4)	28	20	25	37	43	27	31	34	38
	Serious, Critical (Code < 4)	Evaluate*	Evaluate*	< 25	< 37	< 43	<27	<31	<34	<38
	Good/Fair (Code > 4)**	99	99	32	47	55	34	39	44	49
CIP Frame	Good/Fair (Code > 4)	36	26	32	47	55	34	39	44	49
	Poor (Code = 4)	28	20	25	37	43	27	31	34	38
	Serious, Critical (Code < 4)	Evaluate*	Evaluate*	< 25	< 37	< 43	<27	<31	<34	<38
	Good/Fair (Code > 4)**	99	99	32	47	55	34	39	44	49

* These values must be determined by a professional engineer by evaluating the structure for condition and determining safe loads at which the bridge should be posted. Posting should be less than state legal loads for this condition rating.

** For culverts where it is determined live load that has no effect due to the 7' depth of overburden. For culverts in poor condition disregard the depth of overburden and use values in the Poor or Posted condition.

NDOT does not issue load permits on any bridge for which plans are not available.

5.12 QUALITY CONTROL

The NBIS defines Quality Control (QC) as "procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level."

Quality Control is defined for NDOT's program as a system of routine technical activities to measure and control the quality of the bridge inventory data or report as it is being developed. The QC system is designed to include general methods such as accuracy checks on data acquisition and calculations, and the use of approved standardized procedures for measurement, calculation, recording information and reporting. QC activities include:

- Documents, data, or calculations signed by a PE, must have QC completed by an individual of equivalent or better qualifications than the originator (this is documented when the QC individual signs or initials the documents);
- See that the technical activity has followed procedures set by NDOT;
- Providing routine and consistent checks for data integrity, correctness and completeness;
- Identify and address errors and/or omissions;
- Documenting inventory data;
- Recording all QC activities.

Quality Control for this program is the responsibility of the Consultant or agency conducting the activity. Quality Control checks are conducted on every product of a program operation, and thus at a much higher frequency than quality assurance checks. When the QC on a program product is complete, it is finished and delivered to the Bridge Owner for their records.

Consultants providing professional services to Bridge Owners must submit a Quality Control plan to the Bridge Owner for review and approval. QC must be done on the deliverables prior to submittal to the Bridge Owner.

5.13 QUALITY ASSURANCE

Quality Assurance (QA) of all activities of the Bridge Inventory will be performed by NDOT or their selected agent. The QA program activities are described in Chapter 1 of this Manual.

DRAFT

5.14 REVISION HISTORY

Rev	Date	Description
0	2010 January 25	Initial Issue of Chapter
1	2011 November 01	Revision 1
2	2013 March 04	Revision 2
3	2015 March 15	Revision 3
4	2016 March 11	Revision 4
5	2017 March 16	Revision 5
6	2018 March	Revision 6
7	2020 March	Revision 7
8	2025 July	Revision 8 – SNBI Compliance

5.15 FORMS

Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOT Bridge Inspection Program website for the current list of applicable forms and the most recent versions of each form. https://dot.nebraska.gov/business-center/bridge/

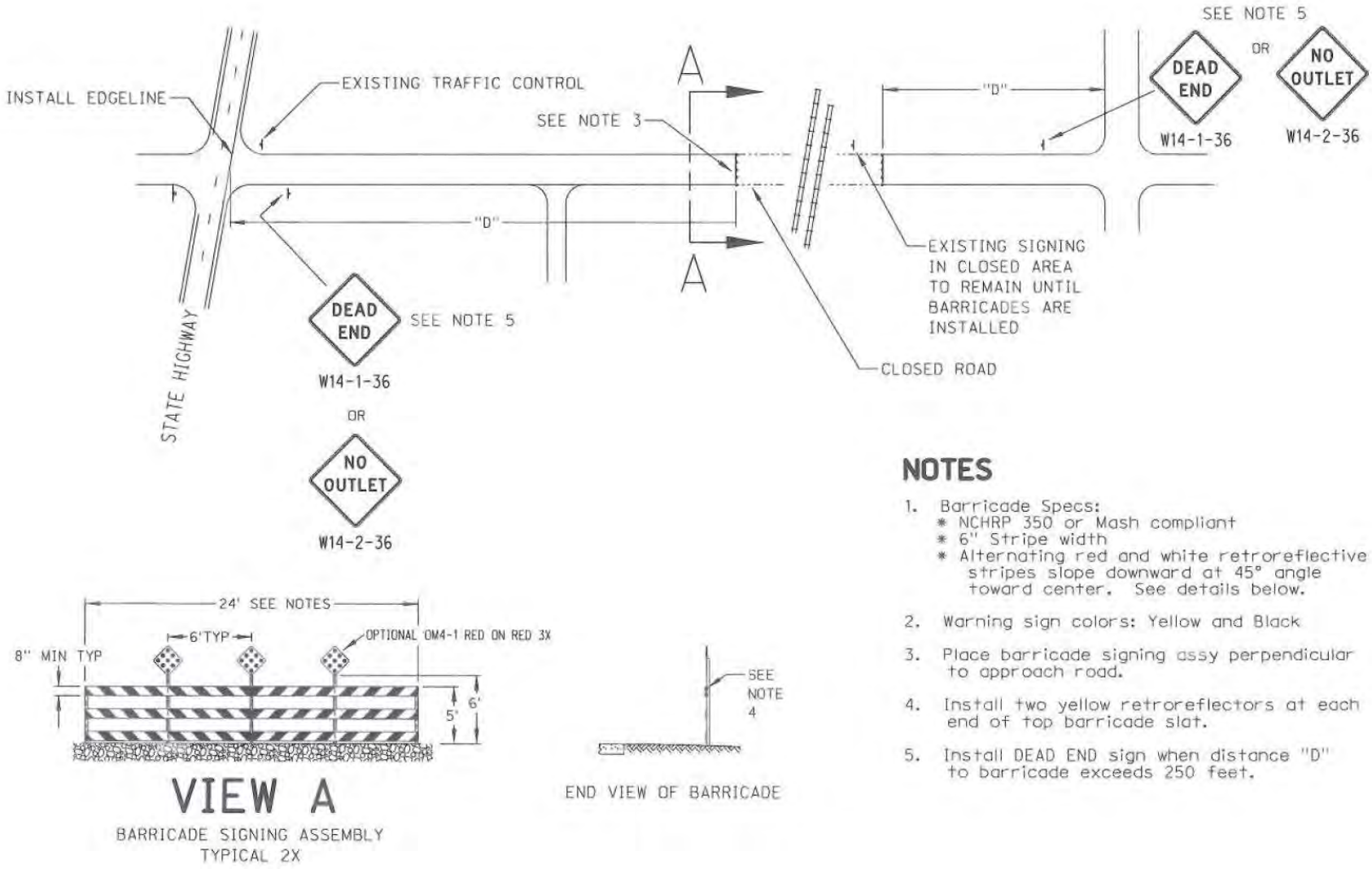
DRAFT

This page intentionally left blank.

DRAFT

Chapter 6 is under review

EXAMPLE OF PERMANENT BRIDGE CLOSURE



NOTES

1. Barricade Specs:
   * NCHRP 350 or Mash compliant
   * 6" Stripe width
   * Alternating red and white retroreflective stripes slope downward at 45° angle toward center. See details below.
2. Warning sign colors: Yellow and Black
3. Place barricade signing assy perpendicular to approach road.
4. Install two yellow retroreflectors at each end of top barricade slat.
5. Install DEAD END sign when distance "D" to barricade exceeds 250 feet.

FRACTURE CRITICAL INSPECTION DELIVERABLES

A. Fracture Critical Inspections SHALL include the following files:

1. Inspection Reports (BR293). This form include the following parts:

BR 293 Cover - Fracture Critical Inspection Report - ***Cover Page and table of content***
BR 293a - Fracture Critical Inspection Report - ***Introduction***
BR 293g - Fracture Critical Inspection Report - ***Summary & Conclusions***
BR 293b - Fracture Critical Inspection Report - ***Bridge Orientation/Layout***
BR 293c - Fracture Critical Inspection Report - ***Identification of <u>All</u> Fracture Critical Members/Details***
BR 293d - Fracture Critical Procedural Report
BR 293e - Fracture Critical Inspection Report - ***NBIS Condition Rating***
BR 293f - Fracture Critical Inspection Report - ***Reference Photos/Sketches***
BR 293h - Fracture Critical Inspection Report - ***Follow-up Procedure and Appendix table of content***
Attachments (See paragraph 4 below)

Note: All BR293 series forms have been combined into a single report and shall be submitted in electronic (.pdf and .docx) formats.

2. Inspection Photos

   Note: All photos shall be submitted in electronic (.jpg) format thru BrM

3. BrM on line submittal

4. Fracture Critical Inspection report attachment MAY include any of the following files:
   a. Channel cross-section field measurements and plot of current and past cross sections superimposed on one plot.
   b. DR27 – Structure Maintenance Checklist if needed in .pdf format
   c. DR320 – Critical Finding Report in .pdf and .docx formats
   d. DR321 – Structure Repair Report in .pdf format
   e. BR385F – Supplemental Hydraulic Finding & Maintenance
   f. Intelligent PDF Form
   g. Latest Load Rating Summary Sheet (LRSS)
   h. Plans or Measurements

   Note: Items f, g and h shall be submitted in electronic (.pdf) format. All other formats, including Word (.doc) format, will NOT be accepted.

NAMING CONVENTIONS

A. Create folders for each structure

1. Example
    a. **C000100305**

B. All files below shall be named as:

STRUCTURE NUMBER_FORM NAME OR SUBMISSION CATEGORY _4 DIGIT YEAR 3 DIGIT MONTH

1. **Year and Month shall be for the date the file was created**

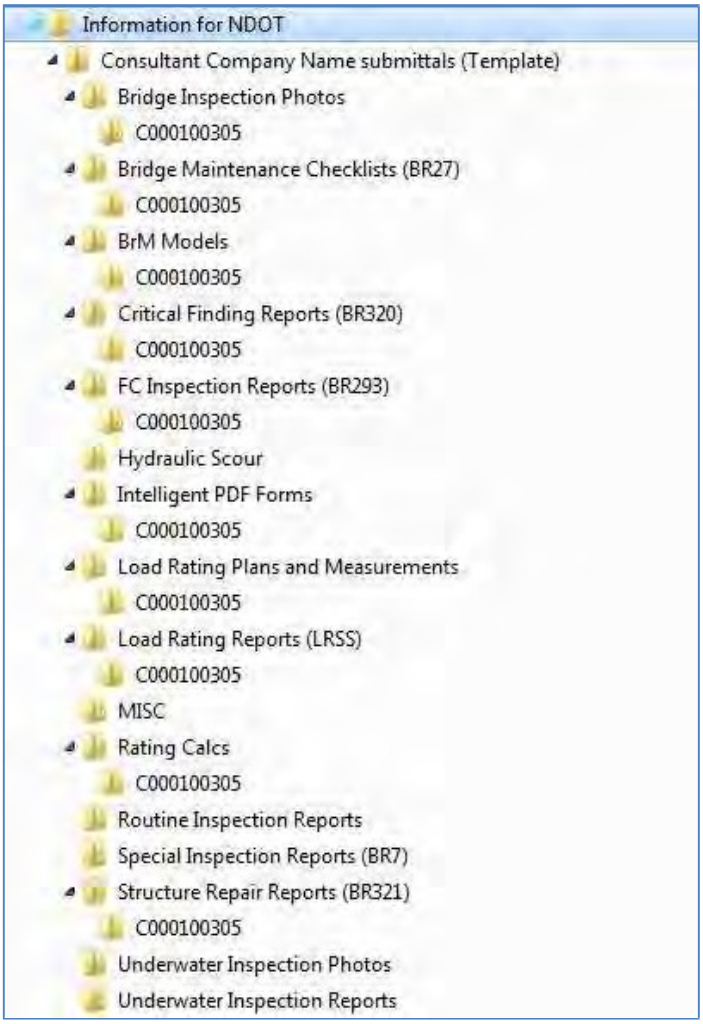
2. **Examples**
    a. Fracture Critical Inspection Report: **C000100305_DR293_2011FEB.pdf**
    b. Structure Maintenance Checklist: **C00010030_DR27_2011FEB.pdf**
    c. Critical Finding Reports: **C00010030_DR320_2011FEB.pdf**
    d. Structure Repair Reports: **C00010030_DR321_2011FEB.pdf**
    e. Rating Calculations (other than BrR output): **C00010030_Calcs_2011FEB.pdf**
    f. Intelligent PDF Form: **C00010030.pdf**
    g. Load Rating Report (LRSS): **C00010030_LRSS_2011FEB.pdf**
    h. Measurements: **C00010030_Field Measurements_2011FEB.pdf**

3. **Exceptions include:**
    a. BrR Model: **C00010030_2011FEB.xml**
    b. Plans: **C00010030_01.pdf**
    C00010030_02.pdf
    c. Inspection Photos: **C000100305_Y11_01.jpg**
    C000100305_Y11_02.jpg
    d. Rating Calculations - BrR output: **C000100305_FLXRPT_2011FEB.LIS**
    e. ~~Pontis File: **COUNTY NAME_FC_2011FEB**~~
    ~~**BURT_FC_2011FEB.pdi**~~

FRACTURE CRITICAL INSPECTION SUBMISSION PROCEDURES

All Fracture Critical Inspection reports, which cannot be submitted through BrM, shall be submitted using the NDOT FTP site. E-mail attachments and CDs will NOT be accepted.

1. Folders shall be created for each structure under each of the predefined submission categories that are applicable to each inspection



Individual files shall be placed within these folders

2. A single CD or flash drive containing all submission data shall be submitted directly to the Bridge Owner

BRM SUBMISSION

A. BrM entries shall be completed within 30 days of inspection

LEGAL SIZES & WEIGHTS FOR VEHICLES IN NEBRASKA

Standard From RM-421b, Sep 93
Updated Oct 1999

LEGAL SIZES AND WEIGHTS FOR VEHICLES IN NEBRASKA

1	Maximum overall width	8 feet 6 inches* (see below)
2	Maximum overall height	14 feet 6 inches*
3	Maximum overall length, single vehicle	40 feet*
4	Maximum overall length, combination of vehicles	65 feet
5	Maximum overall length, semi-trailer (excluding truck-tractor)	53 feet
6	Maximum overall length, semi-trailer and trailer (including connecting devices, excluding truck-tractor)	65 feet
7	Maximum single wheel load	10,000 lbs.
8	Maximum single axle load	20,000 lbs.
9	Maximum tandem axle load	34,000 lbs.

EXCEPTIONS

Width* - Eight feet six inch width shall not apply to farm equipment in temporary movement during daylight hours in normal course of farm operation.

Height - The owners, lessees and operators, jointly and severally, of vehicle exceeding twelve feet six inches in height shall assume the risk of loss to the vehicle and load and shall be liable for any damage that results to overhead obstructions from operation of a vehicle exceeding twelve feet six inches in height.

Length* - The length provisions shall not apply to the temporary moving of farm equipment during daylight hours in the normal course of farm operation, nor to the movement of public utility or other construction and maintenance material and equipment at any time. The length of refrigeration units mounted on the front of trailers which overhang the cab of the truck shall not be counted in determining length. Combination of vehicles, all trailing units of which must be equipped on each wheel with brakes that can be operated from the driving position of the towing vehicle.

****Weight** - In all cases, gross weights are subject to wheel and axle load restriction. It shall be unlawful to operate the public highways of this state any motor truck, truck-tractor, or trailer that weighs in excess of the gross weight for which the registration fee on such vehicle has been paid plus one thousand pounds. An axle load shall be defined as the total load transmitted to the road by all wheels whose centers may be included between two parallel transverse vertical planes forty inches apart, extending across the full width of the vehicle. The distance between axles shall be measured to the nearest foot. When a fraction is exactly one-half foot, the next larger whole number shall be used.

No group of two or more consecutive axles shall carry a load in pounds in excess of the value given in the following table corresponding to the distance in feet between the extreme axles of the group, measured longitudinally to the nearest foot, except two consecutive sets of tandem axles may carry a gross load of thirty-four thousand pounds each when the overall distance between the first and last axles of such consecutive sets of tandem axles is thirty-six, thirty-seven, or thirty-eight feet, and except that any group of three axles shall be restricted to a maximum load of thirty-four thousand pounds unless the distance between the extremes of the first and third axles is at least ninety-six inches in fact.

Dummy axles *shall be disregarded in determining the lawful weight of* a *vehicle or vehicle combination for operation on the highway. Dummy axle shall mean an axle attached* to a *vehicle or vehicle combination in* a *manner* so *that it does not articulate or substantially equalize the load and does not carry* at *least the lesser of eight thousand pounds or eight percent of the gross weight of the vehicle or vehicle combination*.

If any truck shall cross a bridge with total gross load in excess of the posted capacity of said bridge, and as a result of such crossing, any damage results to the bridge, the owner of such truck shall be responsible for all such damage.

Excess Size or Weight - The Department of Roads with respect to highways under its jurisdiction and County authorities with respect to highways under their jurisdiction may in their discretion upon application and good cause being shown therefore, issue a special permit in writing authorizing the applicant to operate or move a vehicle, a combination of vehicles or an object of a size or weight of vehicle or load exceeding the maximum specified by law, provided, no permit shall be issued for a vehicle carrying a load which cannot be dismantled or reduced in size or weight without great difficulty. The Department or County authority issuing a permit may require a permit fee not to exceed ten dollars.

MAXIMUM LOAD IN POUNDS CARRIED ON ANY GROUP OF TWO OR MORE CONSECUTIVE AXLES						
Distance in feet between the extremes of any group of two or more consecutive axles	Two Axles	Three Axles	Four Axles	Five Axles	Six Axles	Seven Axles
4	34,000					
5	34,000					
6	34,000					
7	34,000					
8	34,000	42,000				
9	39,000	42,500				
10	40,000	43,500				
11		44,000				
12		45,000	50,000			
13		45,500	50,500			
14		46,500	51,500			
15		47,000	52,000			
16		48,000	52,500	58,000		
17		48,500	53,500	58,500		
18		49,500	54,000	59,000		
19		50,000	54,500	60,000		
20		51,000	55,500	60,500		
21		51,500	56,000	61,000		
22		52,500	56,500	61,500		
23		53,000	57,500	62,500		
24		54,000	58,000	63,000		
25		54,500	58,500	63,500	69,000	
26		55,500	59,500	64,000	69,500	
27		56,000	60,000	65,000	70,000	
28		57,000	60,500	65,500	71,000	
29		57,500	61,500	66,000	71,500	
30		58,500	62,000	66,500	72,000	
31		59,000	62,500	67,500	72,500	
32		60,000	63,500	68,000	73,000	
33			64,000	68,500	74,000	
34			64,500	69,000	74,500	
35			65,500	70,000	75,000	
36			66,000	70,500	75,500	
37			66,500	71,000	76,000	81,500
38			67,500	72,000	77,000	82,000
39			68,000	72,500	77,500	82,500
40			68,500	73,000	78,000	83,500
41			69,500	73,500	78,500	84,000
42			70,000	74,000	79,000	84,500
43			70,500	75,000	80,000	85,000
44			71,500	75,500	80,500	85,500
45			72,000	76,000	81,000	86,000
46			72,500	76,500	81,500	87,000
47			73,500	77,500	82,000	87,500
48			74,000	78,000	83,000	88,000
49			74,500	78,500	83,500	88,500
50			75,500	79,000	84,000	89,000
51			76,000	80,000	84,500	89,500
52			76,500	80,500	85,000	90,500
53			77,500	81,000	86,000	91,000
54			78,000	81,500	86,500	91,500
55			78,500	82,500	87,000	92,000
56			79,500	83,000	87,500	92,500
57			80,000	83,500	88,000	93,000
58				84,000	89,000	94,000
59				85,000	89,500	94,500
60				85,500	90,000	95,000

MOD3-SO

LOAD RATING REPORT CHECKLIST

The Load Rating Engineer prepares the Load Rating Report and transmits the Report and other files to the Owner and to NDOT. See submittal deadlines in BIP Manual Chapter 5.

Load Rating Report

The Load Rating Report includes the items listed below and details are provided for each item in the following sections.

_____ Load Rating Summary Sheet (LRSS) and Load Rating Review Sheets; current version available from http://dot.nebraska.gov/business-center/bridge/forms/. It is recommended that the LRSS be the first page in the Report (see below).

_____ Structure geometry and condition information from the inspection report (see below).

_____ Calculations supporting the load rating (see below).

_____ Software analysis input and output in permanent format such as hard copy (PDF, TXT) or other secured electronic files (see below).

As part of the Load Rating package, the following must be completed.

_____ The person completing QC shall initials and date all pages of the Report.

_____ The Load Rating Engineer (LRE) is responsible for sealing and signing the Report in accordance with the NE Engineers and Architects regulation Act §81-3437 (3c and 3d).

_____ The completed report shall be delivered to the Bridge Owner

_____ An electronic copy of the Report shall be submitted to NDOT. A copy must be furnished to NDOT either by the Owner or, at the direction of the Owner, by the LRE.

_____ Deliver to NDOT the software input file that can be executed in the software package.

The following sections provide details about each element of the Load Rating Report

Load Rating Summary Sheet (LRSS)

_____ Use the current version – available from http://dot.nebraska.gov/business-center/bridge/forms/.

_____ Analyst shall be the engineer performing the load rating. The Analyst can be the same as the Engineer of Record for the load rating.

_____ Enter the Analyst as first initial, last name. For example, F. Last.

_____ Notations of rating by hand calculations as appropriate

_____ Include the software version used in the rating analysis in the comments section of the LRSS.

_____ The Additional Comments section of the LRSS should include comments regarding the controlling member, posting required, inspection results, bridge geometry, structure modifications/repairs, rating considerations for the deck, rating considerations for the substructure, dead load and distribution factor calculation assumptions, section losses, member defects, bracing assumptions and allowable stresses (see Chapter 5 for examples).

_____ Identify the controlling member in the table in the Ratings and Loads section.

_____ Verify that the LRSS has been completely filled out

_____ Completed LRSS shall be included in the Report (recommended as the first page).

Structure Geometry and Condition Information

_____ Verify that bridge plans and/or current field measurements are available on the NDOT Bridge Management FTP site. If not, upload a PDF of the bridge plans and/or current field measurement to the NDOT Bridge Management FTP site.

_____ Include basic bridge geometry such as sketches.

_____ Include inspection information that documents the conditions affecting the load rating.

_____ Include section losses and/or member defects.

_____ Structure geometry and condition documentation shall be included in the Report.

Calculations and Documentation Supporting the Load Rating

The following are typically hand calculations or spreadsheets if not calculated by the program used to complete the rating.

_____ Calculation for dead loads (DL).

_____ Calculation for distribution factors (DF), including assumptions.

_____ Analysis assumptions.

_____ Analyst's initials and date of preparation shall be on each sheet.

_____ QC reviewer's initials and date of review shall be on each sheet.

_____ Calculations and documentation shall be included in the Report.

Software Analysis Model (BrR or other software)

_____ Filename includes bridge number and the year of the load rating.

_____ Analyst's initials and date of analysis shall be in the comments.

_____ QC reviewer's initials and date of review shall be in the comments.

_____ Description of the members analyzed shall be in the comments.

_____ Allowable bending and shear stresses shall be in the comments.

_____ Section losses and/or member defects shall be in the comments.

_____ DF shall be in the comments.

_____ If the timber deck is rated, include the NBI condition code and the issue that required the rating in comments.

_____ Software version shall be in the comments.

_____ Input file (PDF, TXT) shall be included in the Report.

_____ Output file (PDF, TXT) shall be included in the Report.

_____ Rating Summary Report file (PDF, TXT) identifying the controlling rating factor shall be included in the Report.

_____ Executable model (input file) shall be uploaded to the NDOT Bridge Document Management folder on the FTP site.