Bridge Inspection Program Manual

Nebraska Department of Roads
Bridge Division
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Bridge Inspection Program Manual Table of Contents

INTRO.1 PURPOSE

This Program Manual will be used by NDOR, FHWA, local Bridge Owners and engineering Consultants to reference and clarify the requirements set forth by the National Bridge Inspection Standards (NBIS) and NDOR.

The NBIS and NDOR program objectives include:

- Assuring the information submitted to the Nebraska Bridge Inventory, and subsequently to the Nation Bridge Inventory, maintains a high degree of accuracy and consistency;
- Safeguarding the public's safety; and
- Protection of the capital assets of NDOR and Nebraska Public Agencies.

The objective and intent of the Manual is to assure consistent application of the NBIS and NDOR requirements for the maintenance of the Bridge Inventory in the state of Nebraska. This Manual is to be used in conjunction with the NBIS, FHWA and AASHTO publications on bridge inspection and inventory maintenance. Although this Manual's purpose is to support the bridge inspection program, **it does not preclude justifiable exceptions or actions based on sound engineering principles**

INTRO.2 BIP MANUAL CONTENTS

The **Manual** includes **policies and procedures** for participants to follow in their work on the Nebraska Bridge Inspection Program.

The **Appendix** includes several types of documents:

- **Forms** supporting the program and form instructions. These will be on the website as individual documents. Program participants are urged to always check the website to ensure they are using the most current form.
- **Reference Documents** that are used by participants in the Program activities but that typically do not change. The NBIS is an example of this type of document.
- **Supplemental Guidance** that revises Manual contents or that may provide new guidance during the period between Manual revisions.
- **Bridge Inspection Program Memos** from NDOR will also be placed on the website as individual documents.

INTRO.3 MANUAL ISSUE AND MAINTENANCE

The Manual and Appendix documents are posted on the NDOR Bridge Inspection Program website. Program participants are urged to always check the website to ensure they are using the most current information. The website link is:

http://www.transportation.nebraska.gov/design/bridge/bipm.htm

The Manual and Appendix parts are issued as PDF files. NDOR will not issue hard-copy Manuals.

The Manual was updated in its entirety through Revision 2, March 2013. NDOR anticipates that in the future only sections of the Manual will be revised as needed prior to a given inspection cycle. This allows Manual users who prefer hard-copy Manuals to only update pages with revisions. It is the responsibility of each user to keep their hard-copy Manuals up to date. NDOR will send notification of revisions.

The Forms and their instruction will be updated as needed and may be updated between Manual revisions. The Appendix will be updated as needed.

INTRO.4 PROGRAM PARTICIPANT COMMENTS AND SUGGESTIONS

Program participants are encouraged to provide feedback on the Manual, Forms or other aspects of the BIP.

Submit your comments and suggestions to the Nebraska Bridge Inspection Program, Program Manager. The Program Manager's name and contact information can be found on the Bridge Division's website.

You may mail or email your suggestions and comments.

Please include the following:

- Your name
- Date
- Comment or Suggested Revision/Addition
- Reason for Suggested Revision/Addition
- Benefit of Suggested Revision/Addition
- Note any deviation from current NBIS, FHWA or AASHTO policy

The mailing address:

State Bridge Inspection Program Manager

Bridge Division

Nebraska Department of Roads

1500 Hwy 2

Lincoln NE 68509-4759

INTRO.5 REVISION HISTORY

NDOR has completed several iterations of the Bridge Inspection Program Manual.

- 2008 March, Bridge Manual and Coding Guide: This Manual included policies and coding procedures written by several different Bridge Division Departments.
- 2008 November 10, Draft Manual: The QA Consultant assisted NDOR with consolidation and reorganization of the Manual, and in some cases, de facto current procedures that had not yet been documented were reduced to writing for the initial draft. The initial draft was dated November 10, 2008. This draft was reviewed by FHWA. The draft was posted to NDOR Bridge Division website in March 2009.
- 2009 July 1, Interim Manual: The Interim Manual was posted on the NDOR BIP website July 1, 2009 for the use of program participants, as well as their review and comments. This Interim Manual incorporated the following: FHWA's comments on the November 2008 Draft Manual; Comments received on load rating from some of NDOR's NBI Inspection/Load Rating consultants; Additional refinements of procedures as a result of QA in the inaugural cycle of the QA program to address some clarifications needed on coding; and General comments from NDOR staff, the QA Consultant's team and senior Technical Advisor.
- 2010 January, Initial Issue: The BIP Manual Initial Issue was to be used for the 2010 bridge inspection cycle effective January 25, 2010. This is the FHWA effective date that the most recent version of the AASHTO Manual – *AASHTO Manual for Bridge Evaluation, First Edition, 2008* (MBE) – is incorporated by reference into the National Bridge Inspection Standards at 23 CFR § 650.317. The BIP Manual incorporates the following: Changes references to the AASHTO Manual to the MBE; FHWA's comments on the July 2009 Interim Manual, Other miscellaneous comments; Best practices and process improvements from the Inaugural QA cycle on all operations have been incorporated; Stream Behavior information for Routine Inspectors; Coding clarifications for 18 items; Underwater inspection expected documentation; Updates to Chapter 6, Scour to delete hydraulic assessment procedures and incorporation by reference the Hydraulic Assessment Guidelines, 2009 now issued and posted on the NDOR website; Other revisions from NDOR staff and the QA Consultant's team.

- 2011 November, Revision 1: This manual incorporates information on the FHWA NBIS Metrics; a history of the NBIS; a description of the general life of a Nebraska Bridge; instructions to Bridge Owners on the use of QA findings in improving their programs, expansion on Chapter 2 on Owner records, revision and expansion of NDOR policy for routine (NBI) and special inspections, requirement for Team Leaders to check signs against the Load Rating Summary Sheet, expansion of instructions for load posting and bridge closures, use of maintenance forms revised by NDOR.
- 2013 March, Revision 2: This revision included a reformatting of all parts of the Manual for appearance and also to allow NDOR to revise and issue individual subsections. Therefore, in the future, each subsection will have its own revision number and date. Abbreviations for the Bridge Inspection Program that were in the Introduction were moved to the Appendix. References that were in each Chapter were moved to the Appendix. Chapter 1 revisions include more detailed BIP definitions of maintenance, repair and reconstruction and which of these requires the involvement of a NE Professional Engineer, addition of list of FHWA's NBIS Metrics, the reorganization of the details for the QA Program. Chapter 3 was separated into two parts, one for the NBI Items and one for the NE Items. The NBI Items are coded for all bridges and nearly all will not change with the implementation of Element Level Inspection in Nebraska, which will be detailed in a third part of Chapter 3. Only the State is required by Map-21 to use Element Inspection; it is optional to Local Bridge Owners at this time. Chapter 3-NE Bridge Inventory Coding includes additional pictorial guidance for culvert NE Items, additional pictorial guidance for bearings. Chapter 4 Bridge Inspection was reorganized to emphasize the four inspection types to be recorded in Pontis, and provide additional guidance for Special Inspections. The section on routine inspections for bridges over waterways was moved from Chapter 6 Scour to Chapter 4. Chapter 5 now explicitly states that a Load Rating Report with all the supporting components must be prepared and an electronic copy sent to NDOR, and other verbiage revisions. Chapter 6 included minor verbiage revisions. The Appendix now includes BIP Reference, BIP Manual Abbreviations and the section on repair/maintenance/reconstruction was deleted.

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1.1 GENERAL

The National Bridge Inspection Standards (NBIS) is a Federal Regulation (23 CFR § 650C) 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 Appendix of this Manual. 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.htm.

The Nebraska Bridge Inspection Program has been established to meet the NBIS requirements. The data and information collected from meeting the NBIS requirements also aids Bridge Owners to protect public safety, manage their bridges and preserve these assets.

The primary responsibilities delegated to state transportation agencies in the National Bridge Inspection Standards (NBIS) are for the following:

- Bridge Inspection Organization (23 CFR § 650.307)
- Qualifications of Personnel (23 CFR § 650.309)
- Inspection Frequency (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 NDOR Bridge Inspection Program Operation Matrix in this Chapter.

The Nebraska Department of Roads (NDOR) 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 NDOR for meeting requirements.

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 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

1.2.2 FHWA Oversight

FHWA has the responsibility for overseeing the implementation of the NBIS for all states in the US. In recent years, the oversight has become more rigorous because the US Department of Transportation (US DOT) has continually identified the National Bridge Inspection Program as a high-risk area. More recently, the US DOT Office of Inspector General conducted audits of state bridge inspection programs nationally following the I-35W bridge collapse in Minneapolis, MN. The US Congress Conference Report to FY 2010 Appropriations Act issued strong direction stating it "expects the Federal Highway Administration to make more significant progress in improving its oversight of bridge conditions and safety over the course of fiscal year 2010."

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. A description of the Metrics can be found at http://flh.fhwa.dot.gov/programs/fabs/documents/metrics-and-commentary.pdf.

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 states' 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 NDOR 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 NDOR *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 § 650.305."

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(27))."

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 to NDOR 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-IP-90-017 (HEC-18 Scour), which is covered in the NDOR 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).

"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 NDOR Local Projects Division in accordance with the LPA Manual. The hydraulic design reports for all other Bridge projects shall be submitted to the NDOR Bridge Division prior to construction."

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 NDOR Local Projects Division in accordance with the LPA Manual. The plans for all other Bridge projects shall be submitted to the NDOR 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 NDOR 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 NDOR Local Projects Division in accordance with the LPA Manual. The load-rating documents for all other bridges shall be submitted to the NDOR 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 NDOR 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 NDOR, Federal-aid project**	**Submit to NDOR, 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	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. Such person shall cause to be firmly posted or attached upon each bridge in a conspicuous place at each end thereof a board or metal sign showing the carrying capacity or weight which the bridge will safely carry or bear.” (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 NDOR on whether work on structures constitutes repair, maintenance or reconstruction, and which situations require the involvement of a Professional Engineer. Some common situations are compiled in “Guidance to Bridge Owners on Bridge Rehabilitation” located in the Appendix of this Manual. Owners should contact NDOR 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:

- 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
- Sealing cracks

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 NDOR 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
- 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

1.4 RESPONSIBILITIES

1.4.1 Nebraska Department of Roads

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. NDOR, may, in accordance with the regulation, delegate responsibilities. The responsibilities include:

- Provide 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

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

- Bridge inspection (NBI and Special). (Note that as of the date of this revision, NDOR completes Fracture Critical Inspections, including the NBI Inspection inventory items on the same day as the FC inspection , and Underwater Inspections.);
- Bridge Load Ratings;
- Bridge Hydraulic Assessment;
- Monitoring bridges according to their Scour Plan of Action;
- Addressing critical and non-critical findings;
- Maintaining bridge files and records at their headquarters;
- Cooperating with the NDOR 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.

1.4.3 Engineering Consultants

NDOR 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 requirement;
- Providing inspection Team Leaders with the training and experience required by NBIS and NDOR;
- 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.

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 NDOR 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 Roads
- 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**
- Be certified as a Level III or IV Bridge Safety Inspector under the National Society of Professional Engineer's program for National Certification in Engineer Technologies (NICET) 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.

NDOR issues each Team Leader who meets the NBIS qualifications and NDOR requirements a Bridge Inspection Team Leader Certification. Certification may be obtained as either of the following:

- NBIS Routine Inspection Team Leader; or
- NBIS Routine Inspection and Fracture Critical Inspection Team Leader.

The term of certification is a period of five years, and Team Leaders 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 NDOR-approved comprehensive bridge inspection training course. The 3½-day FHWA NHI Course No. 130078, Fracture Critical Inspection Techniques for Steel Bridge must successfully completed to be certified by NDOR as a Fracture Critical Inspection Team Leader. NDOR 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

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

1. Completed application, Nebraska Bridge Inspector Information Form DR Form 97; and
2. 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 above).

Certification Application – Accepted Proof of Achievement	
Accomplishment	Document
PE registration	Photocopy of the registration certificate with PE license number
NICET certification	Photocopy of certification
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 also 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 NDOR; 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, prior to the expiration of Team Leader certification, achieves:

- Successful completion of the three-day FHWA National Highway Institute (NHI) Course No. 130053A, Bridge Inspection Refresher Training; or
- Successful completion of a minimum of twenty-four (24) hours of other bridge inspection refresher training approved by the NDOR 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 inventory inspections. NDOR will be developing these in the future. NDOR does require the Team Leader to record in the inspection data the Team Leader ID of all Assistants (See Chapter 3.) Those working with Team Leaders need to obtain an ID from the NDOR Program Manager to be used in the NE BIP.

1.7.2.4 Load Rating Engineer

The NBIS and NDOR require that 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 and are **both** required by NDOR.

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

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

1.7.2.6 Hydraulic Engineer

NDOR 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

NDOR requires that an individual completing Quality Control 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 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 NDOR BRIDGE INSPECTION PROGRAM OPERATION MATRIX, PROGRAM REPORTS AND DATA GENERATED MATRIX

The NDOR 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 NDOR 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 Manual Chapter number that specifies the processes to be followed in generating the reports and/or data and for maintaining the records for these.

NDOR Bridge Inspection Program Operation Matrix

BIP = Bridge Inspection Program	CP = Complex	LPA = Local Public Agency	QA = Quality Assurance
BIPDM = BIP Data Manager	DR = Department Roads (DR form prefix)	NDOR = Nebraska Department of Roads	QC = Quality Control
BIPPM = BIP Program Manager	FC = Fracture Critical	PE = Professional Engineer	R = Routine
BO = Bridge Owner	HE = Hydraulic Engineer	POA = Plan of Action	SC = Scour Critical
CF = Critical Finding	LRE = Load Rating Engineer		

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
§ 650.309 (b), (d)	3, 5	Maintain minimum inspector qualifications	Inspectors	Inspector certification	Set minimum requirements	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	Maintain specified inspection frequencies (R, UW, FC, 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, FC and UW inspections	Operation verification
§ 650.313 (a), (b), (d), (e1), (e2), (e3), (f) § 650.315 (a)	12, 16 – 19, 22	Inspection – R Inspection – FC Inspection – UW Inspection – SC Inspection – CP	TL and Inspectors	Pontis file 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 - LARS ratings - Non-LARS rating - NDOR 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 population of all BOs.	Operation verification
§ 650.313 (e3)	18	Scour Assessments	HE	Scour Assessment Report	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

NDOR Bridge Inspection Program Operation Matrix

BIP = Bridge Inspection Program	CP = Complex	LPA = Local Public Agency	QA = Quality Assurance
BIPDM = BIP Data Manager	DR = Department Roads (DR form prefix)	NDOR = Nebraska Department of Roads	QC = Quality Control
BIPPM = BIP Program Manager	FC = Fracture Critical	PE = Professional Engineer	R = Routine
BO = Bridge Owner	HE = Hydraulic Engineer	POA = Plan of Action	SC = Scour Critical
CF = Critical Finding	LRE = Load Rating Engineer		

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 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

See next page for CFR References and the associated FHWA Metric.

23 CFR Section	FHWA NBI Metrics (March 2012)
§ 650.307 Bridge inspection organization	No. 1 Bridge Inspection Organization
§ 650.309 Qualifications of personnel	No. 2 Qualification of personnel – Program Manager No. 3 Qualifications of personnel – Team Leader No. 4 Qualifications of personnel – Load Rating Engineer No. 5 Qualifications of personnel – UW Bridge Inspection Diver
§ 650.311 Inspection frequency	No. 6 Routine inspection frequency – Lower risk bridges No. 7 Routing inspection frequency – Higher risk bridges No. 8 Underwater inspection frequency – Lower risk bridges No. 9 Underwater inspection frequency – Higher risk bridges No 10 Inspection frequency – Fracture critical member No. 11 Inspection frequency – Frequency criteria
§ 650.313 Inspection procedures	No. 12 Inspection procedures – Quality Inspections No. 13 Inspection procedures – Load Rating No. 14 Inspection procedures – Post or Restrict No. 15 Inspection procedures – Bridge Files No. 16 Inspection procedures – Fracture Critical members No. 17 Inspection procedures – Underwater No. 18 Inspection procedures – Scour Critical bridges No. 19 Inspection Procedures – Complex Bridges No. 20 Inspection procedures – QC/QA No. 21 Inspection procedures – Critical Findings
§ 650.315 Inventory	No. 22 Inventory – Prepare and Maintain No. 23 Inventory – Update Data

Program Participant Reports and Data Generated[1]				
Participant	**Qual's Specified?**	**Operation**	**Program Process Described**	**Generated Program document / product (See Chapter 3 for Database item responsibility.)**
PM	Y			Master list of FC 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. 5 Inspection	Maintenance/Repair records
BO	N	Prepare POA	Ch. 5 Bridge Scour	POA
BO (TL or HE)	N	Special Inspection - POA	Ch. 4 Inspection, Ch. 5 Bridge Scour	POA log
TL	Y	Inspection	Ch. 3 Coding Ch. 4 Inspection	Inspection Report – R Inspection Report – FC 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	Scour Assessment Report 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, it also affects public safety.

Participants in the NDOR 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.

QUALITY CONTROL (QC)	QUALITY ASSURANCE (QA)
NBIS Definition	
“procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level.”	“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.”
NDOR BIP Definition	
“routine technical activities, to control the quality of the inventory data as it is being developed”	“planned system of review procedures to check that quality objectives were met in the QC process”
Application	
QC is responsibility of the consultant or agency doing the activity or preparing the program product	QA is the responsibility of personnel not directly involved in report, calculation or data compilation
QC is internal to the organization	QA is external to the QC organization
QC is routine checks of reports, calculations, data	QA reviews products against the expected standard
QC is done on every program product	QA is done on a random sample of all work products
QC identifies/corrects errors/omissions	QA identifies quality lapses
QC, when complete, the program product is ready for delivery	QA, when complete, is a measure of QC and improves program
QC revises internal processes	QA proposes improvements

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 NDOR'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 Pontis;
- Inspection reports, such as fracture critical 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 NDOR'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 confirm 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 NDOR QA Responsibilities

NDOR 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**. NDOR 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 NDOR 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 Appendix of this Manual.

1.10.1 BIP Operations for QA

This procedure will provide the 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 NDOR and FHWA have been verified as being compliant with the CFR. QA Evaluation by NDOR will not be needed unless there are major changes in the future. These include:

- Establish bridge inspection program, Policies and procedures, QC/QA
- Prepare and maintain bridge inventory
- Maintain minimum BIPPM qualifications
- Identify inspection procedures and TL qualifications for complex bridges
- Inspection procedures for Fracture Critical bridges
- Inspection procedures for Underwater Inspection of bridges

The requirements of the NBIS for which the work can vary from cycle to cycle are the operations listed in the NDOR 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 Engineers
- Bridge inspection and reports
- Load ratings, calculations and reports
- Load posting
- Scour assessment and reports
- Scour Plans of Action on scour critical bridges
- Owner’s bridge files
- Follow-up on findings
- Inventory data maintenance

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 2008 will be submitted to FHWA by April 2009. 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 NDOR is the end of November so that NDOR can submit to FHWA by the end of December, to coincide with the FHWA Metric evaluation process.

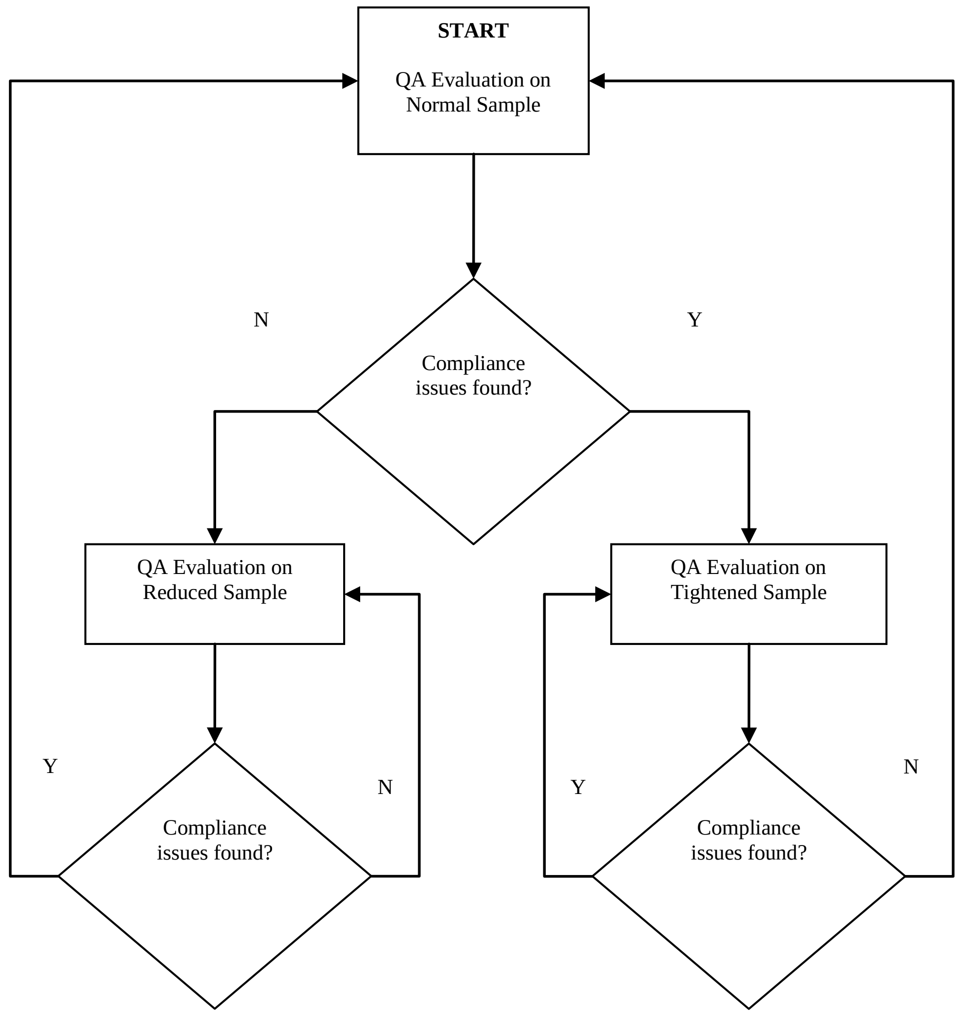
1.10.3 General

The QA Program developed for and implemented by NDOR in 2008 is a data-driven program and evaluates the same NBIS requirements evaluated by FHWA's Metrics adopted in 2011.

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 it 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.


START
QA Evaluation on Normal Sample
Compliance issues found?
N
Y
QA Evaluation on Reduced Sample
QA Evaluation on Tightened Sample
Y
N
Compliance issues found?
Y
N
Compliance issues found?

1.10.3.1 Definitions

The NDOR 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.

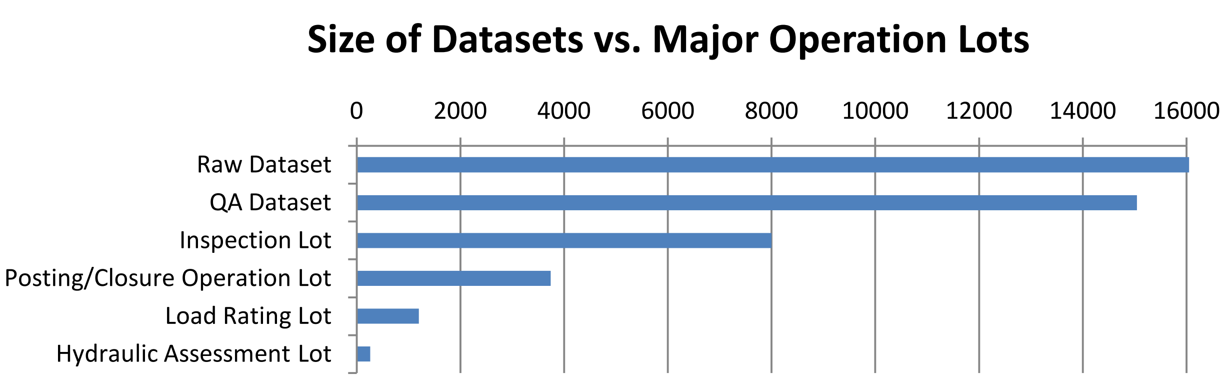
1.10.3.1.2 Operation Variable

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 NDOR'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 NDOR'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 the 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

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

Sample subjects can be evaluated for multiple BIP operations. For example, for the QA evaluation of the 2011 inspection cycle (2012 dataset) Load Rating subjects meeting the Lot criteria were identified in the Inspection Sample. Additional subjects needed to complete the Load Rating Sample, and those were randomly selected from the Load Rating Lot. Note that this was purposely not done for the Posting/Closure Sample due to findings from past cycles and the importance of reviewing all Bridge Owners on this 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
Variable	BIPPM, TLs, LREs, HEs
Lot	N/A
Sample	All program participants associated with subjects in other operations of inspection, underwater inspection, load rating and hydraulic analysis.
Method of QA Evaluation	<u>Inspection Team Leaders</u>: Review the BIPPM list of certified qualified inspection Team Leaders to verify the individual is on this list. Review the list for possible errors. <u>Underwater Inspection Team Leaders</u>: Review the BIPPM a list of certified qualified inspection Team Leaders to verify the individual is on this list. Review their statement of qualifications for work on the NDOR consultants' contract for the inspections and verify their diver certification is current. <u>Load Rating Engineers and Hydraulic Engineers</u>: Review Nebraska Board of Engineers and Architects on-line data base to verify all LREs and HEs are registered in the state of NE.

1.10.5 QA Review of Inspection and Inspection Frequencies

Operation	Inspection and Inspection Frequencies Inspection – R, FC, UW, SC, CP Maintain specified inspection frequencies
Variable	Inspection Team Leader
Lot	Structures for which inspections are completed and data is included in a given NBIS dataset. This typically includes structures inspected within a given cycle and is approximately half of the population.
Sample	The quantity of subjects is based on the ANSI/ASQ Z1.4 Table 1. Subjects are randomly selected from the lot. The Program Manager, based on QA findings from prior cycle will determine the evaluation level, (I reduced, II normal or III tightened). <u>Base Sample Weighted by Structure Attribute: Structurally Deficient (SD)</u> The size of the base sample is determined for the size of the entire lot, but is weighted as follows. A SD subsample is randomly drawn for the quantity SD structures in the lot; the size is also based on ANSI/ASQ table. The balance of the base sample is drawn from the structures in the lot that are non-SD. <u>Base Sample Augmentation for the Variable:</u> From the inaugural cycle through the 2011 inspection cycle (2012 dataset), the random base sample was augmented so that each Team Leader performing inspections in the cycle would have QA Evaluation done on 2% of the structures they inspected (with a minimum of 2). The base sample was augmented if additional subjects are needed to meet these requirements. The additional subjects selected randomly from lot subset of structures inspected by the particular Team Leader and not in the base sample. NDOR may vary the sampling in future cycles based on TL performance measures.
Method of QA Evaluation	Independent inspection by the QA Evaluation Team of structure after the subject TL has concluded their inspection. The QA Team inspection coding, review of critical and non-critical findings are then compared to the subject inspection coding and reporting. Differences in NBI condition ratings of more than one will be noted. Percent agreement between subject and QA Teams coding for all items is determined, but only for applicable items. Applicable items are those that relate to the actual work of the TL. Changes that occur after the subject inspection (e.g. coding procedures, flood events that changed the site conditions) are not included in 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 Daily Inspection Rate. The intervals between the subject NBI inspection date and the prior NBI inspection are determined and compared to the specified not-to-exceed frequency.

1.10.6 QA Review of Underwater Inspections and Frequencies

Operation	Underwater Inspection and Frequencies
Variable	Underwater Inspection TLs
Lot	The lot is the approximately 90 bridges that require underwater inspection in the state. NDOR hires consultant(s) to complete underwater inspections for bridges in the Nebraska Bridge inventory. The interval currently is 60-months; thus, not all NBI dataset contain new UW inspection data.
Sample	The quantity of bridges according to the ANSI/ASQ Z1.4 Table 1 would be 13; however, NDOR and FHWA agreed that a minimum of 2 would be allowed for each UW TL due to the expense of UW inspection. For review of reports (without independent inspection, a random sample will be drawn from the entire lot.
Method of QA Evaluation	Independent inspection by the QA Evaluation Team of structure after the subject TL has concluded their inspection. The QA Team inspection coding, review of critical and non-critical findings are then compared to the subject inspection coding and reporting. Differences in NBI condition ratings of more than one will be noted. Percent agreement between subject and QA Teams coding for all items is determined, but only for applicable items. Applicable items are those that relate to the actual work of the TL. Changes that occur after the subject inspection (e.g. coding procedures, flood events that changed the site conditions) are not included in evaluation of the TL. Larger variations on all inventory items are recorded and evaluated for program improvements. Report Review will consist of checks for consistency with the UW inspection procedures for that specific bridge. The intervals between the subject UW inspection date and the prior UW inspection are determined and compared to the specified not-to-exceed frequency.

1.10.7 QA Review of Load Ratings

Operation	Load Rating Rate each bridge as to its safe load carrying capacity
Variable	Load Rating Engineer
Lot	Structures for which load ratings are completed and data is included in a given NBIS dataset. This typically includes structures load rated within a given cycle, and must be determined from the load rating date shown in NDOR's database.
Sample	The quantity of subjects is based on the ANSI/ASQ Z1.4 Table 1. The Program Manager, based on QA findings from prior cycle will determine the evaluation level, (I reduced, II normal or III tightened). <u>Base Sample Augmentation for the Variable:</u> From the inaugural cycle through the 2011 inspection cycle (2012 dataset), the random base sample was augmented so that for each LRE performing ratings in the cycle would have QA Evaluation done on 2% of the structures they rated (with a minimum of 2). The base sample was augmented if additional subjects are needed to meet these requirements. The additional subjects selected randomly from lot subset of structures inspected by the particular LRE and not in the base sample.

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.
	• Load Analysis and Rating System (LARS) 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-LARS reports
	    • Reports using spreadsheets, a sample calculation will be conducted for each field to verify that the correct formula has been entered.
	    • 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.
	<u>Extensive review</u>
	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-LARS rating method has been employed.

1.10.8 QA Review of Load Postings

Operation	Posting Closure Post or restrict the bridge
Variable	Bridge Owner
Lot	All bridges in the population with NBI Item 41 coded: 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	The quantity of subjects is based on the ANSI/ASQ Z1.4 Table 1. Subjects are randomly selected from the lot. The Program Manager, based on QA findings from prior cycle will determine the evaluation level (I reduced, II normal or III tightened). The level has varied between normal and tightened since the Inaugural cycle due to the high number of bridges found posted/restricted incorrectly
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 Scour Analysis

Operation	Scour Analysis Scour Analysis for Scour Condition
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 analyzed within a given cycle, and must be determined from the hydraulic assessment date shown in NDOR's database.
Sample	The quantity of subjects is based on the ANSI/ASQ Z1.4 Table 1. Subjects are randomly selected from the lot. The Program Manager, based on QA findings from prior cycle will determine the evaluation level, (I reduced, II normal or III tightened). Base Sample Augmentation for the Variable: From the inaugural cycle through the 2011 inspection cycle (2012 dataset), the random base sample was augmented so that for each HE performing analysis in the cycle would have QA Evaluation done on 2% of the structures they reviewed (with a minimum of 2). The base sample was augmented if additional subjects are needed to meet these requirements. The additional subjects selected randomly from lot subset of structures analyzed by the particular HE and not in the base sample.
Method of QA Evaluation	The QA evaluation methods for scour assessments are described in NDOR's Hydraulic Analysis Guidelines.

1.10.10 QA Review of Follow Up on Scour Critical Monitoring

Operation	Scour Critical Monitoring Monitoring Scour Critical Bridges with Plans of Action
Variable	Bridge Owner
Lot	All non-state Bridge Owners – See Owner Records
Sample	The sample is the same as Owner Records. For each Owner two of their scour critical bridges are randomly selected.
Method	The QA review will check scour plans of action for scour critical structures under the jurisdiction of the Bridge Owner to see that the monitoring is being done. Typically, Bridge Owners keep a log of action completed for each action in the POA, which may vary for each structure.

1.10.11 QA Review of Bridge Owner Files

Operation	Owner Records Maintain key record components in the Bridge File
Variable	Bridge Owner
Lot	All non-state Bridge Owners who have bridges under their jurisdiction
Sample	The quantity of subjects is based on the ANSI/ASQ Z1.4 Table 1. Subjects are randomly selected from the lot. The Program Manager will determine the appropriate evaluation level. For each BO, the sample of structures has varied over cycles. At a minimum one of each of the following from the BOs Bridge File, selected randomly from the particular Bridge Owner's bridge inventory, should be reviewed: Fracture Critical Bridge, Bridge under a Scour Plan of Action, Bridge with Maintenance Flag. See additional notes under Method.
Method of QA Evaluation	The following methods have been utilized for cycles through the 2011 Inspection Cycle (2012 Dataset). QA Team visits to the Owners' offices served two purposes: (1) to review organization of the BO Bridge File and Individual Bridge Records, (2) to answer questions regarding NDOR's procedures in the Manual, and explain best practices being used by other BOs. Evaluation tasks include: • BO personnel is interviewed to determine how the Bridge File and Individual Bridge Records are currently organized • Records are checked for the mandatory components of BIP Manual Chapter 2 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.

1.10.12 QA Review of Follow Up on Critical Findings

Operation	Follow-up on Critical Findings
Variable	Bridge Owner
Lot	All non-state Bridge Owners – See Owner Records.
Sample	The sample is the same as Owner Records. For each Owner two of their bridges with Critical Findings are randomly selected from NDOR's Master List.
QA Method	The QA will review structures under the jurisdiction of the Bridge Owner to see that the Critical Finding process is being followed and that closure is being attained.

1.10.13 QA Review of Repair or Maintenance Activities

Operation	Follow-up on Non-critical Findings
Variable	Bridge Owner
Lot	All Bridge Owners – See Owner Records.
Sample	The sample is the same as Owner Records. For each Owner two of their bridges with Maintenance Flags (NE Item) are randomly selected.
QA Method	The QA will review structures under the jurisdiction of the Bridge Owner to see that these are being followed up on and documentation is in the Bridge File or Individual Bridge Record. The QA review will check the non-state Owners' records for structures maintenance history for documentation in the files of the bridges that are included in the subject Owners random sample for records review. There is a wide variety of processes being used.

1.10.14 QA Review of Inventory Data

Operation	Inventory Data
Lot	N/A
Sample	All subjects for the current cycle are checked for data issues. This activity will not be done using a defined sampling plan. NDOR 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. The sample will be the data contained in reports selected for quality assurance review of reports.
Method of QA Evaluation	• The NDOR 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. • 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.

1.11 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

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

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 bridges. 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 NDOR 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, NDOR 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.

NDOR 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 to NDOR hydraulic design reports, bridge design plans, bridge load rating reports and inspection reports for their bridges to the Bridge Division. NDOR requests that these are sent as electronic files. NDOR 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. NDOR is not responsible for ensuring that Owners' information on this ftp site is up to date and current.

Two forms are used for the NE Bridge Inspection Program to indicate the format and location of Owners' documents:

1. The Bridge File Index (BFI). The BFI provides information regarding storage location and format for the various components. This form incorporates (by reference) into Individual Bridge Records those documents maintained in group files, when the location of the group file is shown on the BFI.
2. The Individual Bridge Record Checklist (IBRC). The IBRC is used to verify that documents of an Individual Bridge Record are included in the individual file. Typically, these are hardcopy documents that are related to that individual bridge (e.g. correspondence related to its load rating, bridge plans/measurement).

Examples of location and format for several components are shown in the following table. Each Owner should decide what location and format they will use for each component. The Bridge File Index, however, must guide any party who has need to review or use any Owner Bridge Records to the components of any Individual Bridge Record.

Location, Format	**Examples / Comments**
Group, Hardcopy (GH)	• Correspondence, General, Bridge Division Memos • Maintenance records kept in ledgers or notebooks • Hydraulic Assessments kept in a common notebook(s)
Group, Electronic (GE)	• Photos (site and inspection) typically are taken with digital cameras and stored on an Owners network or office computers within the same folder, with individual folders for each bridge. Location examples: • Drive Name:\...\Bridge Photos\Str ID\Site • Drive Name:\...\Bridge Photos\Str ID\Inspection • Fracture Critical Inspection reports are typically done by consultants and provided to Owners electronically. Location examples: • Drive Name:\...\Fracture Critical Insp\Str ID\Site • Load rating calculations • Load rating calculations, especially those completed by consultants are typically delivered to Owners electronically. These are typically kept in a folder on a computer network in a folder for each structure. • (Location e.g. Drive Name:\...\Load Rating\Str ID)
Individual, Hardcopy (IH)	• Individual Bridge Record Checklist • Correspondence, related to an individual bridge • Load Rating Summary Sheet signed by the Load Rating Engineer • SIA Sheet for each inspection • Pontis reports printed after an NBI inspection • Critical Finding Reports after closure of the Report • Maintenance Checklists after completion of the work
Individual, Electronic (IE)	• Bridge Inspection Procedures for a Complex Bridge • Some Owners prefer to keep their electronic files stored under the Structure ID versus document type. Location examples: • Drive Name:\Bridge File\Str ID\Bridge Photos\Site • Drive Name:\Bridge File\Str ID\Bridge Photos\Inspection • Drive Name:\Bridge File\Str ID\Load Rating\Year • Drive Name:\Bridge File\Str ID\Fracture Critical Inspection\Year • Drive Name:\Bridge File\Str ID\Hydraulic Assessment\Year

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

2.1.1 Nebraska Department of Roads

NDOR is responsible for:

- Providing procedures and guidance regarding Bridge Owners' Bridge File.
- Providing Pontis software to all Nebraska Bridge Owners for use in maintaining inventory information.
- Maintaining the inventory database for National Bridge Inventory and Nebraska Inventory Items.
- Providing consultants to complete fracture critical inspections in Nebraska in accordance with procedures maintained by the Owners (non-state), and providing the Owner with a copy of the inspection report.
- Maintaining the underwater inspection procedures and reports for each bridge requiring underwater inspection in Nebraska, and providing the Owner with a copy of the inspection report.

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

2.1.2 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 access to the Bridge File and all Individual Bridge Records, whether they are electronic or hard copy, for their use.
- Keeping their Bridge File at their site or office.
- Keeping back-up of their electronic documents, either at their site or on the NDOR 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 NDOR 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 reporting closure to NDOR.

2.1.3 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 NDOR 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 NDOR, except at the request of NDOR.
- 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 an Owners Bridge File and Individual Bridge Records.

2.4 DEFINITIONS

2.1.4 AASHTO MBE Definitions

2.1.1.1 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 applies to more than one bridge.

2.1.1.2 Bridge Record

A Bridge Record contains the 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 that substantiates a scour critical condition.

2.1.1.3 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.

2.1.1.4 Inspection Data

Field inspection data is modified with each inspection. Examples of this type of data would include routine inspection (NBI) reports, fracture critical inspection reports, underwater inspection reports, special inspection reports, general assessment of the waterway and scour status, changes in the structures section properties (section loss), changes to items that are dead load on the structure such as gravel or additional utilities.

2.1.1.5 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.

2.1.5 NE BIP Implementation and Definitions

2.1.1.6 Bridge File

The Bridge File includes all component documents, whether hardcopy or electronic format, and whether they are kept in a group or individually. Owners must provide information regarding the location of the component documents to their staff, LPA officials, NDOR and FHWA. NDOR has provided a form, the Bridge File Index (BFI) for this purpose. The BFI provides the location and the format of component documents for their bridges. This form incorporates documents maintained in group files (electronic and hardcopy) into Individual Bridge Records, by reference to the documents and their location.

2.1.1.7 Individual Bridge Record

The Individual Bridge Record (IBR) is a hardcopy file kept at the Owners' facilities that will contain all hard-copy components of the Bridge Record. The Individual Bridge Record must be readily retrieved by Local Public Agency (LPA) officials, NDOR has provided a form, the Individual Bridge Record Checklist (IBRC), to help organize the Record and to show the information kept in the Individual Record.

2.1.1.8 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.

2.1.1.9 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.

2.1.1.10 Site Photos

Site photos are those taken at each routine inspection that provide a pictorial record of the site, and guidance on this can be found in the Chapter 4, Bridge Inspection. See the guide for taking site photos in the Appendix.

2.1.1.11 Inspection Photos

Inspection photos are those necessary to document major defects or other conditions. Examples would be cracked timber stringers, significant section loss of any member and scour related issues.

2.5 MANDATORY COMPONENTS OF BRIDGE FILE AND BRIDGE RECORDS

The following table lists the components of Bridge Records from the MBE, in the order shown in the MBE. NDOR guidance for each component follows the table.

Component from MBE	Nebraska Mandatory Item
Plans	• Construction plans or measurements • Shop drawings
Specifications	Special Provisions or other specifications covering the construction of custom, unique elements or features of the bridge. These records are sometimes necessary for load rating. If these are in the construction project file, indicate the location on the IBRC.
Pile Driving Records	These records are sometimes necessary for load rating. If these are in the construction project file, indicate the location on the IBRC.
Correspondence	NDOR correspondence to the Bridge Owner regarding the bridge
Photographs	• Site photos • Inspection photos
Maintenance and Repair History	• Critical Finding Reports • Maintenance, Repair and Reconstruction documentation • Maintenance of Coatings
Accident History	Documentation of accident damage to load bearing elements of the superstructure or substructure
Inspection Requirements	• Procedures for Fracture Critical bridges, bridges with fatigue-prone details and complex bridges must be kept in the Owner’s Bridge Record • List of FC members
SI&A	All SI&A reports prepared for the bridge
Inventories and Inspections	All inspection documents and reports
Load Rating and Posting	All Load rating calculations and all signed Load Rating Summary Sheets (LRSSs)
Permit Load History	Any records of loads that exceeded the bridge load limits
Scour Assessment and POA	• Hydraulic assessment for scour • Plan of Action (POA) • POA Log

2.1.6 Plans and Measurements

The records for each bridge must contain the bridge's construction plans with as-built information, or detailed measurements sheets, as for timber and steel stringer structures for which plans are not available. This is a mandatory component of the Bridge Record.

Shop drawings should also be included in the Bridge Records. This is a mandatory component of the Bridge Record.

2.1.7 Specifications

Bridges in Nebraska typically are built with the governing NDOR specification for highway and bridge construction. The plans typically will specify the specification edition that was in force at the time of construction.

Structures often have unique features that are built under special provisions. These are a mandatory item to be included in the Bridge Record. These typically are in the construction file, and the location should be referenced on the IBRC.

2.1.8 Correspondence

The MBE recommends that this component include all correspondence related to the structure from construction to the present. NDOR requires that Bridge Owners keep a copy of all correspondence, including emails, from NDOR pertaining to the bridge.

An example would include a copy of the letter NDOR mailed to Bridge Owners regarding excess gravel. Correspondence from NDOR regarding the specifics of this structure is a mandatory component of the Bridge Record.

Some correspondence from NDOR might pertain to several individual bridges. It is recommended that a copy of the correspondence should be included in each Bridge Record.

2.1.9 Photographs

NDOR requires that Owners maintain two sets of photos for each bridge – site photos and inspection photos – both are mandatory components of the Bridge Record. See the Chapter 4, Bridge Inspection for procedures related to processing and filing photos.

Prior to the 2008 inspections, two site photos were required and these were stored in the BISON system.

2.1.10 Materials and Tests

Any materials data from the construction of the bridge is typically included in the construction file, such as pile driving logs, concrete tests, mill certifications and the like. These typically are in the construction file, and the location should be referenced on the IBRC. Pile driving records in particular are important in the rating of bridges.

In rare instances in Nebraska, a bridge may have been load tested and those records should be included.

2.1.11 Maintenance, Repair and Reconstruction History

Each Bridge Record should include a chronological record of maintenance and repairs, Critical Findings Reports and their resolution. Records on any coatings or other protective membranes should be included in the Maintenance and Repair history. Some bridges may have been reconstructed and these plans should be in the IBR.

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.

2.1.12 Accident Records

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.

2.1.13 Posting

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. Some Owners have sign inventories that provide a record of load posting at a particular structure.

2.1.14 Permit Loads

NDOR uses the Superload software to issue permits for oversized loads on the state highway system. This 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 NDOR 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 these based on Load Rating Summary Sheets included in the Bridge Record and/or by consulting their Load Rating Engineer.

2.1.15 Storm Event History

The Bridge Record for structures over waterways should include a history of storm events, flooding events, recording high-water marks and observed scour. Documentation of flooding events and observations are a mandatory component of a Bridge Record for a Scour Critical Bridge. See also the Section on Scour Records.

2.1.16 Traffic Data

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

2.1.1.12 Arterials or Collectors

The NDOR Planning Section periodically updates state and regional traffic data, Average Daily Traffic (ADT) and Average Daily Truck Traffic (ADTT). Local Owners may have other data in their files.

2.1.1.13 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.

2.1.17 Inspection History

Each Bridge Record should include a history of all inspections performed on the bridge. These could include routine (NBI), fracture critical, underwater, special and other inspection types described in Chapter 4, Bridge Inspection.

2.1.18 Inspection Procedure Requirements

Each bridge requiring non-routine inspection techniques (fracture critical, complex and underwater) should include inspection procedures. These would describes a list of specialized tools and equipment needed to complete the inspection.

Fracture critical bridges must have a list of all known FC members in the record. This documentation is a mandatory component of a Bridge Record for inspections.

The LPA Bridge Owners are required to have a copy of the underwater inspection procedures in the records.

2.1.19 Structure Inventory and Appraisal Sheets

The Bridge Record should contain a copy of each SI&A resulting from every inspection completed for the structure. Inspections between routine inspections that modify the NBI data items should also be included.

2.1.20 Inventories and Inspections

The records should contain all inspection reports completed as part of the Nebraska Bridge Inspection Program. See the Chapter on Bridge Inspection for definitions and further information. These would include, as they pertain to each bridge:

- Routine Inspections
- Underwater inspection reports
- Fracture Critical inspection reports
- Special Inspections
    - Initial inspections
    - Post-repair inspections completed after repairs made to address Critical Findings
    - Other inspections related to monitoring the general or a specific condition.

NDOR has been utilizing engineering consultants to complete underwater inspections in Nebraska. The LPA Bridge Owners must have a copy of the inspection report in the records. When UW inspections are completed, NDOR will send a copy of the reports to the LPA Bridge Owners.

NDOR has been utilizing engineering consultants to complete fracture critical inspections in Nebraska. The LPA Bridge Owners must have a copy of the inspection report in the Bridge Record. The consultants typically have been providing a copy directly to the Bridge Owners.

All inspection documents and reports are mandatory components of a Bridge Record.

2.1.21 Load Rating Records

The Bridge Record must include the complete Load Rating Report that includes documentation of calculations for a bridge's load rating. It is mandatory that all bridges have a Load Rating Summary Sheet (LRSS), signed by the Load Rating Engineer, and all load rating calculations included for each load rating completed on the bridge. Originally signed LRSSs should be in the possession of the Owner and included in the Bridge Record.

2.1.22 Scour Records

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

NDOR had hired engineering consultants in 2007 and 2008 to evaluate selected bridges that were coded for Item 113 as 6 or U, for scour in Nebraska. This effort was completed in 2010. For these bridges, a hydraulic study and assessment was completed by an Interdisciplinary Hydraulic Assessment Team and a bridge may have been determined to be scour critical (Item 113 is 3 or less) or the bridge has an unknown foundation (Item 113 is U). The Bridge Division Hydraulic Section screens inspection data for structures that may have scour issues and will provide the Owner the documents for any hydraulic reanalysis.

The record should include the complete Hydraulic Analysis Report. 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 log in the Bridge Record that documents activities related to the POA, such as installation of countermeasures or monitoring.

Scour assessment, POA and the POA Log are mandatory components of the Bridge Record for scour critical (Item 113 is 3 or less) or the bridge has an unknown foundation (Item 113 is U).

NDOR recommends that Owners prepare POA logs in a format that is portable to the field for scour monitoring and reporting. It is the Owners decision how to maintaining a POA, however, the Log must include the date, observations made and the status of the bridge.

Examples of POA logs used by NE Owners include:

- Three ring binder(s) that include(s) copies of Owners POAs and the NDOR form POA Logs for each structure.
- One county map is prepared for each storm event that documents the rainfall total amounts across the county with post-event observations on the back of the map. All event maps and recorded observations are kept in a group, hardcopy file at the Owner’s office.
- 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.

2.6 QUALITY CONTROL

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. The QC expectations are described in more detail in Chapter 1, Bridge Inspection Program Requirements.

2.7 QUALITY ASSURANCE

NDOR 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	Add POA Log, Bridge File Index, Individual Bridge Record Checklist; Miscellaneous clarifications
2	2013 March 04	Revision 2

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 NDOR Bridge Inspection Program website at http://www.nebraskatransportation.org/design/bridge/bipm.htm for the current list of applicable forms and the most recent versions of each form.

Name	DR Form
Bridge File Index	N/A
Individual Bridge Record Checklist	N/A
Plan of Action (POA) Log	N/A

2.10 APPENDIX

Memos and other guidance that may have been issued after the issuance of the current revision of this Chapter can be found at the NDOR Bridge Inspection Program website at http://www.nebraskatransportation.org/design/bridge/bipm.htm.

Participants are urged to check this site to ensure they have all the most current information and forms.

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3-NBI.1 GENERAL

The FHWA database includes Items from Item 1 through Item 116. The descriptions and guidance for use of these are shown in FHWA's Coding Guide. They are also herein and are shown in Calibri Italic font. Where the FHWA's Coding Guide descriptions and tables are in the International System of Units (SI), they have been converted to English units in this Manual, and shown in Calibri Italic font to convey to the Manual user the source of the information. This Chapter also provides NDOR commentary or supplemental guidance on these Items where necessary.

The 200 series Items are Nebraska custom data fields used by NDOR and are not submitted to the FHWA. These items do not print on a structure's Structural Inventory and Appraisal (SI&A) report.

The 300 series Items are Nebraska custom fields used by NDOR and are not submitted to the FHWA. These items do not print on the SI&A report. These were developed by the NDOR 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-NBI.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

3-NBI.3 FHWA CODING MANUAL DEFINITIONS

The definitions of terms used in the Guide are provided below.

Term	***Definition***
Bridge	*The National Bridge Inspection Standards published in the Code of Federal Regulations (23 CFR § 650.3) give the following 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 may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. See Item 112 for illustration.*
Culvert	*A structure designed hydraulically to take advantage of submergence to increase hydraulic capacity. Culverts, as distinguished from bridges, are usually covered with embankment and are composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert. Culverts may qualify to be considered "bridge" length.*
Inventory Route	*The route for which the applicable inventory data is to be recorded. The inventory route may be on the structure or under the structure. Generally inventories along a route are made from west to east and south to north.*
National Bridge Inventory (NBI)	*The aggregation of structure inventory and appraisal data collected to fulfill the requirements of the National Bridge Inspection Standards. Each State shall prepare and maintain an inventory of all bridges subject to the NBIS.*
National Bridge Inventory (NBI) Record	*Data which has been coded according to the Guide for each structure carrying highway traffic or each inventory route which goes under a structure. These data are furnished and stored in a compact alphanumeric format on magnetic tapes or disks suitable for electronic data processing.*
National Bridge Inspection Standards (NBIS)	*Federal regulations establishing requirements for inspection procedures, frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of a State bridge inventory. The NBIS apply to all structures defined as bridges located on all public roads.*
Public Road	*Any road under the jurisdiction of and maintained by a public authority and open to public travel.*
Structure Inventory and Appraisal (SI&A) Sheet	*The graphic representation of the data recorded and stored for each NBI record in accordance with this Guide.*
Strategic Highway Corridor Network (STRAHNET)	*A system of highways which are strategically important to the defense of the United States. It includes the Interstate Highways and 25,215 kilometers of other non-interstate highways. The Military Traffic Management Command Report SE 89-4b-27, Strategic Highway Corridor Network, January 1991, contains additional information on STRAHNET.*
STRAHNET Connectors	*STRAHNET Connectors are roads that connect military installations and ports of embarkation to the STRAHNET. The connector routes represent about 3,042 kilometers of roads that complement STRAHNET.*

Term	***Definition***
Indian Reservation Road (IRR)	*A public road that is located within or provides access to an Indian reservation as described in Title 23, U.S.C., Sect.101. The terminus of a road providing access to an Indian reservation or other Indian land is defined as the point at which the road intersects with a road functionally classified as a collector or higher classification (outside the reservation boundary) in both urban and rural areas. In the case of access from an Interstate Highway, the terminus is the first interchange outside the reservation.*
Land Management Highway System (LMHS)	*Consists of adjoining state and local public roads that provide major public access to Bureau of Land Management administered public lands, resources and facilities.*
Forest Highway (FH)	*A road, under the jurisdiction of, and maintained by, a public authority and open to public travel; wholly or partly within, or adjacent to, and serving the National Forest System (NFS) and which is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources. (23 CFR § 660).*
Forest Service Development Road	*A forest road wholly under the jurisdiction of the Forest Service, which may be "open to public travel". Bridges on Forest Service Development Roads which are "open to public travel" are subject to the NBIS.*
Base Highway Network	*The Base Highway Network includes the through lane (mainline) portions of the NHS, rural/urban principal arterial system and rural minor arterial system. Ramps, frontage roads and other roadways are not included in the Base Network.*
Highway Performance Monitoring System	*The Highway Performance Monitoring System (HPMS) is a database of universe and sample data that describes the nation's public road mileage. The data are annually updated and submitted to FHWA by the State Highway Agencies, Puerto Rico and the District of Columbia. The universe data provides some basic characteristics of all public road mileage while the sample of the arterial and collector systems allows for assessment of the condition, performance, usage and additional characteristics of the nation's major highway systems.*
Rounding and Truncating of Numerical Data	*All numeral values in this Guide, except as specifically noted, will follow standard rounding criteria, that is, 5 and above will be rounded up to the next higher unit and 4 and below will be rounded down to the next lower unit. This is applicable to all decimal rounding. In certain items where rounding may cause a safety hazard for clearance, the numeric measurements will be truncated at the appropriate decimal place. This means that a fractional portion less than a whole unit will be dropped to the lower whole number, for example 2.88 would be truncated to 2.8 when using tenth of a meter accuracy. All decimal points are assumed in the locations as specified in the Guide.*
Commonly Recognized (CoRe) Structural Elements)	*A group of structural elements endorsed by AASHTO as a means of providing a uniform basis for data collection for any bridge management system, to enable the sharing of data between States, and to allow for a uniform translation of data to NBI Items 58, 59, 60 and 62.*
Bridge management System (BMS)	*A system designed to optimize the use of available resources for the inspection, maintenance, rehabilitation and replacement of bridges.*

3-NBI.4 NATIONAL BRIDGE INVENTORY DATA ITEMS

3-NBI.4.1 NBI Items – Numerical Order

The NBI Items are shown in the following table in the order shown in the NBI. Responsibility for entry into the NE database is shown as guidance of participants, but can vary for each structure.

NBI ITEMS SHOWN IN NUMERICAL ORDER

S = static item – typically don't change each inspection cycle
D = dynamic item – may change each inspection cycle
I = initial entry
V = verify – notify BIP Program Manager of changes on marked up SI&A sheet
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Item No.	Item Name	SI&A Category	Code Length /Type	Sufficiency	Static/ Dynamic	PM Staff	Owner	TL	HE	LRE
1	State Code	Identification	3/N		S	I				
2	Highway Agency District	Identification	2/AN		S	I				
3	County (Parish) Code	Identification	3/N		S	I				
4	Place Code	Identification	5/N		S	I				
5	Inventory Route	Identification	9/AN		S	I				
5A	Record Type	Identification	1/AN		S	I				
5B	Route Signing Prefix	Identification	1/N		S	I				
5C	Designated Level of Service	Identification	1/N		S	I				
5D	Route Number	Identification	5/AN		S	I				
5E	Directional Suffix	Identification	1/N		S	I				
6	Features Intersected	Identification	25/AN		S	I				
6A	Features Intersected	Identification	24/AN		S	I				
6B	Critical Facility Indicator	Identification	1/AN		S	I				
7	Facility Carried By Structure	Identification	18/AN		S	I				
8	Structure Number	Identification	15/AN		S	I				
9	Location	Identification	25/AN		S	I				
10	Inventory Rte, Min Vertical Clearance	Geometric Data	4/N		S	I				
11	Milepoint	Identification	7/N		S	I				
12	Base Highway Network	Identification	1/N		S	I				
13	Inventory Route, Subroute Number	Identification	12/AN		S	I				
13A	LRS Inventory Route	Identification	10/AN		S	I				
13B	Subroute Number	Identification	2/N		S	I				
16	Latitude	Identification	8/N		S	I		V		
17	Longitude	Identification	9/N		S	I		V		

NBI ITEMS SHOWN IN NUMERICAL ORDER										
S = static item – typically don't change each inspection cycle D = dynamic item – may change each inspection cycle I = initial entry V = verify – notify BIP Program Manager of changes on marked up SI&A sheet E = enter into Pontis when changed P = provides data										
Item No.	**Item Name**	**SI&A Category**	**Code Length /Type**	**Sufficiency**	**Static/ Dynamic**	**PM Staff**	**Owner**	**TL**	**HE**	**LRE**
19	Bypass/Detour Length	Age and Service	3/N	S3, S4	S[1]	I, E		V		
20	Toll	Classification	1/N		S	I				
21	Maintenance Responsibility	Classification	2/N		S	I				
22	Owner	Classification	2/N		S	I				
26	Functional Class Of Inventory Rte.	Classification	2/N	S2	S[1]	I, E				
27	Year Built	Age and Service	4/N		S	I				
28	Lanes On/Under Structure	Age and Service	4/N		S	I		V		
28A	Lanes On Structure	Age and Service	2/N		S	I		V		
28B	Lanes Under Structure	Age and Service	2/N		S	I		V		
29	Average Daily Traffic	Age and Service	6/N	S2	S1	I, E	P	V		
30	Year Of Average Daily Traffic	Age and Service	4/N		S1	I, E		V		
31	Design Load	Load Rating and Posting	1/N		S	I				
32	Approach Roadway Width	Geometric Data	4/N	S2	S	I		V		
33	Bridge Median	Geometric Data	1/N		S	I		V		
34	Skew	Geometric Data	2/N		S	I				
35	Structure Flared	Geometric Data	1/N		S	I				
36	Traffic Safety Features	Appraisal	4/AN	S4	D	I		E		
36A	Bridge Railings	Appraisal	1/AN		D	I		E		
36B	Transitions	Appraisal	1/AN		D	I		E		
36C	Approach Guardrail	Appraisal	1/AN		D	I		E		
36D	Approach Guardrail Ends	Appraisal	1/AN		D	I		E		
37	Historical significance	Classification	1/N		S	I				
38	Navigation Control	Navigational Data	1/AN		S	I		V		
39	Navigation Vertical Clearance	Navigational Data	4/N		S	I		V		

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Item No.	**Item Name**	**SI&A Category**	**Code Length /Type**	**Sufficiency**	**Static/ Dynamic**	**PM Staff**	**Owner**	**TL**	**HE**	**LRE**
40	Navigation Horizontal Clearance	Navigational Data	5/N		S	I		V		
41	Structure Open/Posted/Closed	Load Rating and Posting	1/AN		D	I, E		E		
42	Type of Service	Age and Service	2/N		S	I		V		
42A	Type of Service On Bridge	Age and Service	1/N		S	I		V		
42B	Type of Service Under Bridge	Age and Service	1/N		S	I		V		
43	Structure Type, Main	Structure Type and Material	3/N	S2	S^2	I, E		V		
43A	Kind of Material/Design	Structure Type and Material	1/N		S^2	I, E		V		
43B	Type of Design/Construction	Structure Type and Material	2/N		S^2	I, E		V		
44	Structure Type, Approach Spans	Structure Type and Material	3/N		S^2	I, E		V		
44A	Kind of Material/Design	Structure Type and Material	1/N		S^2	I, E		V		
44B	Type of Design/Construction	Structure Type and Material	2/N		S^2	I, E		V		
45	Number Of Spans In Main Unit	Structure Type and Material	3/N		S^2	I, E		V		
46	Number Of Approach Spans	Structure Type and Material	4/N		S^2	I, E		V		
47	Inventory Rte Total Horizontal Clearance	Geometric Data	3/N		S1	I, E		V		
48	Length Of Maximum Span	Geometric Data	5/N		S	I		V		
49	Structure Length	Geometric Data	6/N		S	I		V		
50	Curb/Sidewalk Widths	Geometric Data	6/N		S	I		V		
50A	Left Curb/Sidewalk Width	Geometric Data	3/N		S	I		V		
50B	Right Curb/Sidewalk Width	Geometric Data	3/N		S	I		V		

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Item No.	Item Name	SI&A Category	Code Length /Type	Sufficiency	Static/ Dynamic	PM Staff	Owner	TL	HE	LRE
51	Bridge Roadway Width Curb-To-Curb	Geometric Data	4/N	S2	S	I		V		
52	Deck Width, Out-To-Out	Geometric Data	4/N		S	I		V		
53	Min Vertical Clear Over Bridge Roadway	Geometric Data	4/N	S2	S	I		V		
54	Minimum Vertical Underclearance	Geometric Data	5/AN		D	I		E		
54A	Reference Feature	Geometric Data	1/AN		D	I		E		
54B	Minimum Vertical Underclearance	Geometric Data	4/N		D	I		E		
55	Min Lateral Underclear On Right	Geometric Data	4/AN	S2	D	I		E		
55A	Reference Feature	Geometric Data	1/AN		D	I		E		
55B	Minimum Lateral Underclearance	Geometric Data	3/N		D	I		E		
56	Min Lateral Underclear On Left	Geometric Data	3/N	S2	D	I		E		
58	Deck	Condition	1/AN	S2	D			E		
59	Superstructure	Condition	1/AN	S1	D			E		
60	Substructure	Condition	1/AN	S1	D			E		
61	Channel/Channel Protection	Condition	1/AN		D			E		
62	Culverts	Condition	1/AN	S1	D			E		
63	Method Used To Determine Operating Rating	Load Rating and Posting	1/N		D	E				P
64	Operating Rating	Load Rating and Posting	3/N		D	E				P
65	Method Used To Determine Inventory Rating	Load Rating and Posting	1/N		D	E				P
66	Inventory Rating	Load Rating and Posting	3/N	S1	D	E				P
67	Structural Evaluation	Appraisal	1/AN	S2	D[3]					
68	Deck Geometry	Appraisal	1/AN	S2	D[3]					
69	Underclear, Vertical & Horizontal	Appraisal	1/AN	S2	D[3]					

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Item No.	Item Name	SI&A Category	Code Length /Type	Sufficiency	Static/ Dynamic	PM Staff	Owner	TL	HE	LRE
70	Bridge Posting	Load Rating and Posting	1/N		D	E				
71	Waterway Adequacy	Appraisal	1/AN	S2	D	E			P	
72	Approach Roadway Alignment	Appraisal	1/AN	S2	S	I		V		
75	Type of Work	Proposed Improvements	3/N		S[4]	E	P			
75A	Type of Work Proposed	Proposed Improvements	2/N		S[4]	E	P			
75B	Work Done By	Proposed Improvements	1/AN		S[4]	E	P			
76	Length Of Structure Improvement	Proposed Improvements	6/N		S[4]	E	P			
90	Inspection Date	Inspections	4/N		D			E		
91	Designated Inspection Frequency	Inspections	2/N		D[4]		V	E		
92	Critical Feature Inspection	Inspections	9/AN		D[4]			E		
92A	Fracture Critical Details	Inspections	3/AN		D[4]			E		
92B	Underwater Inspection	Inspections	3/AN		D[5]	E				
92C	Special Inspection	Inspections	3/AN		D			E		
93	Critical Feature Inspection Dates	Inspections	12/AN		D			E		
93A	Fracture Critical Details Date	Inspections	4/AN		D			E		
93B	Underwater Inspection Date	Inspections	4/AN		D[5]	E				
93C	Special Inspection Date	Inspections	4/AN		D			E		
94	Bridge Improvement Cost	Proposed Improvements	6/N		D[4]	E	P			
95	Roadway Improvement Cost	Proposed Improvements	6/N		D[4]	E	P			
96	Total Project Cost	Proposed Improvements	6/N		D[4]	E	P			
97	Year Of Improvement Cost Estimate	Proposed Improvements	4/N		D[4]	E	P			
98	Border Bridge	Identification	5/AN		S	I				

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Item No.	Item Name	SI&A Category	Code Length /Type	Sufficiency	Static/ Dynamic	PM Staff	Owner	TL	HE	LRE
98A	Neighboring State Code	Identification	3/AN		S	I				
98B	Percent Responsibility	Identification	2/N		S	I				
99	Border Bridge Structure Number	Identification	15/AN		S	I				
100	STRAHNET Highway Designation	Classification	1/N	S2, S3	S	I				
101	Parallel Structure Designation	Classification	1/AN		S	I				
102	Direction Of Traffic	Classification	1/N		S	I				
103	Temporary Structure Designation	Classification	1/AN		S	I				
104	Highway System Of Inventory Route	Classification	1/N		S	I				
105	Federal Lands Highways	Classification	1/N		S	I				
106	Year Reconstructed	Age and Service	4/N		S[1]	I		V		
107	Deck Structure Type	Structure Type and Material	1/AN		S	I		V		
108	Wearing Surface/Protective System	Structure Type and Material	3/AN		S	I		V		
108A	Type of Wearing Surface	Structure Type and Material	1/AN		S	I		V		
108B	Type of Membrane	Structure Type and Material	1/AN		S	I		V		
108C	Deck Protection	Structure Type and Material	1/AN		S	I		V		
109	Average Daily Truck Traffic	Age and Service	2/N		S	I	P	V		
110	Designated National Network	Classification	1/N		S	I				
111	Pier/Abutment Protection	Navigational Data	1/N		S	I		V		
112	NBIS Bridge Length	Classification	1/AN		S	I		V		
113	Scour Critical Bridges	Appraisal	1/AN		D		E		P	
114	Future Average Daily Traffic	Proposed Improvements	6/N		S	I, E	P			

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P = provides data

Item No.	Item Name	SI&A Category	Code Length /Type	Sufficiency	Static/ Dynamic	PM Staff	Owner	TL	HE	LRE
115	Year Of Future Avg. Daily Traffic	Proposed Improvements	4/N		S	I, E	P			
116	Minimum Navigation Vertical Clearance Vertical Lift Bridge	Navigational Data	4/N		S	I		V		

[1] TL shall verify and notify BIPPM of changes.
[2] These items may change if the structure is rehabilitated or retrofit.
[3] These items are calculated by the NBI Edit/Update Program.
[4] Bridge Owners and their Engineer should determine these.
[5] NDOR is responsible for these items for Underwater Inspection.

3-NBI.4.2 NBI Items – Inventory Order

NBI ITEMS IN ORDER SHOWN IN THE NBI			
Item No.	**Item Name**	**SI&A Category**	**Code Length /Type**
1	State Code	Identification	3/N
8	Structure Number	Identification	15/AN
5	Inventory Route	Identification	9/AN
5A	Record Type	Identification	1/AN
5B	Route Signing Prefix	Identification	1/N
5C	Designated Level of Service	Identification	1/N
5D	Route Number	Identification	5/AN
5E	Directional Suffix	Identification	1/N
2	Highway Agency District	Identification	2/AN
3	County (Parish) Code	Identification	3/N
4	Place Code	Identification	5/N
6	Features Intersected	Identification	25/AN
6A	Features Intersected	Identification	24/AN
6B	Critical Facility Indicator	Identification	1/AN
7	Facility Carried By Structure	Identification	18/AN
9	Location	Identification	25/AN
10	Inventory Rte, Min Vertical Clearance	Geometric Data	4/N
11	Milerpoint	Identification	7/N
12	Base Highway Network	Identification	1/N
13	Inventory Route, Subroute Number	Identification	12/AN
13A	LRS Inventory Route	Identification	10/AN
13B	Subroute Number	Identification	2/N
16	Latitude	Identification	8/N
17	Longitude	Identification	9/N
19	Bypass/Detour Length	Age and Service	3/N
20	Toll	Classification	1/N
21	Maintenance Responsibility	Classification	2/N
22	Owner	Classification	2/N
26	Functional Class Of Inventory Rte.	Classification	2/N
27	Year Built	Age and Service	4/N
28	Lanes On/Under Structure	Age and Service	4/N
28A	Lanes On Structure	Age and Service	2/N
28B	Lanes Under Structure	Age and Service	2/N
29	Average Daily Traffic	Age and Service	6/N
30	Year Of Average Daily Traffic	Age and Service	4/N
31	Design Load	Load Rating and Posting	1/N
32	Approach Roadway Width	Geometric Data	4/N
33	Bridge Median	Geometric Data	1/N
34	Skew	Geometric Data	2/N
35	Structure Flared	Geometric Data	1/N
36	Traffic Safety Features	Appraisal	4/AN
36A	Bridge Railings	Appraisal	1/AN

NBI ITEMS IN ORDER SHOWN IN THE NBI			
Item No.	**Item Name**	**SI&A Category**	**Code Length /Type**
36B	Transitions	Appraisal	1/AN
36C	Approach Guardrail	Appraisal	1/AN
36D	Approach Guardrail Ends	Appraisal	1/AN
37	Historical significance	Classification	1/N
38	Navigation Control	Navigational Data	1/AN
39	Navigation Vertical Clearance	Navigational Data	4/N
40	Navigation Horizontal Clearance	Navigational Data	5/N
41	Structure Open/Posted/Closed	Load Rating and Posting	1/AN
42	Type of Service	Age and Service	2/N
42A	Type of Service On Bridge	Age and Service	1/N
42B	Type of Service Under Bridge	Age and Service	1/N
43	Structure Type, Main	Structure Type and Material	3/N
43A	Kind of Material/Design	Structure Type and Material	1/N
43B	Type of Design/Construction	Structure Type and Material	2/N
44	Structure Type, Approach Spans	Structure Type and Material	3/N
44A	Kind of Material/Design	Structure Type and Material	1/N
44B	Type of Design/Construction	Structure Type and Material	2/N
45	Number Of Spans In Main Unit	Structure Type and Material	3/N
46	Number Of Approach Spans	Structure Type and Material	4/N
47	Inventory Rte Total Horizontal Clearance	Geometric Data	3/N
48	Length Of Maximum Span	Geometric Data	5/N
49	Structure Length	Geometric Data	6/N
50	Curb/Sidewalk Widths	Geometric Data	6/N
50A	Left Curb/Sidewalk Width	Geometric Data	3/N
50B	Right Curb/Sidewalk Width	Geometric Data	3/N
51	Bridge Roadway Width Curb-To-Curb	Geometric Data	4/N
52	Deck Width, Out-To-Out	Geometric Data	4/N
53	Min Vertical Clear Over Bridge Roadway	Geometric Data	4/N
54	Minimum Vertical Underclearance	Geometric Data	5/AN
54A	Reference Feature	Geometric Data	1/AN
54B	Minimum Vertical Underclearance	Geometric Data	4/N
55	Min Lateral Underclear On Right	Geometric Data	4/AN
55A	Reference Feature	Geometric Data	1/AN
55B	Minimum Lateral Underclearance	Geometric Data	3/N
56	Min Lateral Underclear On Left	Geometric Data	3/N
58	Deck	Condition	1/AN
59	Superstructure	Condition	1/AN
60	Substructure	Condition	1/AN
61	Channel/Channel Protection	Condition	1/AN
62	Culverts	Condition	1/AN
63	Method Used To Determine Operating Rating	Load Rating and Posting	1/N
64	Operating Rating	Load Rating and Posting	3/N

NBI ITEMS IN ORDER SHOWN IN THE NBI			
Item No.	**Item Name**	**SI&A Category**	**Code Length /Type**
65	Method Used To Determine Inventory Rating	Load Rating and Posting	1/N
66	Inventory Rating	Load Rating and Posting	3/N
67	Structural Evaluation	Appraisal	1/AN
68	Deck Geometry	Appraisal	1/AN
69	Underclear, Vertical & Horizontal	Appraisal	1/AN
70	Bridge Posting	Load Rating and Posting	1/N
71	Waterway Adequacy	Appraisal	1/AN
72	Approach Roadway Alignment	Appraisal	1/AN
75	Type of Work	Proposed Improvements	3/N
75A	Type of Work Proposed	Proposed Improvements	2/N
75B	Work Done By	Proposed Improvements	1/AN
76	Length Of Structure Improvement	Proposed Improvements	6/N
90	Inspection Date	Inspections	4/N
91	Designated Inspection Frequency	Inspections	2/N
92	Critical Feature Inspection	Inspections	9/AN
92A	Fracture Critical Details	Inspections	3/AN
92B	Underwater Inspection	Inspections	3/AN
92C	Other Special Inspection	Inspections	3/AN
93	Critical Feature Inspection Dates	Inspections	12/AN
93A	Fracture Critical Details Date	Inspections	4/AN
93B	Underwater Inspection Date	Inspections	4/AN
93C	Other Special Inspection Date	Inspections	4/AN
94	Bridge Improvement Cost	Proposed Improvements	6/N
95	Roadway Improvement Cost	Proposed Improvements	6/N
96	Total Project Cost	Proposed Improvements	6/N
97	Year Of Improvement Cost Estimate	Proposed Improvements	4/N
98	Border Bridge	Identification	5/AN
98A	Neighboring State Code	Identification	3/AN
98B	Percent Responsibility	Identification	2/N
99	Border Bridge Structure Number	Identification	15/AN
100	STRAHNET Highway Designation	Classification	1/N
101	Parallel Structure Designation	Classification	1/AN
102	Direction Of Traffic	Classification	1/N
103	Temporary Structure Designation	Classification	1/AN
104	Highway System Of Inventory Route	Classification	1/N
105	Federal Lands Highways	Classification	1/N
106	Year Reconstructed	Age and Service	4/N
107	Deck Structure Type	Structure Type and Material	1/AN
108	Wearing Surface/Protective System	Structure Type and Material	3/AN
108A	Type of Wearing Surface	Structure Type and Material	1/AN
108B	Type of Membrane	Structure Type and Material	1/AN
108C	Deck Protection	Structure Type and Material	1/AN
109	Average Daily Truck Traffic	Age and Service	2/N
110	Designated National Network	Classification	1/N

NBI ITEMS IN ORDER SHOWN IN THE NBI			
Item No.	**Item Name**	**SI&A Category**	**Code Length /Type**
111	Pier/Abutment Protection	Navigational Data	1/N
112	NBIS Bridge Length	Classification	1/AN
113	Scour Critical Bridges	Appraisal	1/AN
114	Future Average Daily Traffic	Proposed Improvements	6/N
115	Year Of Future Avg. Daily Traffic	Proposed Improvements	4/N
116	Minimum Navigation Vertical Clearance Vertical Lift Bridge	Navigational Data	4/N

3-NBI.4.3 NBI Items – Alphabetical Order

NBI ITEMS IN ALPHABETICAL ORDER		
Item No.	**Item Name**	**Code Length/Type**
36C	Approach Guardrail	1/AN
36D	Approach Guardrail Ends	1/AN
72	Approach Roadway Alignment	1/AN
32	Approach Roadway Width	4/N
29	Average Daily Traffic	6/N
109	Average Daily Truck Traffic	2/N
12	Base Highway Network	1/N
98	Border Bridge	5/AN
99	Border Bridge Structure Number	15/AN
94	Bridge Improvement Cost	6/N
33	Bridge Median	1/N
70	Bridge Posting	1/N
36A	Bridge Railings	1/AN
51	Bridge Roadway Width Curb-To-Curb	4/N
19	Bypass/Detour Length	3/N
61	Channel/Channel Protection	1/AN
3	County (Parish) Code	3/N
6B	Critical Facility Indicator	1/AN
92	Critical Feature Inspection	9/AN
93	Critical Feature Inspection Dates	12/AN
62	Culverts	1/AN
50	Curb/Sidewalk Widths	6/N
58	Deck	1/AN
68	Deck Geometry	1/AN
108C	Deck Protection	1/AN
107	Deck Structure Type	1/AN
52	Deck Width, Out-To-Out	4/N
31	Design Load	1/N
91	Designated Inspection Frequency	2/N
5C	Designated Level of Service	1/N
110	Designated National Network	1/N
102	Direction Of Traffic	1/N
5E	Directional Suffix	1/N
7	Facility Carried By Structure	18/AN
6	Features Intersected	25/AN
6A	Features Intersected	24/AN
105	Federal Lands Highways	1/N
92A	Fracture Critical Details	3/AN
93A	Fracture Critical Details Date	4/AN
26	Functional Class Of Inventory Rte.	2/N
114	Future Average Daily Traffic	6/N
2	Highway Agency District	2/AN

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NBI ITEMS IN ALPHABETICAL ORDER		
Item No.	**Item Name**	**Code Length/Type**
104	Highway System Of Inventory Route	1/N
37	Historical significance	1/N
90	Inspection Date	4/N
66	Inventory Rating	3/N
5	Inventory Route	9/AN
13	Inventory Route, Subroute Number	12/AN
47	Inventory Rte Total Horizontal Clearance	3/N
10	Inventory Rte, Min Vertical Clearance	4/N
11	Milepoint	7/N
43A	Kind of Material/Design	1/N
44A	Kind of Material/Design	1/N
28A	Lanes On Structure	2/N
28	Lanes On/Under Structure	4/N
28B	Lanes Under Structure	2/N
16	Latitude	8/N
50A	Left Curb/Sidewalk Width	3/N
48	Length Of Maximum Span	5/N
76	Length Of Structure Improvement	6/N
9	Location	25/AN
17	Longitude	9/N
13A	LRS Inventory Route	10/AN
21	Maintenance Responsibility	2/N
65	Method Used To Determine Inventory Rating	1/N
63	Method Used To Determine Operating Rating	1/N
56	Min Lateral Underclear On Left	3/N
55	Min Lateral Underclear On Right	4/AN
53	Min Vertical Clear Over Bridge Roadway	4/N
55B	Minimum Lateral Underclearance	3/N
116	Minimum Navigation Vertical Clearance Vertical Lift Bridge	4/N
54	Minimum Vertical Underclearance	5/AN
54B	Minimum Vertical Underclearance	4/N
38	Navigation Control	1/AN
40	Navigation Horizontal Clearance	5/N
39	Navigation Vertical Clearance	4/N
112	NBIS Bridge Length	1/AN
98A	Neighboring State Code	3/AN
46	Number Of Approach Spans	4/N
45	Number Of Spans In Main Unit	3/N
64	Operating Rating	3/N
92C	Other Special Inspection	3/AN
93C	Other Special Inspection Date	4/AN
22	Owner	2/N
101	Parallel Structure Designation	1/AN
98B	Percent Responsibility	2/N

NBI ITEMS IN ALPHABETICAL ORDER		
Item No.	**Item Name**	**Code Length/Type**
111	Pier/Abutment Protection	1/N
4	Place Code	5/N
5A	Record Type	1/AN
54A	Reference Feature	1/AN
55A	Reference Feature	1/AN
50B	Right Curb/Sidewalk Width	3/N
95	Roadway Improvement Cost	6/N
5D	Route Number	5/AN
5B	Route Signing Prefix	1/N
113	Scour Critical Bridges	1/AN
34	Skew	2/N
1	State Code	3/N
100	STRAHNET Highway Designation	1/N
67	Structural Evaluation	1/AN
35	Structure Flared	1/N
49	Structure Length	6/N
8	Structure Number	15/AN
41	Structure Open/Posted/Closed	1/AN
44	Structure Type, Approach Spans	3/N
43	Structure Type, Main	3/N
13B	Subroute Number	2/N
60	Substructure	1/AN
59	Superstructure	1/AN
103	Temporary Structure Designation	1/AN
20	Toll	1/N
96	Total Project Cost	6/N
36	Traffic Safety Features	4/AN
36B	Transitions	1/AN
43B	Type of Design/Construction	2/N
44B	Type of Design/Construction	2/N
108B	Type of Membrane	1/AN
42	Type Of Service	2/N
42A	Type of Service On Bridge	1/N
42B	Type of Service Under Bridge	1/N
108A	Type of Wearing Surface	1/AN
75	Type of Work	3/N
75A	Type of Work Proposed	2/N
69	Underclear, Vertical & Horizontal	1/AN
92B	Underwater Inspection	3/AN
93B	Underwater Inspection Date	4/AN
71	Waterway Adequacy	1/AN
108	Wearing Surface/Protective System	3/AN
75B	Work Done By	1/AN
27	Year Built	4/N
30	Year Of Average Daily Traffic	4/N

NBI ITEMS IN ALPHABETICAL ORDER		
Item No.	**Item Name**	**Code Length/Type**
115	Year Of Future Avg. Daily Traffic	4/N
97	Year Of Improvement Cost Estimate	4/N
106	Year Reconstructed	4/N

3-NBI.5 NBI SUFFICIENCY RATING

Sufficiency Rating is a number representing the structure's overall evaluation based on its structural adequacy and safety, serviceability and functional obsolescence and essentiality for public use. This is an Item in the NBIS Inventory and is calculated. The FHWA Coding Guide Appendix describes the rating and provides an example calculation in metric units. The BIP Manual Appendix includes an example calculation in English units.

Item No.	Item Name	Condition	S1 Structural Adequacy (Max 55%)	S2 Serviceability & Functional Obsolescence (Max 30%)	S3 Essentiality for Public Use (Max 15%)	S4 Special Reductions (Max - 13%)	Static/ Dynamic	PM Staff	TL	HE	LRE
19	Bypass/Detour Length				19	19	S[1]	I, E	V		
26	Functional Classification			26 (68 & 69)							
28	Lanes On/Under Structure			28			S	I	V		
29	Average Daily Traffic			29	29		S[1]	I, E	V[2]		
32	Approach Roadway Width			32			S	I	V		
36	Traffic Safety Features					36	D	I	V		
43	Structure Type, Main			43		43	S[2]	I, E	V[2]		
51	Bridge Roadway Width Curb-To-Curb			51			S	I	V		
53	Min Vert. Clear Over Bridge Roadway			53			S	I	V		
54	Min Vertical Underclearnce			54 (69)					E		
55	Min Lateral Underclearnce Right			55 (69)					E		
56	Min Lateral Underclearnce Left			56 (69)					E		
58	Deck	Y		58			D		E		
59	Superstructure	Y	59				D		E		
60	Substructure	Y	60				D		E		
62	Culverts	Y	62				D		E		
66	Inventory Rating		66				D				E
67	Structural Evaluation (from Items 29, 59, 60, 62, 66)			67			D[3]				
68	Deck Geometry (from Items 26, 28, 29, 51, 53)			68			D[3]				
69	Underclear, Vertical & Horizontal (from Items			69			D[3]				

	26, 54, 55, 56)										
71	Waterway Adequacy	Y		71			D			E	
72	Approach Roadway Alignment	Y		72			S	I	V		
100	STRAHNET Highway Designation			100	100		S	I			
Items shown in italics affect other Items for the Sufficiency calculation. S = static items that typically don't change on an inspection cycle, D = dynamic I = initial entry; V = verify; E = entry when changed See footnotes at end of table.											
[1] BO determines and shall notify BIPPM of changes. [2] These items may change if the structure is rehabilitated or retrofit. [3] These items are calculated by the NBI Edit/Update Program.											

3-NBI.6 NBI BRIDGE STATUS: STRUCTURALLY DEFICIENT OR FUNCTIONALLY OBSOLETE

A bridge's sufficiency rating and a general classification of the bridge's status, either structurally deficient or functionally obsolete, are used in preparing the selection list of bridges under the Highway Bridge Program (HBP). NDOR's Bridge Inventory database includes Status data item.

Structures must be NBI highway bridges and have not been constructed or had major reconstruction within the past ten years to be considered for the HBP list. NBI highway bridges are coded as shown. HBP list includes structurally deficient or functionally obsolete bridges.

General NBI Bridge Qualifications	
NBI Item	**Code**
Item 5A – Inventory Route Record Type	1 – Route carried on the structure
Item 42A – Type of Service on bridge	One of the following:
	1 – Highway
	4 – Highway-railroad
	5 – Highway-pedestrian
	6 – Overpass structure at an interchange or second level of a multilevel interchange
	7 – Third level (Interchange)
	8 – Fourth level (Interchange)
Item 112 – NBIS Bridge Length	Y (yes)

Item STATUS – Structurally Deficient or Functionally Obsolete

1 digit

Status	Code
Structurally Deficient	1
Functionally Obsolescent	2

Any bridge classified as structurally deficient is excluded from the functionally obsolete category.

Structurally Deficient Bridges meet the General Qualifications above and meet at least one of the following qualifications:

Table 6-A Structurally Deficient Qualifications

Structurally Deficient Qualifications		
Case	**NBI Item**	**Code**
1	Item 58 – Deck	4 or less
2	Item 59 – Superstructure	4 or less
3	Item 60 – Substructures	4 or less
4	Item 62 – Culvert and Retaining Walls Item 43B – Structure Main, Type of design and/or construction	4 or less One of the following: 19 - Culvert
5	Item 67 – Structural Condition	2 or less
6	Item 71 – Waterway Adequacy Item 42B – Service under bridge	2 or less One of the following: 5 - Waterway 6 - Highway-waterway 7 - Railroad-waterway 8 - Highway-waterway-railroad 9 - Relief for waterway 0 - Other

Functionally Obsolete bridges meet the general qualifications and meet at least one of the following qualifications:

Functionally Obsolete Qualifications		
Case	**NBI Item**	**Code**
1	Item 68 – Deck Geometry	3 or less
2	Item 69 – Underclearances Item 42B – Structure Main, Type of design and/or construction	3 or less One of the following: 1 - Highway, with or without pedestrian 2 - Railroad 4 - Highway-railroad 6 - Highway-waterway 7 - Railroad-waterway 8 - Highway-waterway-railroad 0 - Other
3	Item 72 – Approach Roadway alignment	3 or less
4	Item 67 – Structural Condition	3 or less
6	Item 71 – Waterway Adequacy Item 42B – Service under bridge	3 or less One of the following: 5 - Waterway 6 - Highway-waterway 7 - Railroad-waterway 8 - Highway-waterway-railroad 9 - Relief for waterway 0 - Other

3-NBI.7 NBI DATA ITEMS – ITEMS 1 THROUGH 57

Item 1 – State Code

3 digits

The first two digits are the Federal Information Processing Standards (FIPS) code for States, and the third digit is the FHWA region code. (New Jersey and New York will retain an FHWA region code of 2.)

Code	State
014	Alabama
020	Alaska
049	Arizona
056	Arkansas
069	California
088	Colorado
091	Connecticut
103	Delaware
113	District of Columbia
124	Florida
134	Georgia
159	Hawaii
160	Idaho
175	Illinois
185	Indiana
197	Iowa
207	Kansas
214	Kentucky
226	Louisiana
231	Maine
243	Maryland
251	Massachusetts
265	Michigan
275	Minnesota
284	Mississippi
297	Missouri

Code	State
308	Montana
317	Nebraska
329	Nevada
331	New Hampshire
342	New Jersey
356	New Mexico
362	New York
374	North Carolina
388	North Dakota
395	Ohio
406	Oklahoma
410	Oregon
423	Pennsylvania
441	Rhode Island
454	South Carolina
468	South Dakota
474	Tennessee
486	Texas
498	Utah
501	Vermont
513	Virginia
530	Washington
543	West Virginia
555	Wisconsin
568	Wyoming
721	Puerto Rico

Item 2 – State Highway Department District

2 digits

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

Item 3 – County Code

2 digits

Counties shall be identified using the Federal Information Processing Standards (FIPS) codes given in the current version of the Census of Population and Housing - Geographic Identification Code Scheme.

The FHWA Coding Guide description above only applies to the dataset NDOR submits each year to FHWA.

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 BIP Manual Appendix.

Item 4 – Urban/Municipal Code

4 digits

Cities, towns, townships, villages and other census-designated places shall be identified using the Federal Information Processing Standards (FIPS) codes given in the current version of the Census of Population and Housing - Geographic Identification Code Scheme. If there is no FIPS place code, then code all zeros.

The FHWA Coding Guide description above only applies to the dataset NDOR submits each year to FHWA. This code shall be in accordance with the *U.S. Census of Population and Housing - 1970*.

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 BIP Manual Appendix.

Item 5 – Inventory Route

9 digits

The inventory route is a nine digit code composed of five segments.

Item	*Description*	*Length*
5A	*Record Type*	*1 digit*
5B	*Route Signing Prefix*	*1 digit*
5C	*Designated Level of Service*	*1 digit*
5D	*Route Number*	*5 digits*
5E	*Directional Suffix*	*1 digit*

Item 5A – Record Type

1 digit

There are two (2) types of National Bridge Inventory records: "on" and "under". Code the first digit (leftmost) using one of the following codes:

Code	*Description*
1	*Route carried "on" the structure*
2	*Single route goes "under" the structure*
A through Z	*Multiple routes go "under" the structure.* *A signifies the first of multiple routes under the structure.* *B signifies the second of multiple routes under the structure.* *Z signifies 26 routes under the structure.*

"On" signifies that the inventory route is carried "on" the structure. Each bridge structure carrying highway traffic must have a record identified with a type code = 1 (numeric). All of the NBI data items must be coded, unless specifically excepted, with respect to the structure and the inventory route "on" it.

"Under" signifies that the inventory route goes "under" the structure. If an inventory route beneath the structure is a Federal-aid highway, is a STRAHNET route or connector or is otherwise important, a record must be coded to identify it. The type code must be 2 or an alphabetic letter A through Z. Code 2 for a single route under the structure. If 2 or more routes go under a structure on separate roadways, the code of 2 shall not be used. Code A, B, C, D, etc. consecutively for multiple routes on separate roadways under the same structure. STRAHNET routes shall be listed first. When this item is coded 2 or A through Z, only the following items must be coded: Items 1, 3-11, 16, 17, 19, 20, 26-30, 42, 43, 47-49, 100-104, 109 and 110. All other items may remain blank.

It cannot be overemphasized that all route-oriented data must agree with the coding as to whether the inventory route is "on" or "under" the structure.

Tunnels shall be coded only as an "under" record; that is, they shall not be coded as a structure carrying highway traffic.

There are situations of a route "under" a structure, where the structure does not carry a highway, but may carry a railroad, pedestrian traffic, or even a building. These are coded the same as any other "under" record and no "on" record shall be coded.

Item 5B – Route Signing Prefix

1 digit

In the second position, identify the route signing prefix for the inventory route using one of the following codes:

Code	***Description***
1	*Interstate highway*
2	*U.S. numbered highway*
3	*State highway*
4	*County highway*
5	*City street*
6	*Federal lands road*
7	*State lands road*
8	*Other (include toll roads not otherwise indicated or identified above)*

When two or more routes are concurrent, the highest class of route will be used. The hierarchy is in the order listed above.

Item 5C – Designated Level of Service

1 digit

In the third position, identify the designated level of service for the inventory route using one of the following codes:

Code	***Description***
0	*None of the below*
1	*Mainline*
2	*Alternate*
3	*Bypass*
4	*Spur*
6	*Business*
7	*Ramp, Wye, Connector, etc.*
8	*Service and/or unclassified frontage road*

Item 5D – Route Number

5 digits

Code the route number of the inventory route in the next five positions. This value shall be right justified in the field with leading zeros filled in. If concurrent routes are of the same hierarchy level, denoted by the route signing prefix, the lowest numbered route shall be coded. Code 00000 for bridges on roads without route numbers.

Item 5E – Directional Suffix

1 digit

In the last position, code the directional suffix to the route number of the inventory route when it is part of the route number, using one of the following codes:

Code	***Description***
0	*Not applicable*
1	*North*
2	*East*
3	*South*
4	*West*

In some cases, letters may be used with route numbers and as part of the route numbers and not to indicate direction. In such cases, the letter should be included in the five position route number field.

Examples:

Route Description	***Record***	***Code***
Interstate 95, on	*1 1 1 00095 0*	*111000950*
Interstate 70S, under	*2 1 1 00070 3*	*211000703*
State Spur S10A, under	*2 3 4 0S10A 0*	*2340S10A0*
U.S. 30E Bypass, on	*1 2 3 00030 2*	*123000302*
City street, on	*1 5 0 00000 0*	*150000000*
Ramp from I-81, under	*2 1 7 00081 0*	*217000810*
County Highway 173, on	*1 4 1 00173 0*	*141001730*
Interstate 84, under	*2 1 1 00084 0*	*211000840*
Interstate 495, on	*1 1 1 00495 0*	*111004950*
State Hwy. 120 (STRAHNET), under	*A 3 1 00120 0*	*A31001200*
Alternate State Hwy. 130, under	*B 3 2 00130 0*	*B32001300*
Tunnel on Interstate 70	*2 1 1 00070 0*	*211000700*

Item 6 – Features Intersected

25 digits

This item contains a description of the features intersected by the structure and a critical facility indicator. When Item 5A indicates an "under" record, this item describes the inventory route and/or features under the structure. There are 25 digits divided into two segments.

Item	Description	Length
6A	*Features Intersected*	24 digits
6B	*Critical Facility Indicator*	1 digit

The information to be recorded for this item in the first 24 digits shall be the name or names of the features intersected by the structure. When one of the features intersected is another highway, the signed number or name of the highway shall appear first (leftmost) in the field. The names of any other features shall follow, separated by a semicolon or a comma. Parentheses shall be used to provide a second identification of the same feature (see third example). Abbreviations may be used where necessary, but an effort shall be made to keep them meaningful. The data in this segment shall be left justified in the first 24 positions without trailing zeros.

A structure on a designated STRAHNET or STRAHNET Connector highway and considered to be a critical facility shall be identified by an asterisk in the 25th position. A non-critical facility shall have the digit blank.

Examples:

*I 81, US 51, MILL ROAD **

MISSISSIPPI RIVER

SR 42 (POND ROAD)

Item 7 – Facility Carried by Structure

18 digits

The facility being carried by the structure shall be recorded and coded. In all situations, this item describes the use "on" the structure. This item shall be left justified without trailing zeros.

Examples:

US 66

MAIN STREET

C & O RAILROAD (appropriate for "under" record only)

PEDESTRIAN BRIDGE (appropriate for "under" record only)

Item 8 – Structure Number (ID)

15 /AN characters

It is required that the official structure number be recorded. It is not necessary to code this number according to an arbitrary national standard. Each agency should code the structure number according to its own internal processing procedures. When recording and coding for this item and following items, 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.

The structure number must be unique for each bridge within the State, and once established should preferably never change for the life of the bridge. If it is essential that a structure number(s) must be changed, all 15 digits are to be filled. For any structure number changes, a complete cross reference of corresponding "old" and "new" numbers must be provided to the FHWA Bridge Division.

The identical structure number must appear on the "on" and all "under" records associated with a particular structure. (Refer to Item 5 Inventory Route).

The Nebraska Department of Road uses this general format for structure ID numbers. One of the major problems with structure numbers has been the shifting of numbers left or right in the 15 spaces provided. Therefore, it is required that all 15 digits be provided so that there are no embedded blank spaces.

Item	Description	Length
8A	NE Bridge Owner	1 character
8B	Owner Number	4 digits
8C	Unique Identifier	5 to 6 A/N characters

Item 8A – Bridge Owner Type

Item 8A 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

Item 8B – Bridge Owner Location Code

Item 8A Code	8B Code Description (4 A/N characters)
S	NE highway number followed by underscore
C	NDOR Code for the county (this is not the same as FHWA codes for the same county). See list in Manual Appendix.
M	NDOR Code for the municipality (this is not the same as FHWA codes for the same municipality) See list in Manual Appendix.
U	NDOR Code for the municipality (this is not the same as FHWA codes for the same municipality) See list in Manual Appendix.

Item 8C – Bridge Location ID

Item 8A Code	8C 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

State Example:	S	002_	28242 (note the underscore in the ID)
County Example:	C	0085	00805P
Municipal Example:	M	2415	M2205
Urban Example:	U	1425	D4225

Item 9 – Location

25 digits

This item contains a narrative description of the bridge location. It is recommended that the location be keyed to a distinguishable feature on an official highway department map such as road junctions and topographical features. This item shall be left justified without trailing zeros.

Examples:

6 MI. SW. OF RICHMOND

3.5 MI. S. OF JCT. SR 69

Item 10 – Inventory Route, Minimum Vertical Clearance

4 digits (XX feet XX inches)

Code the minimum vertical clearance over the inventory route identified in Item 5, whether the route is "on" the structure or "under" the structure. The minimum clearance for a 10-foot width of the pavement or traveled part of the roadway where the clearance is the greatest shall be recorded and coded in feet and inches. For structures having multiple openings, clearances for each opening shall be recorded, but only the greatest of the minimum clearances for the two or more openings shall be coded regardless of the direction of travel. This would be the practical maximum clearance. When no restriction exists, code 9999.

Item 11 – Milepoint

6 digits (XXX.XXX miles)

If a milepoint location reference system is being used in the State, code a six digit number to represent the milepoint to thousandths of a mile (with an assumed decimal point). If mileage is coded to the hundredth, it may be used and the item zero filled. The milepoint shall reference the beginning (or other point the State uses) of the structure in the direction of increasing mileage of the inventory route identified in Item 5.

Code all zeros 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 000001 rather than 000000.

Item 12 – Base Highway Network

1 digits

This item is to be coded for all records in the inventory. The Base Highway Network includes the through lane (mainline) portions of the NHS, rural/urban principal arterial system and rural minor arterial system. Ramps, frontage roads and other roadways are not included in the Base Network. For the inventory route identified in Item 5 – Inventory Route, indicate whether the inventory route is on the Base Highway Network or not on that network. Use one of the following codes:

Code	***Description***
0	*Inventory Route is not on the Base Network*
1	*Inventory Route is on the Base Network*

Item 13 – LRS Inventory Route, Subroute Number

12 digits

If Item 12 Base Highway Network has been coded 1, the information to be recorded for this item is the inventory route for the State's Linear referencing system (LRS). If Item 12 has been coded 0, this entire item should be left blank. This item is a 12-digit code composed of two segments.

Item	***Description***	***Length***
13A	*LRS Inventory Route*	*10 digits*
13B	*Subroute Number*	*2 digits*

The LRS inventory route and subroute numbers to be reported in this item must correspond to the LRS inventory route and subroute numbers reported by the State for the HPMS. The LRS inventory route number is coded in the ten positions of segment 13A, right justified and zero filled. The subroute number, if it exists, is coded in the two positions of segment 13B, right justified and zero filled.

The LRS inventory route number can be alphanumeric, but must not contain blanks. The LRS inventory route number is not necessarily the same as that posted along the roadway, but is a number used to uniquely identify a route within at least a county and perhaps throughout the State.

The subroute number is a number that uniquely identifies portions of an inventory route section where duplicate mile points occur. These subroute numbers, if they exist, are identified in the State's HPMS-LRS records. If there is no subroute number, code 00 in this segment.

Examples:

Route	***Code***
Inventory Route 2775, Subroute Number 0	*000000277500*
Inventory Route 2775, Subroute Number 3	*000000277503*

Item 14 – Reserved (by FHWA)

Item 15 – Reserved (by FHWA)

Item 16 – Latitude

8 digits (XX degrees XX minutes XX.XX seconds)

For bridges on STRAHNET and STRAHNET Connector highways and on the NHS, record and code the latitude of each in degrees, minutes and seconds to the nearest hundredth of a second (with an assumed decimal point). The point of the coordinate may be the beginning of the bridge in the direction of the inventory or any other consistent point of reference on the bridge which is compatible with the LRS. If the bridge is not on a STRAHNET highway or the NHS, a code of all zeros is acceptable, but it is preferable to code the latitude if available.

The reason for the increased precision is to facilitate the use of Global Positioning System (GPS) data directly into this item. The increased precision is not currently mandatory and, if GPS readings are not available, the current measuring methods and level of precision may continue to be used. The minimum precision should be to the nearest minute, but the preferred precision is to the nearest hundredth of a second using GPS methods.

Examples:

Latitude		***Code***
35°27.3'	*(current precision)*	*35271800*
	(acceptable coding)	*35270000*
35°27'18.55"	*(GPS reading)*	*35271855*

Item 17 – Longitude

9 digits (XXX degrees XX minutes XX.XX seconds)

For bridges on STRAHNET and STRAHNET Connector highways and on the NHS, record and code the longitude of each in degrees, minutes and seconds to the nearest hundredth of a second (with an assumed decimal point). A leading zero shall be coded where needed. The point of the coordinate may be the beginning of the bridge in the direction of the inventory or any other consistent point of reference on the bridge which is compatible with the LRS. If the bridge is not on a STRAHNET highway or the NHS, a code of all zeros is acceptable, but it is preferable to code the longitude if available.

The reason for the increased precision is to facilitate the use of Global Positioning System (GPS) data directly into this item. The increased precision is not currently mandatory and, if GPS readings are not available, the current measuring methods and level of precision may continue to be used. The minimum precision should be to the nearest minute, but the preferred precision is to the nearest hundredth of a second using GPS methods.

Examples:

Longitude		***Code***
81°5.8'	*(current precision)*	*081054800*
	(acceptable coding)	*081060000*
81°5'50.65"	*(GPS reading)*	*081055065*

Inspection Team Leader needs to verify at each routine inspection.

Item 18 – Reserved (by FHWA)

Item 19 – Bypass, Detour Length

2 (XX miles)

Indicate the actual length to the nearest mile of the detour length. The detour length should represent the total additional travel for a vehicle which would result from closing of the bridge. The factor to consider when determining if a bypass is available at the site is the potential for moving vehicles, including military vehicles, around the structure. This is particularly true when the structure is in an interchange. For instance, a bypass likely would be available in the case of diamond interchanges, interchanges where there are service roads available, or other interchanges where the positioning and layout of the ramps is such that they could be used without difficulty to get around the structure. If a ground level bypass is available at the structure site for the inventory route, record and code the detour length as 00.

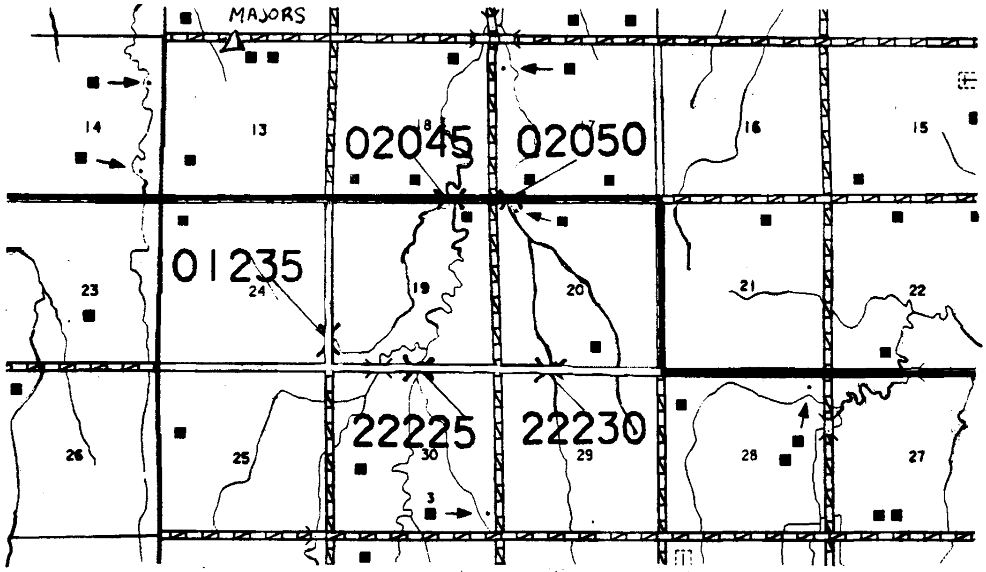
If the bridge is one of twin bridges and is not at an interchange, code 01 where the other twin bridge can be used as a temporary bypass with a reasonable amount of crossover grading. In other cases, indicate the actual length to the nearest mile of the detour length. Code 99 for 99 miles or more.

The detour route will be established following allowable criteria determined by the governing authority. (Some authorities will not allow a designated detour over a road or bridge of lesser "quality.")

Examples:

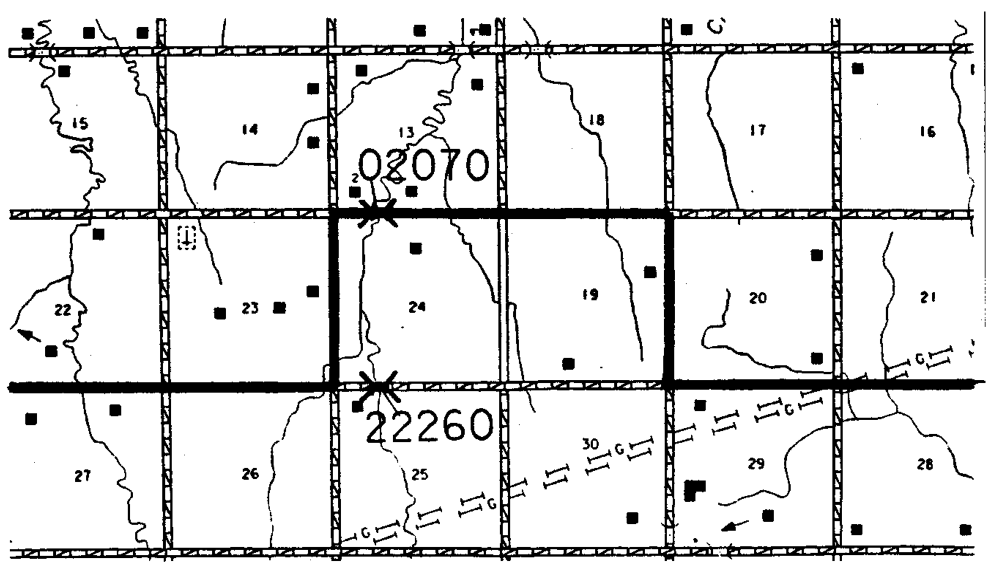
Situation	***Code***
Diamond interchange, structure bypassable	*00*
Cloverleaf, not bypassable; 8-mile detour	*08*
Structure over river; 121-mile detour	*99*
Structure over highway, no interchange, by passable at ground level	*00*
Structure on dead end road	*99*

Additional examples:



Bridge Numbers 01235, 22225, and 22230 are closed. Detour route on Bridge Nos. 02045 and 02050. Bypass Detour Length = 0 miles

.



Bridge No. 22260 is closed. Detour route on Bridge No. 02070. Bypass Detour Length = 2 miles.

Item 20 – Toll

1 digit

The toll status of the structure is indicated by this item. Interstate toll segments under Secretarial Agreement (Title 23 – United States Code – Highways Section 129 as amended by 1991 ISTEA and prior legislation) shall be identified separately. Use one of the following codes:

Code	Description
1	*Toll bridge. Tolls are paid specifically to use the structure.*
2	*On toll road. The structure carried a toll road, that is, tolls are paid to use the facility, which includes both the highway and the structure.*
3	*On free road. The structure is toll-free and carries a toll-free highway.*
4	*On Interstate toll segment under Secretarial Agreement. Structure functions as a part of the toll segment.*
5	*Toll bridge is a segment under Secretarial Agreement. Structure is separate agreements from highway segment.*

FHWA Coding Guide content is shown in Calibri Italic font.

Item 21 – Maintenance Responsibility

2 digits

The actual name(s) of the agency(s) responsible for the maintenance of the structure shall be recorded. The codes below shall be used to represent the type of agency that has primary responsibility for maintaining the structure. If more than one agency has equal maintenance responsibility, code one agency in the hierarchy of State, Federal, county, city, railroad and other private.

Code	***Description***
01	*State Highway Agency*
02	*County Highway Agency*
03	*Town or Township Highway Agency*
04	*City or Municipal Highway Agency*
11	*State Park, Forest, or Reservation Agency*
12	*Local Park, Forest, or Reservation Agency*
21	*Other State Agencies*
25	*Other Local Agencies*
26	*Private (other than railroad)*
27	*Railroad*
31	*State Toll Authority*
32	*Local Toll Authority*
60	*Other Federal Agencies (not listed below)*
62	*Bureau of Indian Affairs*
63	*Bureau of Fish and Wildlife*
64	*U.S. Forest Service*
66	*National Park Service*
67	*Tennessee Valley Authority*
68	*Bureau of Land Management*
69	*Bureau of Reclamation*
70	*Corps of Engineers (Civil)*
71	*Corps of Engineers (Military)*
80	*Unknown*

Item 22 – Owner
2 digits

The actual name(s) of the owner(s) of the bridge shall be recorded. The codes used in Item 21 Maintenance Responsibility shall be used to represent the type of agency that is the primary owner of the structure. If more than one agency has equal ownership, code one agency in the hierarchy of State, Federal, county, city, railroad and other private.

Item 23 – Reserved (by FHWA)

Item 24 – Reserved (by FHWA)

Item 25 – Reserved (by FHWA)

Item 26 – National Functional Classification of Inventory Route
2 digits

For the inventory route, code the functional classification using one of the following codes:

Code	***Description***	
01	*Rural*	*Principal Arterial – Interstate*
02	*Rural*	*Principal Arterial – Other*
06	*Rural*	*Minor Arterial*
07	*Rural*	*Major Collector*
08	*Rural*	*Minor Collector*
09	*Rural*	*Local*
11	*Urban*	*Principal Arterial - Interstate*
12	*Urban*	*Principal Arterial - Other Freeways or Expressways*
14	*Urban*	*Other Principal Arterial*
16	*Urban*	*Minor Arterial*
17	*Urban*	*Collector*
19	*Urban*	*Local*

The bridges shall be coded rural if not inside a designated urban area. The urban or rural designation shall be determined by the bridge location and not the character of the roadway.

Item 27 – Year Built

4 digits

Record and code the year of construction of the structure. Code all four digits of the year in which construction of the structure was completed. If the year built was unknown, provide a best estimate. Initially 1935 was used as the best estimate in the original inventory. See also Item 106 – Year Reconstructed.

Examples:

Construction completed	Code
1956	1956
1892	1892

Item 28 – Lanes On and Under the Structure

4 digits

Record and code the number of lanes being carried by the structure and being crossed over by the structure as a four digit number composed of two segments. The number of lanes should be right justified in each segment with leading zero(s) codes as required.

Segment	Description	Length
28A	Lanes on the structure	2 digits
28B	Lanes under the structure	2 digits

Include all lanes carrying highway traffic (i.e., cars, trucks, buses) which are striped or otherwise operated as a full width traffic lane for the entire length of the structure or under the structure by the owning/maintaining authority. This shall include any full width merge lanes and ramp lanes, and shall be independent of directionality of usage (i.e., a one-lane bridge carrying two-directional traffic is still considered to carry only one lane on the structure). It should be noted here that for the purpose of evaluating the Deck Geometry – Item 68, any "one-lane" bridge, not coded as a ramp (Item 5C = 7), which has a Bridge Roadway Width, Curb-to-Curb – Item 51 coded 16 feet or greater shall be evaluated as two lanes.

When the inventory route is "on" the bridge (the first digit of Item 5 Inventory Route is coded 1), the sum of the total number of lanes on all inventoried routes under the bridge shall be coded. When the inventory route is "under" the bridge (the first digit of Item 5 Inventory Route is coded 2 or A through Z), only the number of lanes being identified by that "under" record shall be coded in Item 28B.

When the inventory route is "under" the structure, the obstruction over the inventory route may be other than a highway bridge (railroad, pedestrian, pipeline, etc.). Code 00 for these cases if there are no highway lanes on the obstructing structure.

Double deck bridges may be coded as 1 or 2 structures as noted in the examples on the next page. Either method is acceptable; however, all related data must be compatible with the method selected.

Examples:

Situation	***Code***
1 lane on, 0 lanes under	*0100 **
3 lanes on, 1 lane under	*0301*
8 lanes on 2-way, 12 lanes under	*0812 ***
5 lanes on double deck each direction, 2 lanes under *5 lanes on double deck each direction, 2 lanes under*	*1002 **** *0502 *****
Railroad and pedestrian on, 4 lanes under	*0004*

*	*For the inventory route on the bridge, the first digit of Item 5 Inventory Route is coded 1.*
**	*This example has three inventory routes under the bridge of six, four and two lanes of two-way traffic respectively. When coding an "under" record for each of these inventory routes, the first digit of Item 5 - Inventory Route is coded A, B, and C, and Item 28 is coded 0806, 0804, and 0802 respectively for the three required records.*
***	*Acceptable if coded as one bridge. However, other data such as ADT, curb-to-curb width, etc., must be for both decks.*
****	*Acceptable if coded as two separate bridges. However, other data such as ADT, curb-to-curb width, etc., must be for a single deck.*

Item 29 – Average Daily Traffic

6 digits

This code shows the average daily traffic volume for the inventory route identified in Item 5. Make certain the unit's position is coded even if estimates of ADT are determined to tens or hundreds of vehicles; that is, appropriate leading zeros shall be coded. The ADT coded should be the most recent ADT counts available. Included in this item are the trucks referred to in Item 109 Average Daily Truck Traffic. If the bridge is closed, code the actual ADT from before the closure occurred.

The ADT must be compatible with the other items coded for the bridge. For example, parallel bridges with an open median are coded as follows: if Item 28 - Lanes On and Under the Structure and Item 51 Bridge Roadway Width, Curb-to-Curb are coded for each bridge separately, then the ADT must be coded for each bridge separately (not the total ADT for the route).

Examples:

Average Daily Traffic	***Code***
540	*000540*
15,600	*015600*
24,000	*024000*

The ADT 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	• NDOR Planning Section provides state and regional traffic data, Average Daily Traffic (ADT) and Average Daily Truck Traffic (ADTT). • 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.

Item 30 – Year of Average Daily Traffic

4 digits

Record the year represented by the ADT in Item 29. Code the four digits of the year so recorded.

Example: *Year of ADT is 1988. Code = 1988.*

Item 31 – Design Load

1 digit

Use the codes below to indicate the live load for which the structure was designed.

Code	Metric Description	English Description
0	Unknown	Unknown
1	M 9	H 10
2	M 13.5	H 15
3	MS 13.5	HS 15
4	M 18	H 20
5	MS 18	HS 20
6	MS 18 + Mod	HS 20+Mod
7	Pedestrian	Pedestrian
8	Railroad	Railroad
9	MS 22.5 or greater	HS 25 or greater
A	HL 93	HL93
B	Greater than HL93	Greater than HL93
C	Other	Other

Code other H, M, HS, or MS design live loads using the nearest equivalent of the numerical portion of the loading.

Code 0 refers to situations where the design live load is unknown due to the absence of plans, design calculations, or other information.

Code 0 formerly was used for both, but now has been modified to only describe "Unknown" situations. This code is to be used where the design live load is unknown due to the absence of plans, design calculations, or other information.

Code 6 references MS 18 + Mod (HS20+Mod). In this context 'Mod' indicates the inclusion of military loading.

Use Code 9 in situations where the design live load is MS 22.5 (HS 25) or greater.

Code 9 has been modified from MS 22.5 or HS 25 to MS 22.5 or greater or HS 25 or greater and is to be used for increased design loads which are based on those configurations.

Code A refers to the standard AASHTO LRFD HL 93 design live load.

Code A is to be used only for HL93 AASHTO design load configurations.

Code B refers to the standard AASHTO LRFD HL 93 configuration modified to be greater than the standard HL 93 design live load.

Code B is to be used only for increased design loads which are based on the HL93 AASHTO design load configuration. As of Revision 1 of this Manual, NDOR does not use any design loading greater than HL-93.

Code C refers to other situations where the design live load is not based upon AASHTO design live load configurations, such as designs based on specific truck loads.

Code C for "Other" has been added for situations which increase the design load but are not based upon AASHTO design trucks. State specific design trucks that exceed AASHTO loading would be reported as a "C".

Item 32 – Approach Roadway Width

3 digits (XXX feet)

Code to the nearest foot a three digit number that represents the normal width of usable roadway approaching the structure. Usable roadway width will include the width of traffic lanes and the widths of shoulders.

Shoulders are defined as follows: shoulders must be constructed and normally maintained flush with the adjacent traffic lane, 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.

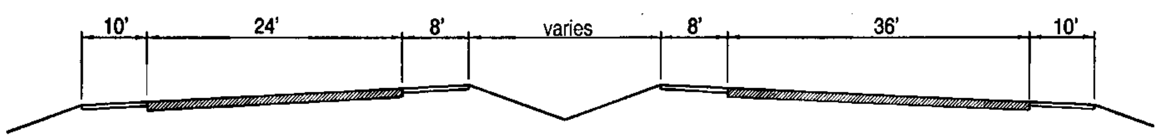
For structures with medians of any type and double-decked structures, this item should be coded as the sum of the usable roadway widths for the approach roadways (i.e., all median widths which do not qualify as shoulders should ***not*** *be included in this dimension).*

When there is a variation between the approaches at either end of the structure, record and code the most restrictive of the approach conditions.

Examples:

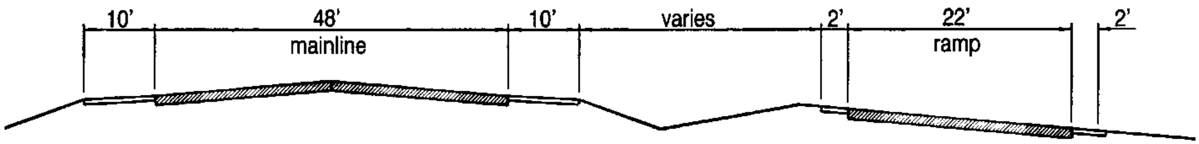
Left Shoulder	***Left Roadway***	***Median Shoulders***	***Right Roadway***	***Right Shoulder***	***Code***
4.0	*--*	*--*	*16*	*6.0*	*026*
6.0	*--*	*--*	*36*	*12.0*	*054*
12.0	*48.0*	*30.0*	*48.0*	*12.0*	*150*
10.0	*24.0*	*16.0*	*36.0*	*10.0*	*096*

The last example above represents the coding method for a structure in which the most restrictive approach has the cross-section shown below:



Regardless of whether the median is open or closed, the data coded must be compatible with the other related route and bridge data (i.e., if Item 51 Bridge Roadway Width, Curb-to-Curb is for traffic in one direction only, then Items 28, 29, 32, etc., must be for traffic in one direction only).

If a ramp is adjacent to the through lanes approaching the structure, it shall be included in the approach roadway width. The total approach roadway width for the example below is 94 feet (a code of 094).



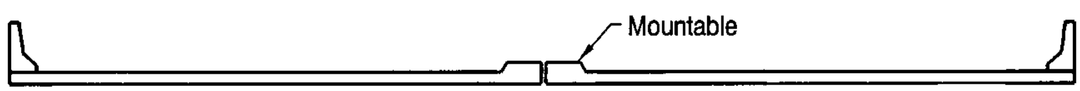
Item 33 – Bridge Median

1 digit

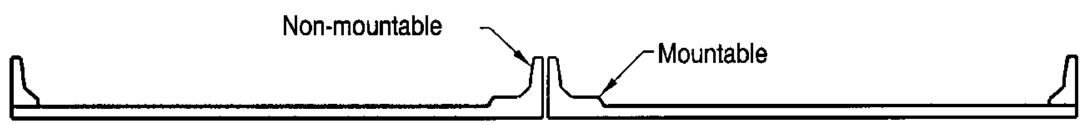
Indicate with a one digit code if the median is non-existent, open or closed. The median is closed when the area between the two roadways at the structure is bridged over and is capable of supporting traffic. All bridges that carry either one-way traffic or two-way traffic separated only by a centerline will be coded 0 for no median.

Code	***Description***
0	*No median*
1	*Open median*
2	*Closed median (no barrier)*
3	*Closed median with non-mountable barriers*

Open Median



Closed Median



Closed Median with Non-mountable Barrier

Item 34 – Skew

2 digits (XX degrees)

The skew angle is the angle between the centerline of substructure units and a line normal to the roadway centerline. When plans are available, the skew angle can be taken directly from the plans. If no plans are available, the angle is to be field measured if possible. Record the skew angle to the nearest degree. If the skew angle is 0°, it should be so coded. When the structure is on a curve or if the skew varies for some other reason, the average skew should be recorded, if reasonable. Otherwise, record 99 to indicate a major variation in skews of substructure units. A two digit number should be coded.

Examples:

Skew angle	***Code***
0°	*00*
10°	*10*
8°	*08*
29°	*29*

Item 35 – Structure Flared

1 digit

This code is a one digit and is used to indicate if the structure is flared (i.e., the width of the structure varies). Generally, such variance will result from ramps converging with or diverging from the through lanes on the structure, but there may be other causes. Minor flares at ends of structures should be ignored.

Code	***Description***
1	*Yes, flared*
0	*No flare*

Item 36 – Traffic Safety Features

4 digits

Bridge inspection shall include the recording of information on the following traffic safety features so that the evaluation of their adequacy can be made.

The data collected shall apply only to the route on the bridge. Collision damage or deterioration of the elements are not considered when coding this item. Traffic safety features is a four digit code composed of four segments reported as follows and described below.

Segment	***Description***	***Length***
36A	*Bridge railings*	*1 digit*
36B	*Transitions*	*1 digit*
36C	*Approach guardrail*	*1 digit*
36D	*Approach guardrail ends*	*1 digit*

Code	***Description****
0	*Inspected feature does not meet currently acceptable standards or a safety feature is required and none is provided.*
1	*Inspected feature meets currently acceptable standards.*
N	*Not applicable or a safety feature is not required.*
*	*For structures on the NHS, national standards are set by regulation. For those not on the NHS, it shall be the responsibility of the highway agency (state, county, local or federal) to set standards.*

Examples:

Situation	***Code***
All features meet currently acceptable standards except transition	*1011*

This item has not been coded consistently in Nebraska. Inspectors should carefully review the BIRM, the descriptions and pictorial guidance in this section, and then contact the Program Manager if they have questions.

Item 36A – Bridge Railings

1 digit

Some factors that affect the proper functioning of bridge railing are height, material, strength and geometric features. Railings must be capable of smoothly redirecting an impacting vehicle.

Traffic railings should provide a smooth, continuous face of rail on the traffic side with the posts set back from the face of rail. Structural continuity in the rail members, including anchorage of ends, is essential. The railing system shall be able to resist the applied loads at all locations.

Bridge railings should be evaluated by using the following guidelines.

Materials for traffic railings can be concrete, metal, timber or a combination thereof.

Careful attention must be given to the treatment of railings at the bridge ends. Collision damage or deterioration of the elements are not considered when coding this item.

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.

Height

- The heights of rails shall be measured relative to the reference surface which shall be the top of the roadway, the top of the future overlay if resurfacing is anticipated, or the top of curb when the curb projection is greater than 9 inches from the traffic face of the railing.
- Traffic railings and traffic portions of combination railings shall not be less than 2 feet 3 inches from the top of the reference surface.
- Parapets designed with sloping traffic faces intended to allow vehicles to ride up them under low angle contacts shall be at least 2 feet 8 inches in height.

Multi-element Rails

- For traffic railings composed of multiple horizontal elements, the maximum clear opening below the bottom rail shall not exceed 17 inches and the maximum opening of upper rails shall not exceed 15 inches.

Item 36B – Transitions

1 digit

The transition from approach guardrail to bridge railing requires that the approach guardrail be firmly attached to the bridge railing. It also requires that the approach guardrail be gradually stiffened as it comes closer to the bridge railing. The ends of curbs and safety walks need to be gradually tapered out or shielded.

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' - 1 ½" or less.

Item 36C – Approach Guardrail

1 digit

The structural adequacy and compatibility of approach guardrail with transition designs should be determined. Rarely does the need for a barrier stop at the end of a bridge. Thus, an approach guardrail with adequate length and structural qualities to shield motorists from the hazards at the bridge site needs to be installed. In addition to being capable of safely redirecting an impacting vehicle, the approach guardrail must also facilitate a transition to the bridge railing that will not cause snagging or pocketing of an impacting vehicle. Acceptable guardrail design suggestions are contained in the AASHTO Guide for Selecting, Locating, and Designing Traffic Barriers.

Item 36D – Approach Guardrail Ends

1 digit

As with guardrail ends in general, the ends of approach guardrails to bridges should be flared, buried, made breakaway, or shielded. Design treatment of guardrail ends is given in the AASHTO Guide for Selecting, Locating, and Designing Traffic Barriers.

Inspectors should consult the Nebraska Board of Public Roads Classifications and Standard for the specified fixed obstacle clearances for each structure. The fixed obstacle clearance is dependent on type of road (Interstate, urban, rural, etc.), roadway classification and ADT. The fixed obstacle clearance, depending on the individual site circumstances, varies from 5 feet to 12 feet.

State Highway		
Item	**Code**	**Comment**
36A – Rail	1	
36B – Transition	0	Post spacing incorrect; one post appears to be missing.
36C – App. guardrail	1	
36D – Guardrail ends	1	Not pictured.

Interstate Bridge		
Item	**Code**	**Comment**
36A – Rail	1	
36B – Transition	1	
36C – App. guardrail	1	
36D – Guardrail ends	1	

Rural road, single span bridge		
Item	**Code**	**Comment**
36A – Rail	0	Standards are not anchored to deck. Horizontal wide flange missing behind thrie beam
36B – Transition	0	No transition present.
36C – App. guardrail	0	No approach guardrail.
36D – Guardrail ends	0	No approach guardrail end.

Rural paved road, single span bridge		
Item	**Code**	**Comment**
36A – Rail	1	
36B – Transition	0	Post spacing is too wide. W beam only, no thrie beam.
36C – App. guardrail	1	
36D – Guardrail ends	1	Approach guardrail end is “boxing glove” is outside the lateral obstacle clearance.

FHWA Coding Guide content is shown in Calibri Italic font.

Rural paved road		
Item	**Code**	**Comment**
36A – Rail	1	
36B – Transition	0	Post spacing is too wide.
36C – App. guardrail	1	
36D – Guardrail ends	1	Approach guardrail end is SKR-350 is outside the clear zone.

State Highway (built to standards at that time)		
Item	**Code**	**Comment**
36A – Rail	1	
36B – Transition	0	Post spacing is too wide, no rub rail, no W beam to thrie beam transition.
36C – App. guardrail	1	
36D – Guardrail ends	1	Not pictured.

Rural Road, two bridges		
Item	**Code**	**Comment**
36A – Rail	1	Bridge rail too short.
36B – Transition	0	Post spacing incorrect; one post appears to be missing.
36C – App. guardrail	1	
36D – Guardrail ends	0	For first bridge, buried ends are not standard.
36D – Guardrail ends	N	For truss bridge since approach rail extends over the first bridge.

FHWA Coding Guide content is shown in Calibri italic font.

Rural road over culvert		
Item	**Code**	**Comment**
36A – Rail	N	Culvert has no bridge rail; guardrail continued across
36B – Transition	N	No transition because there is no bridge rail.
36C – App. guardrail	1	
36D – Guardrail ends	1	Approach guardrail end outside of clear zone.

Rural road over interstate (built to standards of the time)		
Item	**Code**	**Comment**
36A – Rail	0	
36B – Transition	0	No W-beam to thrie beam transition, post spacing too wide.
36C – App. guardrail	0	Approach guardrail not standard
36D – Guardrail ends	0	End section not standard.

Item 37 – Historical Significance

1 digit

The historical significance of a bridge involves a variety of characteristics: the bridge may be a particularly unique example of the history of engineering; the crossing itself might be significant; the bridge might be associated with a historical property or area; or historical significance could be derived from the fact the bridge was associated with significant events or circumstances. Use one of the following codes:

Code	***Description***
1	*Bridge is on the National Register of Historic Places.*
2	*Bridge is eligible for the National Register of Historic Places.*
3	*Bridge is possibly eligible for the National Register of Historic Places (requires further investigation before determination can be made) or bridge is on a state or local historical register.*
4	*Historical significance is not determinable at this time.*
5	*Bridge is not eligible for the National Register of Historic Places.*

Item 38 – Navigation Control

1 digit

Indicate for this item whether or not navigation control (a bridge permit for navigation) is required. Use one of the following codes:

Code	Description
N	*Not applicable, no waterway*
0	*No navigation control on waterway (bridge permit not required)*
1	*Navigation control on water (bridge permit required)*

Item 39 – Navigation Vertical Clearance

3 digits (XXX feet)

If Item 38 Navigation Control has been coded 1, record in feet the minimum vertical clearance imposed at the site as measured above a datum that is specified on a navigation permit issued by a control agency. The measurement shall be coded as a three digit number rounded down to the nearest foot. This measurement will show the clearance that is allowable for navigational purposes. In the case of a swing or bascule bridge, the vertical clearance shall be measured with the bridge in the closed position (i.e., open to vehicular traffic). The vertical clearance of a vertical lift bridge shall be measured with the bridge in the raised or open position. Also, Item 116 Minimum Navigation Vertical Clearance Vertical Lift Bridge shall be coded to provide clearance in a closed position. If Item 38 - Navigation Control has been coded 0 or N, code 000 to indicate not applicable.

Examples:

Measured Vertical Clearance	***Code***
150.0	*150*
20.6	*020*
24.2	*024*

Item 40 – Navigation Horizontal Clearance

4 digits (XXXX feet)

If Item 38 Navigation Control has been coded 1, record for this item the minimum horizontal clearance in feet. This measurement should be that shown on the navigation permit and may be less than the structure allows. If a navigation permit is required but not available, use the minimum horizontal clearance between fenders, if any, or the clear distance between piers or bents. Code the clearance as a four digit number. Code 0000 if Item 38 Navigation Control is coded 0 or N.

Examples:

Horizontal Clearance	***Code***
95 feet	*0095*
538 feet	*0538*
1,200 feet	*1200*

Item 41 – Structure Open, Posted, or Closed to Traffic

1 digit

This item provides information about the actual operational status of a structure. The field review could show that a structure is posted, but Item 70 Bridge Posting may indicate that posting is not required. This is possible and acceptable coding since Item 70 is based on the operating stress level and the governing agency's posting procedures may specify posting at some stress level less than the Operating Rating. One of the following codes shall be used:

Code	Description
A	*Open, no restriction*
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.)*

For code B, this would include any bridge that is not posted, but is required to be posted according to the most current Load Rating Summary Sheet (LRSS).

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 41 after the Owner has completed any action needed to address a Critical Finding and has completed the Critical Finding Form.

Item 42 – Type of Service

2 digit

The type of service on the bridge and under the bridge is indicated by a two-digit code composed of two segments.

Segment	*Description*	*Length*
42A	*Type of service on bridge*	*1 digit*
42B	*Type of service under bridge*	*1 digit*

The first digit indicates the type of service "on" the bridge and shall be coded using one of the following codes:

Code	*Description*
1	*Highway*
2	*Railroad*
3	*Pedestrian/Bicycle*
4	*Highway-railroad*
5	*Highway-pedestrian*
6	*Overpass structure at an interchange or second level of a multilevel interchange*
7	*Third level (Interchange)*
8	*Fourth level (Interchange)*
9	*Building or plaza*
0	*Other*

The second digit indicates the type of service "under" the bridge and shall be coded using one of the following codes:

Code	*Description*
1	*Highway, with or without pedestrian*
2	*Railroad*
3	*Pedestrian/Bicycle*
4	*Highway-railroad*
5	*Waterway*
6	*Highway-waterway*
7	*Railroad-waterway*
8	*Highway-waterway-railroad*
9	*Relief for waterway*
0	*Other*

Item 43 – Structure Type, Main

3 digits

Record the description on the inspection form and indicate the type of structure for the main span(s) with a three digit code composed of two segments.

Segment	Description	Length
43A	Kind of material and/or design	1 digit
43B	Type of design and/or construction	2 digits

The first digit indicates the kind of material and/or design and shall be coded using one of the following codes:

Code	Description
1	Concrete
2	Concrete continuous
3	Steel
4	Steel continuous
5	Prestressed concrete *
6	Prestressed concrete continuous *
7	Wood or Timber
8	Masonry
9	Aluminum, Wrought Iron, or Cast Iron
0	Other
*	Post-tensioned concrete should be coded as prestressed concrete.

The second and third digits indicate the predominant type of design and/or type of construction and shall be coded using one of the following codes:

Code	***Description***
1	*Concrete*
2	*Concrete continuous*
3	*Steel*
4	*Steel continuous*
5	*Prestressed concrete **
6	*Prestressed concrete continuous **
7	*Wood or Timber*
8	*Masonry*
9	*Aluminum, Wrought Iron, or Cast Iron*
0	*Other*
***	*Post-tensioned concrete should be coded as prestressed concrete.*

Examples:

Material and Construction	***Code***
Timber Girders	*702*
Simple Span Concrete Slab	*101*
Simple Span Steel Girders	*302*
Simple prestressed concrete I-beam	*502*
Continuous concrete T-beam	*204*
Continuous steel deck truss	*409*

NDOR uses the FHWA method of coding this data field and does not have custom codes for this data item. One border bridge included in the NDOR Bridge Inventory uses a code not shown in the FHWA Coding Guide. This bridge is under the jurisdiction of the State of Iowa which uses an Iowa code of 423, a welded I-girder with diaphragms in a system with more than two girders.

Item 44 – Structure Type, Approach Spans

3 digits

Indicate with a three digit code compose of two segments, the type of structure for the approach spans to a major bridge or for the spans where the structural material is different. The codes are the same as for Item 43 preceding. However, code 000 if this item is not applicable. Use code 20 (Item 44B) when no one type of design and/or construction is predominate for the approach units. If the kind of material (Item 44A) is varied, code the most predominant.

See Examples under Item 43.

Segment	***Description***	***Length***
44A	Kind of material and/or design	*1 digit*
44B	Type of design and/or construction	*2 digits*

Item 45 – Number of Spans in Main Unit

3 digits

Record the number and indicate with a three digit code the number of spans in the main or major unit. This item will include all spans of most bridges, the major unit only of a sizable structure, or a unit of material or design different from that of the approach spans.

Item 46 – Number of Approach Spans

4 digits

Record the number and indicate with a four digit code the number of spans in the approach spans to the major bridge, or the number of spans of material different from that of the major bridge.

Item 47 – Inventory Route, Total Horizontal Clearance

3 digits (XX.X feet)

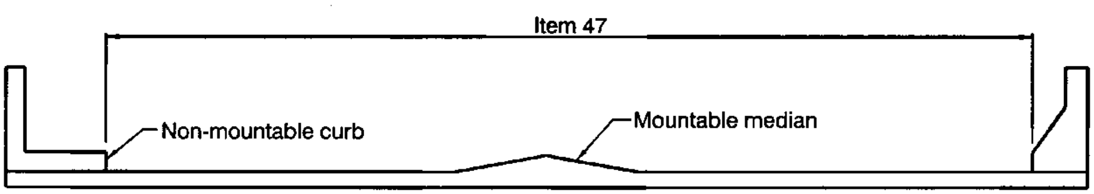
The total horizontal clearance for the inventory route identified in Item 5 should be measured and recorded. The clearance should be the available clearance measured between the restrictive features -- curbs, rails, walls, piers or other structural features limiting the roadway (surface and shoulders). The measurement should be recorded and coded as a three digit number truncated to the nearest tenth of a meter (with an assumed decimal point). When the restriction is 100 meter or greater, code 999.

The NE Inventory is in English units and this item is coded in feet. When the horizontal clearance restriction is 100 feet or greater, code 99.9.

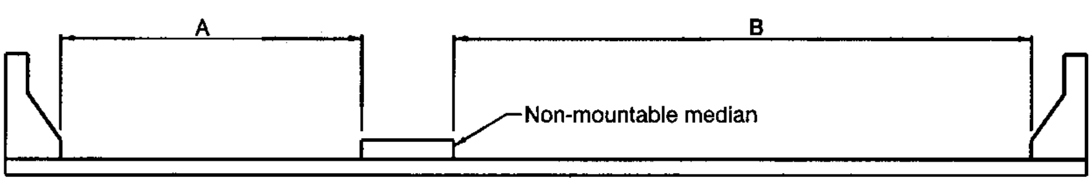
The purpose of this item is to give the largest available clearance for the movement of wide loads. Flush and mountable medians are not considered to be restrictions. This clearance has been identified in two ways; use the most applicable:

- *Clear distance between restrictions of the inventory route either "on" or "under" the structure.*
- *Roadway surface and shoulders – when there are no restrictions.*

For a divided facility with a raised or non-mountable median, or an "under" route divided by piers, record the greater of the restricted widths in either direction, not both directions.



No Median or Flush or Mountable Median



Raised Median or Non-mountable Median
B > A Item 47 = B

Item 48 – Length of Maximum Span

4 digits (XXXX feet)

The length of the maximum span shall be recorded. It shall be noted whether the measurement is center to center of bearing points or clear open distance between piers, bents or abutments. The measurement shall be along the centerline of the bridge.

For this item, code a four digit number to represent the measurement to the nearest foot. (XXXX feet)

Examples:

Length of Maximum Span	Code
50 feet	*0050*
117 feet	*0117*
1,050 feet	*1050*

Item 49 – Structure Length

6 digits (XXXXXX feet)

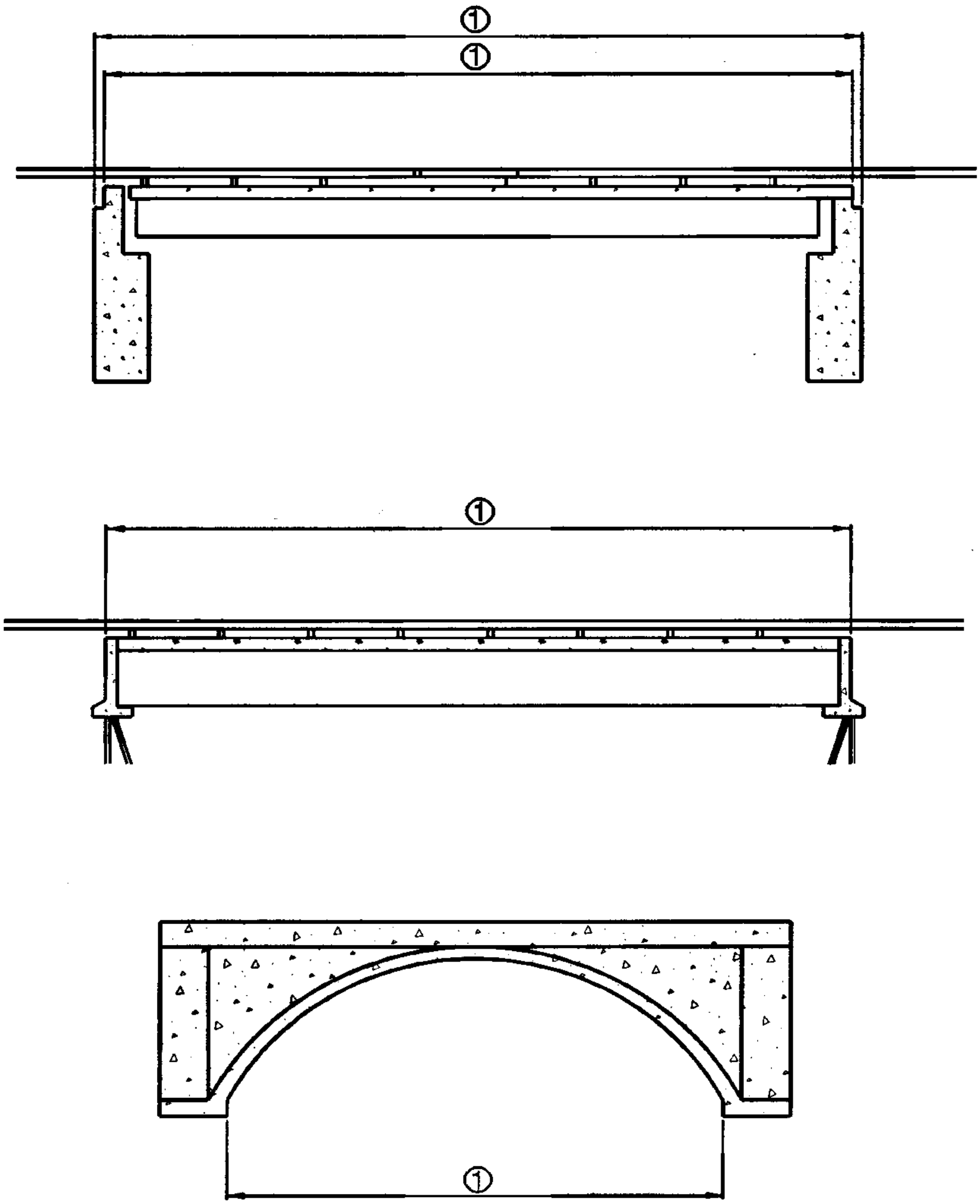
Record and code a six digit number (XXXXXX feet) to represent the length of the structure to the nearest foot. This shall be the length of roadway which is supported on the bridge structure.

The length should be measured from end-to-end of floor.

Culvert lengths should be measured along the center line of roadway regardless of their depth below grade. Measurement should be made between inside faces of exterior walls.

Examples:

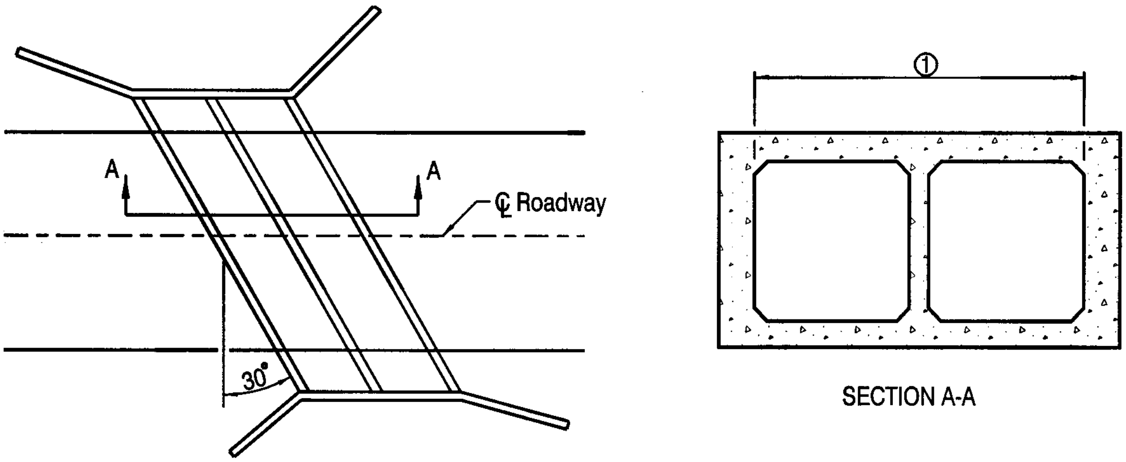
Structure Length	***Code***
50 feet	*000050*
5,421 feet	*005421*
333 feet	*000333*
101,235 feet	*101235*



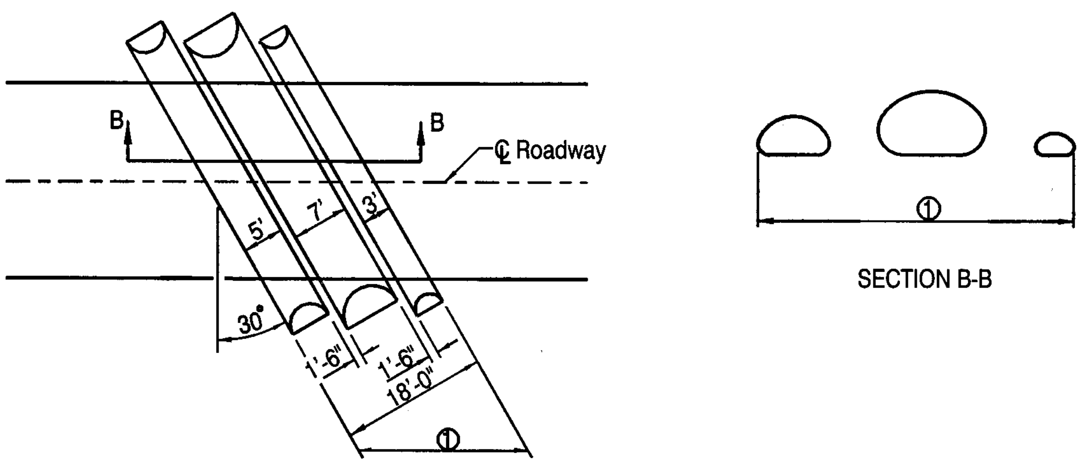
① Item 49 - Structure Length

(Length or Roadway Supported on Structure)

FHWA Coding Guide content is shown in Calibri italic font.



1 Item 49 – Structure Length



1 Item 49 – Structure Length = 18’/cos (30) = 20.78’

(Length or Roadway Supported on Structure)

Item 50 – Curb or Sidewalk Widths

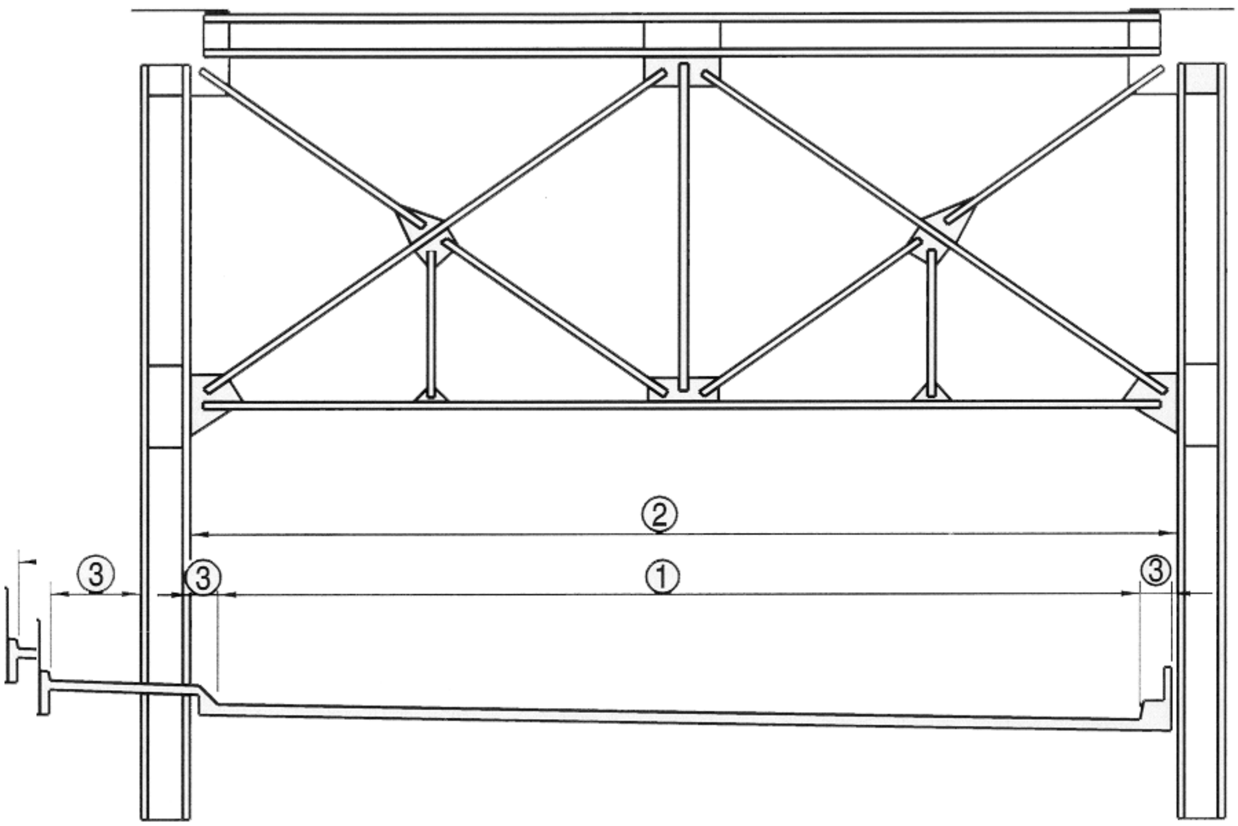
6 digits

Record and code two contiguous three digit numbers (XX.X feet, XX.X feet) to represent the widths of the left and right curbs or sidewalks to nearest tenth of a foot (with assumed decimal points). This is a six digit number composed of two segments, with the leftmost three digits representing the left curb or sidewalk and the rightmost three digits representing the right curb or sidewalk. "Left" and "Right" should be determined on the basis of direction of the inventory.

Segment	***Description***	***Length***
50A	Left curb or sidewalk width	*3 digits*
50B	Right curb or sidewalk width	*3 digits*

Examples:

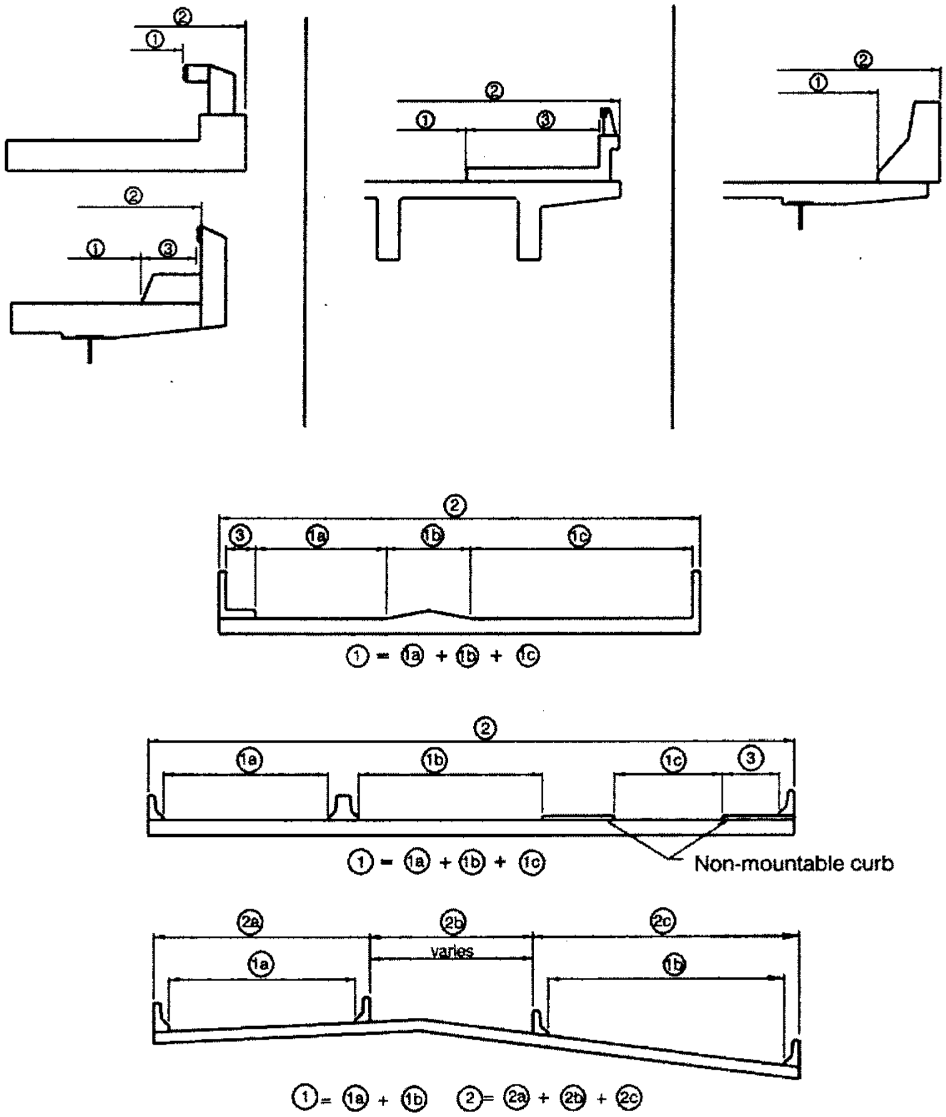
Curb or sidewalk Left Side	***Curb or sidewalk Right Side***	***Code***
None	*8.3'*	*000083*
10.0'	*4.1'*	*100041*
8.3'	*None*	*083000*
12.1'	*11.5'*	*121115*
None	*None*	*000000*
0.6'	*1.5'*	*006015*



1 Item 51 – Bridge Roadway Width, Curb-to-Curb

2 Item 52 – Deck Width, Out-to-Out

3 Item 50 – Curb or Sidewalk Width



① Item 51 - Bridge Roadway Width, Curb-to-Curb

② Item 52 - Deck Width, Out-to-Out

③ Item 53 - Curb or Sidewalk Width

Item 51 – Bridge Roadway Width, Curb-to-Curb

4 digits (XXX.X feet)

The information to be recorded is the most restrictive minimum distance between curbs or rails on the structure roadway. For structures with closed medians and usually for double decked structures, coded data will be the sum of the most restrictive minimum distances for all roadways carried by the structure. The data recorded for this item must be compatible with other related route and bridge data (i.e., Items 28, 29, 32, etc.). The measurement should be exclusive of flared areas for ramps. A four digit number should be used to represent the distance to the nearest tenth of a foot (with an assumed decimal point).

See illustrations under Item 50 Curb or Sidewalk Widths.

Where traffic runs directly on the top slab (or wearing surface) of a culvert-type structure, e.g. an R/C box without fill, code the actual roadway width (curb-to-curb or rail-to-rail). This will also apply where the fill is minimal and headwalls or parapets affect the flow of traffic.

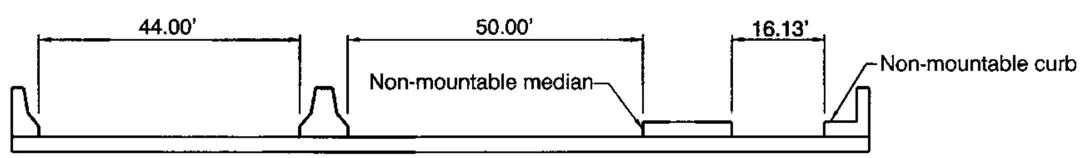
Where the roadway is on fill carried across a structure and the headwalls or parapets do not affect the flow of traffic, code 0000. This is considered proper inasmuch as a filled section simply maintains the roadway cross-section.

Raised or non-mountable medians, open medians and barrier widths are to be excluded from the summation along with barrier-protected bicycle and equestrian lanes.

Examples:

Bridge Roadway Width	***Code***
36.00' wide	*0360*
66.37' wide	*0664*
110.13' wide	*1101*

The last example above would be the coded value for the deck section shown below.



Item 52 – Deck Width, Out-to-Out

4 digits (XXX.X feet)

Record the out-to-out width to the nearest tenth of a foot (with an assumed decimal point). If the structure is a through structure, the number to be coded will represent the lateral clearance between superstructure members. The measurement should be exclusive of flared areas for ramps.

See illustrations under Item 50 Curb or Sidewalk Widths.

Where traffic runs directly on the top slab (or wearing surface) of the culvert (e.g., an R/C box without fill) code the actual width (out-to-out). This will also apply where the fill is minimal and the culvert headwalls affect the flow of traffic.

Where the roadway is on a fill carried across a pipe or box culvert and the culvert headwalls do not affect the flow of traffic, code 0000. This is considered proper inasmuch as a filled section over a culvert simply maintains the roadway cross-section.

Item 53 – Minimum Vertical Clearance Over Bridge Roadway

4 digits (XX feet. XX inches)

The information to be recorded for this item is the actual minimum vertical clearance over the bridge roadway, including shoulders, to any superstructure restriction, rounded down to the nearest hundredth of a meter. When no superstructure restriction exists above the bridge roadway, or when a restriction is 30 meters or greater, code 9999.

The NE Inventory is in English units and this item is coded in feet as four digit number to represent feet and inches. When a restriction is 100 feet or greater, code 99.99.

Examples:

Minimum Vertical Clearance	*Code*
17'-3"	*17.03*
75'-11"	*75.11*
No restriction	*99.99*
115'-6"	*99.12*

Item 54 – Minimum Vertical Underclearance

5 digits (X code, XX feet, XX inches)

Using a one digit code and a four digit number, record and code the minimum vertical clearance from the roadway (travel lanes only) or railroad track ***beneath*** *the structure to the underside of the superstructure. (When both a railroad and highway are under the structure, code the most critical dimension.)*

Segment	*Description*	*Length*
54A	*Reference feature*	*1 digit*
54B	*Minimum Vertical Underclearance*	*4 digits*

Any revision made which will alter the clearances, such as addition of surfacing to the roadway, will necessitate re-measurement of the clearances and correction of the signs and records to reflect the change.

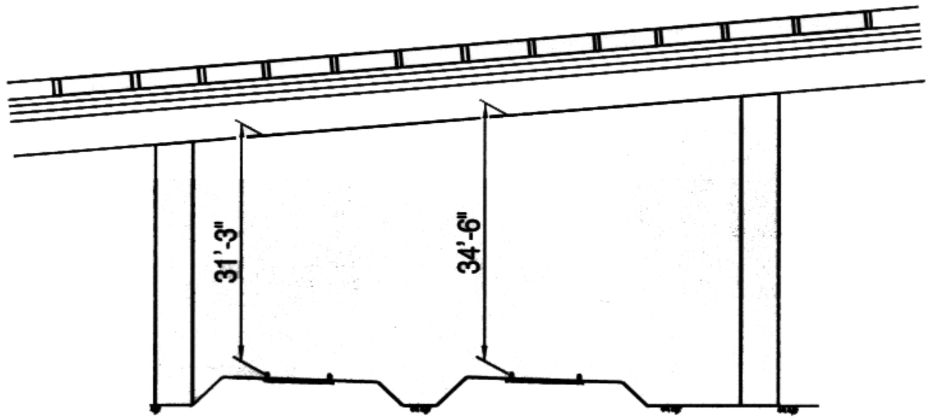
Using one of the codes below, code in the first position, the reference feature from which the clearance measurement is taken:

Code	*Description*
H	*Highway beneath structure*
R	*Railroad beneath structure*
N	*Feature not a highway or railroad*

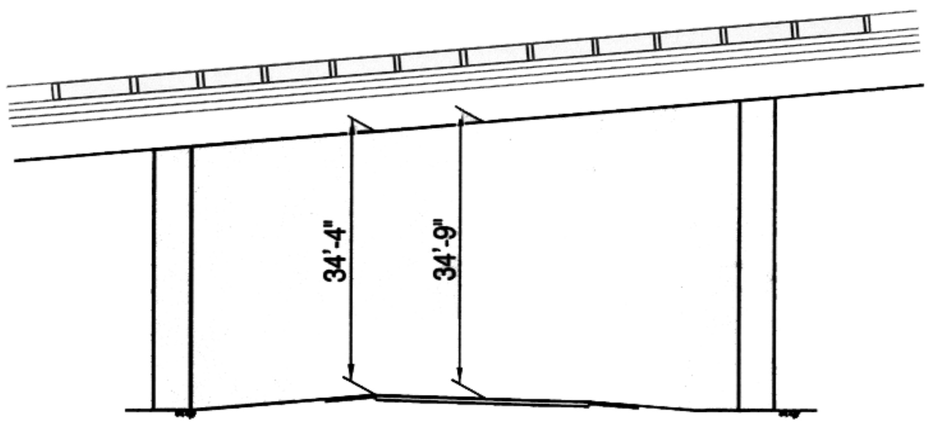
In the next four positions, code a four digit number to represent the minimum vertical clearance from that feature to the structure. If the feature is not a highway or railroad, code the minimum vertical clearance 0000.

EXAMPLES: CODE:

Railroad 31'-3" beneath structure R3103



Highway 34'-4" beneath Structure H3404



Item 55 – Minimum Lateral Underclearance on Right

4 digits (X code, XX.X feet)

Using a one digit code and a three digit number, record and code the minimum lateral underclearance on the right to the nearest tenth of a foot (with an assumed decimal point). When both a railroad and highway are under the structure, code the most critical dimension.

Segment	***Description***	***Length***
55A	*Reference feature*	*1 digit*
55B	*Minimum Lateral Underclearance*	*3 digits*

Using one of the codes below, code in the first position the reference feature from which the clearance measurement is taken:

Code	***Description***
H	*Highway beneath structure*
R	*Railroad beneath structure*
N	*Feature not a highway or railroad*

In the next three positions, code a three digit number to represent the minimum lateral underclearance on the right. The lateral clearance should be measured from the right edge of the roadway (excluding shoulders) or from the centerline (between rails) of the right-hand track of a railroad to the nearest substructure unit (pier, abutment, etc.), to a rigid barrier, or to the toe of the slope steeper than 1 to 3. The clearance measurements to be recorded will be the minimum after measuring the clearance in both directions of travel. In the case of a dual highway this would mean the outside clearance of both roadways should be measured and the smaller distance recorded and coded.

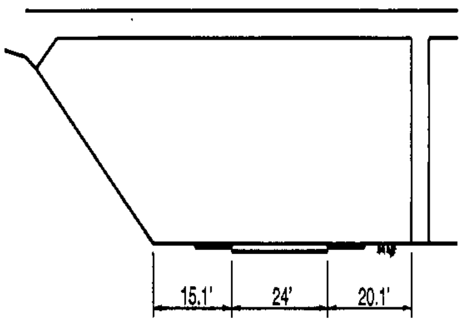
If two related features are below the bridge, measure both and record the lesser of the two. An explanation should be written as to what was recorded. If the feature beneath the structure is not a railroad or highway, code 000 to indicate not applicable.

The presence of ramps and acceleration or turning lanes is not considered in this item; therefore, the minimum lateral clearance on the right should be measured from the right edge of the through roadway.

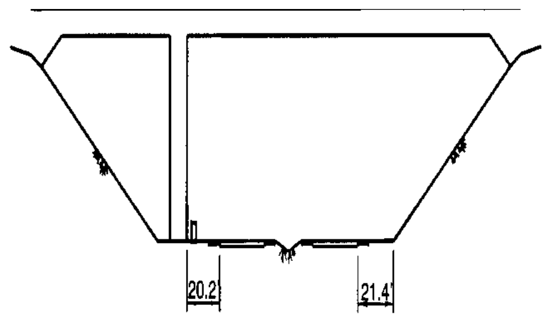
Examples:

Description	***Code***
Railroad 20.4' centerline to pier	*R204*
Highway 20.2' edge of pavement to pier	*H202*
Creek beneath structure	*N000*

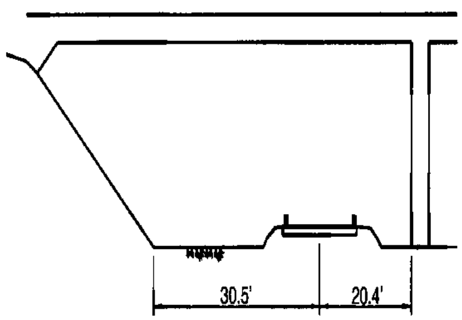
Examples: Item 55 – Minimum Lateral Underclearance on Right (cont'd)



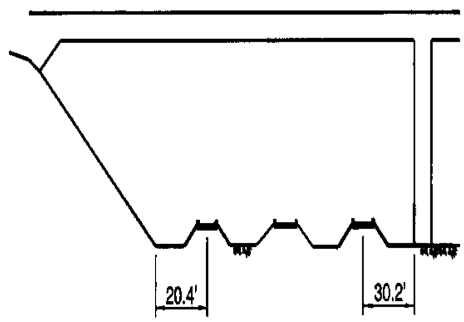
-- Lt. 15.1' Rt. for 2-way Traffic
15.1' Lt. 20.1' Rt. for 1-way Traffic



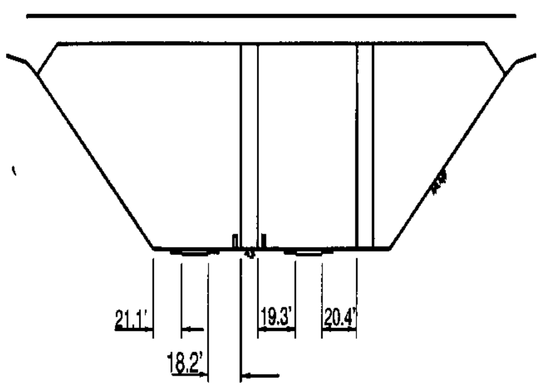
OPEN Lt. 20.2' Rt.



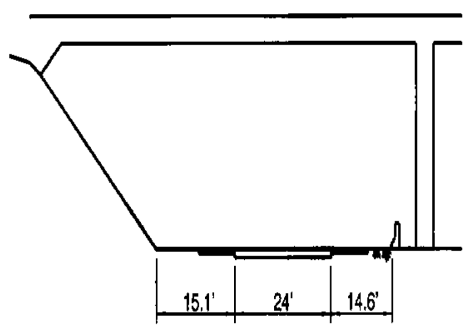
--Lt. 20.4' Rt.



-- LT. 20.4' Rt.



18.2' Lt. 20.4' Rt.



-- Lt. 14.6' Rt. for 2-way Traffic
15.1' Lt. 14.6' Rt. for 1-way traffic

Item 56 – Minimum Lateral Underclearance on Left

3 digits (XX.X feet)

(Code only for divided highways, one-way streets, and ramps; not applicable to railroads.)

Using a three digit number, record and code the minimum lateral underclearance on the left (median side for divided highways) to the nearest tenth of a foot (with an assumed decimal point). The lateral clearance should be measured from the left edge of the roadway (excluding shoulders) to the nearest substructure unit, to a rigid barrier, or to the toe of slope steeper than 1 to 3. Refer to examples under Item 55 - Minimum Lateral Underclearance on Right.

In the case of a dual highway, the median side clearances of both roadways should be measured and the smaller distance recorded and coded. If there is no obstruction in the median area, a notation of "open" should be recorded and 999 should be coded. For clearances greater than 99.8 feet, code 998. Code 000 to indicate not applicable.

Item 57 – Reserved (by FHWA

3-NBI.8 NBI DATA ITEMS - CONDITION RATINGS, ITEMS 58 THROUGH 62

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

The load-carrying capacity will not be used in evaluating condition items. The fact that a bridge was designed for less than current legal loads and may be posted shall have no influence upon condition ratings.

Portions of bridges that are being supported or strengthened by temporary members will be rated based on their actual condition; that is, the temporary members are not considered in the rating of the item. (See Item 103 Temporary Structure Designation for the definition of a temporary bridge.)

Completed bridges not yet opened to traffic, if rated, shall be coded as if open to traffic.

The following table contains the condition codes for FHWA Item 58 Deck, Item 59 Superstructure and Item 60 Substructure. The following general condition ratings are **also** used as a guide in evaluating several Nebraska Inventory Database Items.

In January of 2001, the FHWA completed a comprehensive study to examine the reliability of visual inspections as it is currently practiced in the United States. The conclusion of this study was that because the ratings are assigned after a visual inspection and rely heavily on subjective assessments made by bridge inspectors, there is no single “correct” rating value the group of inspectors could agree on. A single condition description in the table may not exactly match existing bridge condition; thus the Inspector should consider the condition to be in a range of two or three rating values from which the Inspector, based on their experience and knowledge of the structure, can select one to represent the element. The condition codes should describe the general condition of the entire component being rated; however, the Inspector must not hesitate to use ratings of 0, 1 or 2 in cases where a localized deterioration endangers the whole structure.

Code	*Description*
N	*NOT APPLICABLE*
9	*EXCELLENT CONDITION*
8	*VERY GOOD CONDITION - no problems noted.*
7	*GOOD CONDITION - some minor problems.*
6	*SATISFACTORY CONDITION - structural elements show some minor deterioration.*
5	*FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.*
4	*POOR CONDITION - advanced section loss, deterioration, spalling or scour.*
3	*SERIOUS CONDITION - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.*
2	*CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.*
1	*"IMMINENT" FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.*
0	*FAILED CONDITION - out of service beyond corrective action.*

NDOR's policy is that a code of 2 or less on one or more of the following condition ratings is a Critical Finding and requires immediate action.

- Item No. 58, Deck;
- Item No. 59, Superstructure;
- Item No. 60, Substructure; and
- Item No. 61, Channel and Channel Protection; and
- Item No. 62, Culvert; and
- Item No. 320 Piling.

When a condition rating is deemed to be 2 it is a Critical Finding, and NDOR **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 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.

Item 58 – Deck

1 digit

This item describes the overall condition rating of the deck. Rate and code the condition ratings as summarized on the following tables.

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.

*Decks integral with the superstructure will be rated as a **deck only** and not how they may influence the superstructure rating.*

Situation	Code
Bridges with asphalt or gravel overlay where the concrete deck is not visible	5 maximum
Bridges with concrete overlay where original the concrete deck is not visible	Rate as if it is a single-course integral deck
Concrete box culvert where top slab is near the travelled surface and it bears live load;	Code as for a concrete deck
Concrete box culverts where top slab is under deep fill and is not subject to direct live load	N

The condition of the wearing surface/protective system, joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail and scuppers shall not be considered in the overall deck evaluation. However, their condition should be documented.

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.
Bridge Railings	Concrete rails are to be examined for cracks, spalls, scaling or other deterioration of the concrete. Metal handrails should be checked for condition of paint and corrosion. All rails should be checked for any damage from traffic. Note the vertical and horizontal alignment. Settlement in the substructure or deficiencies in the bearings may show in the railings. Examine the joints to see that they are open and functioning as designed. Also, see that railings are secure, and that they are relatively free of slivers or any projections which could be hazardous to pedestrians.
Expansion Joints	Examine the underside of the expansion joints as far as possible to detect any impending problem. Lack of adequate room for expansion, especially in small areas of the joints, will concentrate thermal expansion stresses causing the concrete to shear and spall. This is a serious hazard in structures which cross over roadways, walkways, or any occupied areas.

Concrete Deck		
Item 58 Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert, under deep fill.
9	EXCELLENT CONDITION	No noticeable or noteworthy deficiencies that affect the condition of the deck.
8	VERY GOOD CONDITION	No spalling, scaling or delamination. Minor transverse cracking.
7	GOOD CONDITION	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 CONDITION	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 CONDITION	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 CONDITION	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 CONDITION	Area of the deck has been repaired or is deteriorating, more than 60 %.
2	CRITICAL CONDITION	Advanced deterioration of primary structural elements. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.
1	IMMINENT FAILURE CONDITION	Major deterioration of deck. Bridge is closed to traffic, but redecking action may put it back in service.
0	FAILED CONDITION	Out of service - beyond correction action.

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 the Chapter on 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

Steel Deck		
Item 58 Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert, under deep fill.
9	EXCELLENT CONDITION	No noticeable or noteworthy deficiencies that affect the condition of the deck.
8	VERY GOOD CONDITION	No rusting of steel decking. Steel decking tightly secured to floor system.
7	GOOD CONDITION	Minor rusting of steel deck. Steel deck a little loose at some connections.
6	SATISFACTORY CONDITION	Considerable rusting of steel deck with indications of initial section loss. Steel deck is loose at many locations.
5	FAIR CONDITION	Heavy rusting of steel decking with areas of section loss. Steel deck is loose at numerous locations.
4	POOR CONDITION	Heavy rusting of steel decking resulting in considerable section loss and some holes through deck. Necessitating the replacement of the entire deck.
3	SERIOUS CONDITION	Steel decking should be replaced before reaching this condition.
2	CRITICAL CONDITION	Advanced deterioration of primary structural elements. Fatigue cracks in steel may be present. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.
1	IMMINENT FAILURE CONDITION	Major deterioration of deck. Bridge is closed to traffic, but redecking action may put it back in service.
0	FAILED CONDITION	Out of service - beyond correction action.

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.

Timber Plank Deck		
Item 58 Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert, under deep fill.
9	EXCELLENT CONDITION	No noticeable or noteworthy deficiencies that affect the condition of the deck.
8	VERY GOOD CONDITION	No rotten or crushed wood. No splitting of timber planks. Timber planks tightly secured to floor system.
7	GOOD CONDITION (see guide photos)	Minor cracking or splitting of wood. Planks a little loose at some locations.
6	SATISFACTORY CONDITION (see guide photos)	A number of rotten or crushed planks in need of replacement. Many planks cracked or split. Planks are loose at many locations.
5	FAIR CONDITION (see guide photos)	Numerous rotten or crushed planks in need of replacement. Numerous planks cracked or split. Majority of planks are loose.
4	POOR CONDITION (see guide photos)	Majority of the planks are rotten, crushed and/or splitting, necessitating the replacement of the entire deck.
3	SERIOUS CONDITION	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 CONDITION	Advanced deterioration of primary structural elements. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.
1	IMMINENT FAILURE CONDITION	Major deterioration of deck. Bridge is closed to traffic, but redecking action may put it back in service.
0	FAILED CONDITION	Out of service - beyond correction action.

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.

Item 58 - Timber Plank Deck		
Code	**Condition**	**Description**
7	GOOD CONDITION (see guide photos)	Minor cracking or splitting of wood. Planks a little loose at some locations.

Item 58 - Timber Plank Deck		
Code	**Condition**	**Description**
6	SATISFACTORY CONDITION (see guide photos)	A number of rotten or crushed planks in need of replacement. Many planks cracked or split. Planks are loose at many locations.

FHWA Coding Guide content is shown in Calibri Italic font.

Item 58 - Timber Plank Deck		
Code	**Condition**	**Description**
5	FAIR CONDITION (see guide photos)	Numerous rotten or crushed planks in need of replacement. Numerous planks cracked or split. Majority of planks are loose.

FHWA Coding Guide content is shown in Calibri italic font.

Item 58 - Timber Plank Deck		
Code	**Condition**	**Description**
4	POOR CONDITION (see guide photos)	Majority of the planks are rotten, crushed and/or splitting, necessitating the replacement of the entire deck.

Item 59 – Superstructure

1 digit

This item describes the physical condition of all structural members. Rate and code the condition in accordance with the previously described general condition ratings. Code N for all culverts.

Additional guidance for coding for various types of structures is given in this section.

The structural member should be inspected for signs of distress which may include cracking, deterioration, section loss, and malfunction and misalignment of bearings.

The condition of bearings, joints, paint system, etc. shall not be included in this rating, except in extreme situations, but should be noted on the inspection form.

On bridges where the deck is integral with the superstructure, the superstructure condition rating may be affected by the deck condition. The resultant superstructure condition rating may be lower than the deck condition rating where the girders have deteriorated or been damaged.

Fracture critical components should receive careful attention because failure could lead to collapse of a span or the bridge.

The inspection should include, but not necessarily be limited to, the following observations.

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.

Measure across the expansion gap at expansion hanger devices. Mark for reference, record the distance, ambient temperature and date. This information may be used for movement in the device.

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.

ITEM 59 – CONCRETE SLAB BRIDGES		
Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert, with deep fill.
9	EXCELLENT CONDITION	No noticeable or noteworthy deficiencies that affect the condition of the structure.
8	VERY GOOD CONDITION	No scaling, spalling, or delamination, top and/or bottom Only minor cracking.
7	GOOD CONDITION	Open cracks without disintegration. Light scaling. Visible wear in wheel lines. Ponding water. Cracks with or without efflorescence, top and/or bottom.
6	SATISFACTORY CONDITION	Area of deck spalled, 2% or less. Medium scaling. 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 CONDITION	Area of top surface that has been repaired or shows signs of deterioration,10% - 29%. Cracks with or without efflorescence, top and/or bottom.

ITEM 59 – CONCRETE SLAB BRIDGES		
Code	**Condition**	**Description**
4	POOR CONDITION	Area of top surface that has been repaired or shows signs of deterioration, 30% - 60%. Cracks with or without efflorescence, top and/or bottom. Rust stains on surface.
3	SERIOUS CONDITION	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. Rust stains on surface.
2	CRITICAL CONDITION	Need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete. Rust stains on surface.
1	IMMINENT FAILURE CONDITION	Facility is closed. Study should determine the feasibility for repair.
0	FAILED CONDITION	Facility is closed and is beyond repair.

ITEM 59 – CONCRETE GIRDER BRIDGES		
Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert, with deep fill.
9	EXCELLENT CONDITION	No noticeable or noteworthy deficiencies that affect the condition of the structure.
8	VERY GOOD CONDITION	Minor collision damage involving chipped or spalled concrete.
7	GOOD CONDITION	Hairline cracks in concrete girders without disintegration.
6	SATISFACTORY CONDITION	Minor cracking. Deterioration of structural elements.
5	FAIR CONDITION	Substantial but not critical collision damage to structural elements, concrete girders, trusses, etc. Deterioration of deck girder ends, slab ends, precast ends, etc.
4	POOR CONDITION	Critical collision damage sustained to structural elements. Precautionary measures such as traffic restrictions or temporary shoring may be needed. Substantial disintegration of deck girder, slab, precast units, etc.
3	SERIOUS CONDITION	Disintegration of or damage condition of a structural member which requires traffic restriction or shoring.
2	CRITICAL CONDITION	The need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete.
1	IMMINENT FAILURE CONDITION	Facility is closed. Study should determine the feasibility for repair.
0	FAILED CONDITION	Facility is closed and is beyond repair.

ITEM 59 – STEEL		
Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert.
9	EXCELLENT CONDITION	No noticeable or noteworthy deficiencies that affect the condition of the structure.
8	VERY GOOD CONDITION	Minor collision damage involving chipped or spalled concrete. Bent steel or slight misalignment, not requiring repairs.
7	GOOD CONDITION	Heavy rust in localized areas without any section loss.
6	SATISFACTORY CONDITION	Initial section loss (heavy rust) in localized areas of structural steel members in non-critical stress areas.
5	FAIR CONDITION	Substantial but not critical collision damage to structural support elements, steel girders, trusses, etc. Deterioration of deck girder ends, slab ends, precast ends, etc. Initial section loss (heavy rust) in localized areas of structural steel members in critical stress areas.
4	POOR CONDITION	Critical collision damage sustained to structural support elements. Precautionary measures such as traffic restrictions or temporary shoring may be needed. Substantial disintegration of deck girder, slab, precast units, etc. Significant section loss (heavy rust) of structural steel girder in critical stress areas. (More than 30% section loss).
3	SERIOUS CONDITION	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 CONDITION	The need for repair or rehabilitation is urgent. Facility may have to be closed until the indicated repair is complete.
1	"IMMINENT" FAILURE CONDITION	Facility is closed. Study should determine the feasibility for repair.
0	FAILED CONDITION	Facility is closed and is beyond repair.

ITEM 59 – TIMBER		
Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert.
9	EXCELLENT CONDITION	No noticeable or noteworthy deficiencies that affect the condition of the structure.
8	VERY GOOD CONDITION	Insignificant cracking or splitting of timber beams or stringers at insignificant locations.
7	GOOD CONDITION	Minor decay Cracking Splitting Crushing of timber beams or stringers.
6	SATISFACTORY CONDITION	Some decay, cracking, splitting, or crushing of timber beams or stringers.
5	FAIR CONDITION	Substantial decay, cracking, splitting or crushing of timber beams or stringers.
4	POOR CONDITION	Extensive decay, cracking, splitting, or crushing of timber beams or stringers. Damage by insects such as termites or carpenter ants.
3	SERIOUS CONDITION	Severe decay, cracking, splitting, or crushing of timber beams or stringers. Closing of bridge should be considered.
2	CRITICAL CONDITION	The need for repair or rehabilitation is urgent. Facility must be closed until the indicated repair is complete.
1	IMMINENT FAILURE CONDITION	Facility is closed. Study should determine the feasibility for repair.
0	FAILED CONDITION	Facility is closed and is beyond repair.

Item 60 – Substructure

1 digit

This item describes the physical condition of piers, abutments, piles, footings or other components. Rate and code the condition in accordance with the previously described general condition ratings and the summarized condition ratings shown in this section. Code N for all culverts.

All substructure elements should be inspected for visible signs of distress including evidence of cracking, section loss, settlement, misalignment, scour, collision damage and corrosion. ***The rating factor given by Item 60 should be consistent with the one given to Item 113 whenever a rating factor of 2 or below is determined for Item 113 Scour Critical Bridges.***

It is NDOR's policy, to provide consistency between Items 60 and 113 as noted above, to code Item 60 as follows:

Item 113 Code	Item 60 Code
3, bridge is scour critical	5 or less
2, bridge is scour critical, or 1, bridge is scour critical	4 or less

The substructure condition rating shall be made independent of the deck and superstructure.

Integral-abutment wingwalls to the first construction or expansion joint shall be included in the evaluation. For non-integral superstructure and substructure units, the substructure shall be considered as the portion below the bearings. For structures where the substructure and superstructure are integral, the substructure shall be considered as the portion below the superstructure.

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 not hesitate to use a low rating for the substructure.

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.

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 Pontis comment field.

Pile group collective section area loss (for a group of piles in a single substructure) shall be calculated as follows:

$$\text{Pile group collective section area loss} = \frac{\text{Sum of individual pile section area loss}}{\text{Sum of individual pile section area, original}}$$

Underwater Inspection

Underwater inspection is described in the Chapter on Bridge Inspection in this Manual.

ITEM 60 – CONCRETE		
Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert.
9	EXCELLENT CONDITION	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 or on steel).
8	VERY GOOD CONDITION	Near new condition.
7	GOOD CONDITION	Small (less than 1/16-inch) 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 CONDITION	Open cracks 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). Moderate scouring, no action needed.
5	FAIR CONDITION	Leaching through abutment backwall. Concrete beginning to spall. Abutments leaning in because of settlement or earth load. Spalls around bearing devices, concrete deteriorating, bearing affected. Pile collective area loss on a substructure, 10% to 19% Extensive scouring and undermining of footings. Bearings might be affected.
4	POOR CONDITION	Major spalling around bearing devices. Concrete deteriorating bearing affected. Need for repairs is urgent. Pile collective area loss on a substructure, 20% to 29%. Extensive scouring and undermining of footings affecting stability. Rehabilitation urgently needed.
3	SERIOUS CONDITION	Wings separated from abutment. Dirt spilling through back wall. Girder seats breaking up. Shoring recommended. Pile collective area loss on a substructure, 30% to 49%. Two adjacent pile (next to each other in one bent or one abutment) have section loss. End pile under pile cap has section loss. Footings undermined. Rehabilitation is urgent.

ITEM 60 – CONCRETE		
Code	**Condition**	**Description**
2	CRITICAL CONDITION	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. Traffic restrictions should be considered. Pile collective area loss on a substructure, 50% or more. Footings undermined. Immediate rehabilitation required.
1	IMMINENT FAILURE CONDITION	Facility is closed. Study should determine the feasibility for repair.
0	FAILED CONDITION	Facility is closed and is beyond repair.

ITEM 60 – STEEL		
Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert.
9	EXCELLENT CONDITION	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 or on steel).
8	VERY GOOD CONDITION	Near new condition.
7	GOOD CONDITION	Minor rusting of steel pile.
6	SATISFACTORY CONDITION	Rusting of steel pile. Pile collective section area loss on a substructure, less than 10%.
5	FAIR CONDITION	Pier columns show section loss. Pile collective section area loss on a substructure, 10% to 19%.
4	POOR CONDITION	Need for repairs is urgent. Pile collective section area loss on a substructure, 20% to 29%. Extensive scouring and undermining of footings affecting stability. Rehabilitation urgently needed.
3	SERIOUS CONDITION	Wings separated from abutment. Dirt spilling through back wall. Girder seats breaking up. Shoring recommended. Pile collective section area loss on a substructure, 30% to 49%. Two adjacent piles have section area loss. End pile under pile cap has section area loss. Footings undermined. Rehabilitation is urgent.
2	CRITICAL CONDITION	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. Traffic restrictions should be considered. Pile collective section area loss on a substructure, 50% or more. Footings undermined. Immediate rehabilitation required.
1	IMMINENT FAILURE CONDITION	Facility is closed. Study should determine the feasibility for repair.
0	FAILED CONDITION	Facility is closed and is beyond repair.

ITEM 60 – TIMBER		
Code	**Condition**	**Description**
N	NOT APPLICABLE	For example, on a culvert.
9	EXCELLENT CONDITION	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 or on steel)
8	VERY GOOD CONDITION	Near new condition.
7	GOOD CONDITION	Insignificant decay, cracking, spitting or crushing of timber.
6	SATISFACTORY CONDITION	Timber 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 a substructure, less than 10%.
5	FAIR CONDITION	Substantial decay, cracking, spitting or crushing of timber members requiring some replacement. Pile collective section area loss on a substructure, 10% to 19%.
4	POOR CONDITION	Need for repairs is urgent. Pile collective section area loss on a substructure, 20% to 29%. Extensive scouring and undermining of footings affecting stability. Rehabilitation urgently needed.
3	SERIOUS CONDITION	Wings separated from abutment. Dirt spilling through back wall. Girder seats breaking up. Shoring recommended. Pile collective section area loss on a substructure, 30% to 49%. Two adjacent pile have section area loss. End pile under pile cap has section area loss. Footings undermined. Rehabilitation is urgent.
2	CRITICAL CONDITION	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. Traffic restrictions should be considered. Pile collective section area loss on a substructure, 50% or more. Footings undermined. Immediate rehabilitation required.
1	IMMINENT FAILURE CONDITION	Facility is closed. Study should determine the feasibility for repair.
0	FAILED CONDITION	Facility is closed and is beyond repair.

Item 61 – Channel and Channel Protection

1 digit

This item describes the physical conditions associated with the flow of water through the bridge such as stream stability and the condition of the channel, riprap, slope protection or stream control devices including spur dikes. The inspection should be particularly concerned with visible signs of excessive water velocity which may result in immediate or potential problems. Accumulation of drift and debris on the superstructure and substructure should be noted on the comment file but not included in the condition rating.

Inspectors must observe the adequacy of the waterway opening under the structure. See that the waterway is not obstructed, but that it affords 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 skew of the piers or abutments.

Rate and code the condition in accordance with the previously described general condition ratings and the following descriptive codes:

Code	***Description***
N	*Not applicable. Use when bridge is not over a waterway.*
9	*There are no noticeable or noteworthy deficiencies which affect the condition of the channel.*
8	*Banks are protected or well vegetated. River control devices such as spur dikes and embankment protection are not required or are in a stable condition.*
7	*Bank protection is in need of minor repairs. River control devices and embankment protection have a little minor damage. Banks and/or channel have minor amounts of drift.*
6	*Banks are beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly.*
5	*Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.*
4	*Bank and embankment protection is severely undermined. River control devices have severe damage. Large deposits of debris are in the waterway.*
3	*Bank protection has failed. River control devices have been destroyed. Stream bed aggradations, degradation or lateral movement has changed the waterway to now threaten the bridge and/or approach roadway.*
2	*The waterway has changed to the extent the bridge is near a state of collapse.*
1	*Bridge closed because of channel failure. Corrective action may put back in light service.*
0	*Bridge closed because of channel failure. Replacement necessary.*

Item 62 – Culverts

1 digit

This item evaluates the alignment, settlement, joints, structural condition, scour, and other items associated with culverts. The rating code is intended to be an overall condition evaluation of the culvert. Integral wingwalls to the first construction or expansion joint shall be included in the evaluation. For a detailed discussion regarding the inspection and rating of culverts, consult Report No. FHWA-IP-86-2, CULVERT INSPECTION MANUAL, July 1986.

Item 58 Deck, Item 59 Superstructure, and Item 60 Substructure shall be Coded N for all Culverts. Rate and code the condition in accordance with the previously described general condition ratings and the following descriptive codes:

ITEM 62 - CULVERTS	
Code	***Description***
N	*Not applicable. Use if structure is not a culvert.*
9	*No deficiencies.*
8	*No noticeable or noteworthy deficiencies which affect the condition of the culvert. Insignificant scrape marks caused by drift.*
7	*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	*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	*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	*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	*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	*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. Corrective action required to maintain traffic. Metal culverts have extreme distortion and deflection throughout with extensive perforations and deflection throughout with extensive perforations due to corrosion.*
1	*Bridge closed. Corrective action may put back in light service.*

0	*Bridge closed. Replacement necessary.*

Item 63 – Method Used to Determine Operating Rating

1/AN character

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered in Pontis by the Program Manager Staff.

NDOR beginning in 2012 will report load ratings by rating factor only to FHWA. In prior years, load ratings were reported in Tons. Nebraska SI&A sheets will show Tons.

For additional information see

FHWA Policy Memorandum Load and Resistance Factor Design, June 28, 2000

FHWA Memorandum Revisions to Items 63-66 to Support Load Reporting by Rating Factor, March 22, 2004

FHWA Memorandum Bridge Load Ratings for the National Bridge Inventory, October 30, 2006

FHWA Memorandum Revisions to the Recording and Coding Guide for the Structure, Inventory and Appraisal of the Nation's Bridges (Coding Guide) – Item 31, Design Load, and Items 63 and 65, Method Used to Determine Operation and Inventory Ratings, February 2, 2011.

FHWA Memorandum Revisions to the Recording and Coding Guide for the Structure, Inventory and Appraisal of the Nation's Bridges (Coding Guide) Items 63 and 65, Method Used to Determine Operating and Inventory Ratings, November 15, 2011

The FHWA June 28, 2000 Policy Memorandum required that all new bridges be designed by the LRFD Specifications after October 1, 2007. Load ratings for bridges designed by Load and Resistance Factor Design (LRFD), are governed by the FHWA October 30, 2006 Memorandum and summarized in the following table. FHWA supports Load and Resistance Factor Rating (LRFR) moving forward, but continues to accept Load Factor (LFR) for the large inventory of in-service bridges that have been designed by methods other than LRFD they do not intent to mandate re-rating of existing bridges by LRFR if the bridge has an existing, valid load rating.

Design Date	Design Method	Load Rating Method
Prior to October 1, 2010	LRFD	LRFR or LFR
On or after October 1, 2010	LRFD	LRFR only

FHWA added the alpha codes in 2011 to properly identify Assigned Load Ratings

Use one of the codes below to indicate which load rating method was used to determine the Operating Rating coded in Item 64 for this structure.

Code	*Description*
0	*Field evaluation and documented engineering judgment*
1	*Load Factor (LF)*
2	*Allowable Stress (AS)*
3	*Load and Resistance Factor (LRFR)*
4	*Load Testing*
5	*No rating analysis or evaluation performed*
6	*Load Factor (LF) rating reported by Rating Factor (RF) method using MS18 loading*
7	*Allowable Stress (AS) rating reported by Rating Factor (RF) method using MS18 loading*
8	*Load and Resistance Factor Rating (LRFR) rating reported by Rating Factor (RF) method using MS18 loading*
A	*Assigned rating based on Load Factor Design (LFD) reported in metric tons*
B	*Assigned ratings based on Allowable Stress Design (ASD) reported in metric tons*
C	*Assigned ratings based on Load and Resistance Factor Design (LRFD) reported in metric tons*
D	*Assigned ratings based on Load Factor Design (LFD) reported by rating factor (RF) using MS18 loading*
E	*Assigned rating based on Allowable Stress Design (ASD) reported by rating factor (RF) using MS18 loadings*
F	*Assigned ratings based on Load and Resistance Factor Design (LRFD) reported by rating factor (RF) using HL93 loadings*

Code 0 is to be used when the load rating is determined by field evaluation and documented engineering judgment, typically done when plans are not available or in cases of severe deterioration. Field evaluation and engineering judgment ratings must be documented.

Code 5 is to be used when the bridge has not been load rated or load rating documentation does not exist.

Existing code 5 is clarified to only be used for bridges that have not been load rated or load rating documentation does not exist. Code 0 has been added for use when the load rating is determined by field evaluation and documented engineering judgment, typically done when plans are not available or severe deterioration exists. Field evaluation and engineering judgment ratings must be documented. Bridges that are currently coded 5 must be reviewed to determine if code 0 or 5, or another code, is appropriate.

Item 64 – Operating Rating

3 digits

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered into Pontis by the Program Manager Staff.

NDOR beginning in 2012 will report load ratings by rating factor only to FHWA. In prior years, load ratings were reported in Tons. Nebraska SI&A sheets will show Tons.

For additional information see FHWA Memorandum Revisions to Items 63-66 to Support Load Reporting by Rating Factor, March 22, 2004 and Memorandum Bridge Load Ratings for the National Bridge Inventory, October 30, 2006. FHWA has not yet reissued the Coding Guide.

This capacity rating, referred to as the Operating Rating, will result in the absolute maximum permissible load level to which the structure may be subjected for the vehicle type used in the rating. Code the Operating Rating as a two digit code (XX tons) to represent the total weight in tons of the entire vehicle measured to the nearest ton.

It should be emphasized that only HS loading shall be used to determine the Operating Rating. The total mass in tons of the entire vehicle should be coded; that is, HS20 which has a weight of 36 tons shall be coded '36', and likewise, a HS13 shall be coded '24'.

The MBE provides a choice of load rating methods, such as the new load and resistance factor (LRFR) rating method, in addition to the traditional allowable stress (AS) and load factor (LF) methods. Of the three rating methods, the LF method is the most suitable for use as a national standard, therefore, the FHWA has chosen the LF method as the standard for computing inventory and Operating Ratings reported to the NBI. The highway agencies may, however, elect to use LF, AS or LRFD to establish load limits for purposes of load posting.

If the bridge will not carry a minimum of three tons of live load, the Operating Rating shall be coded '00'; and consistent with the direction of the AASHTO Manual, it shall be closed.

The use or presence of a temporary bridge requires special consideration in coding. In such cases, since there is no permanent bridge, Items 64 and 66 should be coded as 00 even though the temporary structure is rated for as much as full legal load.

A bridge shored up or repaired on a temporary basis is considered a temporary bridge and the inventory and Operating Rating shall be coded as if the temporary shoring were not in place. See Item 103 Temporary Structure Designation for definition of a temporary bridge.

Examples:

	Code
HS20	*36*
Temporary bridge	*00*
Shored-up bridge	*30**
** load capacity without shoring.*	

FHWA Coding Guide content is shown in Calibri italic font.

Item 65 – Method Used to Determine Inventory Rating

1 digit

See Item 63 – Method Used to Determine Operation Rating.

Item 66 – Inventory Rating

3 digits

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered in Pontis by the Program Manager Staff.

NDOR beginning in 2012 will report load ratings by rating factor only to FHWA. In prior years, load ratings were reported in Tons. Nebraska SI&A sheets will show Tons.

For additional information see FHWA Memorandum Revisions to Items 63-66 to Support Load Reporting by Rating Factor, March 22, 2004 and Memorandum Bridge Load Ratings for the National Bridge Inventory, October 30, 2006. FHWA has not yet reissued the Coding Guide.

This capacity rating, referred to as the Inventory Rating, will result in a load level which can safely utilize an existing structure for an indefinite period of time. Only the HS loading shall be used to determine the Inventory Rating. Code the Inventory Rating as a two-digit number to represent the total weight in tons of the entire vehicle measured to the nearest ton. The statements in Item 64 Operating Rating apply to this item also.

3-NBI.9 NBI DATA ITEMS - APPRAISAL RATINGS, ITEMS 67, 68, 69, 71, 72

The items in the Appraisal section are used to evaluate a bridge in relation to the level of service which it provides on the highway system of which it is a part. The structure will be compared to a new one which is built to current standards for that particular type of road as further defined in this section except for Item 72 Approach Roadway Alignment. See Item 72 for special criteria for rating that item.

Items 67, 68, 69, 71 and 72 will be coded with a one digit code that indicates the appraisal rating for the item. The ratings and codes are as follows:

APPRAISAL RATINGS, ITEMS 67, 68, 69, 71, 72	
Code	***Description***
N	*Not applicable*
9	*Superior to present desirable criteria*
8	*Equal to present desirable criteria*
7	*Better than present minimum criteria*
6	*Equal to present minimum criteria*
5	*Somewhat better than minimum adequacy to tolerate being left in place as is*
4	*Meets minimum tolerable limits to be left in place as is*
3	*Basically intolerable requiring high priority of corrective action*
2	*Basically intolerable requiring high priority of replacement*
1	*This value of rating code not used*
0	*Bridge closed*

The FHWA Edit/Update computer program calculates values for Items 67, 68 and 69 according to the tables provided in this manual. These tables and the table for Item 71 shall be used by all evaluators to rate these items. They have been developed to closely match the descriptions for the appraisal evaluation codes of 0 to 9. The tables shall be used in all instances to evaluate the item based on the designated data in the inventory, even if a table value does not appear to match the descriptive codes. For unusual cases where the site data does not exactly agree with the table criteria, use the most appropriate table to evaluate the item. The code of N is not valid for use with Items 67 and 72.

Completed bridges not yet opened to traffic, if rated, shall be appraised as if open to traffic. Design values, for example ADT, shall be used for the evaluation. The data provided will include a code of G for Item 41 Structure Open, Posted, or Closed to Traffic.

Item 67 – Structural Evaluation

1 digit

This item is calculated by the Edit/Update Program based on Table 1, and need not be coded by the bridge inspector. The following specifications are used by the Edit/Update Program:

- *For structures other than culverts, the lowest of the codes obtained from Item 59 Superstructure, Item 60 Substructure, or Table 1 is used.*
- *For culverts, the lowest of the codes obtained from Item 62 Culverts, or Table 1 is used.*
- *If Item 59, Item 60 or Item 62 is coded 1, then Item 67 is equal to zero (0), regardless of whether the structure is actually closed. However, if the structure is closed, it does not mean that this value is zero (0) unless the overall condition and appraisal ratings indicate that a code of 0 is appropriate.*

TABLE 1
RATING BY COMPARISON OF ITEM 29 ADT AND ITEM 66 INVENTORY RATING

Structural Evaluation Rating Code	***Inventory Rating***		
	Average Daily Traffic (ADT)		
	0-500	***501-5000***	***>5000***
9	*>236* (HS20)***	*>236 (HS20)*	*>236 (HS20)*
8	*236 (HS20)*	*236 (HS20)*	*236 (HS20)*
7	*231 (HS17)*	*231 (HS17)*	*231 (HS17)*
6	*223 (HS13)*	*225 (HS14)*	*227 (HS15)*
5	*218 (HS10)*	*220 (HS11)*	*222 (HS12)*
4	*212 (HS7)*	*214 (HS8)*	*218 (HS10)*
3	*Inventory Rating less than value in rating code of 4 and requiring corrective action.*		
2	*Inventory Rating less than value in rating code of 4 and requiring replacement.*		
0	*Bridge closed.*		

** Coded HS rating load (typical)*
*** HS Designation (typical)*

Notes:
1. Use the lower rating code for values between those listed in the table.
2. All bridges on the Interstate system shall be evaluated using the ADT column of >5000 regardless of the actual ADT on the bridge.

Item 68 – Deck Geometry

1 digit

This item is calculated by the Edit/Update Program and need not be coded by the bridge inspector.

The overall rating for deck geometry will include two evaluations: (a) the curb-to-curb or face to face of rail bridge width using Table 2A, B, C or D and (b) the minimum vertical clearance over the bridge roadway using Table 2E. The lower of the codes obtained from these tables is used by the Edit/Update Program. When an individual table lists several deck geometry rating codes for the same roadway width under a specific ADT, the lower code is used. (For example, Table 2A lists deck geometry rating codes of 6, 7 and 8 for a 44 foot roadway width and an ADT of >5000. Use the code of 6.) For values between those listed in the tables, the lower code is used.

The curb-to-curb or face-to-face of rail dimension shall be taken from Item 51 - Bridge Roadway Width, Curb-to-Curb. Item 53 - Minimum Vertical Clearance Over Bridge Roadway is used to evaluate the vertical clearance.

For culverts which have Item 51 – Bridge Roadway Width coded 0000, the Deck Geometry codes will be equal to N.

The values provided in the tables are for rating purposes only. Current design standards must be used for structure design or rehabilitation.

TABLE 2A & 2B RATING BY COMPARISON OF ITEM 29 ADT AND ITEM 51 BRIDGE ROADWAY WIDTH, CURB-TO-CURB								
	TABLE 2A						***TABLE 2B***	
Deck Geometry Rating Code	***Bridge Roadway Width 2 Lanes; 2 Way Traffic***						***Bridge Roadway Width 1 Lane; 2-Way Traffic***	
	ADT (Both Directions)						***ADT (Both Direct.)***	
	0-100	***101-400***	***401-1000***	***1001-2000***	***2001-5000***	***>5000***	***0-100***	***>100***
9	*>32*	*>36*	*>40*	*>44*	*>44*	*>44*	*--*	*--*
8	*32*	*36*	*40*	*44*	*44*	*44*	*15'-11'*	*--*
7	*28*	*32*	*36*	*40*	*44*	*44*	*15*	*--*
6	*24*	*28*	*30*	*34*	*40*	*44*	*14*	*--*
5	*20*	*24*	*26*	*28*	*34*	*38*	*13*	*--*
4	*18*	*20*	*22*	*24*	*28*	*32 (28*)*	*12*	*--*
3	*16*	*18*	*20*	*22*	*26*	*30 (26*)*	*11*	*15'-11'*
2	*Any width less than required for a rating code of 3 and structure is open.*							
0	*Bridge closed.*							
** Use value in parentheses for bridges longer than 200 feet.*								

Notes:

1. Use the lower rating code for values between those listed in the table.

2. Dimensions are in feet.

3. For 1 lane of one-way traffic, Table 2A is used.

4. For 3 or more undivided lanes of two-way traffic, use Table 2C, Other Multilane Divided Facilities.

5. Do not use Table 2B for Code 9 and for Codes 8 through 4 inclusive when the ADT >100. Single lane bridges less than 16 feet wide carrying two-way traffic are always appraised at 3 or below if they carry more than an ADT of 100.

6. One-lane bridges 16 feet and greater in roadway width, which are not ramps, are evaluated as a two-lane bridge using Table 2A.

TABLE 2C & 2D RATING BY COMPARISON OF ITEM 28 NUMBER OF LANES AND ITEM 51 BRIDGE ROADWAY WIDTH, CURB-TO-CURB						
	TABLE 2C				***TABLE 2D***	
Deck Geometry Rating Code	***Bridge Roadway Width 2 or More Lanes Each Direction***				***Bridge Roadway Width 1-Way Traffic***	
	Interstate and Other Divided Freeways		***Other Multilane Divided Facilities***		***Ramps Only***	
	2 Lanes	***3 or more Lanes***	***2 Lanes***	***3 or more Lanes***	***1 Lane***	***2 or more Lanes***
9	*>42*	*>12N+24*	*>42*	*>12N+18*	*>26*	*>12N+12*
8	*42*	*12N+24*	*42*	*12N+18*	*26*	*12N+12*
7	*40*	*12N+20*	*38*	*12N+15*	*24*	*12N+10*
6	*38*	*12N+16*	*36*	*12N+12*	*22*	*12N+8*
5	*36*	*12N+14*	*33*	*11N+10*	*20*	*12N+6*
4	*34(29)**	*11N+12 (11N+7)**	*30*	*11N+6*	*18*	*12N+4*
3	*33(28)**	*11N+11 (11N+6)**	*27*	*11N+5*	*16*	*12N+2*
2	*Any width less than required for a rating code of 3 and structure is open.*					
0	*Bridge closed.*					
** Use value in parentheses for bridges longer than 200 feet. N = number of lanes of traffic.*						
Notes: 1. Use the lower rating code for values between those listed in the tables. 2. Dimensions are in feet. 3. Use Table 2C, other Multilane Divided Facilities, for 3 or more undivided lanes of two-way traffic.						

TABLE 2E RATING BY COMPARISON OF ITEM 53 MINIMUM VERTICAL CLEARANCE OVER BRIDGE ROADWAY AND ITEM 26 FUNCTIONAL CLASSIFICATION			
Minimum Vertical Clearance			
Deck Geometry Rating Code	***Functional Class***		
	Interstate and Other Freeway	***Other Principal and Minor Arterials***	***Major and Minor Collectors and Locals***
9	*>17’-0”*	*>16’-6”*	*>16’-6”*
8	*17’-0”*	*16’-6”*	*16’-6”*
7	*16’-9”*	*15’-6”*	*15’-6”*
6	*16’-6”*	*14’-6”*	*14’-6”*
5	*15’-9”*	*14’-3”*	*14’-3”*
4	*15’-0”*	*14’-0”*	*14’-0”*
3	*Vertical clearance less than value in rating code of 4 and requiring corrective action.*		
2	*Vertical clearance less than value in rating code of 4 and requiring replacement.*		
0	*Bridge closed.*		
Note: 1. Use the lower rating code for values between those listed in the table.			

Item 69 – Underclearances, Vertical and Horizontal

1 digit

This item is calculated by the Edit/Update Program and need not be coded by the bridge inspector.

Vertical and horizontal underclearances are measured from the through roadway to the superstructure or substructure units, respectively. Code "N" is used unless the bridge is over a highway or railroad.

The vertical underclearance is evaluated using Table 3A. The horizontal underclearance is evaluated using Table 3B. The lower of the codes obtained from Table 3A and Table 3B is used by the Edit/Update Program.

Bridges seldom are closed due to deficient underclearances, however, these bridges may be good candidates for rehabilitation or replacement.

Item 54 - Minimum Vertical Underclearance, Item 55 - Minimum Lateral Underclearance on Right, and Item 56 - Minimum Lateral Underclearance on Left shall be used to evaluate this item.

The functional classification used in the table is for the underpassing route. Therefore, the functional classification is obtained from the record for the route "under" the bridge (see Item 5 - Inventory Route).

If the underpassing route is not on a Federal-aid system, is not STRAHNET route, or is not otherwise important, an "under" record may not be available. If no "under" record exists, it is assumed that the route under the bridge is a major or minor collector or a local road for the purpose of using Tables 3A and 3B.

TABLE 3A RATING BY COMPARISON OF ITEM 54 MINIMUM VERTICAL UNDERCLEARANCE AND FUNCTIONAL CLASSIFICATION OF UNDERPASSING ROUTE				
Minimum Vertical Underclearance				
	Functional Class			
Under-clearance Rating Code	***Interstate and Other Freeway***	***Other Principal and Minor Arterials***	***Major and Minor Collectors and Locals***	***Railroad***
9	*>17’-0”*	*>16’-6”*	*>16’-6”*	*>23’-0”*
8	*17’-0”*	*16’-6”*	*16’-6”*	*23’-0”*
7	*16’-9”*	*15’-6”*	*15’-6”*	*22’-6”*
6	*16’-6”*	*14’-6”*	*14’-6”*	*22’-0”*
5	*15’-9”*	*14’-3”*	*14’-3”*	*21’-0”*
4	*15’-0”*	*14’-0”*	*14’-0”*	*20’-0”*
3	*Underclearance less than value in rating code of 4 and requiring corrective action.*			
2	*Underclearance less than value in rating code of 4 and requiring replacement.*			
0	*Bridge closed.*			

Notes:
1. Use the lower rating code for values between those listed in the tables.
2. The functional classification of the underpassing route shall be used in the evaluation. If an "under" record is not coded, the underpassing route shall be considered a major or minor collector or a local road.

TABLE 3B
RATING BY COMPARISON OF ITEMS 55 & 56 MINIMUM LATERAL UNDERCLEARANCES RIGHT & LEFT AND FUNCTIONAL CLASSIFICATION OF UNDERPASSING ROUTE

Minimum Lateral Underclearance							
	Functional Class						***Railroad***
Under-clearance Rating Code	***1-Way Traffic***				***2-Way Traffic***		
	Principal Arterials – Interstate, Freeways or Expressways				***Other Principal and Minor Arterials***	***Major and Minor Collectors and Locals***	
	Mainline		***Ramp***				
	Left	***Right***	***Left***	***Right***			
9	*>30*	*>30*	*>4*	*>10*	*>30*	*>12*	*>20*
8	*30*	*30*	*4*	*10*	*30*	*12*	*20*
7	*18*	*21*	*3*	*9*	*21*	*11*	*17*
6	*6*	*12*	*2*	*8*	*12*	*10*	*14*
5	*5*	*11*	*2*	*6*	*10*	*8*	*11*
4	*4*	*10*	*2*	*4*	*8*	*6*	*8*
3	*Underclearance less than value in rating code of 4 and requiring corrective action.*						
2	*Underclearance less than value in rating code of 4 and requiring replacement.*						
0	*Bridge closed.*						

Notes:
1. *Use the lower rating code for values between those listed in the tables.*
2. *Dimensions are in feet.*
3. *When acceleration or deceleration lanes or ramps are provided under two-way traffic, use the value from the right ramp column to determine code.*
4. *The functional classification of the underpassing route shall be used in the evaluation. If an "under" record is not coded, the underpassing route shall be considered a major or minor collector or a local road.*

Item 70 – Bridge Posting

1 digit

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered into Pontis by the Program Manager Staff.

The National Bridge Inspection Standards require the posting of load limits only if the maximum legal load configurations in the State exceeds the load permitted under the Operating Rating. If the load capacity at the Operating Rating is such that posting is required, this item shall be coded 4 or less. If no posting is required at the Operating Rating, this item shall be coded 5.

This item evaluates the load capacity of a bridge in comparison to the State legal load. It differs from Item 67 - Structural Evaluation in that Item 67 uses Item 66 – Inventory Rating, while the bridge posting requirement is based on Item 64 – Operating Rating.

Although posting a bridge for load-carrying capacity is required only when the maximum legal load exceeds the Operating Rating, highway agencies may choose to post at a lower level. This posting practice may appear to produce conflicting coding when Item 41 - Structure Open, Posted or Closed to Traffic is coded to show the bridge as actually posted at the site and Item 70 - Bridge Posting is coded as bridge posting is not required. Since different criteria are used for coding these 2 items, this coding is acceptable and correct when the highway agency elects to post at less than the Operating Rating. Item 70 shall be coded 4 or less only if the legal load of the State exceeds that permitted under the Operating Rating.

The use or presence of a temporary bridge affects the coding. The actual Operating Rating of the temporary bridge should be used to determine this item. However, the highway agency may choose to post at a lower level. This also applies to bridges shored up or repaired on a temporary basis.

Code	***Description***
4 or less	*Posting required*
5	*No posting required*

The degree that the Operating Rating is less than the maximum legal load level may be used to differentiate between codes. As a guide and for coding purposes only, the following values may be used to code this item:

Code	***Relationship of Operating Rating to Maximum Legal Load***
5	*Equal to or above legal loads*
4	*0.1 - 9.9% below*
3	*10.0 - 19.9% below*
2	*20.0 - 29.9% below*
1	*30.0 - 39.9% below*
0	*> 39.9% below*

For posting purposes, all bridges in Nebraska are load rated at operating level for AASHTO rating truck axle spacing with Nebraska legal axle loads. See Chapter 5 for details of AASHTO and Nebraska legal trucks:

- Type 3 straight truck- gross weight 25 tons
- Type 3S2 semi-trailer truck- gross weight 37 tons
- Type 3-3 truck trailer unit - gross weight 43 tons

The load rating of a bridge is based on the actual condition of the components of the bridge. Inspectors should note in the inspection report factors such as a bad bridge deck substructure, or badly deteriorated piling in abutments that may reduce the capacity of the bridge.

Concrete slab bridges and culverts without plans are load rated based on the condition ratings for the bridge. Inspectors should carefully inspect these types of bridges and thoroughly document any deterioration, cracking or other issues for the Load Rating Engineer's evaluation.

Load rating is completed by a Load Rating Engineer thoroughly familiar with bridge types, the principles of structural design, materials and stress analysis using the MBE and NDOR Load Rating policy.

If, for any of the three rating trucks, the recommended load rating is **less than** the truck's gross weight, the bridge must be posted at the recommended value on the LRSS. **Bridges may not be posted for less than 3 Tons**. Such a bridge must be closed because it would be unsafe even for passenger cars. An Owner with such a bridge may have their Load Rating Engineer determine if a load rating could be improved with strengthening of the critical members.

If any load ratings for any of the three rating trucks are **higher than** the gross weight of the rating trucks, the bridge does not need to be load posted; however, if an Owner chooses to load post such a bridge, the **bridge shall not be posted over the legal limit trucks given above.**

Item 71 – Waterway Adequacy

1 digit

This item appraises the waterway opening with respect to passage of flow through the bridge. The following codes shall be used in evaluating waterway adequacy. Site conditions may warrant somewhat higher or lower ratings than indicated by the table (e.g., flooding of an urban area due to a restricted bridge opening).

Inspectors should also review guidance in Chapter 6 Scour. If the inspector has further questions, they should consult the Owner's Hydraulic Engineer.

Where overtopping frequency information is available, the descriptions given in the table for chance of overtopping mean the following:

Remote	*greater than 100 years*
Slight	*11 to 100 years*
Occasional	*3 to 10 years*
Frequent	*less than 3 years*

Adjectives describing traffic delays mean the following:

Insignificant	*Minor inconvenience. Highway passable in a matter of hours.*
Significant	*Traffic delays of up to several days.*
Severe	*Long term delays to traffic with resulting hardship.*

ITEM 71 WATERWAY ADEQUACY			
Functional Classification			***Description***
Principal Arterials – Interstates, Freeways, or Expressways	***Other Principal and Minor Arterials and Major Collectors***	***Minor Collectors, Locals***	
Code			
N	*N*	*N*	*Bridge not over a waterway.*
9	*9*	*9*	*Bridge deck (low superstructure) and roadway approaches above flood water elevations (high water). Chance of overtopping is remote.*
8	*8*	*8*	*Bridge deck above roadway approaches. Slight chance of overtopping roadway approaches.*
6	*6*	*7*	*Slight chance of overtopping bridge deck and roadway approaches.*
4	*5*	*6*	*Bridge deck above roadway approaches. Occasional overtopping of roadway approaches with insignificant traffic delays.*
3	*4*	*5*	*Bridge deck above roadway approaches. Occasional overtopping of roadway approaches with significant traffic delays.*
2	*3*	*4*	*Occasional overtopping of bridge deck and roadway approaches with significant traffic delays.*
2	*2*	*3*	*Frequent overtopping of bridge deck and roadway approaches with significant traffic delays.*
2	*2*	*2*	*Occasional or frequent overtopping of bridge deck and roadway approaches with severe traffic delays.*
0	*0*	*0*	*Bridge closed.*

Item 72 – Approach Roadway Alignment

1 digit

Code this rating based on the adequacy of the approach roadway alignment. This item identifies those bridges which do not function properly or adequately due to the alignment of the approaches. It is not intended that the approach roadway alignment be compared to current standards but rather to the existing highway alignment. This concept differs from other appraisal evaluations. The establishment of set criteria to be used at all bridge sites is not appropriate for this item. The basic criteria is how the alignment of the roadway approaches to the bridge relate to the general highway alignment for the section of highway the bridge is on.

The individual structure shall be rated in accordance with the general appraisal rating guide in lieu of specific design values. The approach roadway alignment will be rated intolerable (a code of 3 or less) only if the horizontal or vertical curvature requires a substantial reduction in the vehicle operating speed from that on the highway section. A very minor speed reduction will be rated a 6, and when a speed reduction is not required, the appraisal code will be an 8. Additional codes may be selected between these general values.

For example, if the highway section requires a substantial speed reduction due to vertical or horizontal alignment, and the roadway approach to the bridge requires only a very minor additional speed reduction at the bridge, the appropriate code would be a 6. This concept shall be used at each bridge site.

Speed reductions necessary because of structure width and not alignment shall not be considered in evaluating this item.

3-NBI.10 NBI DATA ITEMS – ITEMS 73 THROUGH 116

Item 73 – Reserved (by FHWA)

Item 74 – Reserved (by FHWA)

Item 75 – Type of Work

3 digits

The information to be recorded for this item will be the type of work proposed to be accomplished on the structure to improve it to the point that it will provide the type of service needed and whether the proposed work is to be done by contract or force account. Code a three digit number composed of two segments.

Segment	***Description***	***Length***
75A	*Type of Work Proposed*	*2 digits*
75B	*Work Done by*	*1 digit*

This item must be coded for bridges eligible for the Highway Bridge Replacement and Rehabilitation Program. To be eligible, a bridge must carry highway traffic, be deficient and have a sufficiency rating of 80.0 or less. This item may be coded for other bridges at the option of the highway agency. Use one of the following codes to represent the proposed work type, otherwise leave blank:

Code 75A	***Description***
31	*Replacement of bridge or other structure because of substandard load carrying capacity or substandard bridge roadway geometry.*
32	*Replacement of bridge or other structure because of relocation of road.*
33	*Widening of existing bridge or other major structure without deck rehabilitation or replacement; includes culvert lengthening.*
34	*Widening of existing bridge with deck rehabilitation or replacement.*
35	*Bridge rehabilitation because of general structure deterioration or inadequate strength.*
36	*Bridge deck rehabilitation with only incidental widening.*
37	*Bridge deck replacement with only incidental widening.*
38	*Other structural work.*

If segment A is blank, leave segment B blank. Otherwise, the third digit shall be coded using one of the following codes to indicate whether the proposed work is to be done by contract or by force account:

Code 75B	***Description***
1	*Work to be done by contract*
2	*Work to be done by owner's forces*

Examples:

Type of Work Description	***Item 75 Code***
A bridge is to be replaced by contract because it has deteriorated to the point that it can no longer carry legal loads. The same code should be used if the bridge is replaced because it is now too narrow or the original design was too light to accommodate today's legal loads.	*311*
A bridge is to be replaced because the roadway must be straightened to eliminate a dangerous curve. The work will be done by contract.	*321*
A bridge is to be widened to increase shoulder width or the number of traffic lanes. The existing deck is in good condition and will be incorporated as is into the new structure. The work is to be done by contract.	*331*
A culvert is to be extended by contract to accommodate additional roadway width as part of a reconstruction contract to improve the safety of the adjacent slopes.	*331*
A deck is to be rehabilitated and the bridge widened to provide a full 12-foot shoulder. The existing shoulder is only 4 feet wide and an extra line of girders with appropriate substructure widening must be added. The work will be done by contract.	*341*
A bridge superstructure and substructure are to be rehabilitated by State forces to increase the bridge's load capacity.	*352*
A bridge deck is to be rehabilitated by contract and a safety curb to be removed which results in incidental widening of 2 feet.	*361*
A bridge deck is to be replaced by contract and the deck cantilever overhang extended 2 feet, which is the maximum that can be done without adding another line of stringers or girders to the superstructure.	*371*
A bridge which is no longer needed is to be demolished and an at-grade crossing built by State forces. (This code could also be used to designate incidental safety work on a bridge such as bridge-rail upgrading or replacement.)	*382*

Item 76 – Length of Structure Improvement

6 digits (XXXXXX feet)

Code a six digit number (XXXXXX feet) that represents the length of the proposed bridge improvement to the nearest foot. For replacement or rehabilitation of the entire bridge, the length should be back to back of backwalls of abutments or from pavement notch to pavement notch. For replacement or rehabilitation of only part of the structure, use the length of the portion to be improved.

This item must be coded for bridges eligible for the Highway Bridge Replacement and Rehabilitation Program. It may be coded for other bridges at the option of the highway agency.

For culvert improvements, use the proposed length measured along the centerline of the barrel regardless of the depth below grade. The measurement should be made between the inside faces of the top parapet or edge-stiffening beam of the top slab.

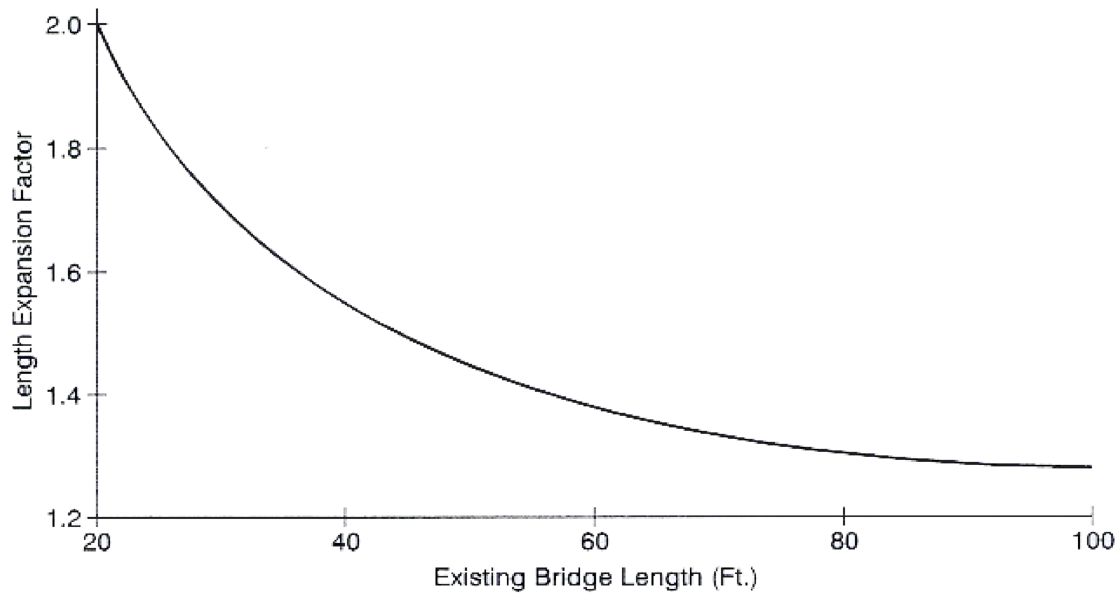
Examples:

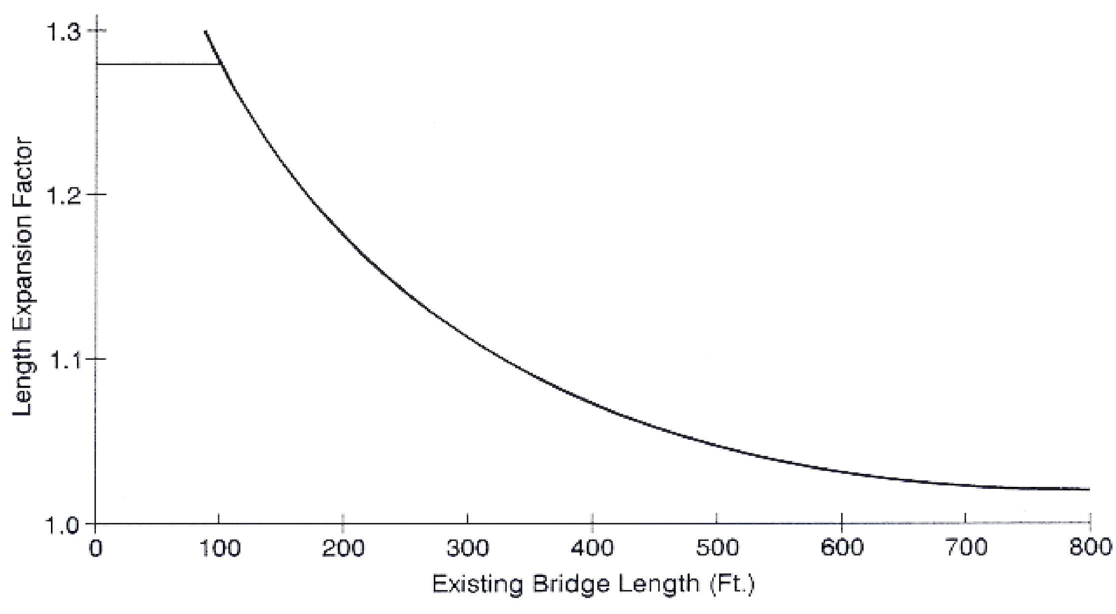
Length of Structure Improvement	***Code***
250 feet	*000250*
1,200 feet	*001200*
12,345 feet	*012345*

For substructure or channel work only, code the length of superstructure over, or supported by, the substructure or channel.

Typically, a replacement bridge is longer than the existing bridge. Nationwide averages for the increase in bridge length with replacement as a function of the existing length are given in the following figure. The length-expansion factors represent data for the years 1981 to 1985. Where site-specific data is lacking, these factors are suggested for estimating the length of replacement bridges. For exceedingly long bridges (i.e., 1000 feet or more) the length expansion factor approaches 1.0.

INCREASED LENGTH OF REPLACED BRIDGES





Replaced Bridge Length = Existing Bridge Length x Length Expansion Factor

Item 77 through Item 89 – Reserved (by FHWA)

Item 90 – Inspection Date

8 digits

Record the month, day and year that the last routine inspection of the structure was performed. This inspection date may be different from those recorded in Item 93 Critical Feature Inspection Date. Code an eight digit number to represent the month, day and year. The number of the month should be coded in the first two digits, the day in the next two digits with leading zeros as required and the year in the last four digits.

Examples:

Inspection date	***Code***
November 3, 1999	*11-03-1999*
March 15, 2000	*03-15-2000*

Item 91 – Designated Inspection Frequency

2 digits

Two digits shall be used to code the number of months between established routine bridge inspections. A leading zero (0) shall be used if necessary. The Program Manager usually determines the routine inspection interval.

The inspection interval will not be based solely on such things as the bridge type or posting. Bridges found to have a defect in a specific element(s), or having the potential to become structurally deficient within the established routine inspection interval, may be deemed to require Special Inspection. A Special Inspection shall be independent of the routine inspection. Bridges placed on the Special Inspection list shall have only the noted elements (s) inspected on the special inspection interval and shall continue to have the routine inspection on its established interval. The Special Inspection interval will not be coded in Item 91.

Examples:

Description	***Code***
Posted bridge with heavy truck traffic and questionable structural details which is designated to be inspected each month	*01*
Bridge is scheduled to be inspected every 24 months	*24*

It should be noted that bridges will also require special non-scheduled inspections after unusual physical traumas such as floods, earthquakes, fires or collisions. These special inspections may range from a very brief visual examination to a detailed in-depth evaluation depending upon the nature of the trauma. For example, when a substructure pier or abutment is struck by an errant vehicle, in most cases only a visual examination of the bridge is necessary. After major collisions or earthquakes, in-depth inspections may be warranted as directed by the engineer in overall charge of the program. After and during severe floods, the stability of the substructure of bridges may have to be determined by probing, underwater sensors or other appropriate measures. Underwater inspection by divers may be required for some scour critical bridges immediately after floods. See Item 113 Scour Critical Bridges.

Item 92 – Critical Feature Inspection

9 digits

Using a series of three-digit code segments, denote critical features that need special inspections or special emphasis during inspections and the designated inspection interval in months as determined by the individual in charge of the inspection program. The designated inspection interval could vary from inspection to inspection depending on the condition of the bridge at the time of inspection.

Segment	***Description***	***Length***
92A	*Fracture Critical Details*	*3 digits*
92B	*Underwater Inspection*	*3 digits*
92C	*Other Special Inspection*	*3 digits*

For each of 92A, B and C, code the first digit Y for special inspection or emphasis needed and code N for not needed. The first digit of 92A, B and C must be coded for all structures to designate either a yes or no answer. Those bridges coded with a Y in Item 92A or B should be the same bridges contained in the Master Lists of fracture critical and special underwater inspection bridges. In the second and third digits of each segment, code a two-digit number to indicate the number of months between inspections only if the first digit is coded Y. If the first digit is coded N, the second and third digits are left blank.

Current guidelines for the maximum allowable interval between inspections can be summarized as follows:

Fracture Critical Details	*24 months*
Underwater Inspection	*60 months*
Other Special Inspections	*60 months*

Examples:

Description	***Item***	***Code***
A 2-girder system structure which is being inspected yearly and no other inspections are required.	*92A* *92B* *92C*	*Y12* *N__* *N__*
A structure where both fracture critical and underwater inspection are being performed on a 1-year interval. Other inspections are not required.	*92A* *92B* *92C*	*Y12* *Y12* *N__*
A structure has been temporarily shored and is being inspected on a 6-month interval. Other inspections are not required.	*92A* *92B* *92C*	*N__* *N__* *Y06*

Item 93 – Critical Feature Inspection Date

18 digits

Code only if the first digit of Item 92A, B, or C is coded Y for yes. Record as a series of six-digit code segments, the month and year that the last inspection of the denoted critical feature was performed.

Segment	Description	Length
93A	Fracture Critical Details	6 digits
93B	Underwater Inspection	6 digits
93C	Other Special Inspection	6 digits

For each segment of this item, when applicable, code a six-digit number to represent the month and the year. The number of the month should be coded in the first two digits with a leading zero as required and the last four digits of the year coded as the last four digits in the field. If the first digit of any part of Item 92 is coded N, then the corresponding part of this item shall be blank.

Examples:

Description	***Item***	***Code***
A structure has fracture critical members which were last inspected in March 1986. It does not require underwater or other special feature inspections.	*93A*	*031986*
	93B	*(blank)*
	93C	*(blank)*
A structure has no fracture critical details, but requires underwater inspection and has other special features (for example, a temporary support) for which the State requires special inspection. The last underwater inspection was done in April 1986 and the last special feature inspection was done in November 1985.	*93A*	*(blank)*
	93B	*041986*
	93C	*111985*

Item 94 – Bridge Improvement Cost

6 digits

Code a six digit number to represent the cost of the proposed bridge or major structure improvements in thousands of dollars. This cost shall include only bridge construction costs, ***excluding*** *roadway, right of way, detour, demolition, preliminary engineering, etc. Code the base year for the cost in Item 97 Year of Improvement Cost Estimate. Do not use this item for estimating maintenance costs.*

This item must be coded for bridges eligible for the Highway Bridge Replacement and Rehabilitation Program. It may be coded for other bridges at the option of the highway agency.

Examples:

Bridge Improvement Cost	***Code***
$ 55,850	*000056*
250,000	*000250*
7,451,233	*007451*

Nationally, the deck area of replaced bridges is averaging 2.2 times the deck area before replacement. The deck area of rehabilitated bridges is averaging 1.5 times the deck area before rehabilitation. Widening square foot costs are typically 1.8 times the square foot cost of new bridges with similar spans. For example, if the average cost of a new bridge is $50 per square foot, the average cost of the widened area would be $90 per square foot.

Each highway agency is encouraged to use its best available information and established procedures to determine bridge improvement costs. In the absence of these procedures, the highway agency may wish to use the following procedure as a guide in preparing bridge improvement cost estimates.

Apply a construction unit cost to the proposed bridge area developed by using (1) current State deck geometry design standards and (2) proposed bridge length from Item 76 Length of Structure Improvement.

Item 95 – Roadway Improvement Cost

6 digits

Code a six digit number to represent the cost of the proposed roadway improvement in thousands of dollars. This shall include only roadway construction costs, excluding bridge, right-of-way, detour, extensive roadway realignment costs, preliminary engineering, etc. Code the base year for the cost in Item 97 Year of Improvement Cost Estimate. Do not use this item for estimating maintenance costs.

This item must be coded for bridges eligible for the Highway Bridge Replacement and Rehabilitation Program. It may be coded for other bridges at the option of the highway agency.

In the absence of a procedure for estimating roadway improvement costs, a guide of 10 percent of the bridge costs is suggested.

Item 96 – Total Project Cost

6 digits

*Code a six digit number to represent the total project cost in thousands of dollars, **including** incidental costs not included in Items 94 and 95. This item should include **all** costs normally associated with the proposed bridge improvement project. The Total Project Cost will therefore usually be greater than the sum of Items 94 and 95. Code the base year for the cost in Item 97 - Year of Improvement Cost Estimate. Do not use this item for coding maintenance costs.*

This item must be coded for bridges eligible for the Highway Bridge Replacement and Rehabilitation Program. It may be coded for other bridges at the option of the highway agency.

In the absence of a procedure for estimating the total project cost, a guide of 150 percent of the bridge cost is suggested.

Item 97 – Year of Improvement Cost Estimate

4 digits

Record and code the year that the costs of work estimated in Item 94 Bridge Improvement Cost, Item 95 Roadway Improvement Cost, and Item 96 Total Project Cost were based upon. This date and the data provided for Item 94 through Item 96 must be current; that is, Item 97 shall be no more than eight years old.

Examples:

Year of Cost Estimate	***Code***
1988 costs	*1988*
2010 costs	*2010*

Item 98 – Border Bridge

5 digits

Use this item to indicate structures crossing borders of States. Code a five-digit number composed of two segments specifying the percent of responsibility for improvements to the existing structure when it is shared with a neighboring State. Code the first three digits with the neighboring State code using State codes listed in Item 1 State Code. Code the fourth and fifth digits with the percentage of total deck area of the existing bridge that the neighboring State is responsible for funding.

Segment	***Description***	***Length***
98A	*Neighboring State Code*	*3 digits*
98B	*Percent Responsibility*	*2 digits*

If a neighboring State codes the structure and accepts 100% of the responsibility, but your State still codes a record for the structure, then Item 98B in your State's record should be coded 99 to represent that your State has no responsibility for the structure.

If structure is not on a border, leave blank.

Nebraska Neighboring State	**Code**
Colorado	088
Iowa	197
Kansas	207
Missouri	297
South Dakota	468
Wyoming	568

Examples:

Description	**Code**
A structure connects Nebraska with Iowa and Iowa is responsible for funding 45 percent of future improvement costs.	19745

Item 99 – Border Bridge Structure Number

15 digits

Code the neighboring State's 15-digit National Bridge Inventory structure number for any structure noted in Item 98 Border Bridge. This number must match exactly the neighboring State's submitted NBI structure number. The entire 15-digit field must be accounted for including zeros and blank spaced whether they are leading, trailing, or embedded in the 15-digit field. If Item 98 is blank, this item is blank.

Item 100 – STRAHNET Highway Designation

1 digit

This item shall be coded for all records in the inventory. For the purposes of this item, the STRAHNET Connectors are considered included in the term STRAHNET. For the inventory route identified in Item 5, indicate STRAHNET highway conditions using one of the following codes:

Code	***Description***
0	*The inventory route is not a STRAHNET highway.*
1	*The inventory route is on a STRAHNET highway.*
2	*The inventory route is on a STRAHNET highway that goes over or under a STRAHNET highway.*
3	*The inventory route is on a STRANET connector route.*

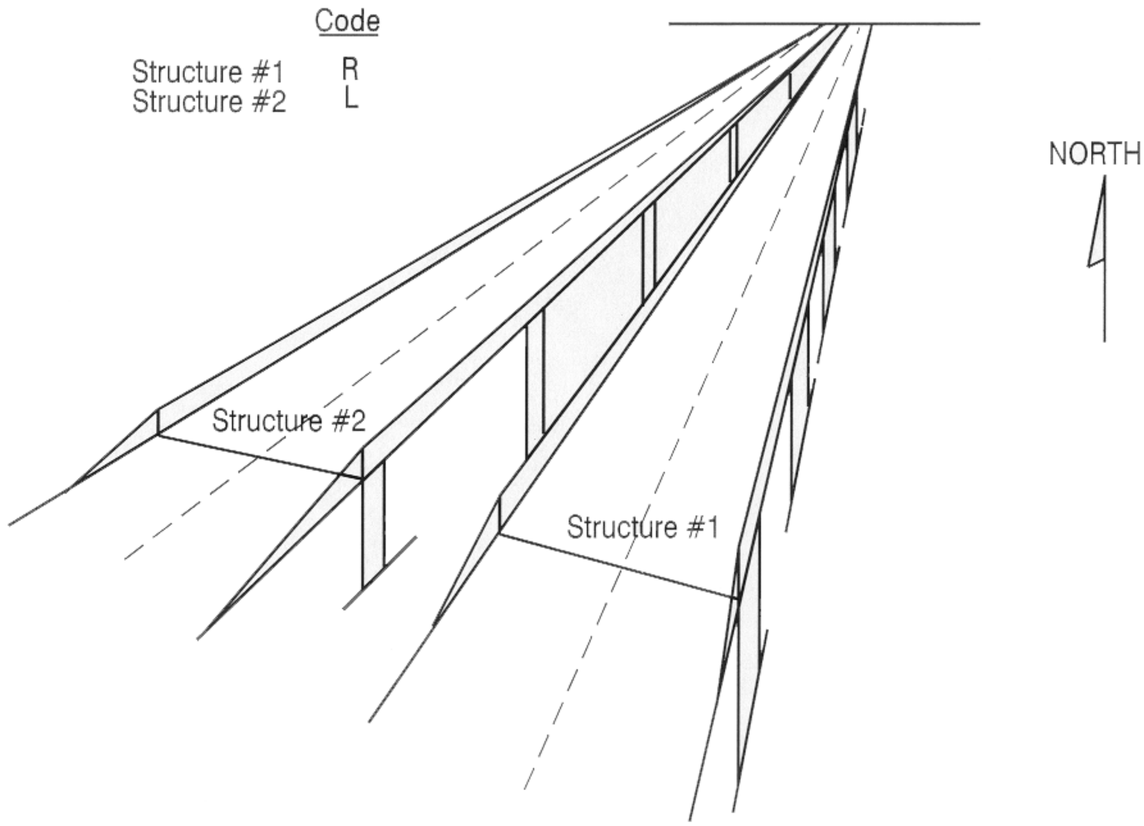
Item 101 – Parallel Structure Designation

1 digit

Code this item with a one digit code and to indicate situations where separate structures carry the inventory route in opposite directions of travel over the same feature. The lateral distance between structures has no bearing on the coding of this item. One of the following codes shall be used:

Code	***Description***
R	*The right structure of parallel bridges carrying the roadway in the direction of the inventory. (For a STRAHNET highway, this is west to east and south to north.)*
L	*The left structure of parallel bridges. This structure carries traffic in the opposite direction.*
N	*No parallel structure exists.*

Example:


Code
Structure #1 R
Structure #2 L
NORTH
Structure #2
Structure #1

Item 102 – Direction of Traffic

1 digit

Code the direction of traffic of the inventory route identified in Item 5 as a one digit number using one of the codes below. This item must be compatible with other traffic-related items such as Item 28A Lanes on the Structure, Item 29 Average Daily Traffic, Item 47 Total Horizontal Clearance and Item 51 Bridge Roadway Width, Curb-to-Curb.

Code	***Description***
0	*Highway traffic not carried*
1	*1-way traffic*
2	*2-way traffic*
3	*One lane bridge for 2-way traffic*

Item 103 – Temporary Structure Designation

1 digit

Code this item with a one digit code and to indicate situations where temporary structures or conditions exist. This item should be blank if not applicable.

Code	*Description*
T	*Temporary structure(s) or conditions exist*

Temporary structure(s) or conditions are those which are required to facilitate traffic flow. This may occur either before or during the modification or replacement of a structure found to be deficient. Such conditions include the following:

1. *Bridges shored up, including additional temporary supports.*
2. *Temporary repairs made to keep a bridge open.*
3. *Temporary structures, temporary runarounds or bypasses.*
4. *Other temporary measures, such as barricaded traffic lanes to keep the bridge open.*

Any repaired structure or replacement structure which is expected to remain in place without further project activity, other than maintenance, for a significant period of time shall not be considered temporary. Under such conditions, that structure, regardless of its type, shall be considered the minimum adequate to remain in place and evaluated accordingly.

If this item is coded T, then all data recorded for the structure shall be for the condition of the structure without temporary measures, except for the following items which shall be for the temporary structure:

Item	*Item Description*
10	*Inventory Route, Minimum Vertical Clearance*
41	*Structure Open, Posted, or Closed to Traffic*
47	*Inventory Route, Total Horizontal Clearance*
53	*Minimum Vertical Clearance Over Bridge Roadway*
54	*Minimum Vertical Underclearance*
55	*Minimum Lateral Underclearance on Right*
56	*Minimum Lateral Underclearance on Left*
70	*Bridge Posting*

Item 104 – Highway System of the Inventory Route

1 digit

*This item is to be coded for all records in the inventory. For the inventory route identified in Item 5, indicate whether the **inventory route** is on the National Highway System (NHS) or not on the system. Use one of the following codes:*

Code	*Description*
0	*Inventory Route is not on the NHS.*
1	*Inventory Route is on the NHS.*

Item 105 – Federal Lands Highways

1 digit

Structures owned by State and local jurisdictions on roads which lead to and traverse through federal lands sometimes require special coded unique identification because they are eligible to receive funding from the Federal Lands Highway Program. One of the following codes shall be used:

Code	*Description*
0	*Not applicable*
1	*Indian Reservation Road (IRR)*
2	*Forest Highway (FH)*
3	*Land Management Highway System (LMHS)*
4	*Both IRR and FH*
5	*Both IRR and LMHS*
6	*Both FH and LMHS*
9	*Combined IRR, FH and LMHS*

Item 106 – Year Reconstructed

4 digits

Record and code the year of reconstruction of the structure. Code all four digits of the latest year in which reconstruction of the structure was completed. If there has been no reconstruction code 0000.

For a bridge to be defined as reconstructed, the type of work performed, whether or not it meets current minimum standards, must have been eligible for funding under any of the Federal-aid funding categories. The eligibility criteria would apply to the work performed regardless of whether all State or local funds or Federal-aid funds were used. What this means is that all bridge repairs and any reconstruction not qualified for Federal-aid can be classified as a maintenance activity.

Some types of eligible work not to be considered as reconstruction are listed:

- *Safety feature replacement or upgrading (for example, bridge rail, approach guardrail or impact attenuators).*
- *Painting of structural steel.*
- *Overlay of bridge deck as part of a larger highway surfacing project (for example, overlay carried across bridge deck for surface uniformity without additional bridge work).*
- *Utility work.*
- *Emergency repair to restore structural integrity to the previous status following an accident.*

- *Retrofitting to correct a deficiency which does not substantially alter physical geometry or increase the load-carrying capacity.*
- *Work performed to keep a bridge operational while plans for complete rehabilitation or replacement are under preparation (for example, adding a substructure element or extra girder).*

Item 107 – Deck Structure Type

1 digit

Record the type of deck system on the bridge with a one digit code. If more than one type of deck system is on the bridge, code the most predominant. Code N for a filled culvert or arch with the approach roadway section carried across the structure. Use one of the following codes:

Code	***Description***
1	*Concrete Cast-in-Place*
2	*Concrete Precast Panels*
3	*Open Grating*
4	*Closed Grating*
5	*Steel plate (includes orthotropic)*
6	*Corrugated Steel*
7	*Aluminum*
8	*Timber*
9	*Other*
N	*Not applicable*

Item 108 – Wearing Surface/Protective System

3 digits

Information on the wearing surface and protective system of the bridge deck shall be coded using a three-digit code composed of three segments.

Segment	***Description***	***Length***
108A	*Type of Wearing Surface*	*1 digit*
108B	*Type of Membrane*	*1 digit*
108C	*Deck Protection*	*1 digit*

Item 108A – Type of Wearing Surface

1 digit

Code 108A	***Description***
1	*Concrete*
2	*Type 47BD-SF (Silica Fume)*
3	*Latex Concrete*
4	*Low Slump Concrete*
5	*Epoxy Overlay*
6	*Bituminous*
7	*Timber*
8	*Gravel*
9	*Other*
0	*None (no additional concrete thickness or wearing surface is included in the bridge deck)*
N	*Not Applicable (applies only to structures with no deck.)*

Item 108B – Type of Membrane

1 digit

Code 108B	*Description*
1	Built-up
2	Preformed Fabric
3	Epoxy
8	Unknown
9	Other
0	None
N	Not Applicable (applies only to structures with no deck.)

Item 108C – Deck Protection

1 digit

Code 108C	*Description*
1	Epoxy Coated Reinforcing
2	Galvanized Reinforcing
3	Other Coated Reinforcing
4	Cathodic Protection
6	Polymer Impregnated
7	Internally Sealed
8	Unknown
9	Other
0	None
N	Not Applicable (applies only to structures with no deck.)

Item 109 – Average Daily Truck Traffic

2 digits

Code a two-digit percentage (XX percent) that shows the percentage of Item 29 Average Daily Traffic that is truck traffic. Do not include vans, pickup trucks and other light delivery trucks in this percentage.

If this information is not available, an estimate which represents the average percentage for the category of road carried by the bridge may be used. Leave blank if Item 29 - Average Daily Traffic is not greater than 100.

Examples:

Average Daily Traffic	***Code***
7% trucks	*07*
12% trucks	*12*

Item 110 – Designated National Network

1 digit

The national network for trucks includes most of the Interstate System and those portions of the Federal-Aid Highways identified in the Code of Federal Regulations (23 CFR § 658). The national network for trucks is available for use by commercial motor vehicles of the dimensions and configurations described in these regulations. For the inventory route identified in Item 5, indicate conditions using one of the following codes:

Code	***Description***
0	*The inventory route is not part of the national network for trucks.*
1	*The inventory route is part of the national network for trucks.*

Item 111 – Pier or Abutment Protection (for Navigation)

1 digit

If Item 38 Navigation Control has been coded 1, use the codes below to indicate the presence and adequacy of pier or abutment protection features such as fenders, dolphins, etc. The condition of the protection devices may be a factor in the overall evaluation of Item 60 Substructure. If Item 38 Navigation Control has been coded 0 or N, leave blank to indicate not applicable.

Code	***Description***
1	*Navigation protection not required*
2	*In place and functioning*
3	*In place but in a deteriorated condition*
4	*In place but reevaluation of design suggested*
5	*None present but reevaluation suggested*

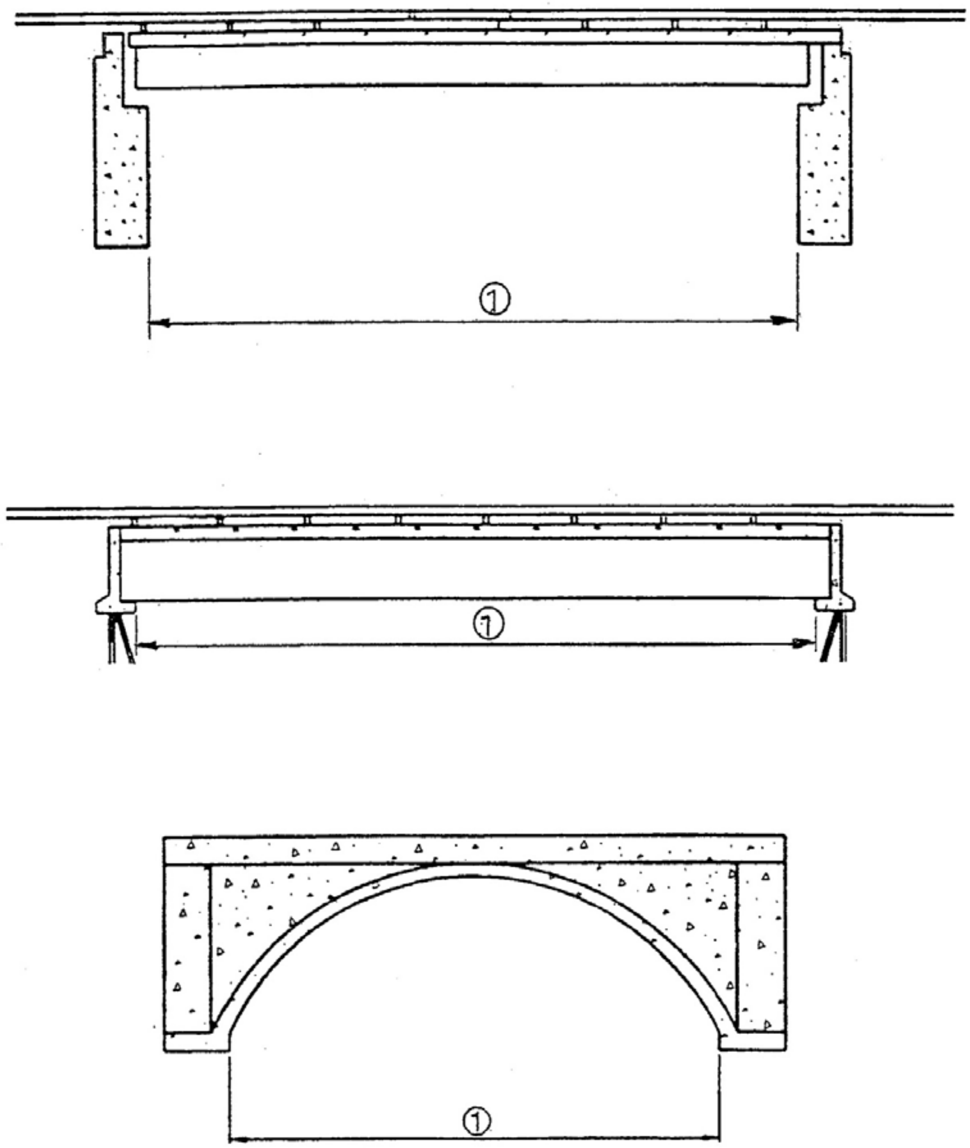
Item 112 – NBIS Bridge Length

1 digit

Does this structure meet or exceed the minimum length specified to be designated as a bridge for National Bridge Inspection Standards purposes? The following definition of a bridge is used (from AASHTO and given in the NBIS, 23 CFR § 650.3):

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 may also include multiple pipes, where the clear distance between openings is less than (or equal to) half of the smaller contiguous opening.

Code	***Description***
Y	*Yes*
N	*No*
R	*Removed*

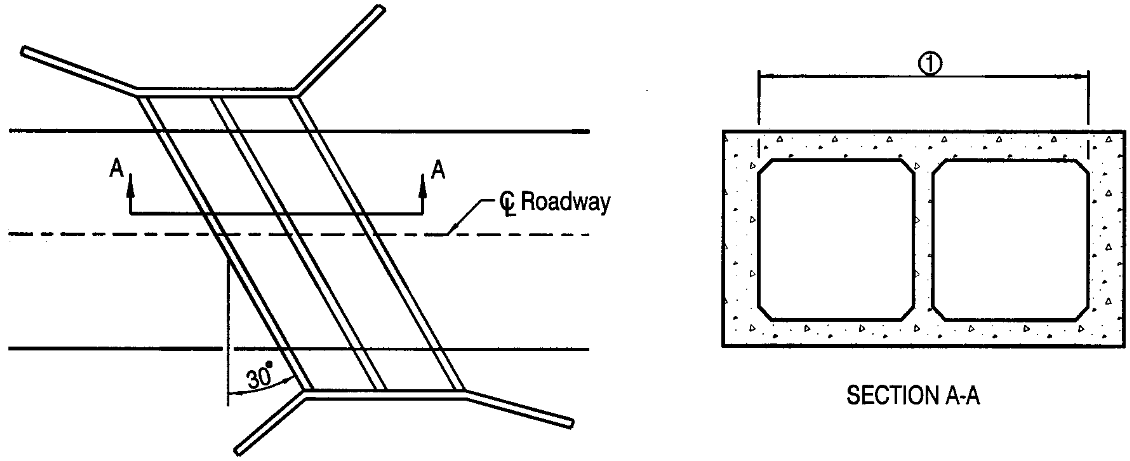


(1) Item 112 – Bridge Length

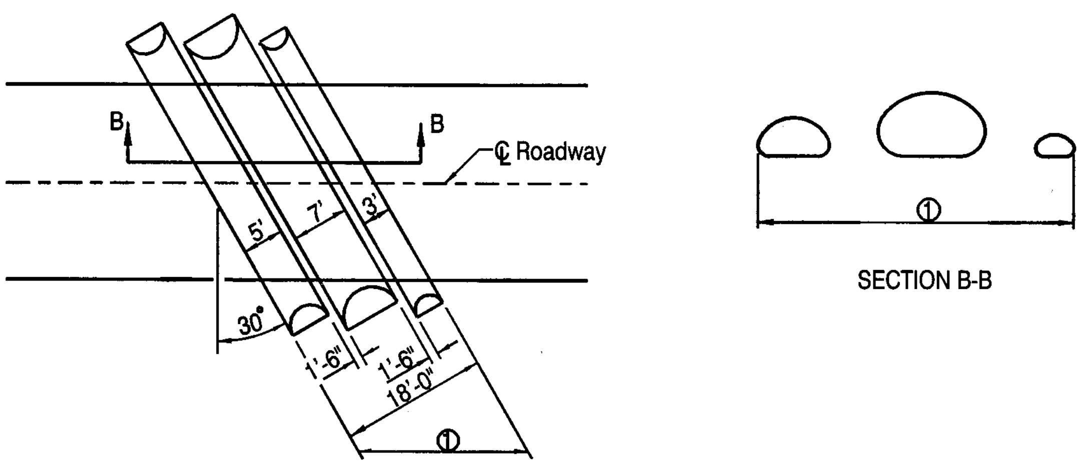
(NBIS Bridge Length is greater than 20 feet between under copings.)

Item 112 – NBIS Bridge Length (cont'd)

Examples:



1 Item 112 – Bridge Length



1 Item 112 – Bridge Length = 18’/ cos (30) = 20.78’

Item 113 – Scour Critical Bridges

1 digit

Use a single-digit code as indicated below to identify the current status of the bridge regarding its vulnerability to scour. Scour analyses shall be made by hydraulic/geotechnical/structural engineers. Details on conducting a scour analysis are included in the FHWA Technical Advisory 5140.23 titled, "Evaluating Scour at Bridges." Whenever a rating factor of 2 or below is determined for this item, the rating factor for Item 60 - Substructure may need to be revised to reflect the severity of actual scour and resultant damage to the bridge. A scour critical bridge is one with abutment or pier foundations which are rated as unstable due to (1) observed scour at the bridge site or (2) a scour potential as determined from a scour evaluation study.

All bridges over waterways are to be evaluated for scour vulnerability by an interdisciplinary scour assessment team 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.

A plan of action must be developed for each scour critical bridge (see FHWA Technical Advisory T 5140.23, HEC 18 and HEC 23).

The interdisciplinary scour assessment team (ISAT) assigns a code for Item 113. The FHWA Recording and Coding Guide codes from the Errata are repeated in the following table. The inspector for a routine inspection of a scour critical bridge does not assign a code for Item 113; however, they will assign codes for the scour-related 300 series data items which record conditions found by the inspector and flags scour issues for the ISAT. These are described later in this Chapter.

Whenever a rating factor of 2 or below is determined for this item, the rating factor for Item 60 Substructure and other affected Items (i.e., load ratings, superstructure rating) should be revised to be consistent with the severity of observed scour and resultant damage to the bridge.

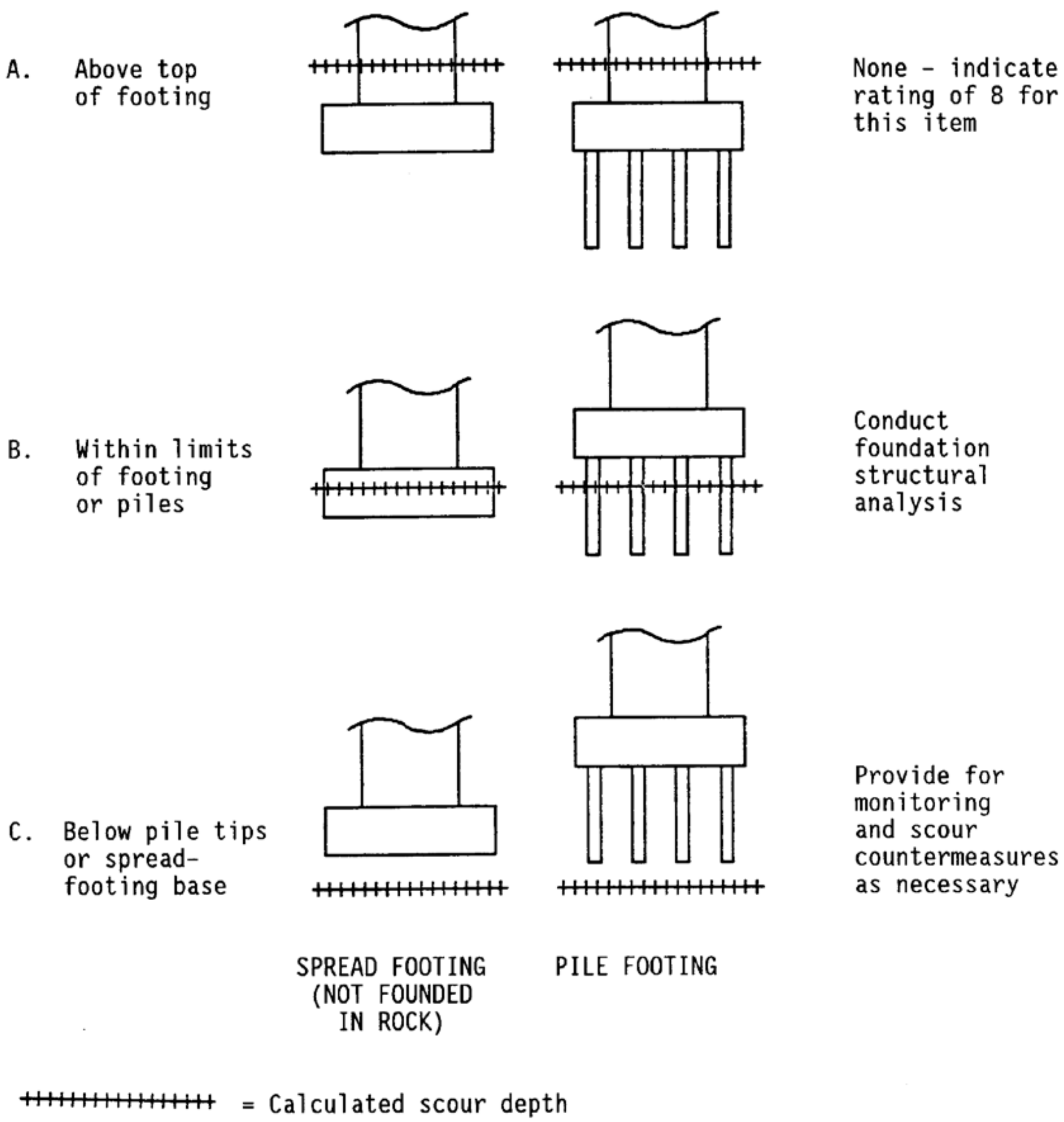
A scour critical bridge is one with abutment or pier foundation rated as unstable due to

(1) observed scour at the bridge site (rating factor of 2, 1, or 0) or

(2) a scour potential as determined from a scour evaluation study (rating factor of 3).

Item 113 Code	***Description***
N	*Bridge not over waterway.*
U	*Bridge with "unknown" foundation that has not been evaluated for scour. Until risk can be determined, a plan of action should be developed and implemented to reduce the risk to users from a bridge failure during and immediately after a flood event (see HEC 23).*
T	*Bridge over "tidal" waters that has not been evaluated for scour, but considered low risk. Bridge will be monitored with regular inspection cycle and with appropriate underwater inspections until an evaluation is performed ("Unknown" foundations in "tidal" waters should be coded U.)*
9	*Bridge foundations (including piles) on dry land well above flood water elevations.*
8	*Bridge foundations determined to be stable for the assessed or calculated scour condition. Scour is determined to be above top of footing (Example A) by assessment (i.e., bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge), by calculation or by installation of properly designed countermeasures (see HEC 23).*
7	*Countermeasures have been installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. Instructions contained in a plan of action have been implemented to reduce the risk to users from a bridge failure during or immediately after a flood event.*
6	*Scour calculation/evaluation has not been made. (Use only to describe case where bridge has not yet been evaluated for scour potential.)*
5	*Bridge foundations determined to be stable for assessed or calculated scour condition. Scour is determined to be within the limits of footing or piles (Example B) by assessment (i.e. bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge), by calculations or by installation of properly designed countermeasures (see HEC 23).*
4	*Bridge foundations determined to be stable for assessed or calculated scour conditions; field review indicates action is required to protect exposed foundations (see HEC 23).*
3	*Bridge is scour critical.* *Bridge foundations determined to be unstable for assessed or calculated scour conditions:* *- Scour within limits of footing or piles. (Example B)* *- Scour below spread-footing base or pile tips. (Example C)*
2	*Bridge is scour critical.* *Field review indicates that extensive scour has occurred at bridge foundations, which are determined to be unstable by:* *- a comparison of calculated scour and observed scour during the bridge inspection, or* *- an engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60.*
1	*Bridge is scour critical.* *Field review indicates that failure of piers/abutments is imminent. Bridge is closed to traffic. Failure is imminent based on:* *- a comparison of calculated and observed scour during the bridge inspection, or* *- an engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60.*

Item 113 Code	***Description***
0	*Bridge is scour critical.* *Bridge has failed and is closed to traffic.*



Scour Foundation Examples

FHWA Coding Guide content is shown in Calibri italic font.

Item 114 – Future Average Daily Traffic

6 digits

Code for all bridges the forecasted average daily traffic (ADT) for the inventory route identified in Item 5. This shall be projected at least 17 years but no more than 22 years from the year data is submitted to the NBI. The intent is to provide a basis for a 20-year forecast. This item may be updated anytime, but must be updated when the forecast falls below the 17-year limit. If planning data is not available, use the best estimate based on site familiarity.

The future ADT must be compatible with the other items coded for the bridge. For example, parallel bridges with an open median are coded as follows: if Item 28 - Lanes On and Under the Structure and Item 51 - Bridge Roadway Width, Curb-to-Curb are coded for each bridge separately, then the future ADT must be coded for each bridge separately (not the total for the route).

Examples:

Future ADT	Code
540	000540
15,600	015600
240,000	240000

Item 115 – Year of Future Average Daily Traffic

4 digits

Record and code the year represented by the future ADT in Item 114. The projected year of future ADT shall be at least 17 years but no more than 22 years from the year of inspection.

Example: Year of Future ADT is 2020. Code = 2020.

Item 116 – Minimum Navigation Vertical Clearance

3 digits (XXX feet)

Record to the nearest foot (rounding down) the minimum vertical clearance imposed at the site as measured above a datum that is specified on a navigation permit issued by a control agency. Code this item only for vertical lift bridges in the dropped or closed position, otherwise leave blank.

Examples:

Vertical Clearance	Code
20.6	020
24.2	024

3-NBI.11 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 NDOR'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 NDOR;
- 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.

NDOR completes QC on data that has been entered into the PONTIS database on a continual basis.

3-NBI.12 QUALITY ASSURANCE

Quality Assurance (QA) of all load rating data in the Bridge Inventory will be performed by NDOR or their selected agent. The QA program activities are described in Chapter 1 of this Manual.

3-NBI.13 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-NBI.14 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 NDOR Bridge Inspection Program website at http://www.nebraskatransportation.org/ design/bridge/bipm.htm 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-NBI.15 APPENDIX

Memos and other guidance that may have been issued after the issuance of the current revision of this Chapter can be found at the NDOR Bridge Inspection Program website athttp://www.nebraskatransportation.org/design/bridge/bipm.htm. Participants are urged to check this site to ensure they have all the most current information and forms.

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3-NE.1 GENERAL

The FHWA National Bridge Inventory Items 1 through Item 116. The definitions, descriptions and guidance for use are in a separate chapter of the BIP Manual, Chapter 3-NBI.

The 200 series Items are Nebraska custom data fields used by NDOR and are not submitted to the FHWA. These items do not print on a structure's Structural Inventory and Appraisal (SI&A) report.

The 300 series Items are Nebraska custom fields used by NDOR and are not submitted to the FHWA. These items do not print on the SI&A report. These were developed by the NDOR 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.

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.

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.

NEBRASKA ITEMS IN NUMERICAL ORDER

S = static item – typically don't change each inspection cycle
D = dynamic item – may change each inspection cycle
I = initial entry
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into Pontis when changed
P = provides data

Item No.	Description	Category	Code Length /Type	Static/ Dynamic	PM Staff	TL	HE	LRE
200	Bridge Footage Allocation	General Bridge Information	20/N	S	I			
201	Federal-Aid Project Number	General Bridge Information	30/N	S	I			
202	Owner's Bridge Number	General Bridge Information	20/AN	S	I	V		
203	Posted Weight Limit	General Bridge Information	30/N	D		E*		
204	FIPS County Code	General Bridge Information	3/N	S	I			
205	FIPS Place Code (NBI Item 4)	General Bridge Information	3/N	S	I			
206	F.A. Route Number	General Bridge Information	4/N	S	I			
207	Highway Route Number	General Bridge Information	4/N	S	I			
208	State Classification of Inventory Route	General Bridge Information	1/N	S	I			
209	Under Facility Name	General Bridge Information	25/AN	S	I			
210	Transporter-Erector Route Bridges	General Bridge Information	1/A	S	I			
211	Priority Commercial System Bridges	General Bridge Information	1/A	S	I			
212	Bridge Rail Type	General Bridge Information	2/N	S	I			
213	Bridge Name	General Bridge Information		S	I	V		
214	School Bus Route	General Bridge Information		S	I	V		
215	Transit Bus Route	General Bridge Information		S	I	V		
216	Emergency Route	General Bridge Information		S	I	V		
301	% of Defective Deck	Bridge Deck and Approaches	2/N	D		E		
303	Roadway Fixed and Expansion Devices	Bridge Deck and Approaches	1/N	D		E		
306	Asphalt and/or Gravel on Deck	Bridge Deck and Approaches	3/AN	D		E		
311	Bearing Devices	Superstructure	1/N	D		E		
316	Condition of Abutments	Substructure	1/N	D		E		

NEBRASKA ITEMS IN NUMERICAL ORDER								
S = static item – typically don't change each inspection cycle D = dynamic item – may change each inspection cycle I = initial entry V = verify, notify BIP Program Manager of changes on marked up SI&A sheet E = enter into Pontis when changed P = provides data								
Item No.	**Description**	**Category**	**Code Length /Type**	**Static/ Dynamic**	**PM Staff**	**TL**	**HE**	**LRE**
317	Condition of Piers	Substructure	1/N	D		E		
320	Condition of Piling	Substructure	1/N	D		E		
321	Piling Type	Substructure	1/A	S	I			
322	Mechanically Stabilized Earth Walls	Substructure	1/A	S	I			
323	Culvert Barrel	Culvert	1/N	D		E		
324	Culvert Ends	Culvert	1/N	D		E		
325	Debris at Inlet	Culvert	1/N	D		E		
326	Embankment Erosion	Culvert	1/N	D		E		
327	Alignment with Structure	Culvert	1/N	D		E		
328	F.L. Drop at Culvert Inlet	Culvert	2/N	D		E		
329	F.L. Drop at Culvert Outlet	Culvert	2/N	D		E		
330	Silt in Barrel	Culvert	2/N	D		E		
335	Inspectors Opinion on Culvert Adequacy	Culvert	1/N	D		E		
342	Total Number of Pins	Miscellaneous	2/N	S		V		
343	Snooper Bridge	Miscellaneous	1/A	S		V		
344	Abutment walls undermined	Scour Related Routine Inspection	1/A	D		E		
344A	Approach Settles/Washes Out	Scour Related Routine Inspection	1/A	D		E		
345	Bridge Crossing a Canal	Scour Related Routine Inspection	1/A	S		E		
346	Is Stream Bed Degraded	Scour Related Routine Inspection	1/A	D		E	V**	
347	Noticeable Contraction of Stream	Scour Related Routine Inspection	1/A	D		E	V**	
348	Local Scour at Piers/Abutments	Scour Related Routine Inspection	1/A	D		E	V**	
349	Banks Eroding/Unstable	Scour Related Routine Inspection	1/A	D		E	V**	
350	Stream Shifted from Bridge Center	Scour Related Routine Inspection	1/A	D		E	V**	
351	Floodwater Reaches Low Superstructure	Scour Related Routine Inspection	1/A	D		E	V**	
351A	Low Road Elevation Above Low Superstructure	Scour Related Routine Inspection	1/A	D		E	V**	

NEBRASKA ITEMS IN NUMERICAL ORDER

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Item No.	Description	Category	Code Length /Type	Static/ Dynamic	PM Staff	TL	HE	LRE
352	Floodwater Over Bridge Deck or Roadway	Scour Related Routine Inspection	1/A	D		E	V**	
353	Potential Debris Upstream	Scour Related Routine Inspection	1/A	D		E	V**	
354	Bents/Piers in Channel	Scour Related Routine Inspection	1/A	D		E	V**	
355	Bridge Alignment with Flow	Scour Related Routine Inspection	1/AN	D		E	V**	
356	Debris Blocking Channel at Bridge	Scour Related Routine Inspection	1/A	D		E	V**	
357	Drop from Upstream Deck to Flowline	Scour Related Routine Inspection	2/N	D		E	V**	
357A	Drop from Upstream Deck to Ground at Abut 1	Scour Related Routine Inspection	2/N	D		E	V**	
357B	Drop from Upstream Deck to Ground at Abut 2	Scour Related Routine Inspection	2/N	D		E	V**	
358	Is There a Scour Problem	Scour Related Routine Inspection	1/A	D		E	V**	
358A	Significant Flood in Last Two Years	Scour Related Routine Inspection	1/A	D		E	V**	
358B	Scour Increased in Last two Years	Scour Related Routine Inspection	1/A	D		E	V**	
358C	Scour Plan of Action Effective Date	Scour Related Routine Inspection	1/A	S		V		
359A	Type of culvert	Culvert	1/A	S		V		
359B	Number of barrels/pipes	Culvert	1/N	S		V		
359C	Span of installation	Culvert	2/N	S		V		
359D	Height of box/pipe	Culvert	2/N	S		V		
359E	Depth of Fill	Culvert	2/N	D		E		
360	Piling	Underwater Inspection	1/N	D		E		
361	Bracing and Connectors	Underwater Inspection	1/N	D		E		
362	Columns and Wall	Underwater Inspection	1/N	D		E		
363	Footing	Underwater Inspection	1/N	D		E		
364	Scour	Underwater Inspection	1/N	D		E		
365	Debris	Underwater Inspection	1/N	D		E		
377	Maintenance Problem	Maintenance and Follow-up	1/N	D		E		
378	Date Maintenance Flagged	Maintenance and Follow-up	1/N	D		E		
379	Recommendations	Maintenance and Follow-up	1/N	D		E		

NEBRASKA ITEMS IN NUMERICAL ORDER

S = static item – typically don't change each inspection cycle
D = dynamic item – may change each inspection cycle
I = initial entry
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into Pontis when changed
P = provides data

Item No.	Description	Category	Code Length /Type	Static/ Dynamic	PM Staff	TL	HE	LRE
380	Critical Finding Outstanding	Maintenance and Follow-up	1/AN	D	E			
381	Rating Program Used	Load Rating	1/N	D				E
384	HS Inventory Rating	Load Rating	1/N	D				E
385	HS Operating Rating	Load Rating	1/N	D				E
386	Office Calculated Posting	Load Rating	1/N	D				E
na	Inspection Team Leader ID	Program	/AN	D		E		
na	Asst. Team Leader ID, 1	Program	/AN	D		E		
na	Asst. Team Leader ID, 2	Program	/AN	D		E		
na	Asst. Team Leader ID, 3	Program	/AN	D		E		
na	Asst. Team Leader ID, 4	Program	/AN	D		E		
na	Load Rating Engineer ID	Program	/AN	D	E			P
na	Load Rating Date	Program	/AN	D	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.

3-NE.4 CONDITION RATINGS (NBI)

The NBI 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 data items. The table is repeated here for the convenience of the Manual users.

Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted.
7	GOOD CONDITION - some minor problems.
6	SATISFACTORY CONDITION - structural elements show some minor deterioration.
5	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
4	POOR CONDITION - advanced section loss, deterioration, spalling or scour.
3	SERIOUS CONDITION - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION - out of service beyond corrective action.

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 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

20/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.

Item 203 – Posted Weight Limit

306 digits

This item is determined by the Inspection Team Leader during routine inspection and entered into Pontis. 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 their proper place.

Nebraska requires weight limits 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 – FIPS County Code

3 digits

Counties shall be identified using the Federal Information Processing Standards (FIPS) codes given in the current version of the Census of Population and Housing – Geographic Identification Code Scheme. (Note: The FHWA records this information as Item 3 in their Inventory database. Numerically, equals the NE numeric code multiplied by 2 minus 1.)

Item 205 – FIPS Place Code

3 digits

Cities, towns, townships, villages, and other census-designated places shall be identified using the Federal Information Processing Standards (FIPS) codes given in the current version of the Census of Population and Housing - Geographic Identification Code Scheme. If there is no FIPS place code, then code all zeros. (Note: The FHWA records this information as Item 3 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

This is a code used in recording route numbers contained in the IHI master file. These route numbers are used to automatically update Item 29, ADT. 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

Item 209 – Under Facility 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

3-NE.6 NE DATA ITEMS – BRIDGE DECK AND APPROACHES

All of 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 = 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 deck by chain dragging or sounding the deck area.

Item 303 – Roadway Fixed and Expansion Devices (Condition)

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.

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)

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 record 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.

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

Item 311 Code: 4 POOR
Description: Rocker has been pushed off sole plate, is off of center, and likely not functioning correctly, minor rust

3-NE.8 NE DATA ITEMS – SUBSTRUCTURE

Item 316 – Condition of Abutments

1 digit

Code this item using the FHWA Condition Ratings codes with NDOR for Item 60 Substructure.

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

1 digit

Code this item using the FHWA Condition Ratings codes with NDOR for Item 60 Substructure.

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

1 digit

Code this item using the FHWA Condition Ratings codes with NDOR for Item 60 Substructure.

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 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.

Item 321 – Piling 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, consultant the Owner's Hydraulic Engineer or NDORBIP Bridge Hydraulics Manager.

The following list is a summary of items related to culverts. These are not to be used for bridges. See the detailed description for each item.

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

Item 323 – Culvert Barrel

1 digit

Code this item using the FHWA Condition Ratings codes and Item 62 coding descriptions for hydraulic observations 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

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 62 coding descriptions for hydraulic observations 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

Item 325 – Debris at Inlet

1 digit

Code this item using the FHWA Condition Ratings codes and Item 61 coding descriptions for hydraulic observations 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

Item 326 – Embankment Erosion

1 digit

Code this item using the FHWA Condition Ratings codes and Item 61 coding descriptions for hydraulic observations, bank erosion on the roadway embankment and around the culvert ends.

Item 326 Code: 9 EXCELLENT CONDITION
Description: No noticeable roadway embankment issues

Item 326 Code: 6 SATISFACTORY CONDITION
Description: Embankment protection is strained

Item 326 Code: 4 POOR CONDITION
Description: Roadway embankment is being eroded

Item 326 Code: 4 POOR CONDITION
Description: Roadway embankment is being eroded

Item 327 – Alignment with Structure

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

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

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

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 62 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

6/AN characters

This is a six-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.
Item 359B	1 digit	Number of barrels or pipes.
Item 359C	2 digits	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 with movement in both expansion and fixed devices.

Item 343 – Snooper Bridge

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.

3-NE.11 NE DATA ITEMS – SCOUR RELATED

The following list is a summary of items related to bridge scour. These are not to be used for culvert bridges. See the detailed description for each item.

Item No.	Description	Code
344	Abutment Walls Undermined	Y, N
344A	Approach Settles/Washes Out	Y, N
345	Bridge 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
355	Bridge 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 are no clues 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

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.

Item 345 – Bridge 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

1 character

This item may be completed by comparing field measurements to dimensions on plans. Stream degradation is common on streams where the channel has been straightened.

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 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 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.

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 scour 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.

Item 349 – Banks Eroding/Unstable

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.

Item 350 – Stream Shifted from Bridge Center

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

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.

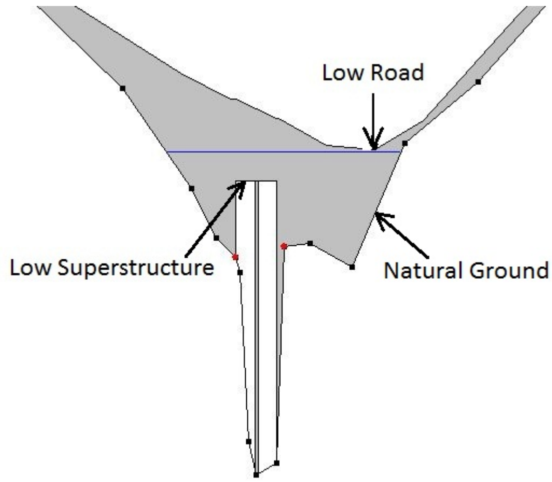
Item 351 Code: N
Description: No evidence floodwater reaches low superstructure.

Item 351A – Low Road Elevation Above Low Superstructure

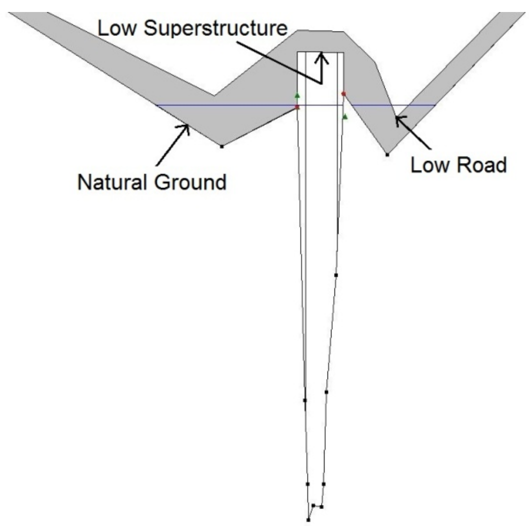
1 character

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

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

1 character

Code = Y if there are established trees, bushes or other 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.

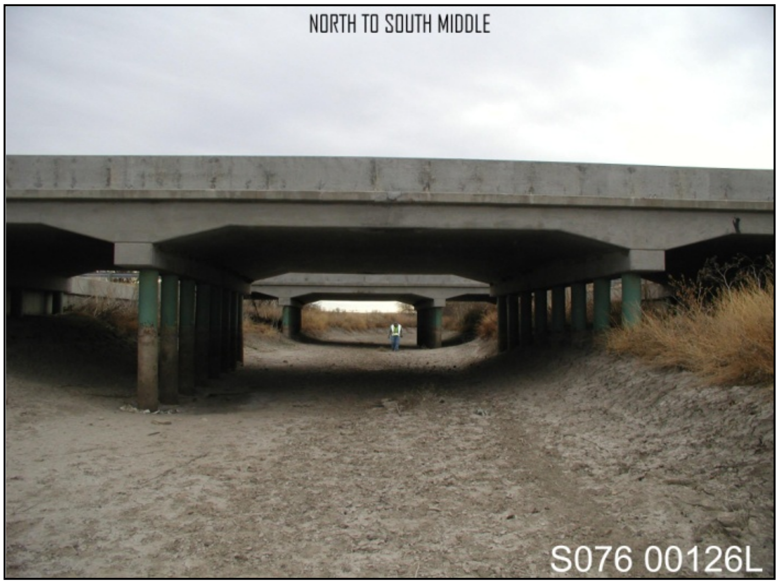
Item 353 Code: N
Description: Upstream view indicates minimal amounts of debris along channel bank and restricting flow through the bridge opening is unlikely.

Item 354 – Bents/Piers in Channel

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 channel banks.

Item 354 Code: N
Description: Bents/piers are not located within the channel banks

Item 355 – Bridge Alignment with Flow

1/AN character

Observe and record the direction of the approaching stream flow relative to the substructure of the bridge. Flow parallel to the substructure and 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 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	

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

1/AN character

Code = Y if a significant amount of debris is lodged against structure.

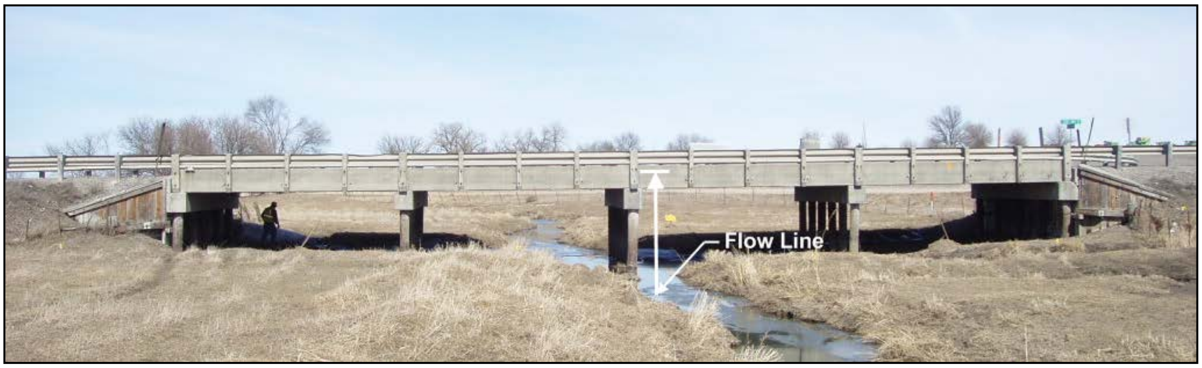
Code = N if no significant debris lodged against structure.

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

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 rip-rap 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 visual indication the substructure is in danger of washing out. This includes but 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

1 character

Code = A if there was significant flood with flow over road. This includes but 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 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 not limited to high water marks below road and no flood reports from the public.

Item 358B – Scour Increased in the Last Two Years

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 water way 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 water way 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.

3-NE.12 NE DATA ITEMS – UNDERWATER INSPECTION

Rate the condition of the underwater items with the NBI 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

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.

3-NE.13 NE DATA ITEMS – MAINTENANCE AND FOLLOW-UP

Item 377 – Maintenance Problem

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

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

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

1/AN character

This item is used by NDOR 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

2 digits

This item is shown in this section only to inform Manual users that this item is no longer used in the Nebraska Bridge Inventory. This item is not used. Historically, this was the amount the stresses have been reduced due to superstructure damage or deterioration.

Item 381 – Load Rating Program Used

1 digit

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered in Pontis 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	NDOR Timber Program	Working Stress
11	NDOR 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	NDOR internal use only	Assigned Rating
37	na	NDOR Policy
38	na	Engineering Judgment
99		

Item 384 – HS Inventory Rating

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 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 Truck

6 digits

This is determined by the Load Rating Engineer and provided on the Load Rating Summary Sheet, then entered in Pontis by the Program Manager Staff. These are the load posting values recommended by the LRE and shall be used to for proper posting in the field.

If these calculated tonnage values are less than the Gross Legal Weight for any of these trucks, then the bridge must be load posted. These are the load posting values calculated recommended by the LRE and shall be used to for proper posting in the field. 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
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

6/AN characters

This date is gathered by BIP Program Staff from the Load Rating Summary Sheet.

Item LOD_RAT_N – Load Rating Engineer ID

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. This data is gathered by BIP Program Staff from the Load Rating Summary sheet.

3-NE.15 NE DATA ITEMS – INSPECTION STAFF

Item	Description	Code Length /Type
BIR_RAT_INSPECTOR	Inspection Team Leader ID	6 A/N characters
BRG_INSP_1	Assistant Inspector 1 ID	6 A/N characters
BRG_INSP_2	Assistant Inspector 2 ID	6 A/N characters
BRG_INSP_3	Assistant Inspector 3 ID	6 A/N characters
BRG_INSP_4	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 the last four digits of their Social Security Number.

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 NDOR'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 NDOR;
- 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.

NDOR completes QC on data that has been entered into the PONTIS 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 NDOR 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-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 NDOR Bridge Inspection Program website at http://www.nebraskatransportation.org/ design/bridge/bipm.htm 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.20 APPENDIX

Memos and other guidance that may have been issued after the issuance of the current revision of this Chapter can be found at the NDOR Bridge Inspection Program website at
http://www.nebraskatransportation.org/design/bridge/bipm.htm.

Participants are urged to check this site to ensure they have all the most current information and forms.

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4.1 GENERAL

The purpose of this chapter of the NDOR Bridge Inspection Program Manual is to set policy and/or provide guidance to Bridge Owners and their inspectors on inspection and inspection reporting.

County line bridges should be inspected and reported by the county that, by mutual agreement, has assumed the 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).

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

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 ROLES AND RESPONSIBILITIES

4.3.1 Bridge Owners

Bridge Owners in Nebraska include the Nebraska Department of Roads, cities, municipalities and counties.

Bridge Owners are responsible for:

- Ensuring the bridges under their authority are being inspected by qualified inspectors and at the intervals complying with the NBIS, and that the data is in the Nebraska bridge inventory as specified in this Chapter.
- Ensuring bridges under their authority have a bridge load rating performed by a qualified engineer (Load Rating Engineer).
- Ensuring that required load posting or restrictions are installed in accordance with this Manual and that the signs are maintained.
- Complying with NDOR 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.)
- Maintaining a complete Bridge File and Individual Bridge Records in their local office. (See Chapter 2, Bridge Inspection Program Records.)
- Ensuring critical findings are addressed by corrective action or permanent closure of the bridge, and the closure of the issue is documented in their Bridge File.
- Ensuring non-critical findings are addressed by corrective action (repair or maintenance), and the closure of the issue is documented in their Bridge File.
- Completing, or causing to be completed, Quality Control (QC) of the inspections, load ratings and hydraulic analyses done for bridges under their authority.
- Ensuring inventory inspections follow the stipulations of the Programmatic Agreement between FHWA-NE Division and NDOR for Visual Statewide Bridge Inspections.

4.3.2 Nebraska Department of Roads

NDOR is responsible for:

- Providing Pontis software to Bridge Owners and their consultants.
- Assigning inventory structure numbers.
- Maintaining the Nebraska Bridge Inventory database.
- Submitting Nebraska Bridge Inventory data to the Federal Highway Administration (FHWA) for inclusion in the National Bridge Inventory database.
- Maintaining the master lists of the following in the Nebraska Bridge Inventory:
    - fracture critical 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 National Bridge Inventory by the Bridge Owners for compliance with Federal regulations.

4.3.3 Consultants Performing Inspections for Bridge Owners

Consultants performing inspections for Bridge Owners are responsible for:

- Being familiar with NDOR and FHWA requirements and policies on bridge inspection.
- Maintaining staff qualifications required for the Nebraska Bridge Inspection Program.
- 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 NDOR.
- Ensuring inventory inspections follow the stipulations of the Programmatic Agreement between FHWA-NE Division and NDOR for Visual Statewide Bridge Inspections.

4.4 QUALIFICATIONS

The NBIS qualification requirements and NDOR 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. NDOR qualifications are more stringent than those for NBIS for some items.

NDOR 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, NDOR and, if applicable, their Consultant employers.

4.5 NBIS DEFINITIONS AND NDOR COMMENTARY

The NBIS definition of types of inspections and NDOR 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. NDOR expectations for inspection procedures are described herein. Note that some of the terms describe the "level" or depth of inspection, but are not a type of inspection that is recorded in Pontis. Later Sections of this Chapter are organized based on the four Pontis inspection types. A table comparing the types of inspections is shown at the end of this Section.

4.5.1 Initial Inspection

"The first inspection of a bridge as it becomes a part of the bridge file to provide all Structure Inventory and Appraisal (SI&A) data and other relevant data and to determine baseline structural conditions." (NBIS definition)

Initial inspections are reported in Pontis as a Special Inspections.

Initial Inspections must be completed by a Team Leader.

NDOR requires that new bridges, replacement bridges, existing bridges that have been significantly altered by widening/lengthening, rehabilitated after a Critical Finding, or bridges with a change in ownership receive an initial inspection. These structures have new data or significant revisions of data for the Nebraska Bridge inventory database.

4.5.2 Routine Inspection

"Regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from initial or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements." (NBIS definition)

Routine inspections must be recorded in Pontis as NBI Inspections.

Routine inspections must be completed by a Team Leader.

Routine inspections may include both inspection of features of the structure and inspection of the site.

4.5.3 Fracture Critical (FC) Member Inspection

"A hands-on inspection of a fracture critical member or member components that may include visual and other nondestructive evaluation." (NBIS definition)

Fracture Critical Inspections must be recorded as Pontis Fracture Critical Inspections.

Fracture Critical Inspections must be completed by a Team Leader who is NDOR certified to complete Fracture Critical Inspection.

A Fracture Critical inspection typically is done along with the Routine Inspection.

4.5.4 Underwater Inspection

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

Underwater Inspections must be recorded as Pontis Underwater Inspections.

Underwater Inspections must be completed by a Team Leader who is also a commercial diver.

The underwater inspection is required for structures with substructure units that are submerged in water depths greater than 4 feet (1.22 m) throughout the year

4.5.5 Special Inspection

"An inspection scheduled at the discretion of the Bridge Owner, used to monitor a particular known or suspected deficiency." (NBIS definition)

Special Inspections must be recorded as Pontis Special Inspections.

Some Special Inspections must be performed by a Team Leader; otherwise, they must be performed by a person familiar with the bridge and the deficiency/condition being inspected and available to accommodate the assigned frequency of investigation.

In 2012, NDOR initiated a policy that any inspection that changes inventory data and that is not a Routine (as defined in this Manual), Fracture Critical, or Underwater inspection, shall be entered into the database as a Special Inspection.

Special Inspections may be scheduled or event-driven.

4.5.6 Damage Inspection

"This is an unscheduled inspection to assess structural damage resulting from environmental factors or human actions." (NBIS definition)

Damage inspections are not an inspection type in Pontis.

An initial assessment of damage to a bridge may be done by a person who is not a Team Leader. The damage should be documented (including findings, date, course of action). Depending on the severity of the damage and steps taken to address damage, a Team Leader may need to enter data into Pontis as a Special Inspection and placed in the Individual Bridge Record.

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

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

4.5.7 In-depth Inspection

"A close-up, inspection of one or more members above or below the water level to identify any deficiencies not readily detectable using routine inspection procedures; hands-on inspection may be necessary at some locations." (NBIS definition)

In-depth inspections are not an inspection type in Pontis.

In-depth inspection is done along with Routine, Fracture Critical, Underwater or Special Inspections.

4.5.8 Hands-on Inspection

"Inspection within arm's length of the component. Inspection uses visual techniques that may be supplemented by nondestructive testing." (NBIS definition)

Hands-on inspections are not an inspection type in Pontis.

Hands-on inspection is done along with Routine, Fracture Critical, Underwater or Special Inspections.

Inspection Matrix

Type (listed in MBE)	Purpose	Changes NBI or NE Inventory Data?	Reported in Pontis as	Timing	Inspection By
Initial	1) Provide/verify all data for the SI&A 2) Determine baseline structural conditions 3) Identifies members needing Fracture Critical or Underwater inspection 4) Provide structure notes	Yes – provides baseline data for the inventory	Special	Event-driven, for New, Reconstructed, Repaired Bridges, or Owner Change	Team Leader
Routine	1) Determine the physical and functional condition of the bridge 2) Identify any changes from "Initial" or previously recorded conditions 3) Ensure that the structure continues to satisfy present service requirements.	Yes – regular updates	NBI	Scheduled	Team Leader
Fracture Critical	Inspection Fracture Critical members with appropriate methods, testing and tools. Always "hands-on" - a very detailed, close visual inspection.	Yes – regular updates	Fracture Critical	Scheduled	Team Leader
Underwater	Monitor structure features obscured by normal water elevations	Yes – regular updates	Underwater	Scheduled	Team Leader who is commercial diver
Special	Scheduled to monitor a known or suspected deficiency, such as foundation settlement or scour, member condition, and the public's use of a load posted bridge. Event-driven inspection for damage from traffic or scour.	Yes	As Special	Scheduled or Event-driven	Team Leader
Damage (See Notes below.)	Assess structural damage from environmental or human factors; possible emergency load restriction	Potentially (See Notes below.)	(See Notes below.)	Event-driven	(See Notes below.)
In-Depth	This describes the degree, or level, that can be applied to FC, UW, Special or Damage inspections where appropriate. It is not a proper type of inspection.	N/A	N/A	Scheduled or Event-driven	N/A

Damage Inspection Notes:
Initial assessment may be done by person authorized by the BO.
If structure to be left in service, TL must inspect and record condition ratings changes, if any, as a Special Inspection.
If critical finding issue, TL will inspect after CF is addressed and record changes, if any, as a Special Inspection.

4.6 SUBMITTAL REQUIREMENTS FOR INVENTORY DATA AND OTHER RECORDS

NDOR, requires that participants generating data and supporting reports submit them to NDOR as soon as QC has been completed, but within **90 days** of:

- Any inspection (Routine, Fracture Critical, Underwater and Special).
- Any inspection of new bridges or reconstructed bridges
- Any change in inventory data for existing bridges including
  - Revised Load Rating or Posting/Closure
  - Revised Scour Condition
  - Replacement of structure with non-bridge length structure
  - Ownership change.

Participants need to allow sufficient time for QC to be completed prior to submittal to NDOR.

NDOR continually updates the state inventory as data is received from Bridge Owners. Program participants should be aware that this is more stringent than the NBIS requirement that for non-state agency bridges the SI&A data to be entered into the state and national inventory database within 180 days of the date of inspection. This procedure allows data collected in a calendar year to be reviewed and entered into the database prior the April 1 deadline for inventory submittal to FHWA. NDOR and FHWA monitor compliance with the BIP submittal requirements.

Owner must notify the Bridge Division in writing to delete the structure from the Inventory.

See NDOR's *Policy for Design, Load-Rating and Inspection of Public Road Bridges*, May 24, 2010 In Chapter 1, Bridge Inspection Program Requirements for Bridge Plans, Load Rating Report, Hydraulic design and Analysis Report submittal requirements.

4.7 ROUTINE (NBI) INSPECTIONS

4.7.1 Definition

"Regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from initial or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements." (NBIS definition)

Structures with Fracture Critical members have inspection requirements that are in addition to those of this section.

Routine inspection of bridges over waterways includes review for potential scour issues and more information is given in this section.

Routine inspection of complex structures have additional considerations that are described in this section.

The following flowchart provides a general process for routine inspections of structures.

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 NDOR Bridge Inspection Program requirements.

4.7.2 Pontis Recording

Routine inspections must be recorded in Pontis as NBI (Routine) inspections.

4.7.3 Routine Inspection Interval

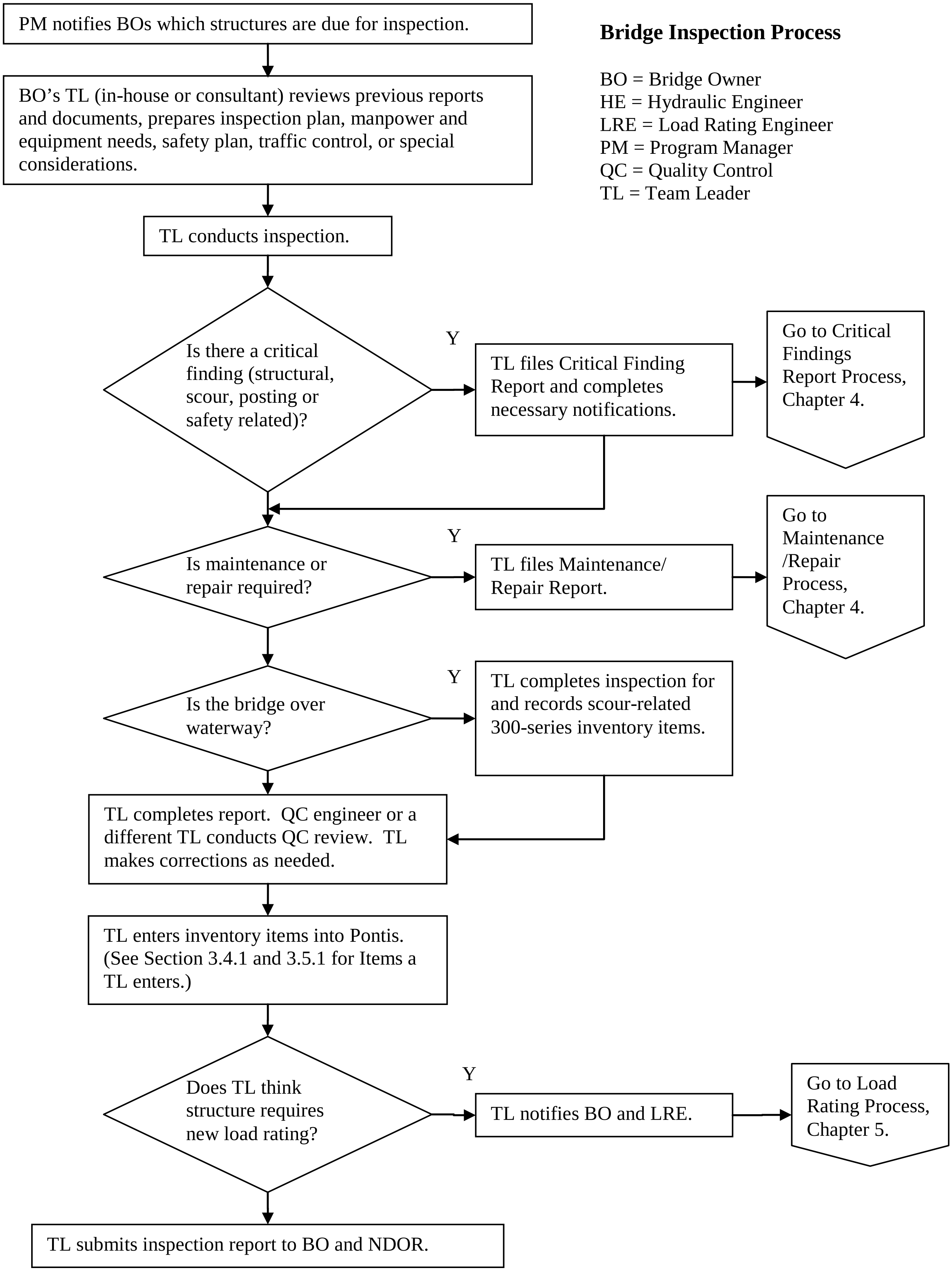
NBIS requires that bridges be routinely inspected at intervals no greater than 24 months. It also allows inspection intervals of up to 48 months with FHWA approval.

NDOR requires that all routine inspection intervals be done at intervals not exceeding 24 months. These inspections are the biennial routine inspections, and shown in Pontis as NBI inspection.

The FHWA Metric on frequency uses Pontis NBI Inspection dates to calculate the actual interval. Only routine inspections should be entered into Pontis NBI inspection. In 2012, NDOR initiated a policy that non-routine inspections that change inventory data (e.g., Initial, Feature inspection, Damage inspection) will be recorded in Pontis as a Special Inspection and **not** an NBI inspection. See Section on Special Inspections.

Bridge Inspection Process

BO = Bridge Owner
HE = Hydraulic Engineer
LRE = Load Rating Engineer
PM = Program Manager
QC = Quality Control
TL = Team Leader



4.7.4 Parties Completing Routine Inspections

Routine inspections must be completed by a Team Leader.

4.7.5 Inspection Procedures- General

4.7.5.1 General Planning and Preparation

This section describes general office planning and preparation tasks that apply to all types of inspections. Inspectors should also review the FHWA BIRM, particularly Section 3.1.4 “Preparing for Inspection”. Unique tasks that apply to specific types of inspections, such as fracture critical inspections can be found in other sections of this Chapter. General planning and preparation includes, but may not be limited to, the following:

File review for each bridge structure, including review of prior inspections and bridge items noted for monitoring.

Arrangement for the provision of warning signs and other traffic control.

4.7.5.2 Safety

Inspectors should review before an inspection assignment the FHWA BIRM Section 3.2 “Safe Practices” for thorough coverage of recommended requirements. Inspectors should also review the MBE for safeguarding the safety of personnel conducting the inspections as well as the safety of the public.

Inspectors should never work alone. Extreme caution should be exercised when using extension ladders or catwalks on bridges. They should be thoroughly inspected before any load is placed on them.

A bridge may require use of special equipment, qualification or techniques. See the sections on fracture critical and underwater inspections.

4.7.5.3 Inspection Tools

Inspectors should review the FHWA BIRM before an inspection assignment Section 3.4 “Inspection Equipment” for thorough coverage of recommended requirements.

Inspector should have available for use the following basic tools at a minimum:

- Ladder
- Pocket tape
- Chipping hammer
- Scraper
- Calipers
- Straight edge
- 100-foot tape
- Camera
- Flashlight
- Wire brush
- Ice pick
- Level
- Mirror

Special equipment, such as 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.

4.7.6 Inspection Procedures - Posting/Closure

Proper installation of bridge restrictions is a matter of public safety. Proper installation of bridge restrictions is a major concern of FHWA and NDOR. NDOR 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 note should be shown in the inspection report that the TL has completed this check.

These situations are Critical Findings:

- Missing signs or
- Posting signs with values higher than those recommenced values on the LRSS
- Bridge that is supposed to be closed, but is found open.

Often Owners can address these situations the same day after notifications from the Team Leader.

4.7.7 Inspection Procedures - Material Considerations

The Load Rating Engineer will need detailed information on the remaining section at certain locations on the bridge for various load effects (bending moment, shear, compression and tension). The lists given below are general in nature and not comprehensive. The Inspection staff, while in the field, should contact the LRE if there are any questions and to ensure key measurements are obtained in the field.

4.7.7.1 Steel

Corrosion and section loss can adversely affect the load capacity of a bridge.

Critical Section Loss Locations for Steel	
Load Effect	**Typical critical section**
Bending moment in beams of simple spans	Midspan; bracing spacing is also a key factor
Bending moment in beams for continuous spans	Length of beams/stringers near the midspan and the length of beams/stringers over the piers; bracing spacing is also a key factor.
Shear in beams	At the supports
Tension members, typically in trusses	The entire length of the member; gusset plates
Compression members, typically in trusses	Length of the member between bracing point or ends; gusset plates

4.7.7.2 Timber

Timber structures can, over time, exhibit deterioration and section loss. Often they are damaged due to a vehicle load that exceeded the strength.

Critical Section Loss Locations for Timber	
Load Effect	**Typical critical section**
Bending moment in beams of simple spans	Midspan; bracing spacing is also a key factor
Shear in beams	At the supports
Tension members, typically in trusses	The entire length
Compression members, typically the supporting pile	The entire length; bracing spacing is also a key factor (length of the member between bracing point or ends).

4.7.7.3 Concrete

Routine Inspections of concrete decks should include the use of a delamination detector that will readily define the deteriorated area, such as chain drag or hammer sounding. 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 testing such as electrical potential or chloride content tests are not part of Routine Inspection. The Bridge Owner will determine if additional testing is needed for part of an inventory, special or in-depth inspection.

<table>
<tr><th colspan="4">Concrete Bridge Deck Evaluation and Condition Coding
(Condition Indicators as % of Deck Area)</th></tr>
<tr><th>Classification</th><th>Condition Code</th><th>Spalls</th><th>Delaminations</th></tr>
<tr><td rowspan="3">Light Deterioration</td><td>9</td><td>None</td><td>None</td></tr>
<tr><td>8</td><td>None</td><td>None</td></tr>
<tr><td>7</td><td>None</td><td>< 5% of all Deck Concrete</td></tr>
<tr><td rowspan="2">Moderate Deterioration</td><td>6</td><td colspan="2">< 2% Spalls or
sum of all deteriorated Deck Concrete < 10%</td></tr>
<tr><td>5</td><td colspan="2">< 5% Spalls or
sum of all deteriorated Deck Concrete 10% to 29%</td></tr>
<tr><td rowspan="3">Extensive Deterioration</td><td>4</td><td colspan="2">> 5% Spalls or
sum of all deteriorated Deck Concrete 30% to 60%</td></tr>
<tr><td>3</td><td colspan="2">> 5% Spalls or
sum of all deteriorated Deck Concrete > 60%</td></tr>
<tr><td>2</td><td colspan="2">Deck Structural capacity grossly inadequate.</td></tr>
<tr><td rowspan="2">Structurally Inadequate Deck</td><td>1</td><td colspan="2">Holes in Deck, or danger of other sections of deck failing.</td></tr>
<tr><td>0</td><td colspan="2">Deck has failed completely.
Bridge can be repaired by deck replacement only.</td></tr>
</table>

4.7.7.4 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. It is important that inspectors recognize beam shear cracks and report these to the LRE.

4.7.8 Inspection Procedures – Bridges Over Waterways

Bridges over waterways are of particular concern for Owners. Scour can occur in stream crossings where debris and/or erodible soils are present. Scour is also more likely if a structure's length and its waterway opening encroach into the natural waterway of the stream resulting in high stream velocities during storm events. Some bridges have scour counter measures that must be monitored. More recent bridge design procedures result in structural elements that are resistant to failure from scour. All of these factors are taken into account during a Scour Assessment for a bridge.

Scour Assessments for all bridges within Nebraska over waterways were completed in 2010. New bridges undergo assessment during design. These scour assessments, their resultant coding for NBI Item 113, and possible Plan of Action should be in the Owners Bridge File. They also may guide the determination of the underwater inspection interval.

4.7.8.1 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.

4.7.8.2 Scour Critical Structures Plan of Action

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. Inspection preparation should include a review of the POA. Changes to the condition of the bridge that are noted by a bridge inspector on a routine inspection may trigger a revision to the POA.

4.7.8.3 Inspection and Reporting for Bridge 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.

Inspection preparation shall include a review of past inspection reports and the current POA, if the structure has this, 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 those from the current POA or prior inspection (if there is no POA):
  - 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

The Team Leader records observations using the NE scour-related 300 Item series bridge inventory coding items which cover evidence of scour and flood events as well as factors that can potentially contribute to scour during flood events. See Chapter 3 for the complete list of the NE scour-related 300 Item series and guidance on coding these items.

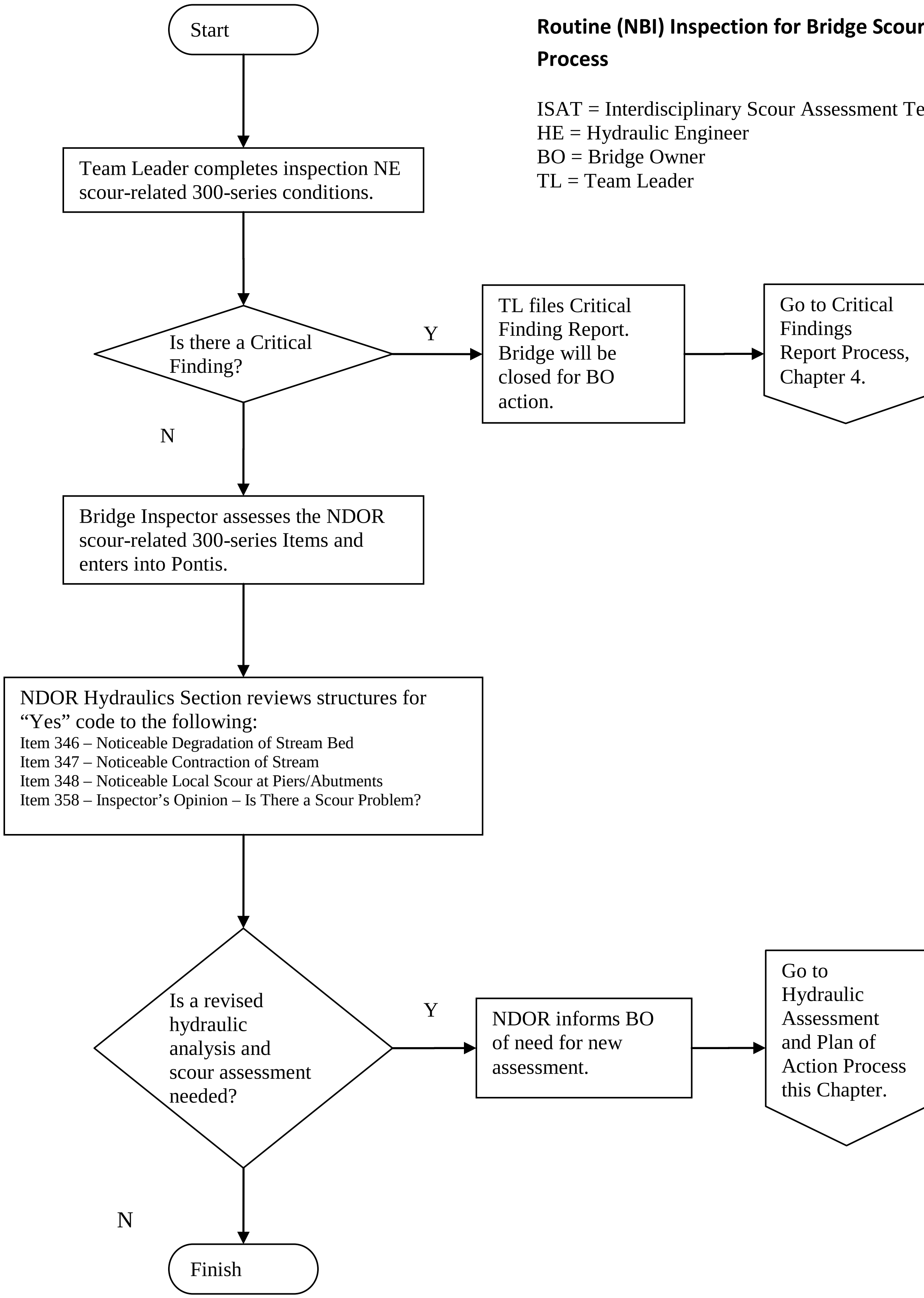
If any of the following is coded as "YES" by the inspector, the structure may need to be flagged for consideration for a scour assessment:

- Item 346 - Noticeable Degradation of Stream Bed
- Item 347 - Noticeable Contraction of Stream
- Item 348 - Noticeable Local Scour at Piers/Abutments
- Item 358 - Inspector's Opinion – Is there a Scour Problem.

The Team Leader should file a Critical Findings Report if the condition of the bridge warrants a substructure condition rating, Item 60, of 2 or less. See Chapter 3 Bridge Inspection. A flow chart of scour related inspection follows.

Routine (NBI) Inspection for Bridge Scour Process

ISAT = Interdisciplinary Scour Assessment Team
HE = Hydraulic Engineer
BO = Bridge Owner
TL = Team Leader



4.7.9 Inspection Procedures – Complex Bridge

The NBIS defines a Complex Bridge as "a movable, suspension, cable stayed and other bridges with unusual characteristics."

NDOR defines a Complex Bridge as "a bridge possessing unique or unusual design features not often found in Nebraska."

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 to the Owner.

NDOR will review all bridges in the state and identify Complex Bridges.

Complex 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 bridges:

- S030 37847, Columbus, Columbus Viaduct, Steel Arch-Thru
- S068 00044, Ravenna, Ravenna Viaduct, Steel Arch-Thru
- S002 50816, Nebraska City, Concrete Continuous Segmental Box Girder

4.7.10 Inspection Reports

4.7.10.1 General

The field investigation 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 4.11Critical Findings Reporting of this Chapter.

An inspector may discover non-critical findings that may need repair or maintenance. Report these in the inspection report and also directly to the Bridge Owner.

Inspection reports should be clear and use sketches and photographs to document the findings. Inspection reports should include the following:

- All noteworthy findings including:
  - any bridge component with a condition rating of 4 (poor) or less with photos and notes clearly describing the location, severity and extent of the defect or deterioration
  - any item in need of repair or maintenance
  - any evidence of a change in scour condition
- Fracture critical members, fatigue-prone details and special feature inspections must be included in the comment file.
- Features that require close monitoring **must have** detailed documentation. A description of the problem, or potential problem, with sketches and photos must be included in the special inspection report.
- Report repairs to the structure that alter any previously recorded data.

4.7.10.2 Photographs

Site photos are required at each inspection. A minimum of 10 digital photographs of the site in general. See the guide for taking site photos in the Appendix.

Inspection photos document particular inspection findings. The quantity of inspection photos must be sufficient to accurately document the finding(s).

Known issues, such as a fracture critical findings, or other issues of special concern.

Photographs **must have** date and time printed on them automatically. NDOR recommends labeling with a filename that includes the structure ID followed by a sequence number or other unique identifier for that photo.

An advisory regarding photos: NDOR 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. This is totally at the discretion of the Inspector.

4.7.10.3 Pontis Input

Routine inspections must be recorded in Pontis as NBI Inspections.

The inspection data collected is input by the Inspector into Pontis.

Each new NBI inspection must be entered by clicking on the **“New”** button under the inspection tab and follow through with a New Inspection. **Do not** enter a new NBI inspection using “Edit” as it will overwrite the previous inspection. Verify that a new inspection report is created for the same structure.

Inspectors must input the date of the new NBI inspection, and make necessary changes in the condition ratings and other inspection items that are the responsibility of the Team Leader to enter. Inspectors are advised to carefully review the Tables of Inventory Items in Chapter 3 Inventory Coding for the specific items that Inspectors enter into the inventory (dynamic items) or should verify while they are in the field (static items).

- Dynamic items can change with each NBI (routine) inspection. It is important that Items that affect bridge Sufficiency Ratings be coded accurately.
- Static items do not change with each NBI (routine) inspection. These items, however, are verified during inspection. The Team Leader should red-line any changes to these items on a copy of the SI&A sheet and send them to the BIP Program Manager. The Program Manager is responsible for changing these items in the database.

These items have been found during QA Evaluation to have significant variability or issues in coding. Inspectors are advised to carefully code in accordance with Chapter 3 Bridge Inventory Coding.

Inventory Items Needing Careful Attention		
Item No.	**Description**	**Comments**
36	Traffic Safety Features	Standards change thus Inspectors should check this each cycle.
41	Structure Open, Posted, or Closed to Traffic	Clarification added in Chapter 3 of this Manual.
90	Inspection date	Input a **NEW** report into Pontis for a new inspection and **DO NOT** edit the data that was the prior inspection.
303	Roadway Fixed and Expansion Devices	Item updated in Revision 1, TLs need to review.
311	Bridge bearing devices	Clarification added in Chapter 3 of this Manual.
316, 317, 320	Substructure items	Clarification added in Chapter 3 of this Manual.
321	Piling type	Clarification added in Chapter 3 of this Manual.
326, 327	Stream related	Inspectors should also consult Chapter 6 Scour.
377	Maintenance comments	Clear, specific comments needed.
378	Maintenance date	If comments are provided, date must be provided.

Comments input into reports and Pontis are very important. Comments must be clear and detailed to the extent that they can be fully and appropriately interpreted at a later date by a different inspector. Comments should include the Condition Code as well as justification of the Condition Codes that an Inspector assigns, especially when Condition Codes drop to 5 and below. Inspectors must document the type and location of defects. This is important for bridge management personnel and for load rating. Comments are required for items that are lowered by more than one point.

Documentation in Pontis of maintenance completed and repairs made is also important.

Export completed Pontis inspection reports to NDOR frequently. This will ensure that inspections are received by the NDOR within the required NBI time frame.

New inspections delete previous inspection notes and then add current inspections notes.

4.8 FRACTURE CRITICAL INSPECTION

4.8.1 Definition

"A hands-on inspection of a fracture critical member or member components that may include visual and other nondestructive evaluation." (NBIS definition)

A hands-on inspection is defined as within the inspector's arms length.

4.8.2 Pontis Recording

Fracture Critical inspections must be recorded in Pontis as Fracture Critical Inspections.

4.8.3 Fracture Critical Inspection Interval

Fracture critical members must be inspected at intervals not to exceed 24 months, in accordance with the NBIS, but may be a shorter inspection interval. NDOR 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.

Fracture Critical inspections are typically done along with Routine Inspections. The date of this inspection is recorded in Pontis as Fracture Critical inspection date and NBI (routine) inspection date.

Note that NDOR's policy beginning in 2012 is that Fracture Critical bridges with elements requiring inspection between the routine inspection interval shall be a Special Inspection. See Section on Special Inspections – Scheduled. The date of this inspection is recorded in Pontis as Fracture Critical inspection date and Special Inspection date (and **not** an NBI inspection.)

4.8.4 Parties Completing Fracture Critical Inspection

Fracture Critical Inspections must be completed by a Team Leader who is NDOR Certified to complete Fracture Critical Inspection.

4.8.5 Fracture Critical Inspection Procedures

4.8.5.1 Fracture Critical Structure Types and Members

A fracture critical member is defined in the NBIS as "a steel member in tension, or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse." Collapse is defined in the AASHTO LRFD Specifications as a "major change in geometry of a bridge rendering it unfit for use."

According to the 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 fracture critical structure types and members is shown below for the inspector's information. Inspectors should also see AASHTO MBE and FHWA Report No. FHWA-IP-86-26, *Inspection of Fracture Critical Bridge Members*.

- One- or two-girder systems, including single box girders with two webs
- Suspended spans with two girders and/or two eyebar components
    - Eyebar chain
    - Hanger rods
    - Floorbeams spaced more than 14ft apart
    - Cable
    - Cable stayed
- Two-truss systems
    - Eyebar members
    - Lower chord
    - Counters
    - Floorbeams spaced more than 14ft apart
    - Gusset plates
    - Pins
    - Brackets holding up Floorbeams
- Tied arches
- Steel pier caps and cross girders with 2 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
- Steel pier caps without load path redundancy

4.8.5.2 Bridge-Specific Inspection Procedures

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 fracture critical bridge shall have an inspection procedure prepared by an engineer that identifies each fracture critical member as well as each fatigue detail and fracture-prone detail. If a procedure is not in the bridge file, an engineer must prepare a procedure for that structure. This procedure provides a list of fracture critical members and fatigue and fracture-prone details on the structure, 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.

Fracture critical bridge inspection procedures once prepared will likely be used for many inspections. Procedures will likely need revision if fracture critical member conditions change or methods of inspection change or are added.

A fracture critical inspection procedure shall include the following elements:

- Location of fracture critical members as described in writing or shown on sketches or photos.
- Method of access to fracture critical elements (i.e., ladder, platform, boat, snooper, etc.).
- Inspection method(s) to be performed on each fracture critical 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.

4.8.6 Fracture Critical Inspection Reports

4.8.6.1 General

The Team Leader needs to record in Pontis the date of the Fracture Critical inspection.

The inspection needs to record the status of all fracture critical members, regardless of their condition. When a crack is found, it is very likely that similar details may also be cracked; inspection of all similar details is mandatory. The inspector must report all cracks, especially in a fracture critical member, 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 FC Inspection Report must include the NDOR FC inspection forms as well as a report narrative.

4.8.6.2 Report Narrative

The Fracture Critical 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 Fracture Critical Member (FCM)
    - Include FCM inspection plans
      - Inventory of the FCMs
      - Identify fatigue prone details
      - Quality control tool
    - Systematic procedure for efficient inspection
  - Inspection Procedures
    - FCM inspection plan
      - General statement indicating that a hand-on visual assessment of the FCMs 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
    - Reference to a detailed sketch or photo
  - Why
    - Observed reason
  - Summary and Conclusions
    - Overall condition of the FCMs
    - How individual defects affect each member as a whole
    - All defects listed and priorities for each FCM
    - Address change in condition of FCMs from the previous inspection
    - Identify any negative trends that may be developing.

4.9 UNDERWATER INSPECTION

4.9.1 Definition

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

The underwater inspection is required for structures with substructure units that are submerged in water depths greater than 4 feet (1.22 m) throughout the year. The underwater 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 on-going resistance to scour is the objective of an underwater inspection.

In Nebraska, NDOR conducts all underwater inspections required, regardless of the Bridge Owner. The Bridge Owner must have the report in the bridge record.

4.9.2 Pontis Recording

Underwater Inspections must be recorded in Pontis as Underwater Inspections.

4.9.3 Underwater Inspection Interval

The NBIS requires that underwater inspection intervals not exceed 60 months. NDOR provides guidance for two cases.

4.9.3.1 Bridges over Natural Waterways

Underwater Inspection Intervals			
NBI Item 113*	**Description**	**Maximum Interval**	**Comment**
U	Unknown foundation	To be determined by HE assessment	
T	Bridge over "tidal" waters	60 months	N/A in NE
9 to 4	Stable for calculated scour	60 months	
3 or 2	Scour critical based on calculated scour	To be determined by HE assessment	Include requirement in POA.
1	Scour critical and substructure failure is imminent; bridge is closed.	Inspection not required unless bridge is reopened.	Include requirement in POA.
0	Scour critical and bridge is closed.	Inspection not required unless bridge is reopened.	
*See Chapter 3 for complete descriptions of NBI Item 113.			

4.9.3.2 Bridges over Controlled-Flow Channels

Bridges over controlled-flow channels, such as power canals, shall have an underwater inspection interval not to exceed 60 months. These types of waterways typically have controlled and nearly constant stream velocities.

Some bridges cross irrigation canals, but often are dry and allow inspection without diving.

4.9.4 Parties Completing Underwater Inspections

Underwater inspections must be completed by a Team Leader who is also a commercial diver.

OSHA 29 CFR Part 1910, Subpart T, *Commercial Diving Operations*, shall govern the inspections that require diving. The team conducting the inspection should preferably include a Professional Engineer. The underwater inspector, at a minimum, will be a certified diver, have a basic knowledge of medical emergency procedures such as CPR and First Aid, be in good physical condition and be familiar with the theory and operation of the diving equipment and tools that will be used to complete the bridge inspection.

The dive team shall be appropriate in size for the structure, but shall consist of a minimum of three team members. Each member should be able to function in any of the positions and to rotate duties. These positions will include:

- Main diver who is responsible for the actual tactile and visual inspection of the structure and reporting the information. The main diver must be a certified team leader.
- Safety diver who is responsible for the safety of the main diver.
- The dive tender who assists the main and safety divers when putting on their equipment, during entry into and exit from the inspection site, and visual tracking of the divers.

4.9.5 Procedures

Underwater 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. Underwater inspection reports the current waterway cross-sections, profiles and soundings in contrast to past data.

The Underwater inspection report is an integral part of the bridge records and provides information on elements not visible during a routine inspection.

Underwater bridge inspection is a complex technical assignment requiring specialized diving skills and experience. All inspections must be conducted in a safe and thorough manner. Underwater inspections are often performed in poor visibility, fast moving rivers or canals in potentially hazardous surroundings. The diving experience of the underwater inspector is of the utmost importance. Individually, inspectors must be competent and skilled divers. At the same time, they also must be able to function and accept responsibilities as team members.

Structures requiring underwater inspection shall have individual procedures for conducting the dive. Additionally, individual procedures are required for the actual inspection, similar to those for fracture critical structures.

NDOR hires a consultant to complete all the underwater bridge inspections for all Owners in Nebraska. NDOR has developed a standard report format for underwater 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 underwater inspection reports are reviewed by the Program Manager. The Program Manager will review the condition ratings and compare them to the routine inventory inspection. The Program Manager will track the UW condition ratings and may update the condition ratings reported in the inventory if the underwater inspection report indicates this is necessary. The Program Manager will send a copy of the underwater inspection report to the Bridge Owner for their bridge record.

4.9.6 Inspection Preparation and Planning

4.9.6.1 General

The inspection dive team leader must complete the following:

- Verify the qualifications of all members of the dive team;
- Review the previous inspection report, dive log and the SI&A sheet;
- Hold the Predive Meeting with the Dive Team.

4.9.6.2 Predive Meeting

A predive meeting will be held to review both the dive procedure and the underwater 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 what team member responsibilities will be.
- 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 location of the nearest hospital.
  - The equipment manager is responsible for the emergency communication system, using either a cellular phone or the NDOR 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.

4.9.7 Inspection - Minimum Expectations

4.9.7.1 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.

4.9.7.2 Concrete

Note the length, width, location and orientation of cracks. Note spalling and deterioration of the concrete members.

4.9.7.3 Steel

Check for corrosion on all structural members, noting any loss in section and 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.

4.9.7.4 Timber

Timber members that are subject to cycles of wetting and drying are highly susceptible to deterioration. All timber pile shall be checked to detect 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.

4.9.8 Inspection Reporting

4.9.8.1 Postdive Meeting and Report

The dive team leader will conduct a postdive meeting with the dive team members and should address the following points:

- Review the underwater inspection of the structure and discuss the conditions that currently exist.
- Complete the Underwater Bridge Inspection Report and the Work Dive Log.
- 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.

4.9.8.2 Underwater Inspection Report

An Underwater Bridge Inspection Report will be completed 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 the Program Manager.

4.9.8.3 Divers' Personal Dive Log

A Record of Dive Log will be completed in accordance with Code of Federal Regulations, 29 CFR 1910: Subpart T – *Commercial Diving Operations*. This Record of Dive will be completed onsite immediately following the inspection dive. This Dive Log shall be submitted to the Bridge Owner and the Program Manager.

4.10 SPECIAL INSPECTIONS

4.10.1 Definition

"An inspection scheduled at the discretion of the Bridge Owner, used to monitor a particular known or suspected deficiency." (NBIS definition)

In 2012, NDOR initiated a policy that any inspection that changes inventory data and that is not a Routine (as defined in this Manual), Fracture Critical, or Underwater inspection, shall be entered into the database as a Special Inspection.

Special Inspections may be scheduled or event-driven.

A scheduled special inspection is done on a specified date or interval of time, to closely monitor the defect for adverse changes in its condition, and 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, or for structures that have sustained damage and thus change in condition.

4.10.2 Pontis Recording

Special Inspections must be recorded as Pontis Special Inspections.

4.10.3 Special Inspection Interval or Timing

4.10.3.1 Special Inspections – Scheduled

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. NDOR recommends that Owners keep a master list of their bridges that are subject to Special Inspection.

NDOR has determined certain conditions or cases that require a Special Inspection and these are shown in the following table. The purpose of the inspection is to verify the condition and the condition codes.

Scheduled Special Inspections Required by NDOR to Verify Condition Rating	
Case	**Inspection By**
Bridges with load restriction **and** A condition rating of 4 or less for **any** of the following: Item 59 Superstructure Item 60 Substructure Item 62 Culvert **and either** of the following: Item 29 ADT of 400 or more Item 208 State Classification of Route of 6 or less (arterial or higher level).	Team Leader
Bridges with a condition rating of 3 or less for **any** of the following: Item 59 Superstructure Item 60 Substructure Item 62 Culvert	Team Leader
Fracture Critical bridges with a condition rating of 3 or less for the Item 59 Superstructure due to a fracture critical element	Fracture Critical 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 (ADT and ADTT)
- Bridge condition or presence of known deficiencies
- Fatigue prone details.

Scheduled Special Inspections Examples

Scheduled Special Inspections 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
Inspection of a fracture critical element with a known issue	FC certified Team Leader

4.10.3.2 Special Inspections – Event-driven

In 2012, NDOR initiated a policy that any inspection that changes inventory data and that is not a Routine (as defined in this Manual), Fracture Critical, or Underwater inspection, shall be entered into the database as a Special Inspection.

The initial inspection of a bridge is a Special Inspection. A Special Inspection is required for new bridges, bridges that have been reconstructed (changed in configuration e.g. widening, lengthening, supplemental bents) or bridges with a change in ownership. These shall be entered into Pontis as a Special Inspection and not an NBI Inspection.

New and reconstructed bridges must have their initial inspection before opening to traffic.

A Special Inspection may be required and input into Pontis if a bridge has sustained damage due to environmental or human factors such as scour or vehicular impact.

Cases requiring a Special Inspection are shown in the following table.

Event-driven Special Inspections Examples		
Case	**Inspection By**	**Timing**
Recently completed bridge (Initial inspection)	Team Leader	Prior to opening to public traffic
Inspection of an altered/retrofit bridge	Team Leader	Prior to opening to public traffic
Structures retrofitted or repaired to address a particular FC issue that required a half-interval (e.g.12-month) and to be returned to the routine inspection interval (e.g. 24-month)	FC qualified Team Leader	Prior to opening to public traffic
Bridge that had a repair	Team Leader	Determined by the Owner
Structure damaged after vehicle impact that revises inventory data (condition ratings, etc.)	Team Leader	Determined by the Owner
Structure damaged after a flood event that revises inventory data (condition ratings, etc.)	Team Leader	Determined by the Owner

4.10.4 Parties Completing Special Inspections

Special Inspections that must be performed by a Team Leader include initial inspections and Damage Inspections

It is preferred that a Team Leader complete all Scheduled Special Inspections. A person familiar with the deficiency/condition being monitored and available to accommodate the assigned frequency of investigation may complete the inspection, except that any change in the deficiency/condition for the worse must be inspected by a Team Leader.

4.10.5 Procedures – Scheduled Special Inspections

Bridges shall be placed on a special inspections list when, in the Program Manager's, Bridge Owner's or Inspector's opinion, a non-critical defect is discovered that warrants short term monitoring to ensure that the defect's condition is stable, or that repairs or replacement is made before the defect can become critical.

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. 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. NDOR has provided DR form 7 to assist in logging documentation of changes in condition observed for bridges with this type of inspection.

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 special inspections.

4.10.6 Procedures – Event-driven Special Inspections

4.10.6.1 Initial Inspection (New or reconstructed bridge)

The initial inspection of a bridge is a Special Inspection. The procedures to be used are those used for a routine inspection that verify the condition of the structure. These shall be entered into Pontis as a Special Inspection and not an NBI Inspection.

Bridges that are new must have its 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 conditions. At this inspection, a Team Leader should also verify the need for Fracture Critical Inspection procedures and provide any other structures that may affect the future routine inspections.

Bridges that have been reconstructed (changed in configuration e.g. widening, lengthening, supplemental bents) 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.

Bridges with a change in ownership must also have an initial inspection to establish the baseline condition for the structure under the new Owner.

4.10.6.2 Damage Inspection

Damage Inspection is an event-driven (unscheduled) inspection to assess structural damage resulting from environmental or man-inflicted causes. Examples include a large storm event that has caused scour related damage, vehicular impact to a bridge that damage load bearing elements of the bridge, or vehicular impact to a bridge that damages traffic safety related elements of a bridge. For additional information, refer to Section 4.1.1 and 4.5.6.

The Bridge Owner must determine if the damage requires an emergency load restriction, lane closure, bridge closure or if a bridge has failed. If any of those conditions exist, a qualified Inspection Team Leader must complete a Damage Inspection. 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 Inspection Team Leader and 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 significantly depending upon the extent of the damage. If major damage has occurred, inspectors must evaluate fractured members, section loss, make 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 as to document more fully the extent of damage and the urgency and magnitude of repairs.

A Damage Inspection report should be made by the Bridge Owner to include in the Bridge Record. This is a custom report, and 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.

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 (NDOR) Maintenance work order (non-state)

NDOR 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. See Section 4.1 in this Chapter.

Non-state Bridge Owners have maintenance work order systems that they use to report, document and effect 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.

4.11 CRITICAL FINDING REPORTING

4.11.1 Purpose

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 critical findings be reported periodically to FHWA. NDOR requires the use of DR 320 Critical Findings Report for reporting them, for Owners to determine their action plan and document its completion, and for notification to NDOR that the Critical Finding is closed.

4.11.2 Critical Findings Definition

The NBIS defines a critical finding as “a structural or safety related deficiency that requires an immediate follow-up inspection or action”.

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 damage of the structure by traffic or stream.

NDOR had defined these Conditions that constitute a critical finding include, but are not limited to the following:

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
A scour analysis results in a Scour Critical, Item 113 of 1	Scour Assessment
A condition rating of 2 or less for any of the following Items: Deck, Item 58 Superstructure, Item 59 Substructure, Item 60 Culvert, Item 62 Channel and Channel Protection, Item 61	Inspection

Owners often can address posting/closure issues the same day as 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. If the required action is not complete, the discovering party should file a Critical Findings Report and deliver to the Owner.

In cases where it is possible that the bridge might be used safely at lower posted load limit, a load rating must be completed. 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.

4.11.3 Responsibilities for Critical Findings Reporting and Follow-Up

All discovery, immediate actions taken, and the actual work performed and follow-up must be recorded. The process described below and shown in the following flowchart.

4.11.3.1 Discovering Party

The party discovering the Critical Finding should immediately notify the Owner. Critical Findings maybe 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 CFR and take the required measures given on the CFR. These actions include required notifications to the Bridge Owner, NDOR Program Manager and others. The CFR must be completed and submitted to the Bridge Owner within 48 hours of the discovery of the finding.

4.11.3.2 Bridge Owners

Bridge Owners have the ultimate responsibility for management of their structures for the public safety. Owners must:

report to NDOR 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 NDOR of 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 NDOR CFR updates every 6 months. notify the Program Manager when the action to address the find is completed.

4.11.3.3 Nebraska Department of Roads

NDOR'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.

4.11.3.4 Consultants Performing Services for Bridge Owners

It is the responsibility of the Consultants to be familiar with NDOR and FHWA policies, and to follow procedures related to notifications and preparation of the report as described herein.

4.11.4 Procedures for the Critical Finding Report Form DR 320

DR Form 320 and the instructions for completing this form, DR 320i, are available from the State Bridge Office or may be downloaded from the NDOR web site. This form and instruction are revised periodically.

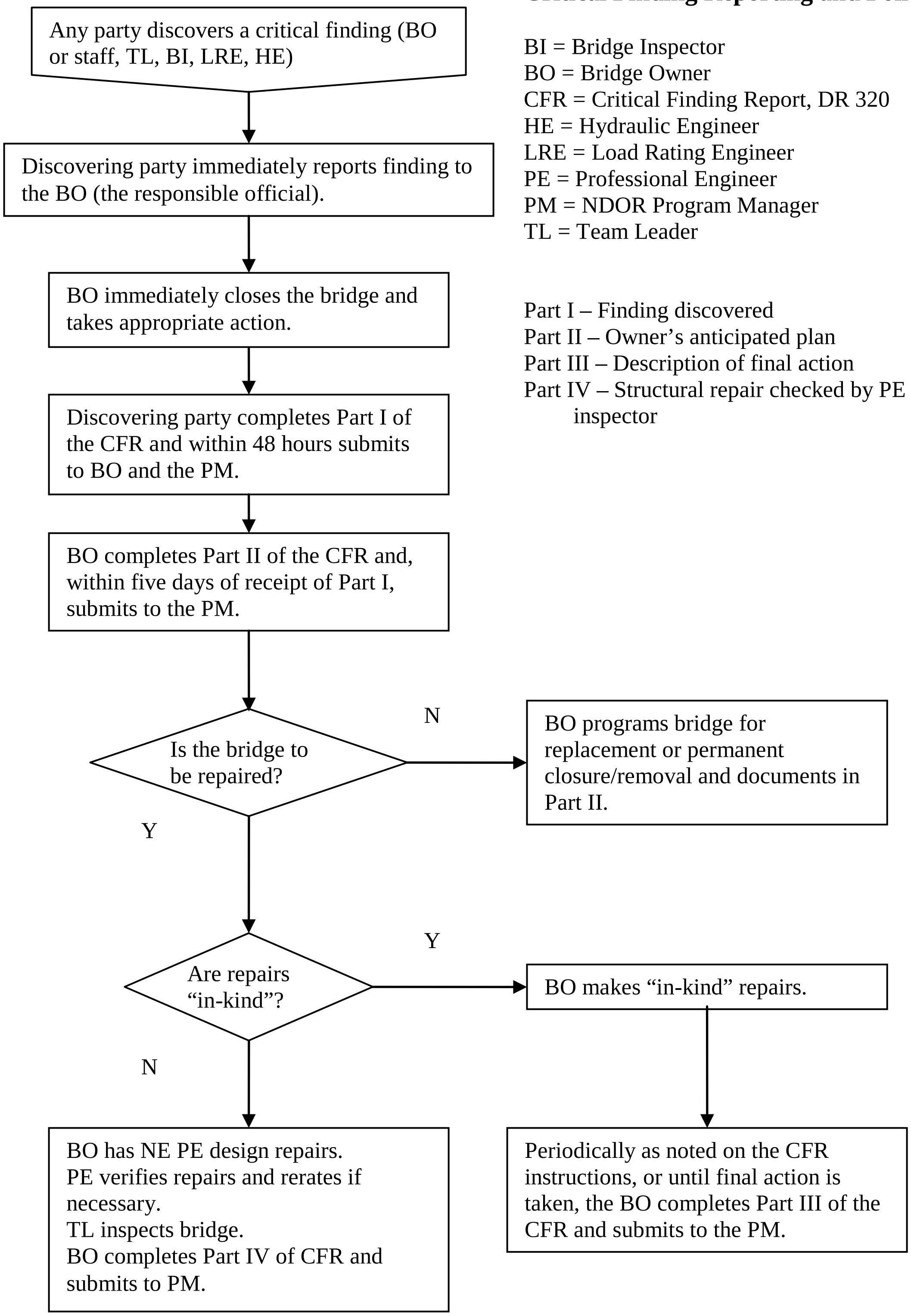
DR Form 320 includes individual parts for unique action from the Inspector and the Bridge Owner along with timeframes for completion of each part.

- 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 an inspector or a load rating engineer, but may be another party who represents the Bridge Owner, such as maintenance staff.
- 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
- 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.
- Part IV documents data related to structural repairs made to correct the finding. It is to be completed by a responsible official for the Bridge Owner.

Critical Finding Reporting and Follow-up

BI = Bridge Inspector
BO = Bridge Owner
CFR = Critical Finding Report, DR 320
HE = Hydraulic Engineer
LRE = Load Rating Engineer
PE = Professional Engineer
PM = NDOR Program Manager
TL = Team Leader

Part I – Finding discovered
Part II – Owner's anticipated plan
Part III – Description of final action
Part IV – Structural repair checked by PE & inspector



4.12 NON-CRITICAL FINDING REPORTING -- REPAIR AND MAINTENANCE

4.12.1 Purpose

Non-critical findings include items of repair or maintenance. See Chapter 1 Bridge Program Requirements for definitions used for repair, maintenance and reconstruction. Some Nebraska Local Bridge Owners have processes and systems in place to accomplish maintenance and repair and the documentation of completion. Those who do not have such a system in place are encouraged to use these NDOR forms.

4.12.2 Structure Maintenance Checklist Form DR 27

The Structure Maintenance Checklist includes a listing of typical maintenance work done on bridges. Examples of maintenance include wash the bridge, sweep the deck, clean dirt off bearings, or clean 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.

4.12.3 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. See the prior section of this Chapter.

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 or 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.

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 the Chapter 1 for guidance for 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

4.13 BRIDGE INSPECTION AND COMPLIANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT

Program participants that visit bridge sites in Nebraska should be aware that there are biological resources that may be encountered at these sites.

A Programmatic Agreement (PA) between FHWA and NDOR for visual bridge inspections was agreed upon on June 23, 2010. This agreement can be found at

http://www.dor.state.ne.us/gov-aff/pdfs-docs/environmental/programmatic-agreements/ GuidelinesforPAUse.pdf.

This PA was developed to outline the policy and procedures for environmentally approved federally-funded actions that involve specific transportation improvement activities.

All questions related to Inventory bridge inspection and biological should be directed to NDOR Bridge Division

Based on past experiences with similar actions, the FHWA has determined that visual bridge inspection activities do not involve significant environmental impacts. The PA included these two stipulations:

Stipulation 1: NDOR agrees to review actions environmentally approved by this programmatic agreement to ensure unusual circumstances as outlined by 23 CFR 771.117(b) do not exist. If an unusual circumstance is identified, NDOR will coordinate with FHWA for guidance. From 23 CFR 771.117(b),

“Such unusual circumstances include:

1. Significant environmental impacts;
2. Substantial controversy on environmental grounds;
3. Significant impact on properties protected by section 4(f) of the DOT Act or section 106 of the National Historic Preservation act; or
4. Inconsistencies with any Federal, State, or local law, requirement or administrative determination relating to the environmental aspects of the action.”

Stipulation 2: NDOR agrees to the following conditions of bridge inspection:

- During bridge inspection, noise will be kept to a minimum to avoid disturbing nesting or roosting birds.
- Any nest containing eggs or young shall be left undisturbed.
- No physical samples will be taken from the bridge, nor geotechnical samples collected.

The bridge inspection staff and/or contractor shall not state, store or stockpile materials and equipment in known/potential wetlands and/or known/potential streams that exhibit a clear “bed and bank” channel. Potential wetland areas consist of any area that is known to pond water, swampy areas or area supporting known wetland vegetation (e.g. Cattails, bulrush, canary reed grass, smartweed, or areas where there is a distinct difference in vegetation (at lower elevations) from the surrounding uplands areas.

4.14 MEDIA INQUIRY PROCEDURES AND CONFIDENTIALITY

Nationwide there has been increased interest in the condition of the nation's bridges. Terminology used in bridge inspection programs can and have been taken out of context in media reports and have been reported inaccurately. The media may approach Inspection or other staff regarding the work they are completing for Bridge Owners (inspection, field assessments, etc.). All media inquiries made to any Owner inspector, Consultant inspector or other staff reviewing or investigating a bridge will be referred to the Owner's Public Relations Office.

Information collected and recorded by all persons participating in the Nebraska Bridge Inspection Program is for the use of the Bridge Owners, the Nebraska Department of Roads and the Federal Highway Administration. Any information collected and recorded as part of this Bridge Inspection Program should not be released to any party not part of this program unless specifically authorized by the Bridge Owner. Program participants should contact the Program Manager for guidance if they have questions

4.15 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 NDOR’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 NDOR;
- 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.

4.16 QUALITY ASSURANCE

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

4.17 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

4.18 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 NDOR Bridge Inspection Program website for the current list of applicable forms and the most recent versions of each form. http://www.nebraskatransportation.org/ design/bridge/bipm.htm.

Name	DR Form
Special Inspection – Bridge Report	7
Structure Maintenance Checklist	27
Complex Bridge – Unusual Feature Inspection List	29
Fracture Critical Inspection Report, Bridge Orientation/Layout	293
Fracture Critical Inspection Report, Introduction	293a
Fracture Critical Inspection Report, Identification of All Fracture Critical Member/Details	293b
Fracture Critical Procedural Report	293c
Fracture Critical Inspection Report, General Structure Condition	293d
Fracture Critical Inspection Report, Summary and Conclusions	293e
Fracture Critical Inspection Report, Follow-up Procedure	293g
Bridge Inspection Field Sketch Template	319
Critical Finding Report	320
Critical Finding Report, Instructions	320i
Structure Repair Report	321
Underwater Inspection Report	600-607
Fracture Critical Inspection Photos	293p
Fracture Critical Inspection Instructions	293i

4.19 APPENDIX

Memos and other guidance that may have been issued after the issuance of the current revision of this Chapter can be found at the NDOR Bridge Inspection Program website at http://www.nebraskatransportation.org/design/bridge/bipm.htm. Bridge Owners and Inspectors are urged to check this site to ensure they have all the most current information and forms.

5.1 GENERAL

The intent of these procedures is to provide guidance and direction on proper load rating and load posting of bridges.

The load rating will be an evaluation of the load carrying capacity of the superstructure, including the deck, and substructure elements and their connections. Bridge conditions change over time and so will the load rating. The load rating will be determined by a professional engineer and determined by calculations, engineering judgment 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 have been prepared by a Nebraska Professional Engineer, be based on a 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 rated less than 3 tons for any legal Nebraska truck at operating level shall be closed and barricaded to all traffic. A detail for a permanent closure is in the Manual Appendix.

5.2 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.

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*. First Edition, 2008 (MBE)
- AASHTO. *Standard Specifications for Highway Bridges*, 17th Edition.
- AASHTO. *LRFD Bridge Design Specifications*, 4th Edition with 2008 Edition Interim.

5.3 ROLES AND RESPONSIBILITIES

5.3.1 Bridge Owners

Bridge Owners in Nebraska include the Nebraska Department of Roads, cities, municipalities, counties and private owners of bridges being used by the public.

Bridge Owners are responsible for:

- Ensuring bridges under their authority to 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 NDOR and retain the originally signed by the LRE in the Individual Bridge Record to determine load capacities and postings.
- Having the bridge properly posted, if posting is required, as specified in this Chapter.
- Providing documentation of revised load posting to NDOR , 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 NDOR 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.

5.3.2 Nebraska Department of Roads

NDOR 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, Bridges Structures and Hydraulics.
- 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.

NDOR is the repository of bridge data including bridge plans, pictures and other records. This repository does not constitute the Bridge Owner's official Bridge File.

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 NDOR 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 Rating for Bridge Owners

Consultants are responsible for being familiar with NDOR Bridge Inspection Program policies and procedures. Consultants performing load ratings for Bridge Owners are responsible for Quality Control (QC) 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 60 days** of receipt of the Load Rating Summary sheet from the LRE. This is very important since load postings typically drop due to deterioration the structure or damage.

Bridge Owners must **provide documentation** of revised load posting or bridge closures to NDOR **no later than 30 days** after the load posting signs or barricades are installed.

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 NDOR within 3 days of barricade installation.

5.4.3 Submittal of Load Rating Reports to NDOR

Load Ratings Reports for new or reconstructed bridges must be submitted to NDOR 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 special inspection of damage. Load ratings required due to damage or deterioration shall be re-load rated within 60 days of the date of bridge inspection.

NDOR requires that participants generating data and supporting reports submit them to NDOR as soon as QC has been completed, but no later than 90 days of any change in inventory data. Load Rating Reports typically result in a change any inventory data must be submitted to NDOR 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. See Chapter 2, Bridge Inspection Program Records covering Owner's records.

NDOR 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. NDOR can only accept plans in electronic format for inclusion in the archive.

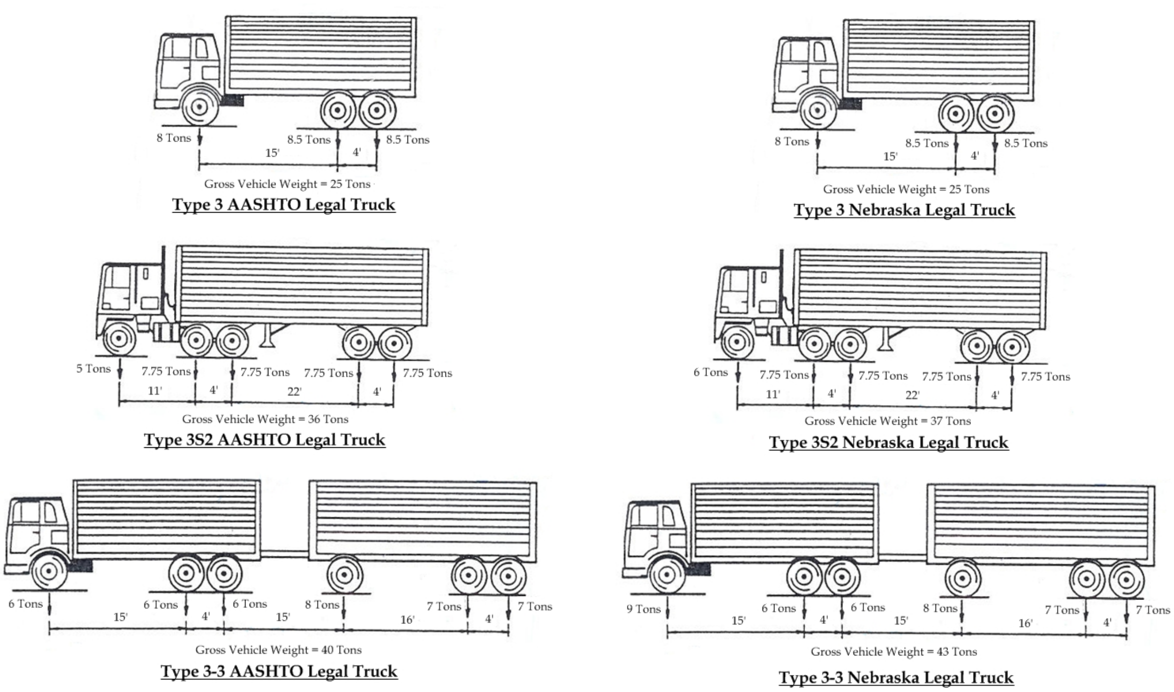
This ftp site is available for Bridge Owners, FHWA and consultants via password. Bridge Owners may use the ftp site as a location for backup of their documents.

5.6 NEBRASKA LEGAL TRUCKS AND AASHTO TRUCKS

Load ratings are normally completed for three types of trucks as well as for design loading as required by AASHTO. Sometimes, other types of vehicles are use d to load rate a bridge; for example, if a special permit load to transport a heavy load is used, and has a unique axle spacing.

AASHTO requires that load ratings be completed with the AASHTO standard rating vehicles as well as for AASHTO design vehicle loads. Design live loads typically are larger than actual vehicles in use on the road. See the AASHTO Manual for design live load information.

Load rating vehicles are representative of trucks typically using roads in the United States. Each state determines by statue the maximum legal axle weight and spacing for vehicles in their particular state. The following figure on the right shows the load rating vehicles Nebraska uses with their corresponding Nebraska legal truck axle weights determined by Nebraska statute. The AASHTO rating vehicles are on the left for comparison. Only the Type 3 truck is the same for both.



AASHTO LEGAL TRUCKS

NEBRASKA LEGAL TRUCKS

These photos generally depict the configuration of each Legal truck.

NE Type 3

NE Type 3 S2

NE Type 3-3

5.7 BRIDGE LOAD POSTING

5.7.1 General

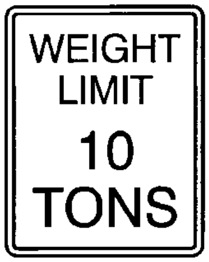
The Bridge Owner must have a current load rating in the Individual Bridge Record at the Owner's office. The load rating shall be prepared by a Load Rating Engineer and documented on the Load Rating Summary Sheet which shall be accessible to determine load capacities and postings.

As a general rule, bridges capable of carrying Nebraska legal truck loads do not require posting. A bridge shall be load posted at the Recommended Positing 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. All bridges rated less than 3 Tons at the Operating Level shall be closed and barricaded to all traffic.

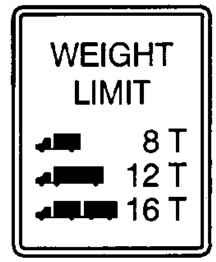
Bridge Owners or their consultant LRE are responsible for reviewing inspection reports and assessing the structures regarding the need to revise the load rating. The LRE notifies the Bridge Owners if a structure's load rating indicates load posting is required or if the bridge should be closed due to the load rating.

See 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

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.

NDOR highly recommends that Bridge Owners use the R12-5 sign showing three truck-posting for **all** structures that require load posting. The R12-1 single limit sign, which would show the lowest tonnage truck, unnecessarily limits the use of the structure.

Weight limit signs should be installed in accordance with the Manual of Uniform Traffic Control Devices. NDOR 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

Nebraska Department of Roads - Bridge Division

Load Rating Summary Sheet

Analyst ....

State Bridge Number .... Analysis Date ....

County Bridge Number .... Year Built ....

Structure Type .... Year Reconstructed ....

Highway System .... Design Load ....

NBI Rating Factor Summary (HS or HL93):

Inventory Capacity .... Operating Capacity ....

Legal Truck Summary:

Type 3 (Tons) .... Type 3S2 (Tons) .... Type 3-3 (Tons) ....

Recommended Posting Summary:

Type 3 (Tons/NA) .... Type 3S2 (Tons/NA) .... Type 3-3 (Tons/NA) ....

Posting is required for capacities less than 25T, 37T, and 43T respectively. Gross Posting should be avoided.

Permit Load Summary:

Type 3 (Tons) .... Type 3S2 (Tons) .... Type 3-3 (Tons) ....

For permitting purposes only, capacity based on a single lane distribution factor with no impact. *Condition code(s) too low.
No other vehicles are to be allowed on the bridge, crawl speeds less than 5 mph, and no gear shifting or braking, are to be strictly observed

The Legal Truck Summary results are the values **calculated** by the LRE for each of the Nebraska Legal Trucks.

The Recommended Posting Summary values are those recommended by the LRE for each of the Nebraska Legal Trucks based on their engineering judgment. Recommended values may be lower than the Legal Truck Summary values. **The Owner shall not load post a bridge higher than values shown in the Recommended Posting Summary.**

- **If any values shown in the Recommended Posting Summary are <u>less</u> than the gross vehicle weight for the Nebraska trucks, then the bridge must be load posted.**
- If any values shown in the Recommended Posting Summary are **more** than the gross vehicle weight for the Nebraska trucks, no load posting is required.
- A value of “NA” indicates that posting is not required for that specific truck. If a sign is installed, then for that truck, the gross vehicle weight for the Nebraska Legal weight should be on the sign; **(Type 3 = 25 Tons, Type N3S2 = 37 Tons, and Type N3-3 = 43 Tons)**

See the examples that follow.

The Nebraska Legal Weights are:

Type 3 25 Tons	Type N3S2 37 Tons	Type N3-3 43 Tons

The LRSS show these values.

Legal Truck Summary:

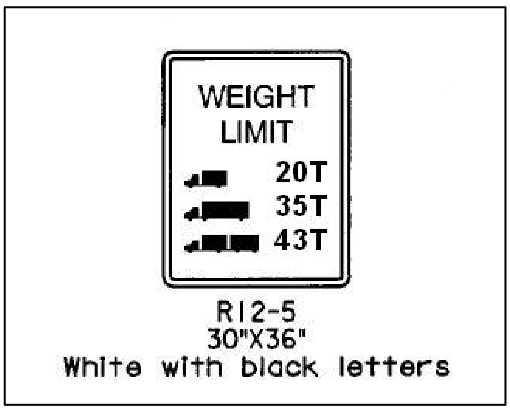
Type 3 (Tons)	20	Type 3S2 (Tons)	35	Type 3-3 (Tons)	57

Recommended Posting Summary:

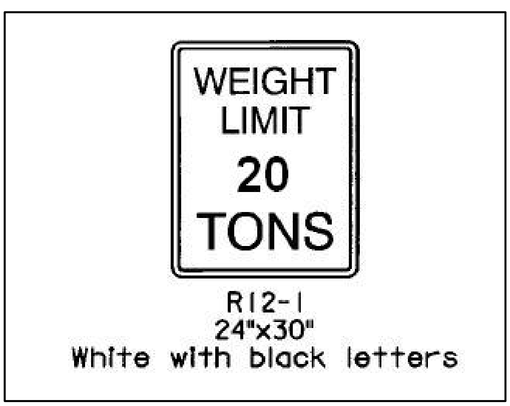
Type 3 (Tons/NA)	20	Type 3S2 (Tons/NA)	35	Type 3-3 (Tons/NA)	NA

Posting is required for capacities less than 25T, 37T, and 43T respectively. Gross Posting should be avoided.

The three-truck posting sign would look like the following. Note the Type 3-3 shows the 43 Ton Legal weight.



The single-truck posting sign would look like the following. Note that NDOR recommends using the three-truck sign for all roads. An Owner may use the single-truck signs, but only on local roads.



5.8 SITUATIONS REQUIRING LOAD RATING OR ASSESSMENT

There are certain situations where a 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

Reconstruction is any work that changes the bridge roadway width, the load carrying capacity (increase or decrease). Structural and geometric changes all require a PE to complete design, then seal and sign the plans and specifications. The engineer shall also complete the load rating. (Note: Reconstruction can alter 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 likely be necessary.)

Examples of reconstruction:

- Deck alteration that effectively increases dead load, as for replacement of a timber deck with a concrete deck;
- Addition of new spans;
- Converting pin and hangers to continuous design;
- Converting simple spans to continuous design (conversion of simple prestress girders with continuous re-deck);
- Substructure modification that includes new pile spacing or configuration or cap alterations (repairs, jackets, concrete encasement, additional bent);
- Modification/alteration to fracture critical details (pins, link plates, redundant catch systems);
- Modification/alteration or addition of fatigue prone details (cover plate, pins, link plates);
- Replacement of the substructure
- Replacement of the existing stringers with different size or type
- Replacement of the superstructure
- Replacement the deck
- Bridge widening

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) or 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 competed

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).
- Repaired to address a critical finding or a repair 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 drops in condition rating (Item 58 Deck, Item 59 Superstructure, Item 60 Substructure, Item 62 Culverts, or NE Item 320 Piling) may trigger a new load rating.

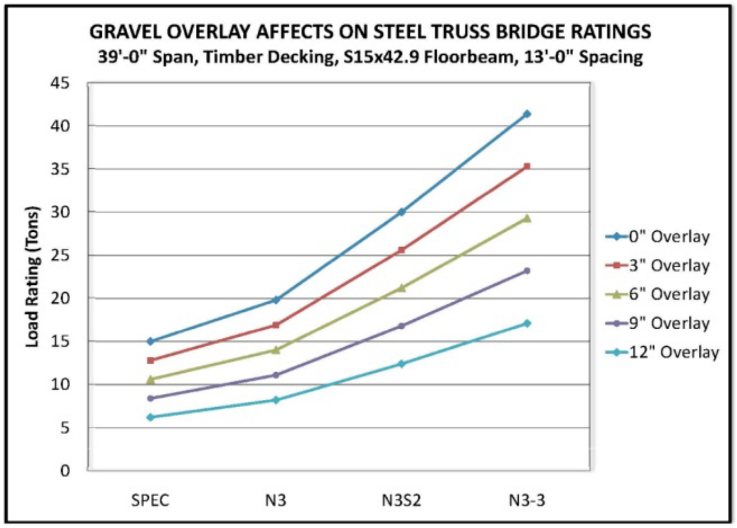
- Condition rating drops from 5, Fair Condition to 4, Poor Condition;
- Condition rating drops from 4, Poor Condition to 3, Serious Condition.

Note that when a bridge inspection results in the condition rating (Item 58 Deck, Item 59 Superstructure Item 60 Substructure, Item 62 Culvert, or NE Item 320 Piling) of 2 or less, the structure must be closed to traffic.

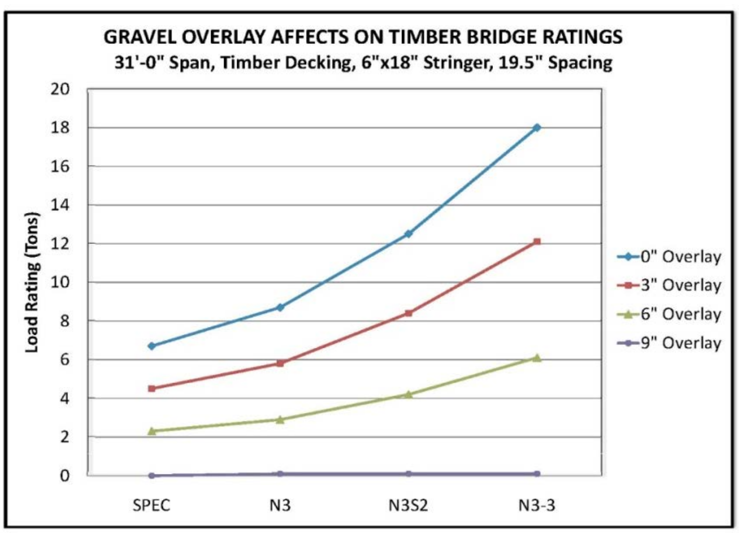
5.8.5 Change in Overburden Dead Load

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 trucks types and for two structure types that are typical in rural Nebraska. The Special Vehicle shown in the graphs that follow is a typical modern tractor pulling a grain wagon with a single 25 Ton axle.



Floor Beams of a Three-panel Pony Truss



Timber Stringer Bridge

5.9 INVENTORY ITEMS RELATED TO DESIGN LOAD, RATING AND POSTING

The LRE determines the values shown in the following table as well as Permit loads for the three legal trucks in Nebraska. All values are reported on the LRSS.

NBIS and NE Inventory Items related to Design Load, Load Rating and Load Posting

S = static item – typically don't change each inspection cycle
D = dynamic item – may change each inspection cycle
I = initial entry
V = verify, notify BIP Program Manager of changes on marked up SI&A sheet
E = enter into Pontis when changed
P = prepared by

Item No.	Item Name	Static/ Dynamic	PM Staff	TL	LRE	Coding (See Chapter 3 Bridge Inventory Coding for complete detail.)
31	Design Load	S	I			
41	Structure Open/Posted/Closed	D	I	E		Actual operational as found by the inspector B – open, posting recommended but not implemented K – bridge closed P – posted
63	Method Used To Determine Operating Rating	D	E		P	
64	Operating Rating	D	E		P	Calculated (NDOR requires Rating factor)
65	Method Used To Determine Inventory Rating	D	E		P	
66	Inventory Rating	D	E		P	Calculated (NDOR requires Rating factor)
70	Bridge Posting	D	E			Office calculated for current condition 5 – no posting required 4 or less – posting required
203A	Posted Weight Limit Truck 1	D		E		As found by the TL
203B	Posted Weight Limit Truck 2	D		E		As found by the TL
203C	Posted Weight Limit Truck 3	D		E		As found by the TL
380	Percent of Stress Reduction					Void
381	Rating Program Used		E		P	
384	HS Inventory Rating		E			No longer used in the NE Inventory
385	HS Operating Rating		E			No longer used in the NE Inventory
386A	Load Rating for NE Legal truck, Type 3	D	E		P	Recommended for current bridge condition
386B	Load Rating for NE Legal truck, Type 3S2	D	E		P	Recommended for current bridge condition
386C	Load Rating for NE Legal truck, Type 3-3	D	E		P	Recommended for current bridge condition

Load Rating Engineers must be familiar with FHWA Memorandum *Bridge Load Ratings for the National Bridge Inventory*, October 30, 2006. FHWA advises reporting in rating factors, versus Tons, for all structures. Coding methods had been revised in 2004 to allow reporting of rating factors for all rating methods (Load and Resistance Factor, Load Factor and Allowable Stress). In 2012, NDOR began reporting rating factors to FHWA.

FHWA further made revisions to Coding for several items. See these FHWA Memorandums:

- *Bridge Revisions to the Recording and Coding Guide for the Structure, Inventory and Appraisal of the Nation's Bridges (Coding Guide) – Item 31, Design Load, and Items 63 and 65, Method Used to Determine Operating and Inventory Ratings*, February 2, 2011.
- *Revisions to the Recording and Coding Guide for the Structure, Inventory, and Appraisal of the Nation's Bridges (Coding Guide) Items 63 and 65, Method Used to Determine Operating and Inventory Rating*, November 15, 2011.

5.10 LOAD RATING VEHICLES

Illustrations of the Nebraska Legal Trucks and the AASHTO truck are shown previously in Section 5.6 above. These illustrations show the axle spacing and axle loads.

Vehicle Type	Type	NE ID for load rating	AASHTO Weight	Nebraska Legal Weight	Wheel Load (half axle)
H20	Design		20 Tons	na	16,000 lbs
HS20	Design		36 Tons	na	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
HL-93	Design		36 Tons***	na	16,000 lbs

* AASHTO Type 3 and Nebraska Type 3 have 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.

NBIS Inventory and Operating Ratings (Items 64 and 66) 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 for Type 3, Type N3S2 and Type N3-3 trucks for multiple lanes (where applicable) and impact. Wheel loads for analysis shall be equal to half of the axle load for a given truck.

Permit Load ratings are based on Operating Level and are calculated for NE legal trucks in a single lane with no impact. An additional analysis should be done with this load. If completed with LARS for non-state bridges, the LRE should submit the LARS files to NDOR. Permit Load Summary load ratings are shown on the LRSS, and are not reported in the Nebraska Inventory.

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 and 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 includes 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

Load rating report at a minimum shall include the following:

- Load Rating Summary Sheet; It is recommended that the LRSS be the first page in the Report.
- The inspection report showing the inspection date and the condition that generated the need for rerating;
- Calculations and documentation of values used in the load rating such as live load distribution factors and dead load values;
- Documentation of section reduction for members, if taken;
- Bridge load rating software input and output documentation in permanent format such as hard copy, pdf, or other secured electronic files.

The person completing the QC shall initial and dated all pages of the Report.

An electronic copy of the Report shall be submitted to NDOR. See Deadlines in this Chapter. A copy must be furnished to NDOR either by the Owner or, at the direction of the Owner, through the LRE.

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 (posting and permitting) 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. A LRSS example is in the Appendix. Instructions for completing the Summary Sheet are provided with the form; additional guidance is given in this section.

Bridge Owner retains the original sealed, signed and dated by the Load Rating Engineer retained in the Bridge Owner's Bridge Record.

5.11.2.1 Analyst

The Analyst field on this Summary Sheet shall be the Load Rating Engineer's Nebraska license number; these are typically four or five digit numbers. Do not include the "E" that precedes the NE PE license number as shown on the license.

5.11.2.2 Additional Comments Section

The purpose of the Additional Comments section of the Summary Sheet is to provide a complete summary of the condition of the bridge, 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 examples below.
- The controlling element of the load rating and associated key points;
- Date of inspection report documenting the condition that generated the need for rerating
- Documentation of critical findings and/or maintenance issues;
- 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 concrete deck;
- The effect of gusset plates in the structure on the load rating, especially if they govern the load rating;
- The version of LARS used to perform the load rating;
- The names of the LARS files for the load rating, including file names for structures with steel and timber LARS files;

Examples of comments would include these types of statements:

- "This bridge is currently posted at XX Tons."
- "This bridge is currently posted at XX, XX and XX Ton for truck Types 3, N3S2 and N3-3, respectively."
- "The recommended bridge load rating is shown above, and is greater than the legal limits for Nebraska Legal trucks; load posting is not required."
- "The recommended bridge load rating is shown above, and is lower than the legal limits for Nebraska Legal trucks; load posting is required."
- "The recommended bridge load rating shown above, and is lower than the current posting of XX Tons. Load posting must be adjusted accordingly.";
- This bridge is currently not posted. The recommended load rating is shown above and the bridge needs to be load posted accordingly.";
- "This bridge has no existing plans. Based on the inspected condition of the structural elements, this bridge is deemed to safely support loads in accordance with the NDOR Bridge Rating Table for Concrete Bridges with No Existing Plans."

5.11.3 Load Rating Computational Means – General Guidance

The following table is a compilation of computational means for generally used by NDOR for load rating of bridges and is provided as guidance for those performing load ratings. The Load Rating Engineer of record 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	Rating software (LARS, Virtis, etc.)
Concrete girder, CIP, simple and continuous	Rating software (LARS, Virtis, etc.)
PS Concrete slab, continuous	Structural analysis software or other custom tools
PS Concrete NU or AASHTO girder, simple and continuous	Rating software (LARS, Virtis, etc.)
PS Concrete IT girder, simple and continuous	Rating software (LARS, Virtis, etc.)
PS Concrete double tee beam	Rating software (LARS, Virtis, etc.)
PS Concrete, hollow core slab	Rating software (LARS, Virtis, etc.)
Steel, rolled beam stringer, simple or continuous	Rating software (LARS, Virtis, etc.)
Steel, plate girder, simple or continuous	Rating software (LARS, Virtis, etc.)
Steel, truss	Rating software (LARS, Virtis, etc.)
Timber, stringer	Rating software (LARS, Virtis, etc.)
Steel culverts	NDOR provided spreadsheet
Concrete culverts	Rating software (BRASS)
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	Structural analysis software or other custom tools
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

Load ratings completed with software must be completely and permanently documented. Permanent records should be hard-copy and/or electronic documents such as a pdf of dated rating input files and output files of software-generated ratings.

NDOR uses Bentley LARS software for bridge ratings on state bridges because it is compatible with Bentley Superload software used for permitting over-sized vehicles. NDOR prefers that other Bridge Owners and their Consultants use LARS bridge rating software to maintain the uniformity of the Nebraska Bridge Inventory database.

LARS documentation for specific customization settings used by NDOR is provided in the Appendix of this Manual. Bridges that have multiple simple spans of the same material should be included in the same LARS file. Bridges that have multiple spans of differing materials (steel and timber) are very common. For bridges with steel and timber spans, two LARS files will be included in the records. It is recommended that the LARS file for steel be named with the structure number followed by the letter “S”. Likewise, the file for the timber span(s) should be named with the structure number followed by the letter “T”.

5.11.5 Load Rating Methods

The following is a brief summary of load rating methods. See FHWA Memorandum *Bridge Load Ratings for the National Bridge Inventory*, October 30, 2006 for additional information on method to be used for a given bridge.

5.11.5.1 Allowable Stress Rating (ASR)

Allowable stress method compares unfactored load effects and stresses to an allowable stress for a given material in accordance with the MBE. NDOR's policy is to use the ASR method only on timber and masonry elements.

5.11.5.2 Load Factor Rating (LFR)

Load Factor 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. NDOR's policy is to use LF for steel and concrete elements.

5.11.5.3 Load and Resistance Factor Rating (LRFR)

Load and Resistance Factor method compares factored load effects to the resistance of a member of a given material in accordance with the MBE LRFR. FHWA will require that bridges and total replacement bridges designed by LRFD Specifications using HL-93, after October 1, 2010. 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 customary 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.

5.11.6.3 Posting Level

Posting Level corresponds to a load capacity selected by the governing state agency for load posting bridge structures. NDOR'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), 5.1.1 (concrete), 5.1.1 (timber) and 5.11.11 (other) for additional information.

5.11.7.1 Span lengths

The distance between the centerlines of bearing is to be 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 factor 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.

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 govern the overall rating of a bridge. If it does, this needs to be noted in the Summary Sheet. 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.

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 Fracture Critical (FC) Structures

Steel fracture critical structures with fatigue prone connection details (pins, gusset plates, welds on FC members in tension, etc.), require connections 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 ADTT.

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.

5.11.8.6 Shear Resistance in Steel Floor Beams, LARS

LARS software will not rate floor beams for shear at this time; however, Bentley is developing this feature. Manual calculations must be done and included in the load rating records.

5.11.8.7 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 Summary Sheet Comments, but the member may be considered effective when calculating a load rating.

Truss members may be modeled in LARS by inputting the section properties calculated manually. Include the manual calculations in the Load Rating Report.

5.11.8.8 Gusset Plates

Bridge owners are strongly encouraged 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.

5.11.8.9 Policy for Bracing by Deck – Expired, 2012

NDOR 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, and this policy is described in this section. This policy expired January 1, 2012. NDOR continues to document and monitor those bridges that had invoked this policy in the load rating of the structure.

In the case where lateral bracing was not present, corrective action by the Bridge Owner was completed by installing lateral bracing. The Bridge Owner subsequently reported the current bracing status and the bridge was rerated based on the installed lateral bracing configuration and spacing. If the Bridge Owner did not install lateral bracing for the beams by the policy's expiration date, the structure was rated for the actual acceptable bracing layout, which may be totally unbraced.

In the case where lateral bracing existed, the Bridge Owner verified the configuration and spacing of lateral bracing, and the bridge was rerated.

The policy was based on research done by the University of Texas at Austin conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration entitled "Bracing Effects of Bridge Decks", as endorsed by the University of Nebraska at Lincoln (UNL) and the National Bridge Research Organization (NaBRO). The research found that the decks typically had sufficient stiffness to force the supporting stringers to yield before buckling. Also, according to section 6.1.4 (6.1.5 in Oct 2003 Edition) of the AASHTO Manual for Condition Evaluation of Bridges (second edition), there may be instances in which the behavior of a member under traffic is not consistent with that predicted by the controlling design specification. In this situation, deviations from the controlling specifications based on the known behavior of the members under traffic may be used and should be fully documented.

NDOR's policy was that in the calculation of a load rating, the unbraced length of simple span steel girders could be reduced by one-half for steel beams meeting the following requirements. Steel spans not meeting these requirements were rated with the actual unbraced length.

- The bridge is a simple span steel girder design.
- The span length ≤ 40 ft.
- Deck is bearing directly on the top flange at midspan.
- At least 4 lines of girders of equal section are present.
- The actual cross section remaining is used in the computation of load capacity.
- Deck condition code (Item No 58) shall be greater than or equal to 5 (Fair).
- Superstructure condition code (Item No 59) shall be greater than or equal to 5 (Fair).

When the policy was applied to the load rating of any structure the following restrictions also applied:

- The moment capacity applied to the final load rating shall be limited to that of the factored yield moment for determining operating and inventory levels (i.e. use of plastic section capacity is prohibited).
- The routine inspection interval must be limited to no more than 12 months.
- Routine inspections shall include specific comments as to the observed lateral stability of the girders and verification that all requirements as to the implementation of this policy are still met (see policy above).
- Appropriate reference to this policy shall be made on the Load Rating Summary Sheet in the Additional Comments section. An example note is:

"Based on a thorough review of the mm/dd/yyyy inspection report, the beam’s unbraced length is reduced by one-half in accordance with the Bracing by Concrete or Timber Deck Policy in the calculation of this load rating. A 12-month routine inspection interval is required until the Owner installs lateral bracing. Future inspections shall include specific comments as to the observed lateral stability of all girders and that all requirements for implementation of this policy are still applicable."

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 type bridges on Nebraska Roads. For concrete bridges without plans, see the subsequent section.

NDOR 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. There are some monolithically cast concrete girders in use. Slab type bridges include continuous concrete slabs, pre-cast, nonprestressed 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. 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 timber bridge plans are nonexistent, data collection, inspection and field measurement will be required. NDOR 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.

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 with the exception of 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 need for re-load rating. NDOR requires that the deck be load rated if the timber deck condition rating is 3 or less.

5.11.10.6 Lateral Bracing

Lateral bracing is not included in the evaluation of timber members as performed by LARS. 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, I_u 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 code, Item No. 58 is greater than 4, the stringers may be considered laterally braced by:
  - The embedment of the stringer into the concrete;
  - The continuous nailing of timber planks into the stringer.

If the above two conditions don't exist and if lateral bracing is not present at the points of bearing and one or no intermediate diaphragms are present the bridge shall be closed until corrective action is taken.

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, C_L, 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 C_L be taken to be greater than 1.0.
- C_L shall be computed at inventory level using F_b* = 1050 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.

5.11.10.9 Stringer Condition and Capacity Calculation

Defect modeling (i.e. section remaining) is not a capability currently provided for in LARS. Modeling of the effective section capable of contributing to the resistance of applied loads within the load rating software will often be a matter of sound engineering judgment.

5.11.10.9.1 Broken Stringers

See Figure A, Broken Stringer that follows. In the event that 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.

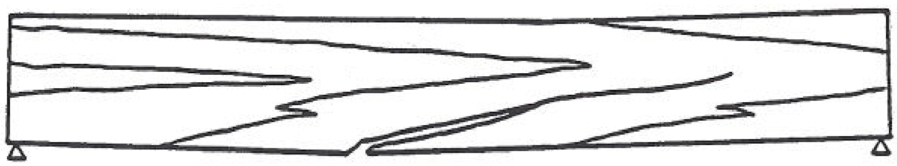
Shear and bending strength will be determined based on the section remaining (i.e. according to the effective section depth). Shear increase factors shall **not** be applied.

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.

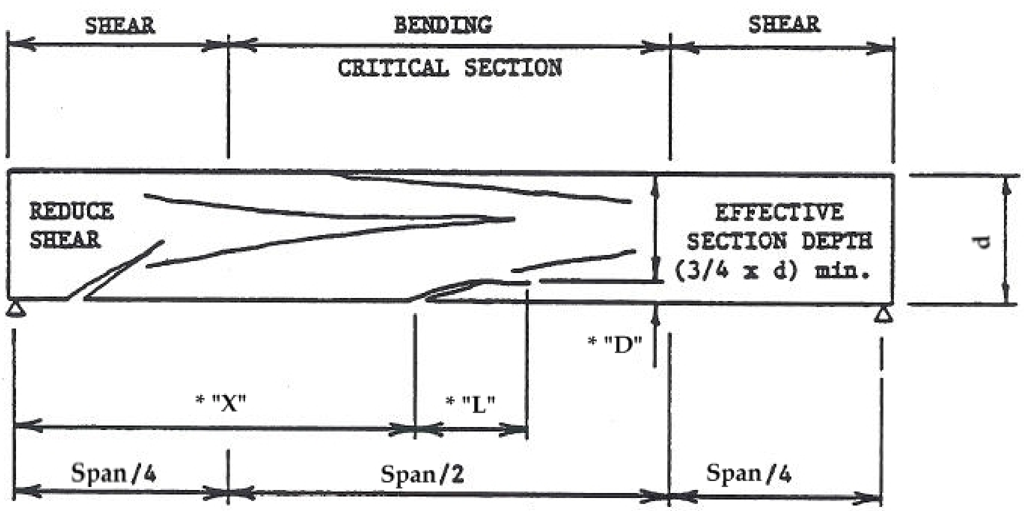
Splits extending **less than ¾ the length of the stringer shall not** be considered to affect member capacity and may be ignored. Splits extending **greater than ¾ the length of the stringer shall** be considered to affect member capacity and shall be analyzed using the section remaining. The section remaining used for rating shall be on the side of the split with the larger depth. Shear increase factors shall **not** be applied.

EVALUATING CONDITION OF TIMBER MEMBERS



BROKEN STRINGER

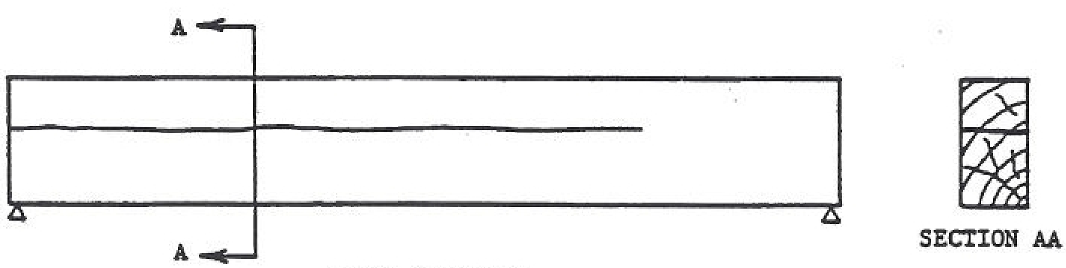
Figure A



* 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 occur 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.

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

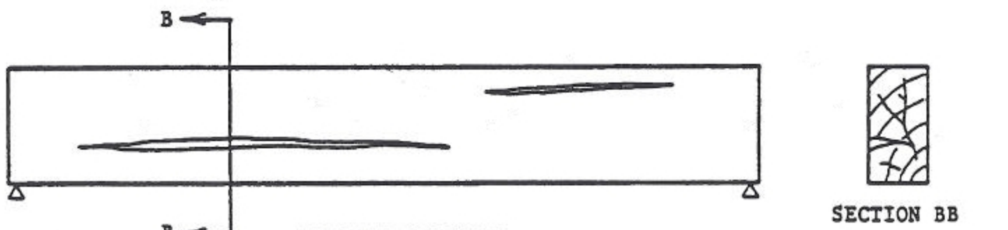
A knot shall be defined as a separation of the wood fibers due to an inner-grown limb and associated grain deviation.

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 know from the effective section depth).

5.11.11 Material Specific Considerations - Other

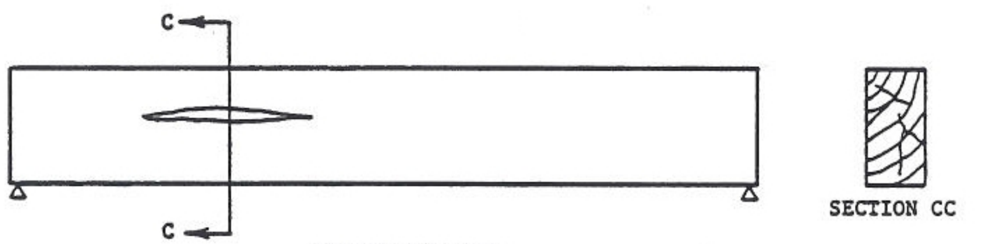
There are a few bridges in Nebraska with atypical materials, including masonry and aluminum culverts. LREs are to consult with the NDOR Bridge Inspection Program Manager for load rating these structures.

EVALUATING CONDITION OF TIMBER MEMBERS



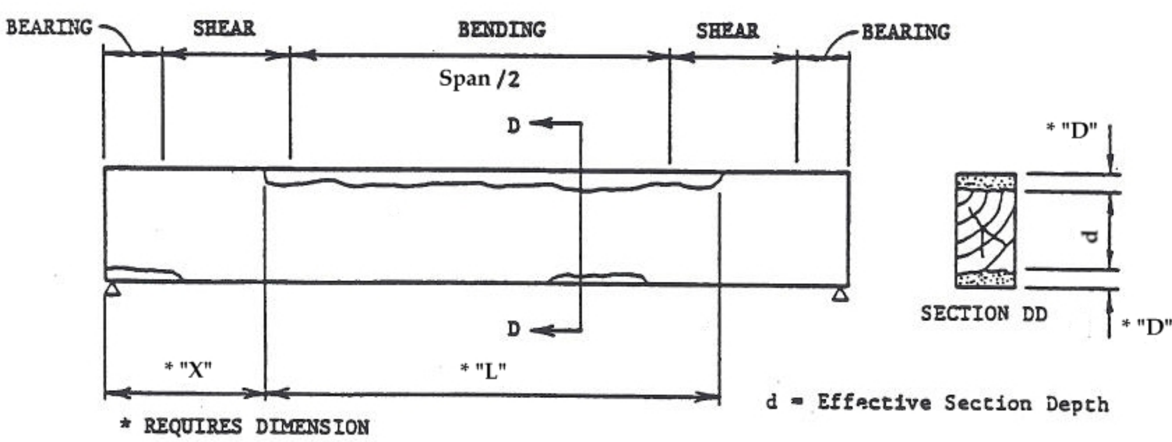
CHECKED STRINGER

Figure D



SHAKED STRINGER

Figure E



DECAYED STRINGER

Figure F

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 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 a LRE. NDOR, 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 a 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.

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 Comment section shall include a statement by the LRE. See Section 5.11.2 above. Bridge Rating Table for Concrete Bridges with No Existing Plans."

NDOR Bridge Load Rating Table for Concrete Bridges without Plans
(Values shown in Tons. This table subject to revision at NDOR discretion.)

Struc-ture	Condition Rating	HS Operating	HS Inventory	Type 3	Type 3S2	Type 3-3
CIP Slab	Good/Fair (Code > 4)	36	26	32	47	55
	Poor (Code = 4)	28	20	25	37	43
	Serious, Critical (Code < 4)	Evaluate*	Evaluate*	< 25	< 37	< 43
CIP Box Culvert	Good/Fair (Code > 4)	36	26	32	47	55
	Poor (Code = 4)	28	20	25	37	43
	Serious, Critical (Code < 4)	Evaluate*	Evaluate*	< 25	< 37	< 43
	Good/Fair (Code > 4) +	99	99	32	47	55
CIP Frame	Good/Fair (Code > 4)	36	26	32	47	55
	Poor (Code = 4)	28	20	25	37	43
	Serious, Critical (Code < 4)	Evaluate*	Evaluate*	< 25	< 37	< 43
	Good/Fair (Code > 4) +	99	99	32	47	55

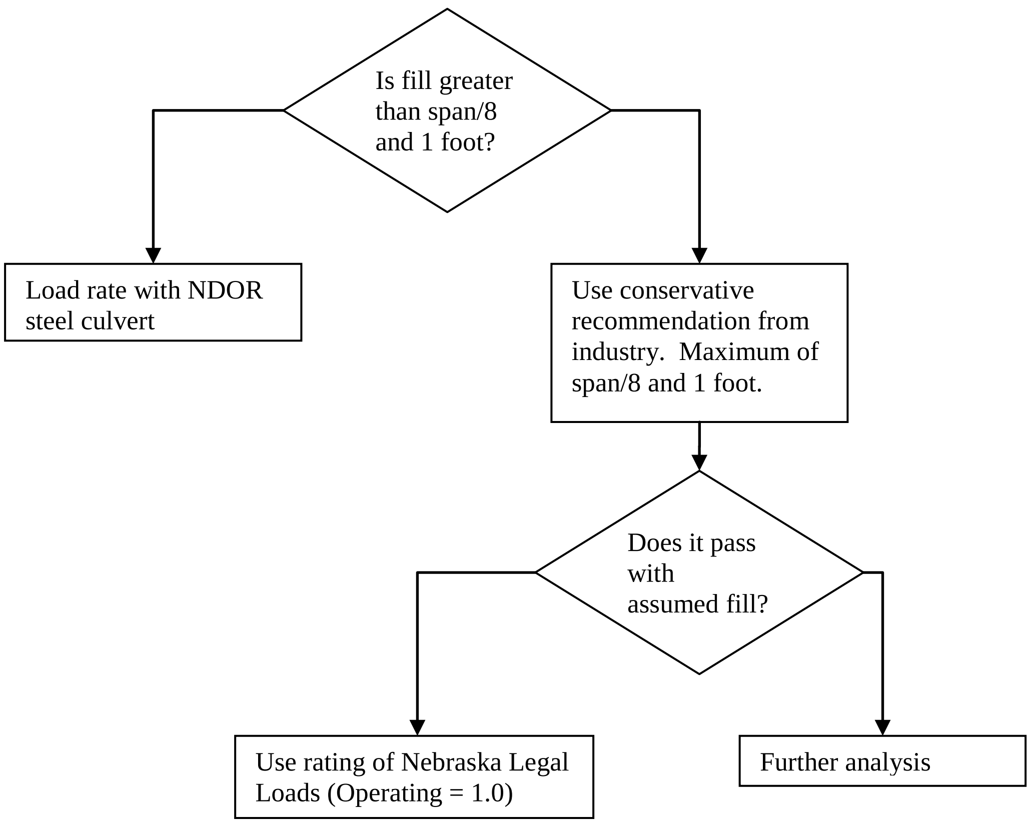
* These values must be determined by a professional engineer by evaluating the structure for condition and determining safe loads at which the bridge should be posted. Posting should be less than state legal loads for this condition rating.

\+ 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.

NDOR does not issue load permits on any bridge for which plans are not available.

5.11.13 Steel Culvert Bridges

NDOR recommends load rating steel culvert bridges based on the methodology in the National Corrugated Steel Pipe Association (NCSPA) Design Data Sheet No. 19, "Load rating and structural evaluation of in-service, corrugated steel structures.", and information from Ohio Department of Transportation. NDOR has developed a spreadsheet for load rating these structure based on the NCSPA method and it is available for LRE use. The process is described in the following flowchart.



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 NDOR'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 NDOR;
- 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 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.

5.13 QUALITY ASSURANCE

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

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

5.15 FORMS

Forms used in completing load ratings that are mentioned in this Chapter are listed below. Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOR Bridge Inspection Program website for the current list of applicable forms and the most recent versions of each form. http://www.nebraskatransportation.org/ design/bridge/bipm.htm

Name	DR Form
Load Rating Summary Sheet	DR465
Load Rating Summary Sheet Instructions, truck configurations	N/A
Field Measurement Forms	N/A

5.16 APPENDIX

Memos and other guidance that may have been issued after the issuance of the current revision of this Chapter can be found at the NDOR Bridge Inspection Program website at http://www.nebraskatransportation.org/design/bridge/bipm.htm.

Bridge Owners and Load Rating Engineers are urged to check this site to ensure they have all the most current information and forms for load rating.

Name	Revision Date
NDOR LARS Configuration Settings	N/A

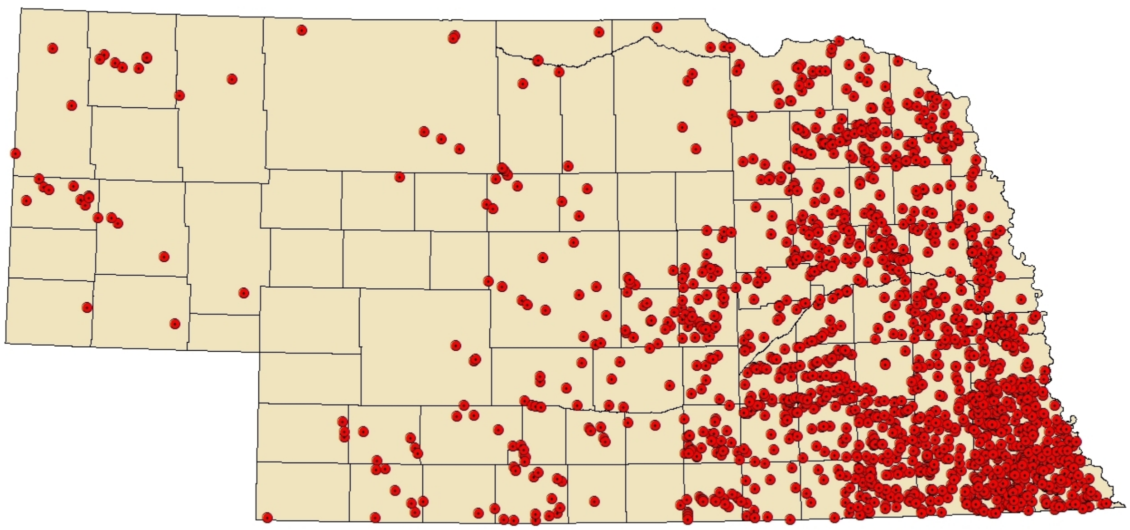
6.1 GENERAL

The purpose of this chapter of the NDOR Bridge Inspection Program Manual is to provide guidance to Bridge Inspectors on channel behavior and to provide information on how inspectors' observations contribute to the overall process of monitoring scour at bridges. Another key purpose is to set policy and provide guidance to Bridge Owners and their hydraulic engineers to meet the NBIS requirements regarding scour critical bridges:

- Identify scour critical bridges;
- Prepare a Plan of Action (POA) for scour critical bridges;
- Monitor known and potential deficiencies;
- Address scour-related critical findings;
- Monitor bridges that are scour critical in accordance with the Plan of Action.

The most common cause of bridge failures are floods. The removal of material from around bridge foundations (i.e. scour) is the most common cause of flood damage to bridges. A 1973 national study indicated that of the 383 bridge failures that year, 25 percent involved pier damage and 72 percent involved abutment damage. Flood related damage is costly. A 1994 storm in Georgia left over 500 bridges damaged from scour. The cost to replace or repair these bridges exceeded $130 million.

The following map was developed in 2010 and shows the scour critical bridges as determined from hydraulic assessment. Scour is particularly prominent in southeast Nebraska where the area soils are susceptible to erosion and in the early 1900 many of the streams were straightened, thus steepening the stream grade and disrupting the natural gradient. Scour in stream beds in Nebraska generally takes place in sand beds at stream velocity of 5 feet/second and can scour at every storm, then as water recedes, the scour holes fill back in. Stream beds with cohesive, clay soils typical start to scour when stream velocity reaches 7 feet/second.



Scour Critical Bridges (April 2011

The need to ensure public safety, minimize cost and minimize the adverse effects resulting from bridge closures requires designing and maintaining bridge foundations to resist the effects of scour. Minimizing future flood damage requires careful inspection of bridges for scour and scour-related behavior.

Bridges and roadways crossing floodplains are an encroachment on the natural floodplain and their design includes consideration of hydraulic constraints, cost, risks, regulatory requirements, channel behavior, environmental impacts, engineering requirement and social concerns. Bridge contraction scour, local pier/bent scour and abutment scour can be estimated and the structure and countermeasures can be designed to withstand the calculated effects. Existing bridges may not have been designed with current methods for calculating scour nor have properly designed countermeasures and thus may be susceptible to damage or collapse during flood events and the resulting scour. Properly designed bridges may experience scour due to changes in channel behavior at the site. These structures must be identified and monitored in accordance with a defined POA.

A scour assessment utilizes hydraulic, geotechnical and structural data to determine the vulnerability of existing bridges to failure from flood events. The Interdisciplinary Scour Assessment Team (ISAT) is composed of trained bridge inspectors, para-professional bridge personnel, and hydraulic, geotechnical and structural engineers, who combine their special skills to prioritize and inspect bridges, assess channel behavior and evaluate the structures for scour.

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.

6.2 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.

6.3 ROLES AND RESPONSIBILITIES

6.3.1 Bridge Owners

Bridge Owners in Nebraska include the Nebraska Department of Roads, cities, municipalities and counties.

Bridge Owners are responsible for:

- Providing a scour assessment and hydraulic analysis that defines the scour NBI Item 113 code for new and existing bridges and retaining the information in the Owners Bridge File.
- Maintain a list of their scour critical bridges.
- Ensuring the bridges under their authority are evaluated for potential scour;
- Ensuring that scour critical bridges under their authority have a Plan of Action;
- Monitoring scour critical bridges and updating the POA, including maintenance of scour countermeasures.
- Completing, or ensuring completion, Quality Control (QC) of the scour assessments and POAs for bridges under their authority.
- Maintaining current scour assessments/evaluations and POA for their scour critical bridges.
- Maintaining a log documenting the POA monitoring activities and actions taken.
- Ensuring scour documentation is kept in the Bridge Owner’s Bridge File.
- Maintaining a master list of all scour critical bridges.
- Maintaining design data and plans for scour countermeasures.
- Documenting visual inspections, including necessary measurements and photographs of scour mitigation, stream channel in the vicinity of the bridge, bridge substructure elements and approach embankments must be retained in the Individual Bridge Record.
- Reporting changes to stream, scour mitigation, bridge substructure elements or roadway embankments to the NDOR, including updated Item 300 series.

6.3.2 Nebraska Department of Roads

NDOR is responsible for monitoring the Bridge Inspection Program as well as offering expertise in the assessment of scour conditions and scour ratings. Responsibilities include:

- Providing guidelines for hydraulic analysis;
- Providing guidelines for assessment of scour;
- Updating annually the statewide master list of scour critical bridges;
- Ensuring that all bridges have scour evaluations completed and NBI Item 113 Scour Critical Bridges coded correctly;
- Ensuring that all scour critical bridges have POAs developed and implemented.
- Reviewing all bridge inspections for Item 358 Is There a Scour Problem, and other scour-related inspection items, to determine the need for a new hydraulic assessment.

6.3.3 Consultants Performing Services for Bridge Owners

Consultants performing inspections for Bridge Owners are responsible for:

- Being familiar with NDOR and FHWA requirements and policies on bridge hydraulics, scour assessment and preparation of POAs.
- Maintaining staff qualifications required for the Nebraska Bridge Inspection Program.
- Completing Quality Control on services 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 NDOR.

6.4 QUALIFICATIONS

The NBIS and NDOR qualification requirements are described in Chapter 1 of this Manual.

NDOR requires that engineers performing hydraulic analysis and scour assessments for structures and preparing POAs for Owners be experienced hydraulic engineers and registered professional engineers in Nebraska. It is recommended but not required that HEs completing hydraulic analysis and scour assessments be NDOR Certified Bridge Inspection Team Leaders.

NDOR recommends that individuals monitoring bridges during or after flood events are either a Hydraulic Engineer or an NDOR Certified Bridge Inspection Team Leader.

6.4.1 Hydraulic Engineer

The Hydraulic Engineer (HE) requirements are described in Chapter 1 of this Manual.

The HE leads the Interdisciplinary Scour Assessment Team (ISAT), is responsible for the data that is submitted to NDOR for the National Bridge Inventory, and seals and signs the Hydraulic Analysis Report or Scour Assessment with their NE Professional Engineers seal.

The HE is responsible for delivering the completed Report to the Owner. The HE of record is responsible for ensuring that an engineer of equal or higher qualifications than the original analyst completes QC on the hydraulic analysis report and supporting files prior to submittal to the Owner.

6.5 DEFINITIONS

These definitions apply to the NE Bridge Inspection Program.

6.5.1 Hydraulic Analysis Report

Typically, both NDOR and Consultant HEs complete Hydraulic Analysis Reports for new structures. These are completed in accordance with NDOR's Hydraulic Analysis Guidelines.

6.5.2 Scour Assessment Report

This is the Bridge Scour Inspection and Analysis as defined in the Hydraulic Analysis Guidelines for the evaluation of existing bridges for susceptibility to scour.

6.6 SUBMITTAL REQUIREMENTS

6.6.1 Hydraulic Analysis Report

Hydraulic Analysis Reports for new bridges must be submitted to the Owner prior to construction.

The Owner must submit the Hydraulic Analysis Report to NDOR within 30 days of receipt. See also Chapter 1 for NDOR Policy.

6.6.2 Scour Plan of Action

BO prepares Plan of Action, DR 385c and submits a copy to NDOR within 30 days of the scour critical status notification. HE may assist the BO.

6.7 CHANNEL BEHAVIOR

6.7.1 Six Stages of Channel Development

An understanding of the six stages of channel development is necessary for successful evaluation of potential scour related problems at a specific site. Channels are dynamic and naturally adjust to changes in climate and changes imposed by man. Channel adjustments usually occur very slowly when reacting to natural environmental change. When the channel is subjected to man made alterations, such as dredging or straightening, changes can occur rapidly.

The dominant parameters that influence channel adjustments are water discharge, channel slope, sediment transport and the average size of channel bed material. A change in any of these four parameters causes the channel to readjust.

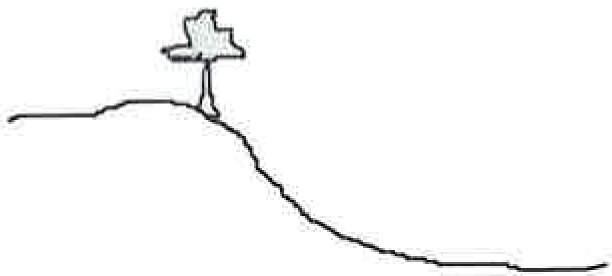
These six stages of development are used to understand how the channel adjusts when it is subjected to man made alterations. They are described in the table below and shown with illustrations and photos on the following pages. A glossary of channel element and behavior terms can be found as an Appendix to this Chapter.

Stages of Channel Development		
Stage	**Name**	**Description**
I	PREMODIFIED	The channel is in its natural state. A channel in this stage is relatively stable and properly designed bridges experience few scour problems.
II	CONSTRUCTED	This phase identifies channels recently modified by channel straightening. This phase usually has a short duration. After a major runoff event, major channel readjustments to the artificial channel are evident.
III	DEGRADATION	During this phase of channel evolution, degrading progresses in an upstream direction with a progression of headcuts. Bank heights increase and bank slopes become steeper.
IV	THRESHOLD	At this time Degradation is ending, headcuts are not visible, alternate bars start to form and channel widening by mass wasting is the dominant channel shaping process.
V	AGGRADATION	Stream meandering occurs and the flowline elevations aggrade.
VI	RESTABILIZATION	Channel equilibrium is reestablished, channel capacity is reduced and rates of channel readjustments are dramatically reduced.

Stage 1, Premodified Characteristics

- Stable
- vegetated banks to flow line
- Sediment transport
- Convex top bank shape
- Relatively shallow channel depths
- Meandering channel

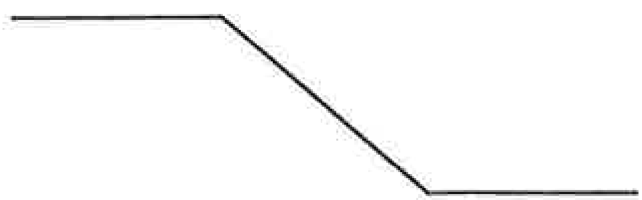
I

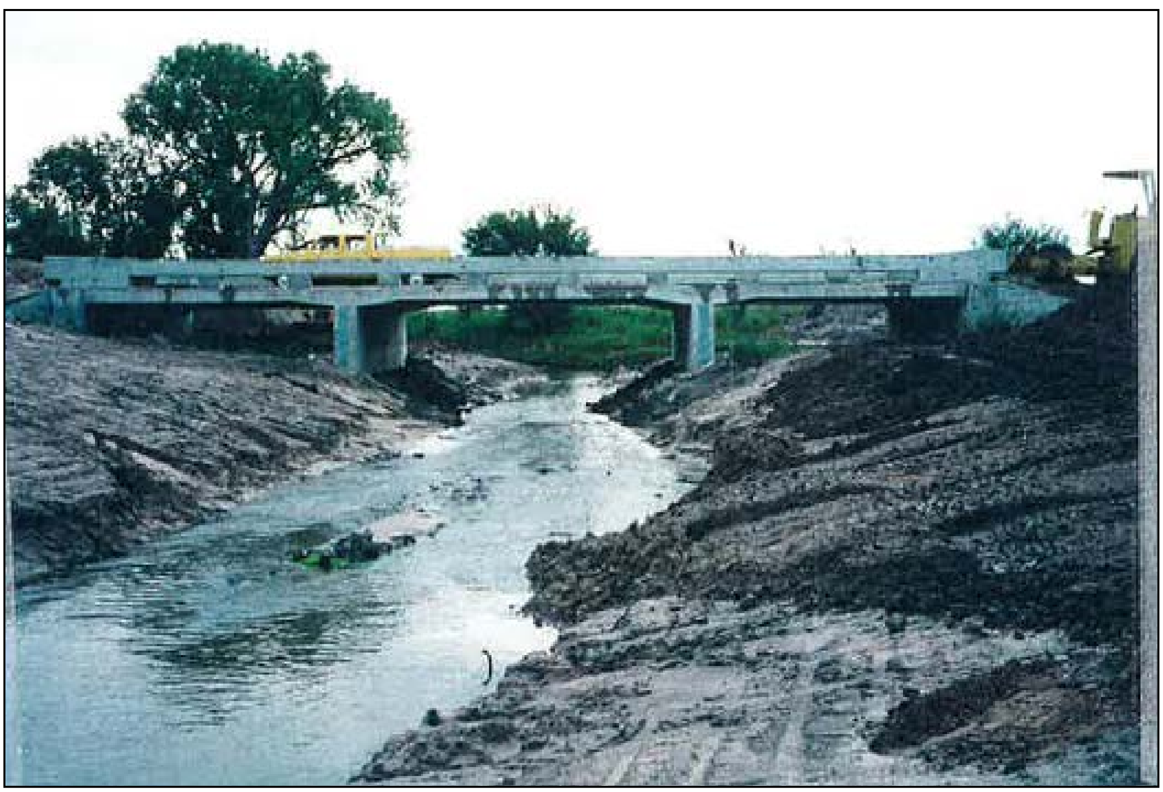


Stage II, Constructed (Modified) Characteristics

- Trapezoidal cross section
- Linear bank surfaces
- Removal of vegetation

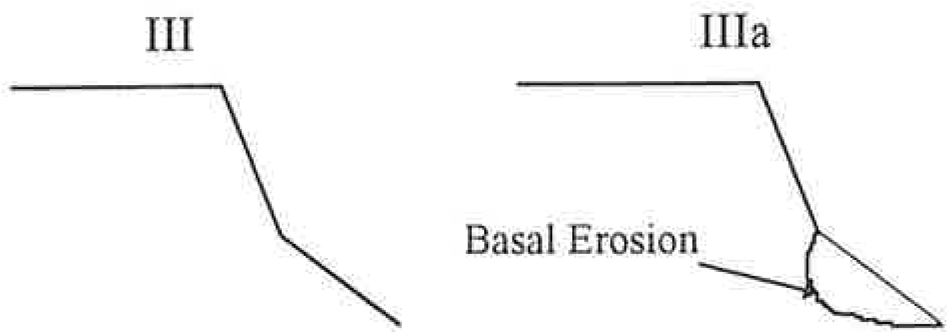
II





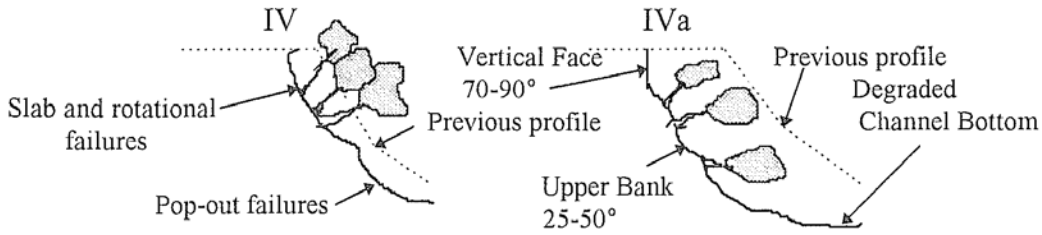
Stage III, Degradation Stage Characteristics

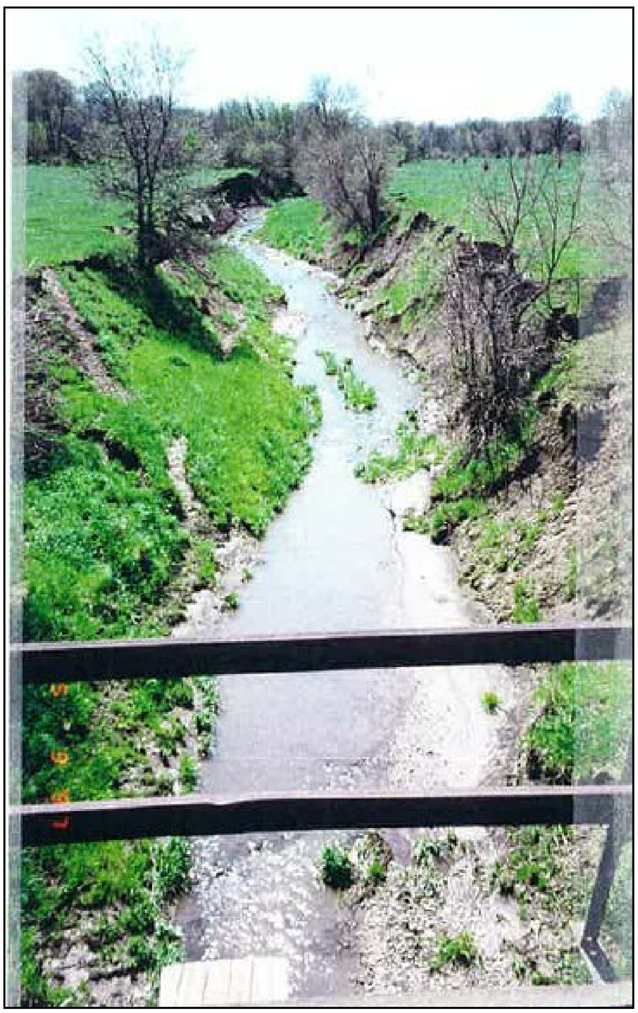
- Basal erosion on banks
- Pop out failures
- Heightened and steepened stream bank surfaces
- Head cuts
- Channel depth increasing
- Vegetation height relative to flow line and may lean to channel



Stage IV, Threshold Characteristics

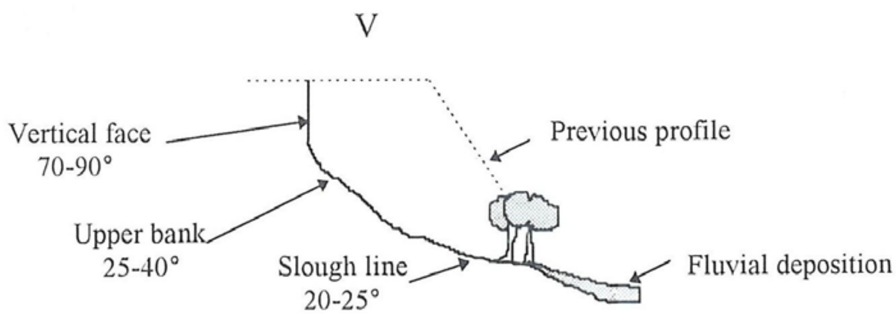
- Degradation continues
- Basal erosion on banks
- Slab, rotational and pop-out failures
- Bank retreat
- Vertical face on upper bank surfaces
- Some reduction in bank angles
- Flow line very low relative to top bank
- Tilted and failed vegetation





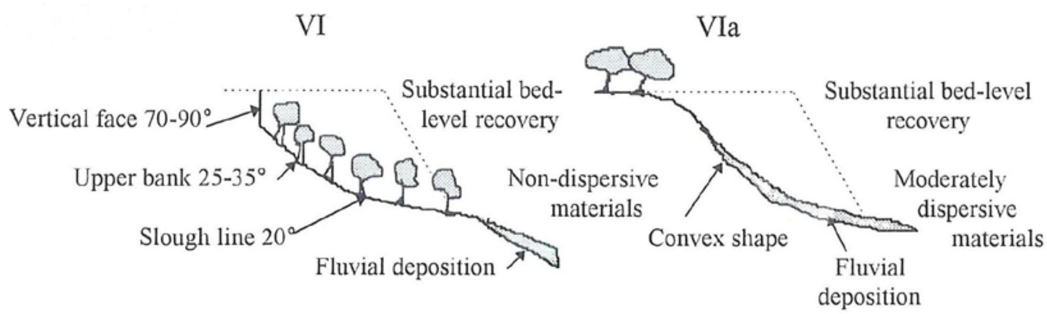
Stage V, Aggradation Stage, Characteristics

- Initial deposition of alternate bars
- Reworking of failed material on lower banks
- Low angled slides of previously failed material
- Bank retreat
- Vertical face upper bank and slough line
- Flattened bank angles
- Channel depth decreasing
- Development of new flood plain
- Tilted and fallen vegetation
- Re-establishing vegetation of banks.



Stage VI, Restabilization Characteristics

- Further development of meandering thalweg
- Further deposition of alternate bars
- Reworking of fallen material
- Low angle slides
- Stable, alternate channel bars
- Convex short vertical face at top bank
- Flattened bank angles
- Relatively shallow channel depth
- Re-establishing vegetation extends up slough-line and upper bank
- Vegetation establishing on bars



Geomorphic Processes Along Modified Streams								
Stage	**Active Process**	**Channel Process**	**Channel Flowline Slope**	**Channel Banks**	**Channel Capacity**	**Estimated Duration**	**Floodplain Inundated**	**Land Loss**
I	Premodified	Natural	Meandering Natural Slope	2:1 or flatter	2-3 years	-------	> 2-3 years	------
II	Constructed (Modified)	Artificially Straightened	Straight Valley Slope	Artificial	3-5 year	± 5 year	> 3-5 years	Gain Due to Length Reduction
III	Degradation	Depth Increasing	Straight Valley Slope	Steeper than 2:1 to Vertical	Transitioning 25-100 year	± 25 year	> 5-100 years	± 1x Depth
IV	Threshold (Transition)	Widening	Straight Valley Slope	Slopes Flatten Towards 2:1	25-100 year	± 25 year	> 25-100 years	2-4 x Depth
V	Aggradation	Depth and Width Decreasing	Transition Towards Natural	Inside Bend <2:1 Outside Bend >2:1	Transitioning	± 100 year	Transition Period	Meandering
VI	Restabilization	Natural	Meandering Natural Slope	2:1 or flatter	2-3 year	------	> 2-3 years	------

6.7.2 Bridge Scour - General

Scour is the result of the erosive action of flowing water, excavating and transporting material from the bed and banks of streams. Different materials scour at different rates. Granular soils such as sand rapidly erode, cohesive or cemented soils (i.e. clays) are more resistant. The ultimate scour in cohesive soils can be as deep as scour in sand-bed streams; it is just a matter of time.

There are three main components of scour (see the following figure):

- long-term scour (aggradation-degradation)
- contraction scour
- local scour

Total scour depth is generally considered to be the sum of the depth of these three components. Bridge scour is time dependent and generally occurs on the rising stage of flow. A scour hole can refill as flow recedes.

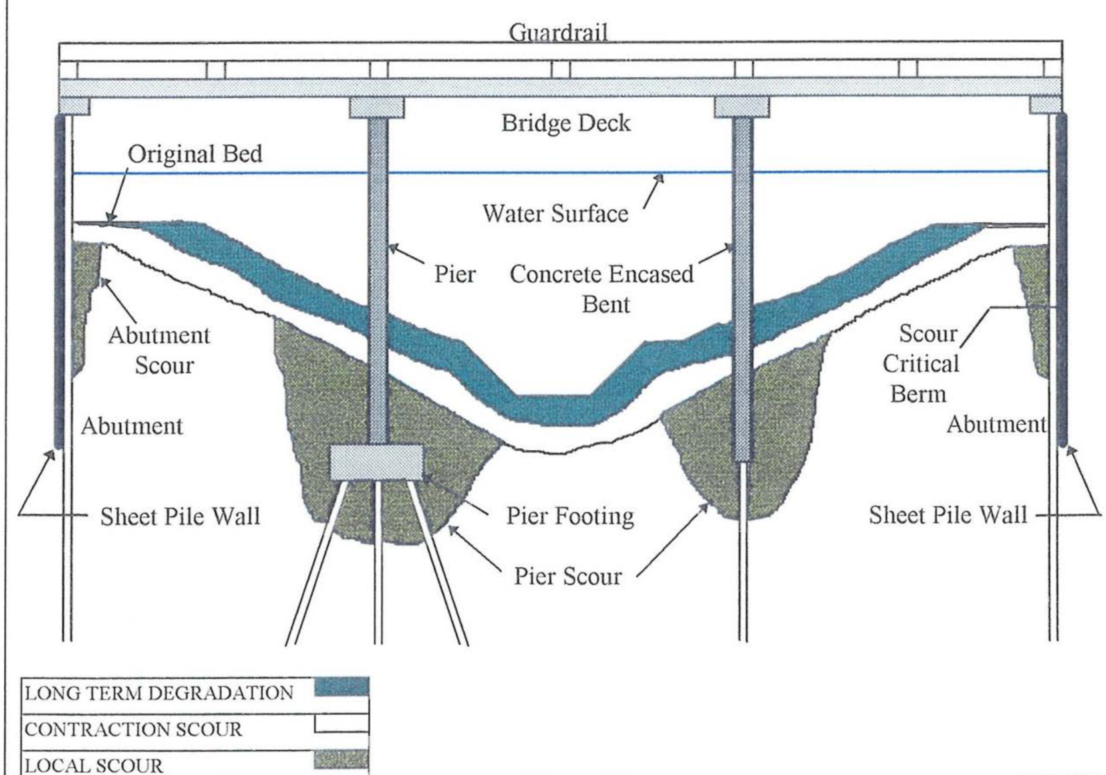


Figure 3.1 (NDOR)

Aggradation and degradation is the long term change in stream bed elevation. Aggradation adds material to the bed elevation, degradation removes it. It is estimated by comparing stream cross-section profiles over time.

Contraction scour is the removal of bed material across most or all of the width of the channel. It is caused by:

- natural stream constrictions
- contraction of flow by bridge or approaches
- islands, bars, berms, ice, debris, or vegetation
- change in downstream control

Local scour is the removal of bed material from a small part of the channel. It occurs at an obstruction such as a pier, abutment, embankment, etc. It is caused by the acceleration of flow and vortex development resulting from the impact of the flow with these obstructions.

Rivers are in a constant state of change. A shift in the meander of the stream near a bridge may erode the approach or change the total scour because of the change in the attack angle.

6.7.3 Long-Term Scour (Aggradation and Degradation)

Aggradation and degradation are long-term streambed elevation changes due to natural or man-induced causes. Aggradation involves the deposition of material at a site eroded from the watershed upstream of the site. Degradation involves the lowering or scouring of the streambed due to a deficit in sediment supply from upstream. Aggradation and degradation are not caused by the bridge but are geomorphic processes that occur in a watershed and balances water flow and sediment transport within the basin.

The long-term trend of aggradation or degradation may change during the life of the structure. The changes could be the result of natural processes or human activities. Factors affecting long-term bed elevation changes include:

- dams and reservoirs (up or downstream of bridge);
- changes in watershed land use (urbanization, deforestation, etc.);
- channelization or cutoffs of meander bends which result in increases in channel gradient and capacity (natural or man-made) as shown in the following aerials;
- gravel mining from the streambed;
- diversion of water into or out of the stream; and
- movement of a stream bed.

Consequences of degradation are bank failures and channel widening (the result of steeper and deeper banks).

The following photo shows a natural meander cutoff north of the east-west county road. The channel was also straightened through the bridge site. The west bank just north of the road is being attacked by the stream flow.

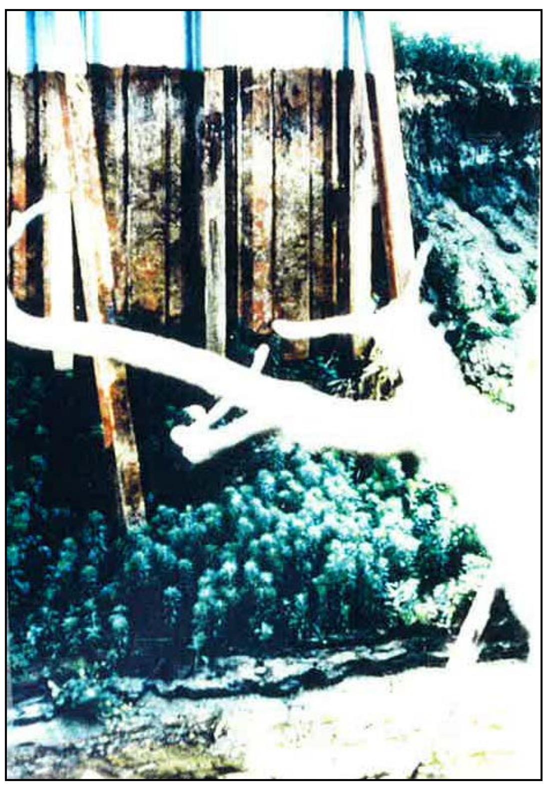
Natural meander cutoff and straightened channel

The following photo shows a straightened channel. The alignment of the natural channel is evident from the curvilinear bands of vegetation and timber and the apparent depressed areas.

Straightened channel

Degradation can undermine substructures as shown in the following photos showing bent and abutment.

Undermining at a bridge bent



Undermining at a bridge abutment

Aggradation is the result of sediment depositing along the lower downstream reaches that has eroded from upstream degrading reaches. It results in a loss of channel capacity which in turn increases the frequency of flooding and the magnitudes of peak flows (see the following photo).

Bridge opening partially silted shut from aggradation

6.7.4 Contraction Scour

Contraction scour is the removal of streambed material. It happens throughout the entire bridge opening due to increased flow velocities through the bridge. Increased velocities are a result of the flow area under the bridge being less than the flow area of the typical channel or when overbank (floodwaters) are forced through the bridge.

For the majority of main channel bridges, the scour hole will silt in after the flood waters recede unless soil conditions prevent re-silting. Softer, relatively fresh silt or freshly deposited sand across the bridge opening that differs from the upstream and downstream conditions is an indication contraction scour has occurred. Scour holes under overflow bridges will remain visible after flood events (see the following photo).

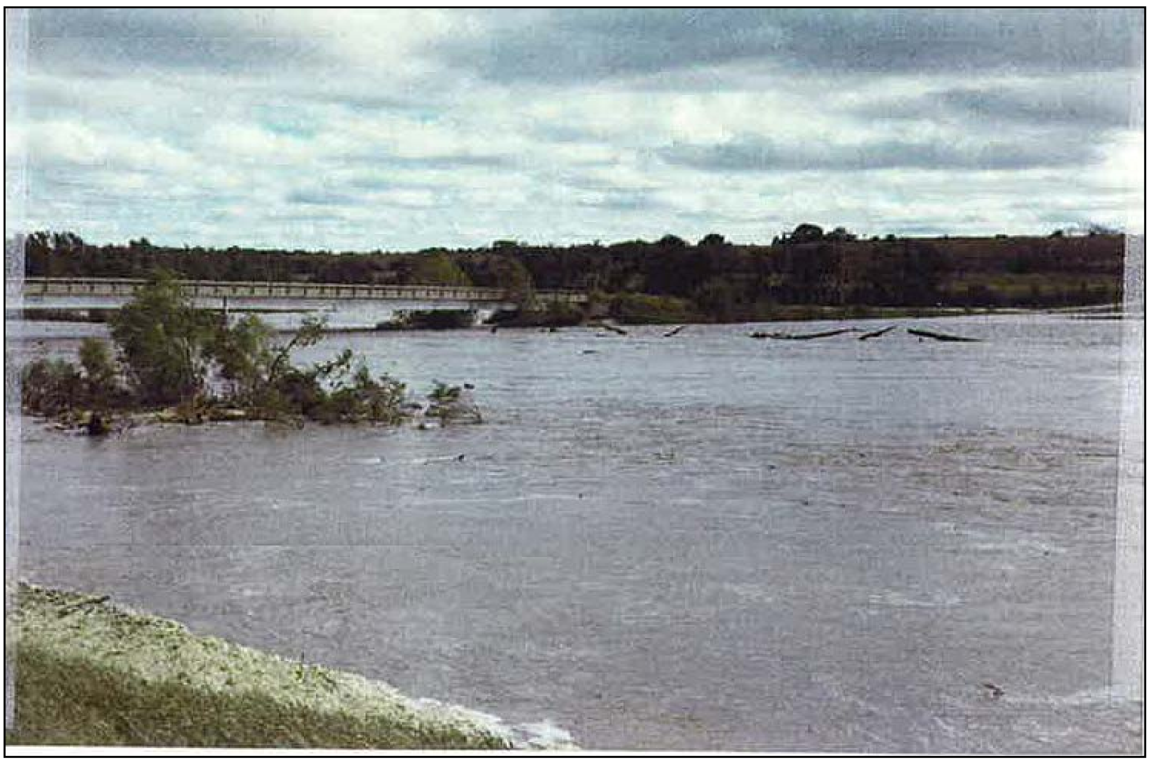
Overflow structure with scour hole

Contraction scour potential can be assessed in the field by the following:

- Road overflow
- Overflow structures in the flood plain
- Bridge length

It is possible to have any combination of these present. The worse case would be a short bridge projecting into a deep channel with no overflow present. Likewise, a lower risk case would have a bridge spanning the entire main channel, overflow structures in the flood plain and the road sagged to allow overflow.

Road overflow – A sag in the roadway allowing overflow in the flood plain reduces flow through the bridge (see the following photo). The relief provided by this sag decreases velocities and potential contraction scour through the bridge. Indications of road overflow include debris on the road, a washed out appearance of a gravel surface or local experience with flooding.



Main bridge and roadway sag (County road over Blue River)

Overflow structures in the flood plain – Overflow structures provide relief for flow similar to road overflow (see photo below). They provide additional opening under the roadway to relieve pressure on the main structure during high flows. The reduction of velocity results in a reduced risk of contraction scour in the main channel. The overflow structures also experience contraction scour and may be at risk depending on their size and the amount of flow.

Road overflow section with overflow structure

Bridge Length – Bridge abutments projecting into a channel cause a flow constriction (see following photo). This constriction increases the flow velocities and the potential contraction scour. Abutments projecting into a channel are subject to local scour from the flow that is directed at the abutment. Contraction and local abutment scour can cause the approach to wash out. Bridge lengths spanning the channel top width or longer provide a greater waterway area under the bridge, which decreases the flow velocity and scour potential.

Bridge with inadequate length

It is important to note that an ice jam can block the flow in the main channel (see following photo). This obstruction may cause the majority of water in the channel to flow overland increasing the volume and velocity of flow through nearby overflow structures.

Ice jam in main channel

The potential contraction scour at these sites could be substantially increased (see the following photos). Some major rivers in Nebraska that are prone to ice jams include the Platte River, the Elkhorn Rivers and the Loup Rivers.

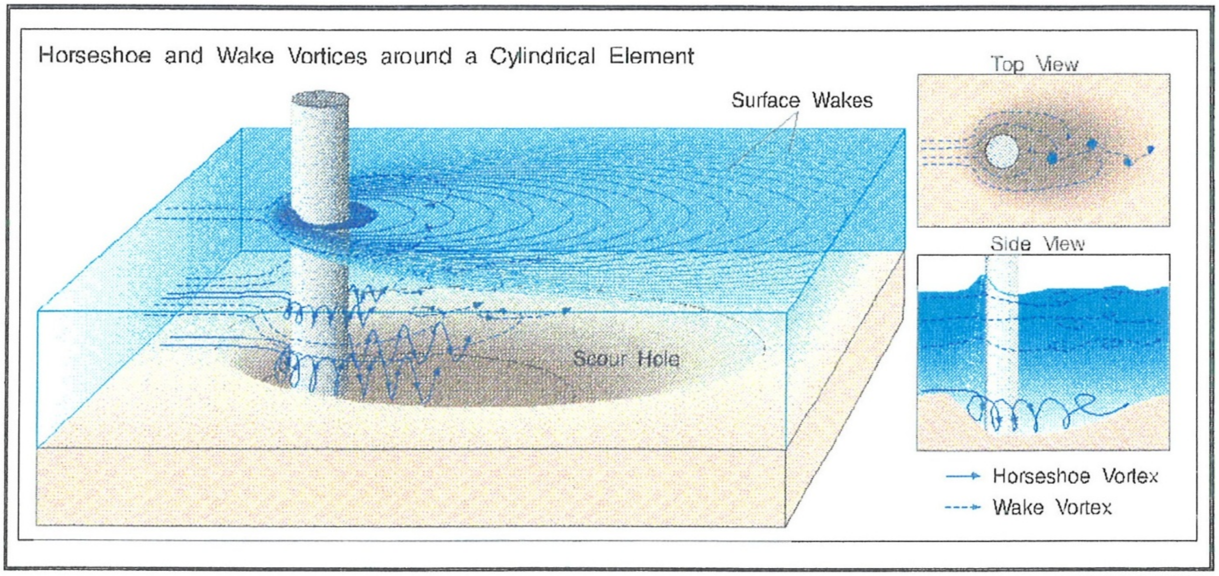
Road overflow section between overflow structures

Overflow bridge flowing full due to ice condition

Overflow bridge failure due to high flows under bridge shown above

6.7.5 Local Scour

Local scour occurs in the immediate vicinity of a pier or abutment due to the localized acceleration of the flow around the pier or abutment wall. Water piles up at the upstream side of the pier, resulting in a downward flow down the upstream face of the pier. This downward component, together with localized acceleration of flow around the pier, results in the formation of the horseshoe vortex and the removal of streambed material around the base of the pier (see the following figure).



(USGS-MHTD)

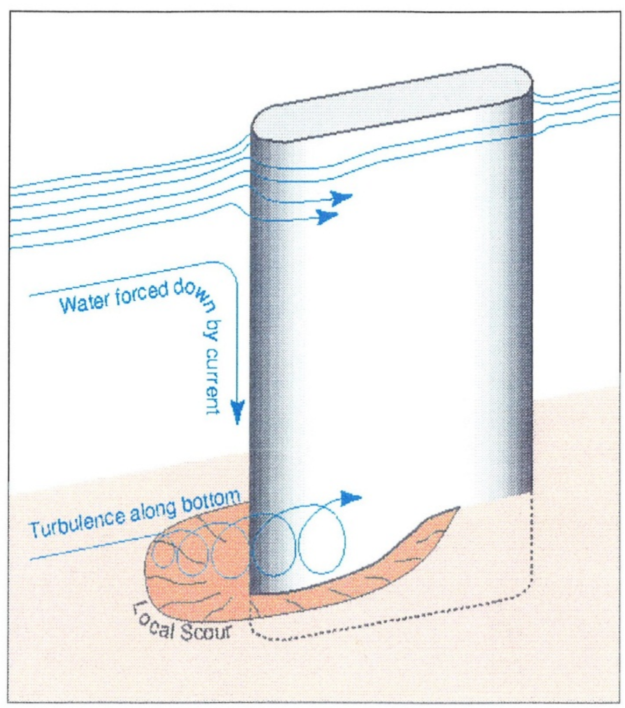
As with contraction scour, local scour holes usually silt in for main channel bridges unless soil conditions prevent silting. Local scour holes are likely to remain for overflow bridges where there is little or no incoming sediment. Softer, relatively fresh silt or freshly deposited sand near piers or abutments is an indicator that local scour has occurred.

The potential for local scour can be assessed by field observations of the following:

- Pier shape and size
- Pier alignment and bridge skew (attack angle)
- Debris
- Stream meanders
- Depth of flow
- Velocity

Pier Shape and Size – square faced piers can cause 10% more local scour than round nosed piers and 20% more local scour than a sharp nosed pier, for piers of similar width. Wider piers increased the downward component of flow and the localized acceleration of flow increasing the local scour potential.

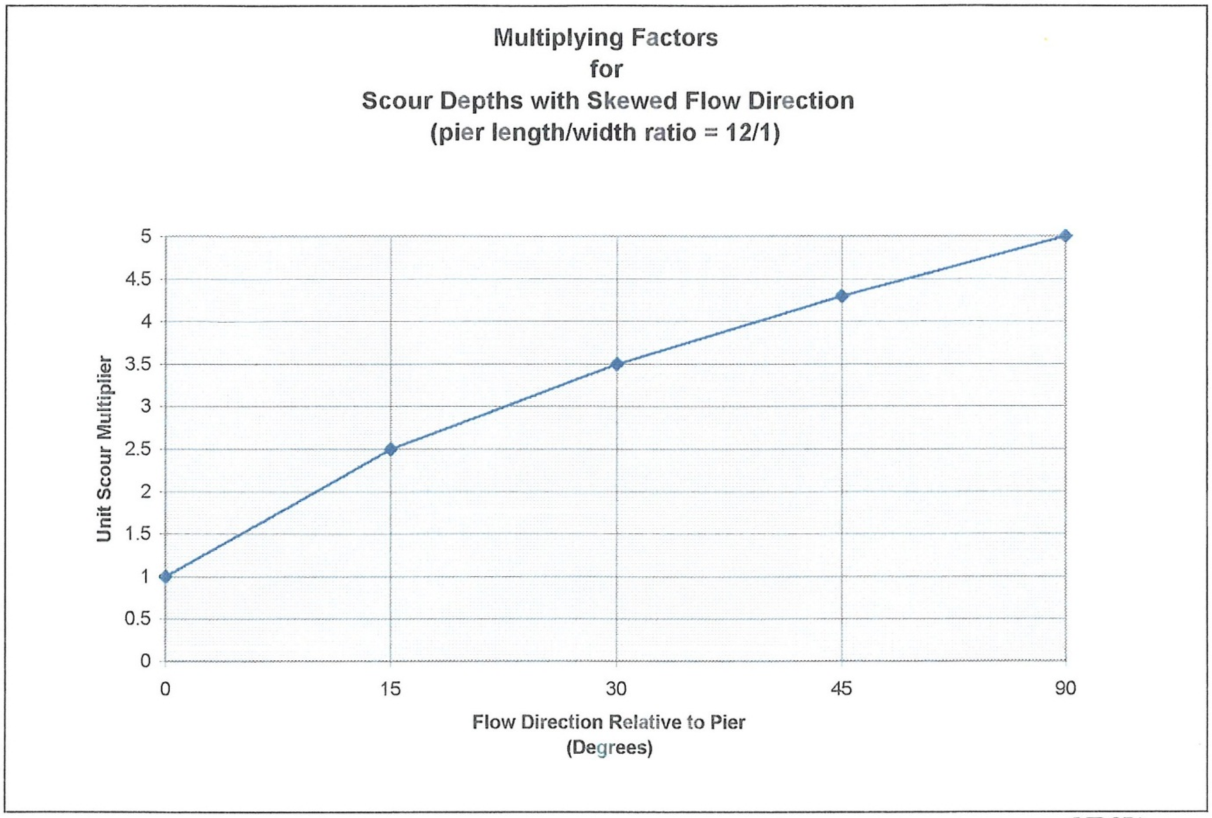
Pier Alignment and Bridge Skew (Attack Angle) – As the stream flows around a pier, water is deflected downward and scour can occur around the pier (see following figure).



(USGS-INDOT)

Flow Paths Around Pier

A misaligned pier obstructs flow by effectively making the pier wider. The scour potential is magnified by the constriction of flow and the increased intensities of the vortices created as water strikes the pier. Pier misalignment with flow of only 15° can double the magnitude of local scour (see figure and photos below).



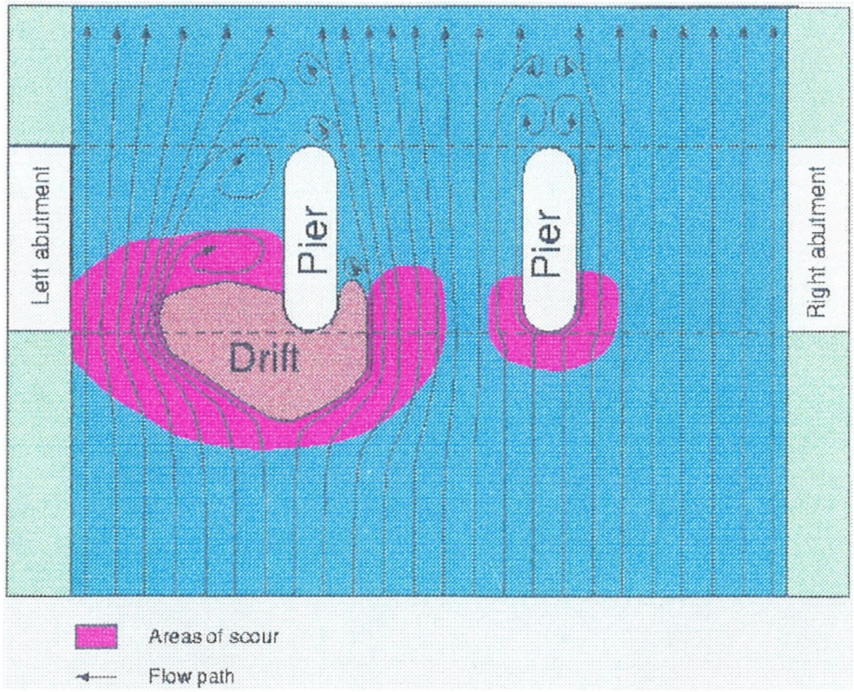
(NDOR)

Affect of Flow Direction on Scour

Misaligned bridge

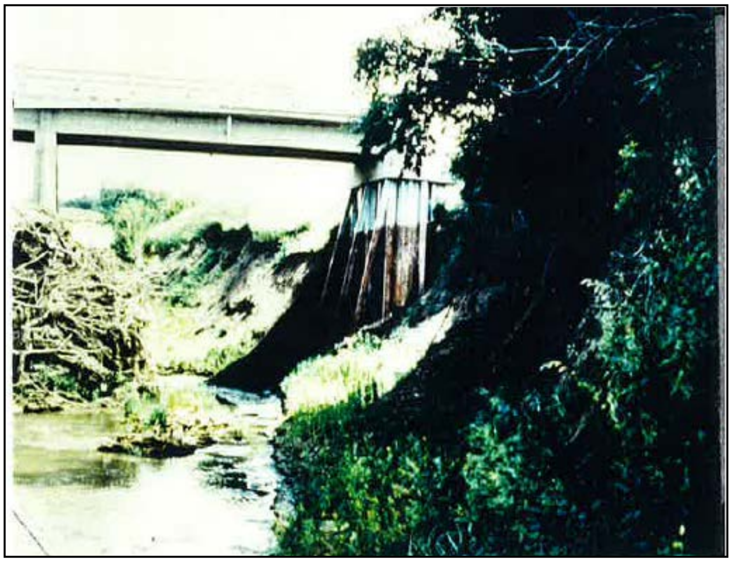
Abutment failure due to improper skew

Debris – Bridge piers block the flow of the stream making them ideal spots for debris to be trapped. The bridge opening decreases as more debris accumulates. The resulting flow constriction increases velocities through the bridge and can redirect the flow. The flow could be redirected towards an abutment or downward below the debris pile increasing potential pier scour (see the following).



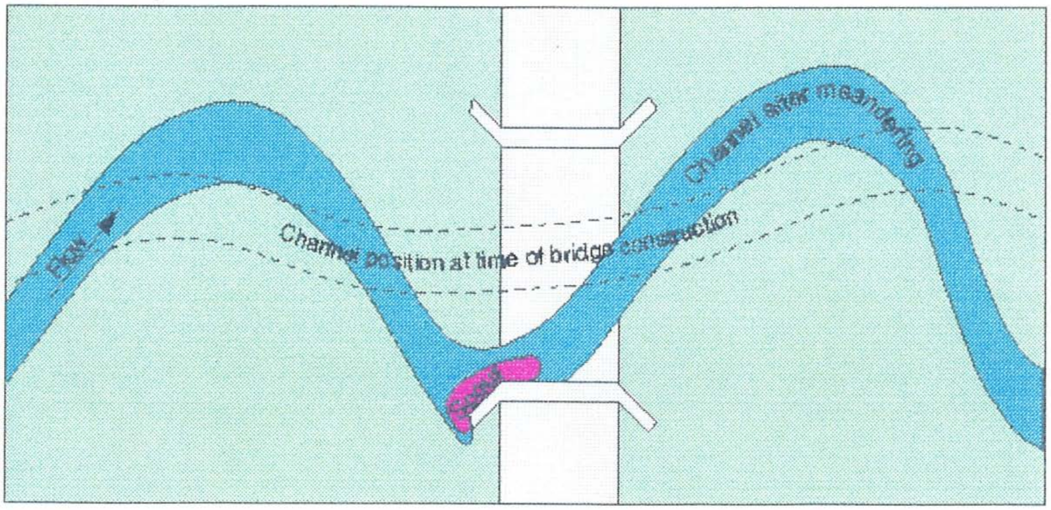
(USGS-INDOT)

Flow Paths Around Piers with Debris (Drift)



Debris trapped at pier

Stream Meanders – Bridges are usually constructed perpendicular to the flow in the stream. As stream meanders form and move, the angle of flow approaching a bridge changes. If the angle of attack increases significantly increased scour can occur at the piers or abutments (see the following).



(USGS-INDOT)

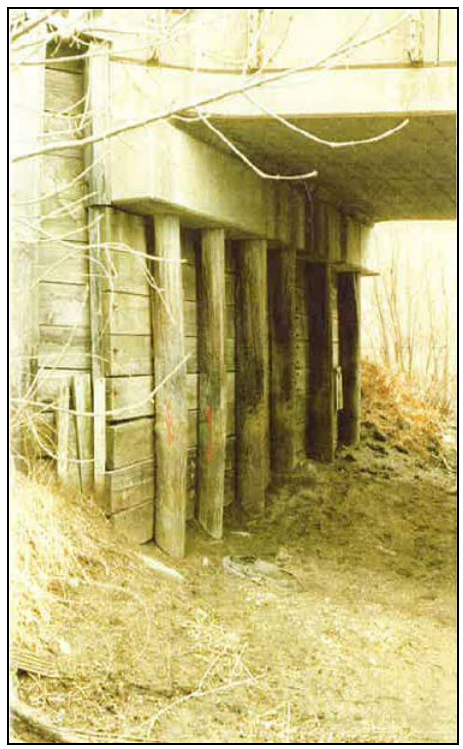
Meandering Channel Showing Resulting Scour

Stream meander attacking abutment

Depth of Flow – Shallow streams do not have the local scour capability of deeper streams.

Velocity – Lower velocities and less local scour potential will occur at bridges where the stream slope is small, the abutments do not block the channel, overflow structures are present or road overflow occurs. Higher velocities and increased scour potential occur where the stream slope is steeper, where the abutments project into the channel, or where all flow is forced through the bridge opening (no overflow structures or road overflow occurring).

Local scour at abutments occurs similarly to local scour at piers. Water piles up at the abutment face and is forced downward. This along with the increased flow velocity near the abutment generates currents that remove material at the base of the abutment. Abutments are designed to resist scour down to critical berm elevation. Once the critical berm is reached, any additional scour could cause abutment failure or the approach roadway to wash out. Indications of scour below critical berm included sheet pile buckling, bottom of bridge plank wall exposed or bottom of concrete wall exposed (see the following photo.)



All these factors should be considered when evaluating a structure for local scour potential. Local experience and flood observations of bridge sites are also helpful in determining local scour risks.

It should also be noted that erosion holes caused by deck drains, roadway runoff, cattle paths and ditch drainage into the stream do not qualify as local scour, but as local erosion only.

6.8 IDENTIFICATION OF SCOUR CRITICAL BRIDGES BY HYDRAULIC ASSESSMENT

The NBIS defines a scour critical bridge as “a bridge with a foundation element that has been determined to be unstable for the observed or evaluated scour condition.” The FHWA Recording and Coding Guide further defines a scour critical bridge as a bridge with abutment or pier foundation rated as unstable due to:

- Observed scour at the bridge site (Item 113 of 2, 1, or 0); or
- Scour potential as determined from a scour evaluation study, i.e. calculated scour (Item 113 of 3).

The HE will assign a code for Item 113 following the ISAT inspection, hydraulic analysis and scour assessment. The FHWA Recording and Coding Guide codes from the Errata are repeated in the following table. A five-step evaluation/calculation process is used by the ISAT to assess bridges for scour. The general process is shown in the following flow chart.

Whenever a rating factor of 2 or below is determined for Item 113, the rating factor for Item 60 Substructure and other affected Items (i.e., load ratings, superstructure rating) should be revised to be consistent with the severity of observed scour and resultant damage to the bridge.

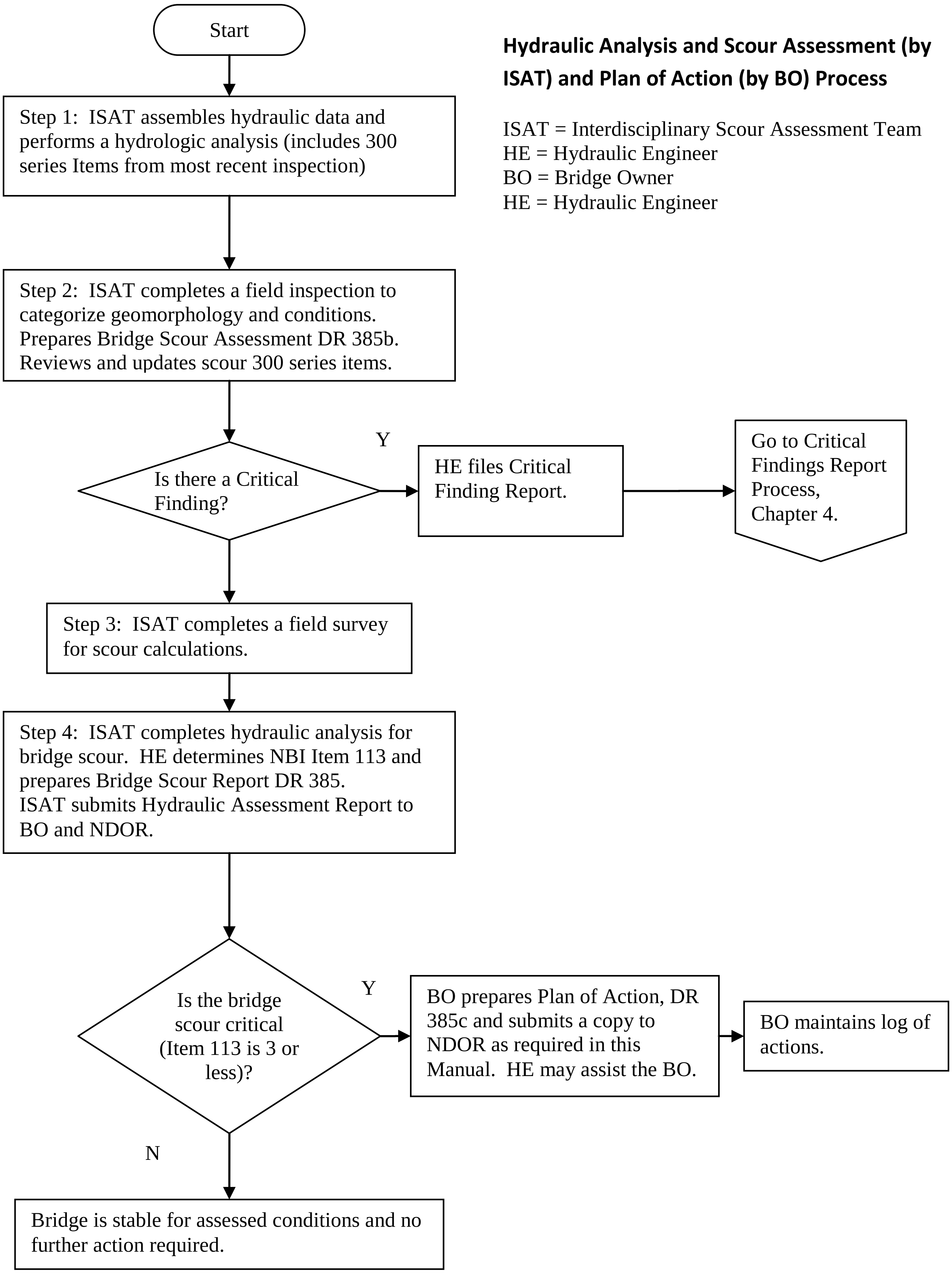
The Bridge Scour Report, DR Form 385 includes the scour-related 300 series inventory items. The values previously recorded by the Team Leader are verified by the Hydraulic Engineer who is responsible for reporting any revisions to the coding.

The Team Leader for a routine inspection of a scour critical bridge does not assign a code for Item 113; however, they will assign codes for the scour-related 300 series data items which record conditions found during inspection.. These items are flags of scour issues for the ISAT. See Section 6.1 below

Each Bridge Owner is responsible for maintaining a list of their scour critical bridges.

Hydraulic Analysis and Scour Assessment (by ISAT) and Plan of Action (by BO) Process

ISAT = Interdisciplinary Scour Assessment Team
HE = Hydraulic Engineer
BO = Bridge Owner
HE = Hydraulic Engineer



6.9 BRIDGE SCOUR PLAN OF ACTION

6.9.1 General

A bridge scour Plan of Action (POA) is a written document prepared by the Bridge Owner setting out specific instructions for management of the structure for the public safety. A POA typically describes actions to be taken until the scour critical bridge can be replaced or permanent countermeasures installed. An HE may provide assistance to Bridge Owners when they are preparing their POAs.

A scour critical bridge will have a POA until:

- Adequate permanent countermeasures are installed or
- The bridge is replaced with a structure that can adequately accommodate the stream flow.

6.9.2 Preparation

FHWA Memorandum HIBT-30 requires preparation of a POA for each scour critical bridge. A POA is required for all bridges with Item 113 coded U, or 3 or less.

Guidance for POA preparation is contained in FHWA Hydraulic Engineering Circular (HEC) 18, 20 & 23. A Bridge Scour Plan of Action form, DR Form 385c, has been developed by NDOR for Bridge Owners in Nebraska.

The Interdisciplinary Scour Assessment Team (ISAT) reports scour critical findings to the Bridge Owners for development of a POA. The Bridge Owner is given a copy of the scour study report and a POA form. The data in the report provides hydraulic and scour details the Owner may utilize for developing the POA.

The Bridge Owner should submit a copy of the POA to NDOR as required in this Manual. See Section 6.6 above.

6.9.3 POA Content

The POA may require increased inspections, periodic monitoring, installation of scour countermeasures, conditional closure and/or bridge replacement. An acceptable POA includes:

- Monitoring
- Maintenance, if feasible
- Emergency Contacts in case closure becomes necessary
- Closure Plan and Detour Route
- Reopening Criteria.

Actions may include one or several of these actions:

- Monitoring during or after flood events
- Installation of countermeasure
- Closure, either temporary or permanent.

If any inventory data needs to be revised, for example if the bridge is closed, a Special Inspection will need to be completed. See Chapter 4, Inspection.

Actions for a POA should be selected based on the Owners assessment of the risk. A high risk site may require an inspector to be at the site prior to flood arrival and may be between/during/after flood events. Prestorm rainfall parameters are identified to define when to initiate an onsite visit. A low risk of failure site may be visited during the flood event and/or post flood. A visit to the site may be defined by rainfall parameters, flooding information and road overflow reports.

The POA should also include steps to be taken In the event a bridge closure is needed. A closure plan and detour route is required in the POA. The plan defines equipment needs, instructions on how to close the road and defines a detour route. The agencies/people that may be immediately notified after a closure are identified. The general criteria and authorizing inspector for the reopening the bridge is specified.

6.9.4 POA Monitoring and Follow Up

Bridge Owner shall also maintain a POA Monitoring Log. This is a document that records the actions taken and maintenance activities performed related to the POA. Reports of any scour mitigation action shall include drawings and photos.

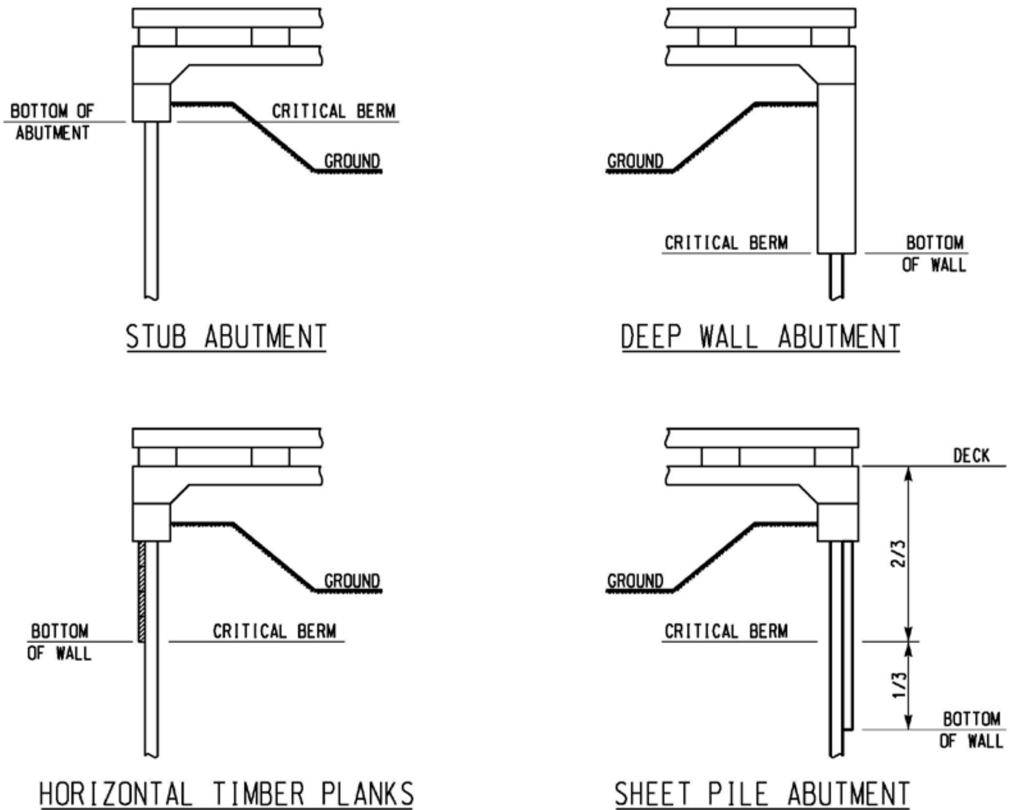
DR Form DR385e, POA Monitoring Log, and DR Form DR385f Supplemental Hydraulic Findings and Maintenance for Scour Critical Bridges are included in the Appendix. A best practice for implementing POAs would be preparation of three-ring binder(s) that could be used in the field after possible inspections required by the POA. The binder should include each structure that required a POA: the POA; and the POA log form on which the Owner could record any POA activities (site visits, maintenance, repair, installation of permanent counter measures).

6.10 REQUIRED DOCUMENTATION FOR SCOUR CRITICAL BRIDGES

NBIS Item No. 113 (See Section 3.11 to Reference Examples)		**Required Documentation in Owner's Bridge File**
U	Bridge with "unknown" foundation that has not been evaluated for scour. Until risk can be determined, a plan of action should be developed and implemented to reduce the risk to users from a bridge failure during and immediately after a flood event.	• Place on list of bridges needing evaluation • Current Plan of Action • Monitoring Log
7	Countermeasures have been installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. Instructions contained in a plan of action have been implemented to reduce the risk to users from a bridge failure during or immediately after a flood event.	Documentation of countermeasure design and construction (plans, details, photos) and current condition during routine inspections
6	Scour calculation/evaluation has not been made.	Documentation that Owner is acquiring-Scour Assessment Report
5	Bridge foundations determined to be stable for **assessed or calculated** scour condition. Scour is determined to be within the limits of footing or piles (Example B) by assessment (i.e., bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge), by calculations or by installation of properly designed countermeasures.	Hydraulic Analysis Report or Scour Assessment Report
4	Bridge foundations determined to be stable for **assessed or calculated** scour conditions; field review indicates action is required to protect exposed foundations	• Hydraulic Analysis Report or Scour Assessment Report , including calculated scour depth resulting in instability • Should be checked after high water events for scour and damage to countermeasures
3	Bridge is scour critical; bridge foundations determined to be unstable for **assessed or calculated** scour conditions: - Scour within limits of footing or piles. (Example B) - Scour below spread-footing base or pile tips. (Example C)	• Hydraulic Analysis Report or Scour Assessment Report, including calculated scour depth resulting in instability • Place on Master List (Bridge Owner's and NDOR's) of Scour Critical Bridges • Current Plan of Action • Monitoring Log
2 or less	Bridge is scour critical; field review indicates that extensive scour has occurred at bridge foundations, which are determined to be unstable by: - a comparison of calculated scour and **observed** scour during the bridge inspection, or - an engineering evaluation of the **observed** scour condition reported by the bridge inspector in Item 60**.**	• Documentation of observed scour depths • Hydraulic Analysis Report or Scour Assessment Report, including calculated scour depth resulting in instability (Optional) • Place on Master List (Bridge Owner's and NDOR's) of Scour Critical Bridges • Current Plan of Action • Monitoring Log

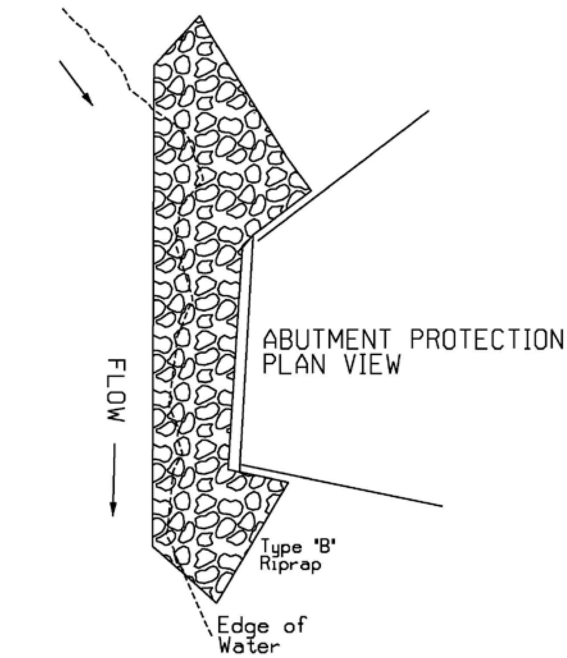
6.11 COUNTERMEASURES AND THE CRITICAL BERM ELEVATION

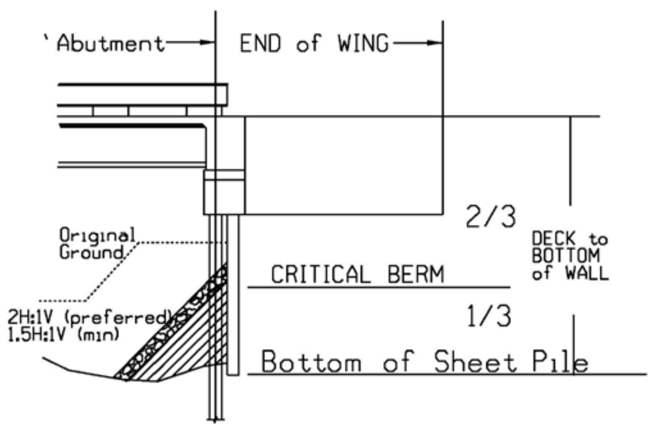
The critical berm elevation is typically the elevation at which scour depth could cause a failure of the abutment or approach. Scour depth can be calculated by hydraulic analysis to determine the critical berm elevation.



Critical Berm for sheet pile is 2/3 the distance from bridge deck to bottom of sheet pile.

One third of the distance from bottom of sheet pile to bridge deck is required for stability.





ABUTMENT PROTECTION
SHEET PILE WALL SHOWN

When scour has occurred near an abutment, typically the berm or other protection must be repaired. The critical berm elevation defines the depth requirements for a repair or countermeasure.

A slope perpendicular to the flow and extending up the wing should be 2H:1V preferred, with a minimum of 1.5H:1V.

Riprap should be Type “B” or broken concrete complying with NDOR Standard Construction Specifications. Broken concrete must be reduced to the size to meet the Specifications. Large slabs of concrete should not be used as they may direct flow into the area to be protected, or toward the opposite abutment or a pier.

The upstream and downstream limits of the repair are based on site conditions. The minimum limits are normally between the upstream and downstream toes of the roadway fill. Riprap must be transitioned to the natural stream bank to avoid abrupt velocity and flow direction changes. The riprap must tie into the upstream embankment, along the wings, through the bridge opening and tie to the downstream embankment.

6.12 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 NDOR'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 NDOR;
- 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.

6.13 QUALITY ASSURANCE

Quality Assurance (QA) of all hydraulic assessments and POAs will be performed by NDOR or their selected agent. The QA program activities are described in Chapter 1 of this Manual.

6.14 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

6.15 FORMS

Forms used in completing hydraulic assessments that are mentioned in this Chapter are listed below. Participants and contributors to the Nebraska Bridge Inspection Program are advised to go to the NDOR Bridge Inspection Program website for the current list of applicable forms and the most recent versions of each form.
http://www.nebraskatransportation.org/design/bridge/hyd.htm

Name	DR Form
Bridge Scour Report	385
Bridge Scour Assessment	385b
Bridge Scour Plan of Action	385c
Bridge Scour Worksheet	385d
POA Monitoring Log	385e
Supplemental Hydraulic Findings and Maintenance for Scour Critical Bridges	385f

6.16 APPENDIX

Memos and other guidance that may have been issued after the issuance of the current revision of this Chapter can be found at the NDOR Bridge Inspection Program website. Bridge Owners and Inspectors are urged to check this site to ensure they have all the most current information and forms. http://www.nebraskatransportation.org/design/bridge/bipm.htm.

Name	Revision Date
Channel Terms Glossary	2010 Jan 25

APPENDIX

The Appendix to the Nebraska Department of Roads Bridge Inspection Program (BIP) Manual provides the information listed below. The Manual sets for policies and procedures to be used for safety inspection and evaluation of bridges in the states that are subject to the National Bridge Inspection Standards.

REFERENCE DOCUMENTS FOR THE MANUAL

This Appendix to the Manual contains documents that are referenced in the Chapters of the Manual, such as lists of County and City codes and the current National Bridge Inspection Standards is listed in this table. Typically these documents do not change.

Item Description (listed alphabetically)	BIP Manual Chapter
Abbreviations	All
Sufficiency Calculation (English Units)	3
Channel Behavior Glossary	6
Fracture Critical Inspection Submission Procedures and Naming Convention	4
National Bridge Inspection Standards CFR Vol. 69, Part 650, Subpart C	1
NE Local Public Agencies List	3
Permanent Road Closure	5
Referenced Publications	All
Standard Bridge Photo Locations / Descriptions	4

http://www.transportation.nebraska.gov/design/bridge/bipm.htm

BRIDGE INSPECTION PROGRAM FORMS

The Manual Appendix also incorporates by reference all forms that are used as part of the Bridge Inspection Program. The Forms Section of each Manual chapter lists forms that apply to work of that chapter. Forms are revised periodically and the most current are posted to the Bridge Division website. All participants are advised to get the most current forms from the Bridge Division website at

http://www.transportation.nebraska.gov/design/bridge/bipm.htm

BRIDGE INSPECTION PROGRAM MEMOS AND LETTERS

The Manual Appendix also incorporates by reference all NDOR memos, letters, policies and other documents that may be issued by NDOR that supplement the BIP Manual, and may be incorporated into future revisions of the Manual. They are not included with this Manual document because they are revised or added periodically; these will be posted to the Bridge Division website. All participants are advised to get the most current forms from the Bridge Division website at

http://www.transportation.nebraska.gov/design/bridge/bipm.htm

SUPPLEMENTAL MANUAL GUIDANCE

The Manual Appendix also incorporates by reference all supplemental guidance to the BIP Manual that NDOR may provide between the issue of Manual revisions. These will be posted to the Bridge Division website and participants will be notified.

http://www.transportation.nebraska.gov/design/bridge/bipm.htm

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

ABBREVIATIONS

BIP	Bridge Inspection Program
BIPDM	Bridge Inspection Program Data Manager
BIPPM	Bridge Inspection Program Program Manager
BO	Bridge Owner
CF	Critical Finding
CP	Complex
DR	Department Roads (DR form prefix)
FC	Fracture Critical
HE	Hydraulic Engineer
ISAT	Interdisciplinary Scour Assessment Team
LARS	Load Analysis and Rating System
LPA	Local Public Agency
LRE	Load Rating Engineer
LRSS	Load Rating Summary Sheet
NBIS	National Bridge Inspection Standards
NCSPA	National Corrugated Steel Pipe Association
NDOR	Nebraska Department of Roads
PE	Professional Engineer
POA	Plan of Action
QA	Quality Assurance
QC	Quality Control
R	Routine
SC	Scour Critical
TL	Team Leader

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CHANNEL BEHAVIOR CLOSSARY

Aggradation	General and progressive buildup of the longitudinal profile of a channel bed due to sediment deposition.
Alluvium	Unconsolidated material deposited in floodplain by a stream.
Alluvial stream	A stream which has formed its channel in cohesive or non-cohesive materials that have been and can be transported by the stream.
Alternating bars	Elongated deposits found alternately near the right and left banks of a channel.
Average velocity	Velocity at a given cross section determined by dividing discharge by cross sectional area.
Backwater	The increase in water surface elevation relative to the elevation occurring under natural channel and floodplain conditions, induced by a bridge or other structure that obstructs or constricts a channel. Backwater also can occur downstream of a constriction where flow expands, as in wide, wooded floodplains.
Bank	The side slopes of a channel between which the flow is normally confined.
Bank full discharge	Discharge that, on the average, fills a channel to the point of overflowing.
Bank protecting	Engineering works for the purpose of protecting stream banks from erosion.
Bank Revetment	Erosion-resistant materials placed directly on a streambank to protect the bank from erosion.
Bar	An elongated deposit of alluvium within a channel, not permanently vegetated.
Bed load	Sediment that is transported in a stream by rolling, sliding or skipping along the bed or very close to it; considered to be within the bed layer. Also, called contact load or contact sediment discharge.
Bed material	Material found in and on the bed of a stream (may be transported as bed load or in suspension).

Bedrock	The solid rock exposed at the surface of the earth or overlain by soils and unconsolidated material.
Braided stream	A stream whose flow is divided at normal stage by small mid-channel bars or small islands; the individual width of bars and islands is less than about three times water width; braided stream has the aspect of a single large channel within which are subordinate channels.
Bridge opening	The cross-sectional area beneath a bridge that is available for conveyance of water.
Bridge waterway	The area of a bridge opening available for flow, as measured below a specified stage and normal to the principal direction of flow.
Channel	The bed and banks that confine the surface flow of a stream.
Channelization	Straightening or deepening of a natural channel by artificial cutoffs, grading, flow-control measures or diversion of flow into a man-made channel.
Clear-water scour	Scour at a pier or abutment (or contraction scour) when there is no movement of the bed material upstream of the bridge crossing at the flow causing bridge scour.
Confluence	The junction of two or more streams.
Constriction	A natural or artificial control section, such as a bridge crossing, channel reach or dam, with limited flow capacity in which the upstream water surface elevation is related to discharge.
Contraction	The effect of channel or bridge constriction on flow streamlines.
Countermeasure	A measure intended to prevent, delay or reduce the severity of hydraulic problems.
Contraction scour	Scour in a channel or on a floodplain that is not localized at a pier, abutment, or other obstruction to flow. In a channel, contraction scour results from the contraction of streamlines and usually affects all or most of the channel width.
Critical berm	Elevation on abutment wall below which if material is eroded or scoured away, the increased soil pressure results in potential wall collapse. Sheet piling is designed to support the fill down to the critical berm. For concrete wall abutments critical berm is the bottom of concrete.

Cross section	A section normal to the trend of a channel or flow.
Debris	Floating or submerged material, such as logs or trash, transported by a stream.
Degradation (bed)	A general and progressive lowering of the channel bed due to scour.
Depth of scour	The vertical distance a streambed is lowered by scour below a reference elevation.
Dike	An impermeable linear structure for the control or containment of overbank flow. A dike trending parallel with a stream bank differs from a levee in that it extends for a much shorter distance along the bank, and it may be surrounded by water during floods.
Dike (groin, spur, jetty)	A structure extending from a bank into a channel that is designed to: (a) reduce the stream velocity as the current passes through the dike, thus encouraging sediment along the bank (permeable dike); or (b) deflect erosive current away from the stream bank (impermeable dike).
Dominant discharge	(a) The discharge which is of sufficient magnitude and frequency to have a dominating effect in determining the characteristics and size of the stream course, channel and bed. (b) That discharge which determines the principal dimensions and characteristics of a natural channel. The dominant formative discharge depends on the maximum and mean discharge, duration of flow, and flood frequency. For hydraulic geometry relationships, it is taken to be the bank full discharge which has a return period of approximately 1.5 years in many natural channels.
Drift	Alternative term for “debris”.
Eddy current	A vortex-type motion of a fluid flowing contrary to the main current, such as the circular water movement that occurs when the main flow becomes separated from the bank.
Erosion	Displacement of soil particles on the land surface or in a stream due to water or wind action.
Equilibrium scour	Scour depth in sand-bed stream with dune bed about which 1 live bed pier scour level fluctuates due to variability in bed material transport in the approach flow.

Fine sediment load (wash load)	The part of the total sediment load that is composed of particle sizes finer than those represented in the bed. Normally, the fine-sediment load is finer than 0.062 mm for sand-bed channel. Silts, clays and sand could be considered wash load in course gravel and cobble bed channels.
Flanking	Erosion resulting from stream flow between the bank and the forward end of a countermeasure for stream stabilization.
Floodplain	A nearly flat, alluvial lowland bordering a stream, that is subject to inundation by floods.
Flow-control structure	A structure either within or outside a channel that acts as a counter-measure by controlling the direction, depth, or velocity of flowing water.
Gabion	A basket or compartmented rectangular container made of steel wire mesh. When filled with cobbles or other rock of suitable size, the gabion becomes a flexible and permeable block with which flow-control structures can be built.
Geomorphology	That branch of both physiography and geology that / morphology deals with the form of the earth, the general configuration of its surface, and the changes that take place due to erosion of the primary elements and in the buildup of erosional debris.
Grade-control structure (sill, check dam)	Structure placed bank to bank across a stream channel usually with its central axis perpendicular to flow) for the purpose of controlling bed slope and preventing scour or headcutting.
Guide bank	Preferred term for spur dike.
Hardpoint	A streambank protection structure whereby “soft” or erodible materials are removed from a bank and replaced by stone or compacted clay. Some hard points also occur naturally along streambanks as passing currents remove erodible materials leaving nonerodible materials exposed.
Headcutting	Channel degradation associated with abrupt changes in the bed elevation (headcut) that generally migrates in an upstream direction.
Incised reach	A stretch of stream with an incised channel that only rarely overflows its banks.

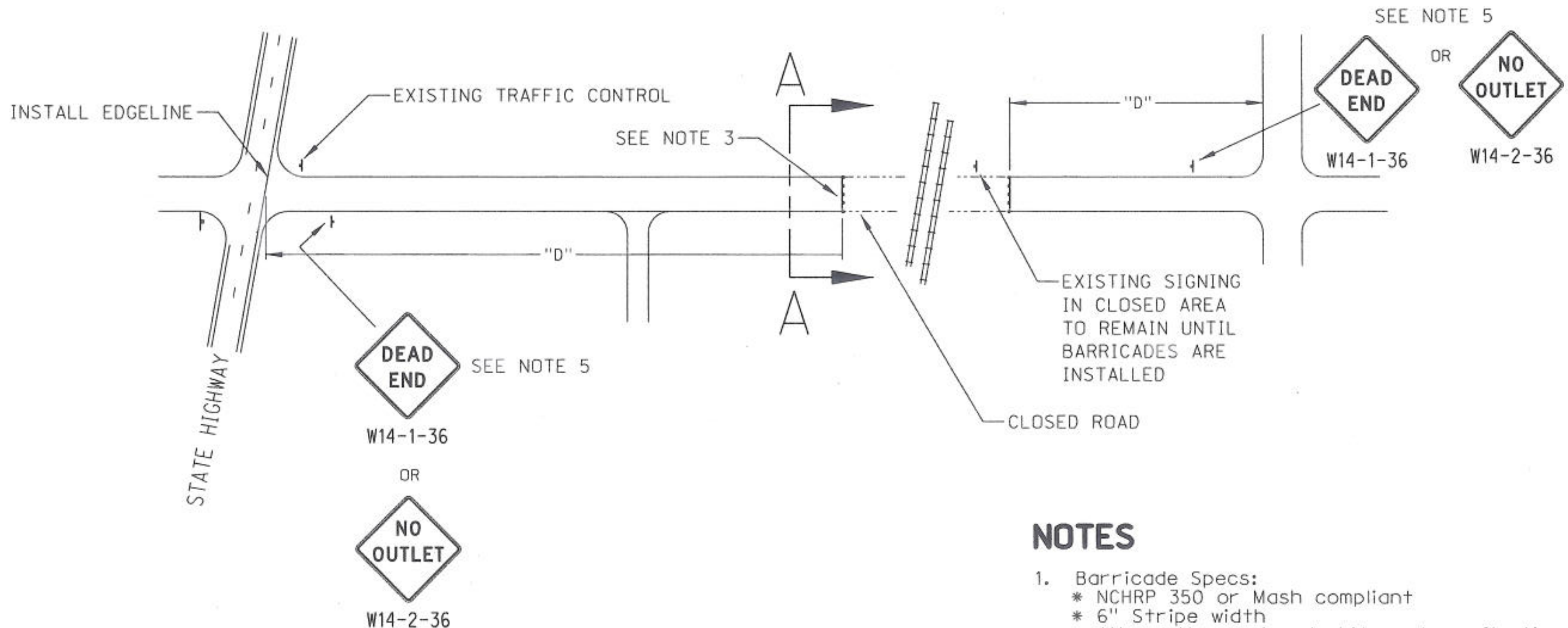
Jetty	(a) An obstruction built of piles, rock or other material extending from a bank into a stream, so placed as to induce scouring or bank building, or to protect against erosion. (b) A similar obstruction to influence stream, lake or tidal currents, or to protect a harbor.
Lateral erosion	Erosion in which the removal of material is extended in a lateral direction, as contrasted with degradation and scour in a vertical direction.
Launching	Release of undercut material (stone riprap, rubble, slag, etc.) downslope or into a scoured area.
Levee	An embankment, generally landward of top bank, that confines flow during high water periods, thus preventing overflow into lowlands.
Live-bed scour	Scour at a pier or abutment (or contraction scour) when the bed material in the channel upstream of the bridge is moving at the flow causing bridge scour.
Local scour	Scour in a channel or on a floodplain that is localized at a pier, abutment, or other obstruction to flow.
Meander or full meander	A meander in a river consists of two consecutive loops, one flowing clockwise and the other anti-clockwise.
Meander belt	The distance between lines drawn tangent to the extreme limits of successive fully developed meanders.
Meandering	A stream which follows a sinuous path due to natural physical causes not imposed by external restraint, and is characterized by curved flow and alternating shoals and bank erosion.
Median diameter	The particle diameter of the 50 percentile point on a size distribution curve such that half of the particles (by weight for samples of sand, silt, or clay and by number for samples of gravel) are larger and half are smaller.
Migration	Change in position of a channel by lateral erosion of one bank and simultaneous accretion of the opposite bank.
Natural levee	A low ridge formed along streambanks during floods by deposition that slopes gently away from the channel banks.
Normal stage	The water stage prevailing during the greater part of the year.

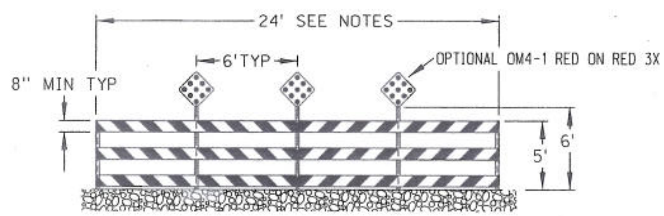
Overbank flow	Water movement over top bank either due to stream stage or to inland surface water runoff.
Perennial stream	A stream or reach of a stream that flows continuously for all or most of the year.
Reach	A segment of stream length that is arbitrarily bounded for purposes of study.
Retard (retarder structure)	A permeable or impermeable linear structure in a channel, parallel with the bank and usually at the toe of the bank, intended to reduce flow velocity, induce deposition, or deflect flow from the bank.
Revetment	Rigid or flexible armor placed to inhibit scour and lateral erosion (see bank revetment).
Riparian	Pertaining to anything connected with or adjacent to the banks of a stream.
Riprap	In the restricted sense, layer or facing of broken rock or concrete dumped or placed to protect a structure or embankment from erosion; also the broken rock or concrete suitable for such use. Riprap has also been applied to almost all kinds of armor, including wire-enclosed riprap, grouted riprap, sacked concrete, and concrete slabs.
River training works	Any structure configuration constructed in a stream or placed on, adjacent to, or in the vicinity of a streambank that is intended to deflect currents, induce sediment deposition, induce scour, or in some other way alter the flow and sediment regimes of the stream.
Rubble	Rough, irregular fragments of materials of random size used to retard erosion. The fragments may consist of broken concrete slabs or masonry.
Sack revetment	Sacks (e.g., burlap, paper, or nylon) filled with mortar, concrete, sand, stone or other available materials used as protection against erosion.
Scour	Erosion or removal of streambed or bank material from bridge foundations due to flowing water, usually considered as long-term bed degradation, contraction, and local scour.
Scoured depth	Total depth of the water from water surface to a scoured bed level (compare with “depth of scour”).

Sediment	Fragmental material transported, suspended or deposited fluvial by water.
Sediment discharge	The quantity of sediment that is carried past any cross section of a stream in a unit of time. Discharge may be limited to certain sizes of sediment or to a specific part of the cross section.
Sediment load	Amount of sediment being moved by a stream.
Seepage	The slow movement of water through small cracks and ports of the bank material.
Sinuosity	The ratio between the thalweg length and the valley length of a sinuous stream.
Slope (channel or stream)	Fall per unit length along the channel of the bed water surface or energy gradeline. Also, sideslope of a channel bank.
Sloughing	Sliding of overlying material; same ultimate effect as caving, but usually occurs when a bank or an underlying stratum is saturated.
Spur dike/guide bank	A dike extending upstream from the approach embankment at either or both sides of the bridge opening. Guide banks may also extend downstream from the bridge.
Stable channel	A condition that exists when a stream has a bed slope and cross section which allows its channel to transport the water and sediment delivered from the upstream watershed without aggradation, degradation or bank erosion.
Stage	Water-surface elevation of a stream with respect to a reference elevation.
Stone riprap	Natural cobbles, boulders or rock dumped or placed as protection against erosion.
Stream	A body of water that may range in size from a large river to a small rill flowing in a channel. By extension, the term is sometimes applied to a natural channel or drainage course formed by flowing water whether it is occupied by water or not.
Streambank erosion	Removal of soil particles or a mass of particles from a bank surface due primarily to water action. Other factors such as weathering, ice and debris abrasion, chemical reactions, and land use changes may also directly or indirectly lead to bank erosion.

Streambank failure	Sudden collapse of a bank due to an unstable condition such as due to removal of material at the toe of the bank by scour.
Streambank protection	Any technique used to prevent erosion or failure of a streambank.
Suspended sediment	The quantity of suspended sediment passing through a discharge stream cross section above the bed layer in a unit of time.
Thalweg	The line extending down a channel that follows the main current of the flow.
Tieback	Structure placed between revetment and bank to prevent flanking.
Toe of bank	That portion of a stream cross section where the lower bank terminates and the channel bottom or the opposite lower bank begins.
Toe protection	Loose stones laid or dumped at the toe of an embankment, groin, etc., or masonry or concrete wall built at the junction of the bank and the bed in channels or at extremities of hydraulic structures to counteract erosion.
Turbulence	Motion of fluids in which local velocities and pressures fluctuate irregularly in a random manner as opposed to laminar flow where all particles of the fluid move in distinct and separate lines.
Velocity	The rate of motion in a fluid on a stream or of the objects or particles transported therein, usually expressed in m/s or f/s.
Vortex	Turbulent eddy in the flow generally caused by an obstruction such as a pier or abutment (e.g. horseshoe vortex).
Waterway opening width	Width or area of bridge opening at a specific elevation, (area) measured normal to principle direction of flow.

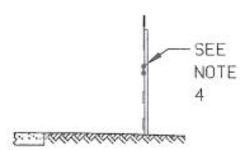
EXAMPLE OF PERMANENT BRIDGE CLOSURE





VIEW A

BARRICADE SIGNING ASSEMBLY
TYPICAL 2X



END VIEW OF BARRICADE

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 series):

BR 293 Cover - Fracture Critical Inspection Report - ***Cover Page***
BR 293 Exec - Fracture Critical Inspection Report - ***Executive Summary***
BR 293a - Fracture Critical Inspection Report - ***Introduction***
BR 293b - Fracture Critical Inspection Report - ***Bridge Orientation/Layout***
BR 293c - Fracture Critical Inspection Report - ***Identification of All 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 293g - Fracture Critical Inspection Report - ***Summary & Conclusions***
BR 293h - Fracture Critical Inspection Report - ***Follow-up Procedure***

Note: All BR293 series forms shall be combined into a single report and submitted in electronic (.pdf) format. All other formats, including Word (.doc) format will NOT be accepted.

2. Inspection Photos

   Note: All photos shall be submitted in electronic (.jpg) format

3. Updated Pontis File

B. Fracture Critical Inspections MAY include the following files:

1. Inspection Action Items and Supporting Documentation

   a. DR27 – Structure Maintenance Checklist
   b. DR320 – Critical Finding Report
   c. DR321 – Structure Repair Report

d. Rating Calculations
    a. When LARS is used to perform analysis the report generated from Detail-All Checkpoints-Flexural Member Report (FLXRPT.LIS) must be included in electronic (.lis) format
    b. If a spread sheet is used for additional computations one working copy must be submitted in electronic (.xlsx or xls) format
e. Intelligent PDF Form
f. Load Rating Report (LRSS)
g. Plans or Measurements

Note: All of the above items shall be submitted in electronic (.pdf) format. All other formats, including Word (.doc) format will NOT be accepted.

h. LARS Model

Note: All LARS files shall be submitted in electronic (.bmd) format. In the event the structure cannot be analyzed using LARS software, an electronic file shall be submitted in the format unique to that software.

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 LARS 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:

i. LARS Model: **C00010030_2011FEB.bmd**
j. Plans: **C00010030_01.pdf**
C00010030_02.pdf
k. Inspection Photos: **C000100305_Y11_01.jpg**
C000100305_Y11_02.jpg

l. Rating Calculations - LARS output: **C000100305_FLXRPT_2011FEB.LIS**

m. Pontis File: **COUNTY NAME_FC_2011FEB**

BURT_FC_2011FEB.pdi

FRACTURE CRITICAL INSPECTION SUBMISSION PROCEDURES

All Fracture Critical Inspections shall be submitted using the NDOR FTP site. E-mail attachments and CD's 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 containing all submission data shall be submitted directly to the Bridge Owner

POONTIS SUBMISSION

A. Pontis entries shall be completed within 30 days of inspection

1. Bridges due for inspection in December of 2010 and December of 2011 shall be submitted to NDOR by March 1 of the following year
2. E-mail notification of submittal shall be made to Steve Andersen at Steve.Andersen@Nebraska.gov

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 NDOR. See submittal deadlines in BIP Manual Chapter 5.

Load Rating Report

The Load Rating Report includes information listed the following sections.

______ Load Rating Summary Sheet and Load Rating Review Sheets - It is recommended that the LRSS be the first page in the Report.

______ Structure Geometry and condition information from the inspection (See below.)

______ Calculations supporting the rating (See below.)

______ Software analysis input and output in permanent format such as hard copy (pdf, txt) or other secured electronic files. (See below.)

______ The person completing the QC shall initial and dated all pages of the Report.

______ The Load Rating Engineer is responsible for sealing and signing the Report in accordance with the NE Engineers and Architects regulation Act §81-3437 (3c and 3d).

______ Transmittal of the completed report to the Bridge Owner

______ Transmittal of an electronic copy of the Report shall be submitted to NDOR. A copy must be furnished to NDOR either by the Owner or, at the direction of the Owner, by the LRE.

______ Transmittal to NDOR the software input file that can be executed in the software package.

Structure Geometry and Condition Information

______ Verify that bridge plans and or current field measurements available on the NDOR Bridge Management FTP site. If not, upload a PDF of the bridge plans and/or current field measurement to the NDOR Bridge Management FTP site

______ Include basic bridge geometry

______ Include inspection information that documents the conditions affecting the load rating

______ Include section losses and/or member defects

______ Structure geometry and condition documentation included in the Report

Calculations and Documentation Supporting the Rating

These are typically manual or spreadsheet calculations.

______ Calculation for dead loads (DL)

______ Calculation for distribution factor (DF) including assumptions

______ Analysis assumptions

______ Analyst's initials and date of preparation on each sheet

______ QC reviewer's initial and date of review on each sheet

______ Calculations and documentation included in the Report

Software Analysis Model (LARS or other software)

(Note: LARS comment section is limited to 247 characters. Provide all the detail possible in the comments, but in all cases provide the detail in the Calculations/Documentation supporting the rating).

______ Filename includes bridge number and the year of the rating

______ Analyst initials and date of analysis in comments

______ QC reviewers initials in comments

______ Description of the members analyzed in comments

______ Allowable bending and shear stresses in comments

______ Section losses and/or member defects in comments

______ DF in comments

______ Timber deck NBI condition code and issue requiring the rating in comments

______ Software version in comments

______ Data echo input (PDF, TXT) included in the Report

______ Output (PDF, TXT) included in the Report

______ Rating summary report identifying the controlling rating factor (PDF, TXT) included in the Report

______ Executable model (input file) uploaded to the NDOR Bridge Document Management folder on the FTP site.

Load Rating Summary Sheet (LRSS) and Load Rating Review Sheets

______ notations of rating by hand calculations as appropriate

______ software version used in the rating analysis in the comments section of the LRSS.

______ LRSS comments regarding: 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 members that were analyzed in the Load Rating Evaluation Summary. Don't show members as being analyzed that were not.

______ Verify that the LRSS has been completely filled out

______ Completed LRSS and Load Rating Review Sheets included in the Report

PART 650—BRIDGES, STRUCTURES, AND HYDRAULICS

■ 1. The authority citation for part 650 continues to read as follows:

Authority: 23 U.S.C. 109 (a) and (h), 144, 151, 315, and 319; 33 U.S.C. 401, 491 *et seq.*, 511 *et seq.*; 23 CFR 1.32; 49 CFR 1.48(b), E.O. 11988 (3 CFR, 1977 Comp. p. 117); Department of Transportation Order 5650.2 dated April 23, 1979 (44 FR 24678); sec. 161 of Public Law 97–424, 96 Stat. 2097, 3135; sec. 4(b) of Public Law 97–134, 95 Stat. 1699; and sec. 1057 of Public Law 102–240, 105 Stat. 2002; and sec. 1311 of Pub. L. 105–178, as added by Pub. L. 105–206, 112 Stat. 842 (1998).

■ 2. Revise subpart C to read as follows:

Subpart C—National Bridge Inspection Standards

Sec.

Subpart C—National Bridge Inspection Standards

§ 650.301 Purpose.

This subpart sets the national standards for the proper safety inspection and evaluation of all highway bridges in accordance with 23 U.S.C. 151.

§ 650.303 Applicability.

The National Bridge Inspection Standards (NBIS) in this subpart apply to all structures defined as highway bridges located on all public roads.

§ 650.305 Definitions.

Terms used in this subpart are defined as follows:

American Association of State Highway and Transportation Officials (AASHTO) Manual. ''Manual for Condition Evaluation of Bridges,'' second edition, published by the American Association of State Highway and Transportation Officials (incorporated by reference, *see* § 650.317).

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 undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

Bridge inspection experience. Active participation in bridge inspections in accordance with the NBIS, in either a field inspection, supervisory, or management role. A combination of bridge design, bridge maintenance, bridge construction and bridge inspection experience, with the predominant amount in bridge inspection, is acceptable.

Bridge inspection refresher training. The National Highway Institute ''Bridge Inspection Refresher Training Course'' [1] or other State, local, or federally developed instruction aimed to improve quality of inspections, introduce new techniques, and maintain the consistency of the inspection program.

Bridge Inspector's Reference Manual (BIRM). A comprehensive FHWA manual on programs, procedures and techniques for inspecting and evaluating a variety of in-service highway bridges. This manual may be purchased from the U.S. Government Printing Office, Washington, DC 20402 and from National Technical Information Service, Springfield, Virginia 22161, and is available at the following URL: *http://www.fhwa.dot.gov/bridge/bripub.htm.*

Complex bridge. Movable, suspension, cable stayed, and other bridges with unusual characteristics.

Comprehensive bridge inspection training. Training that covers all aspects of bridge inspection and enables inspectors to relate conditions observed on a bridge to established criteria (see the Bridge Inspector's Reference Manual for the recommended material to be covered in a comprehensive training course).

Critical finding. A structural or safety related deficiency that requires immediate follow-up inspection or action.

Damage inspection. This is an unscheduled inspection to assess structural damage resulting from environmental factors or human actions.

[1] The National Highway Institute training may be found at the following URL: *http://www.nhi.fhwa.dot.gov./*

Fracture critical member (FCM). A steel member in tension, or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse.

Fracture critical member inspection. A hands-on inspection of a fracture critical member or member components that may include visual and other nondestructive evaluation.

Hands-on. Inspection within arms length of the component. Inspection uses visual techniques that may be supplemented by nondestructive testing.

Highway. The term ''highway'' is defined in 23 U.S.C. 101(a)(11).

In-depth inspection. A close-up, inspection of one or more members above or below the water level to identify any deficiencies not readily detectable using routine inspection procedures; hands-on inspection may be necessary at some locations.

Initial inspection. The first inspection of a bridge as it becomes a part of the bridge file to provide all Structure Inventory and Appraisal (SI&A) data and other relevant data and to determine baseline structural conditions.

Legal load. The maximum legal load for each vehicle configuration permitted by law for the State in which the bridge is located.

Load rating. The determination of the live load carrying capacity of a bridge using bridge plans and supplemented by information gathered from a field inspection.

National Institute for Certification in Engineering Technologies (NICET). The NICET provides nationally applicable voluntary certification programs covering several broad engineering technology fields and a number of specialized subfields. For information on the NICET program certification contact: National Institute for Certification in Engineering Technologies, 1420 King Street, Alexandria, VA 22314–2794.

Operating rating. The maximum permissible live load to which the structure may be subjected for the load configuration used in the rating.

Professional engineer (PE). An individual, who has fulfilled education and experience requirements and passed rigorous exams that, under State licensure laws, permits them to offer engineering services directly to the public. Engineering licensure laws vary from State to State, but, in general, to become a PE an individual must be a graduate of an engineering program accredited by the Accreditation Board for Engineering and Technology, pass the Fundamentals of Engineering exam, gain four years of experience working under a PE, and pass the Principles of Practice of Engineering exam.

Program Manager. The individual in charge of the program, that has been assigned or delegated the duties and responsibilities for bridge inspection, reporting, and inventory. The program manager provides overall leadership and is available to inspection team leaders to provide guidance.

Public road. The term ''public road'' is defined in 23 U.S.C. 101(a)(27).

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.

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

Routine inspection. Regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from initial or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements.

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.

Scour. Erosion of streambed or bank material due to flowing water; often considered as being localized around piers and abutments of bridges.

Scour critical bridge. A bridge with a foundation element that has been determined to be unstable for the observed or evaluated scour condition.

Special inspection. An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency.

State transportation department. The term ''State transportation department'' is defined in 23 U.S.C. 101(a)(34).

Team leader. Individual in charge of an inspection team responsible for planning, preparing, and performing field inspection of the bridge.

Underwater diver bridge inspection training. Training that covers all aspects of underwater bridge inspection and enables inspectors to relate the conditions of underwater bridge elements to established criteria (see the Bridge Inspector's Reference Manual section on underwater inspection for the recommended material to be covered in an underwater diver bridge inspection training course).

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

§ 650.307 Bridge inspection organization.

(a) Each State transportation department must inspect, or cause to be inspected, all highway bridges located on public roads that are fully or partially located within the State's boundaries, except for bridges that are owned by Federal agencies.

(b) Federal agencies must inspect, or cause to be inspected, all highway bridges located on public roads that are fully or partially located within the respective agency responsibility or jurisdiction.

(c) Each State transportation department or Federal agency must include a bridge inspection organization that is responsible for the following:

(1) Statewide or Federal agencywide bridge inspection policies and procedures, quality assurance and quality control, and preparation and maintenance of a bridge inventory.

(2) Bridge inspections, reports, load ratings and other requirements of these standards.

(d) Functions identified in paragraphs (c)(1) and (2) of this section may be delegated, but such delegation does not relieve the State transportation department or Federal agency of any of its responsibilities under this subpart.

(e) The State transportation department or Federal agency bridge inspection organization must have a program manager with the qualifications defined in § 650.309(a), who has been delegated responsibility for paragraphs (c)(1) and (2) of this section.

§ 650.309 Qualifications of personnel.

(a) A program manager must, at a minimum:

(1) Be a registered professional engineer, or have ten years bridge inspection experience; and

(2) Successfully complete a Federal Highway Administration (FHWA) approved comprehensive bridge inspection training course.

(b) There are five ways to qualify as a team leader. A team leader must, at a minimum:

(1) Have the qualifications specified in paragraph (a) of this section; or

(2) Have five years bridge inspection experience and have successfully completed an FHWA approved comprehensive bridge inspection training course; or

(3) Be certified as a Level III or IV Bridge Safety Inspector under the National Society of Professional Engineer's program for National Certification in Engineering Technologies (NICET) and have successfully completed an FHWA approved comprehensive bridge inspection training course, or

(4) Have all of the following:

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

(ii) Successfully passed the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering examination;

(iii) Two years of bridge inspection experience; and

(iv) Successfully completed an FHWA approved comprehensive bridge inspection training course, or

(5) Have all of the following:

(i) 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;

(ii) Four years of bridge inspection experience; and

(iii) Successfully completed an FHWA approved comprehensive bridge inspection training course.

(c) The individual charged with the overall responsibility for load rating bridges must be a registered professional engineer.

(d) An underwater bridge inspection diver must complete an FHWA approved comprehensive bridge inspection training course or other FHWA approved underwater diver bridge inspection training course.

§ 650.311 Inspection frequency.

(a) *Routine inspections.* (1) Inspect each bridge at regular intervals not to exceed twenty-four months.

(2) Certain bridges require inspection at less than twenty-four-month intervals. Establish criteria to determine the level and frequency to which these bridges are inspected considering such factors as age, traffic characteristics, and known deficiencies.

(3) Certain bridges may be inspected at greater than twenty-four month intervals, not to exceed forty-eight-months, with written FHWA approval. This may be appropriate when past inspection findings and analysis justifies the increased inspection interval.

(b) *Underwater inspections.* (1) Inspect underwater structural elements at regular intervals not to exceed sixty months.

(2) Certain underwater structural elements require inspection at less than sixty-month intervals. Establish criteria to determine the level and frequency to which these members are inspected considering such factors as construction material, environment, age, scour characteristics, condition rating from past inspections and known deficiencies.

(3) Certain underwater structural elements may be inspected at greater than sixty-month intervals, not to exceed seventy-two months, with written FHWA approval. This may be appropriate when past inspection findings and analysis justifies the increased inspection interval.

(c) *Fracture critical member (FCM) inspections.* (1) Inspect FCMs at intervals not to exceed twenty-four months.

(2) Certain FCMs require inspection at less than twenty-four-month intervals. Establish criteria to determine the level and frequency to which these members are inspected considering such factors as age, traffic characteristics, and known deficiencies.

(d) Damage, in-depth, and special inspections. Establish criteria to determine the level and frequency of these inspections.

§ 650.313 Inspection procedures.

(a) Inspect each bridge in accordance with the inspection procedures in the AASHTO Manual (incorporated by reference, *see* § 650.317).

(b) Provide at least one team leader, who meets the minimum qualifications stated in § 650.309, at the bridge at all times during each initial, routine, in-depth, fracture critical member and underwater inspection.

(c) Rate each bridge as to its safe load-carrying capacity in accordance with the AASHTO Manual (incorporated by reference, *see* § 650.317). Post or restrict the bridge in accordance with the AASHTO Manual or in accordance with State law, when the maximum unrestricted legal loads or State routine permit loads exceed that allowed under the operating rating or equivalent rating factor.

(d) Prepare bridge files as described in the AASHTO Manual (incorporated by reference, *see* § 650.317). Maintain reports on the results of bridge inspections together with notations of any action taken to address the findings of such inspections. Maintain relevant maintenance and inspection data to allow assessment of current bridge condition. Record the findings and results of bridge inspections on standard State or Federal agency forms.

(e) Identify bridges with FCMs, bridges requiring underwater inspection, and bridges that are scour critical.

(1) Bridges with fracture critical members. In the inspection records, identify the location of FCMs and describe the FCM inspection frequency and procedures. Inspect FCMs according to these procedures.

(2) Bridges requiring underwater inspections. Identify the location of underwater elements and include a description of the underwater elements, the inspection frequency and the procedures in the inspection records for each bridge requiring underwater inspection. Inspect those elements requiring underwater inspections according to these procedures.

(3) Bridges that are scour critical. Prepare a plan of action to monitor known and potential deficiencies and to address critical findings. Monitor bridges that are scour critical in accordance with the plan.

(f) *Complex bridges.* Identify specialized inspection procedures, and additional inspector training and experience required to inspect complex bridges. Inspect complex bridges according to those procedures.

(g) *Quality control and quality assurance.* Assure systematic quality control (QC) and quality assurance (QA) procedures are used to maintain a high degree of accuracy and consistency in the inspection program. Include periodic field review of inspection teams, periodic bridge inspection refresher training for program managers and team leaders, and independent review of inspection reports and computations.

(h) *Follow-up on critical findings.* Establish a statewide or Federal agency wide procedure to assure that critical findings are addressed in a timely manner. Periodically notify the FHWA of the actions taken to resolve or monitor critical findings.

§ 650.315 Inventory.

(a) Each State or Federal agency must prepare and maintain an inventory of all bridges subject to the NBIS. Certain Structure Inventory and Appraisal (SI&A) data must be collected and retained by the State or Federal agency for collection by the FHWA as requested. A tabulation of this data is contained in the SI&A sheet distributed by the FHWA as part of the ''Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges,'' (December 1995) together with subsequent interim changes or the most recent version. Report the data using FHWA established procedures as outlined in the ''Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges.''

(b) For routine, in-depth, fracture critical member, underwater, damage and special inspections enter the SI&A data into the State or Federal agency inventory within 90 days of the date of inspection for State or Federal agency bridges and within 180 days of the date of inspection for all other bridges.

(c) For existing bridge modifications that alter previously recorded data and for new bridges, enter the SI&A data into the State or Federal agency inventory within 90 days after the completion of the work for State or Federal agency bridges and within 180 days after the completion of the work for all other bridges.

(d) For changes in load restriction or closure status, enter the SI&A data into the State or Federal agency inventory within 90 days after the change in status of the structure for State or Federal agency bridges and within 180 days after the change in status of the structure for all other bridges.

§ 650.317 Reference manuals.

(a) The materials listed in this subpart are incorporated by reference in the corresponding sections noted. These incorporations by reference were approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. These materials are incorporated as they exist on the date of the approval, and notice of any change in these documents will be published in the **Federal Register**. The materials are available for purchase at the address listed below, and are available for inspection at the National Archives and Records Administration (NARA). These materials may also be reviewed at the Department of Transportation Library, 400 Seventh Street, SW., Washington, DC, in Room 2200. For information on the availability of these materials at NARA call (202) 741–6030, or go to the following URL: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* In the event there is a conflict between the standards in this subpart and any of these materials, the standards in this subpart will apply.

(b) The following materials are available for purchase from the American Association of State Highway and Transportation Officials, Suite 249, 444 N. Capitol Street, NW., Washington, DC 20001. The materials may also be ordered via the AASHTO bookstore located at the following URL: *http://www.aashto.org/aashto/home.nsf/FrontPage.*

(1) The Manual for Condition Evaluation of Bridges, 1994, second edition, as amended by the 1995, 1996, 1998, and 2000 interim revisions, AASHTO, incorporation by reference approved for §§ 650.305 and 650.313.

(2) 2001 Interim Revision to the Manual for Condition Evaluation of Bridges, AASHTO, incorporation by reference approved for §§ 650.305 and 650.313.

(3) 2003 Interim Revision to the Manual for Condition Evaluation of Bridges, AASHTO, incorporation by reference approved for §§ 650.305 and 650.313.

[FR Doc. 04–27355 Filed 12–13–04; 8:45 am]

BILLING CODE 4910–22–P

Nebraska County, Municipality and City Numbers

* Municipality in multiple counties

(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

County	County No.	District No.
Adams	01	4
Antelope	02	3
Arthur	03	6
Banner	04	5
Blaine	05	6
Boone	06	3
Box Butte	07	5
Boyd	08	8
Brown	09	8
Buffalo	10	4
Burt	11	3
Butler	12	1
Cass	13	1
Cedar	14	3
Chase	15	7
Cherry	16	8
Cheyenne	17	5
Clay	18	4
Colfax	19	3
Cuming	20	3
Custer	21	6
Dakota	22	3
Dawes	23	5
Dawson	24	6
Deuel	25	5
Dixon	26	3
Dodge	27	2
Douglas	28	2
Dundy	29	7
Fillmore	30	4
Franklin	31	7

County	County No.	District No.
Frontier	32	7
Furnas	33	7
Gage	34	1
Garden	35	5
Garfield	36	8
Gosper	37	7
Grant	38	6
Greeley	39	4
Hall	40	4
Hamilton	41	4
Harlan	42	7
Hayes	43	7
Hitchcock	44	7
Holt	45	8
Hooker	46	6
Howard	47	4
Jefferson	48	1
Johnson	49	1
Kearney	50	7
Keith	51	6
Keya Paha	52	8
Kimball	53	5
Knox	54	3
Lancaster	55	1
Lincoln	56	6
Logan	57	6
Loup	58	8
Madison	59	3
McPherson	60	6
Merrick	61	4
Morrill	62	5

County	County No.	District No.
Nance	63	4
Nemaha	64	1
Nuckolls	65	4
Otoe	66	1
Pawnee	67	1
Perkins	68	7
Phelps	69	7
Pierce	70	3
Platte	71	3
Polk	72	4
Red Willow	73	7
Richardson	74	1
Rock	75	8
Saline	76	1
Sarpy	77	2
Saunders	78	1
Scotts Bluff	79	5
Seward	80	1
Sheridan	81	5
Sherman	82	4
Sioux	83	5
Stanton	84	3
Thayer	85	4
Thomas	86	6
Thurston	87	3
Valley	88	4
Washington	89	2
Wayne	90	3
Webster	91	4
Wheeler	92	8
York	93	4
Border State County	96	n/a

Nebraska County, Municipality and City Numbers
* Municipality in multiple counties
(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

Municipality or City	City No.	County
Abie	0005	Butler
Adams	0010	Gage
Ainsworth	0015	Brown
Alma	0045	Harlan
Albion	0020	Boone
Alda	0025	Hall
Alexandria	0030	Thayer
Allen	0035	Dixon
Alliance	0040	Box Butte
Alvo	0050	Cass
Amherst	0055	Buffalo
Anoka	0065	Boyd
Anselmo	0070	Custer
Ansley	0075	Custer
Arapahoe	0080	Furnas
Arcadia	0085	Valley
Arlington	0090	Washington
Arnold	0095	Custer
Arthur	0100	Arthur
Ashland	0105	Saunders
Ashton	0110	Sherman
Atkinson	0115	Holt
Atlanta	0120	Phelps
Auburn	0125	Nemaha
Aurora	0130	Hamilton
Avoca	0135	Cass
Axtell	0140	Kearney
Ayr	0145	Adams
Bancroft	0150	Cuming
Barada	0155	Richardson
Barneston	0160	Gage
Bartlett	0165	Wheeler
Bartley	0170	Red Willow
Bassett	0175	Rock
Battle Creek	0180	Madison
Bayard	0185	Morrill
Bazile Mills	0190	Knox
Beatrice	0195	Gage
Beaver City	0200	Furnas

Municipality or City	City No.	County
Beaver Crossing	0205	Seward
Bee	0210	Seward
Beemer	0215	Cuming
Belden	0220	Cedar
Belgrade	0225	Nance
Bellevue	0230	Sarpy
Bellwood	0235	Butler
Belvidere	0240	Thayer
Benedict	0245	York
Benkelman	0250	Dundy
Bennet	0255	Lancaster
Bennington	0260	Douglas
Bertrand	0265	Phelps
Berwyn	0270	Custer
Big Springs	0275	Deuel
Bladen	0280	Webster
Blair	0285	Washington
Bloomfield	0290	Knox
Bloomington	0295	Franklin
Blue Hill	0300	Webster
Blue Springs	0305	Gage
Boelus	1250	Howard
Boys Town	0310	Douglas
Bradshaw	0315	York
Brady	0320	Lincoln
Brainard	0325	Butler
Brewster	0330	Blaine
Bridgeport	0335	Morrill
Bristow	0340	Boyd
Broadwater	0345	Morrill
Brock	0350	Nemaha
Broken Bow	0355	Custer
Brownville	0360	Nemaha
Brule	0365	Keith
Bruning	0370	Thayer
Bruno	0375	Butler
Brunswick	0380	Antelope
Burchard	0385	Pawnee
Burr	0390	Otoe

Nebraska County, Municipality and City Numbers
* Municipality in multiple counties
(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

Municipality or City	City No.	County
Burton	0395	Keya Paha
Burwell	0400	Garfield
Bushnell	0405	Kimball
Butte	0410	Boyd
Byron	0415	Thayer
Cairo	0420	Hall
Callaway	0425	Custer
Cambridge	0430	Furnas
Campbell	0435	Franklin
Carleton	0440	Thayer
Carroll	0445	Wayne
Cedar Bluffs	0450	Saunders
Cedar Creek	0453	Cass
Cedar Rapids	0455	Boone
Center	0460	Knox
Central City	0465	Merrick
Ceresco	0470	Saunders
Chadron	0475	Dawes
Chambers	0480	Holt
Chapman	0485	Merrick
Chappel	0490	Deuel
Chester	0495	Thayer
Clarks	0500	Merrick
Clarkson	0505	Colfax
Clatonia	0510	Gage
Clay Center	0515	Clay
Clearwater	0520	Antelope
Clinton	0525	Sheridan
Cody	0530	Cherry
Coleridge	0535	Cedar
Colon	0540	Saunders
Columbus	0545	Platte
Comstock	0550	Custer
Concord	0555	Dixon
Cook	0560	Johnson
Cordova	0565	Seward
Cornlea	0570	Platte
Cortland	0575	Gage
Cotesfield	0580	Howard
Cowles	0585	Webster

Municipality or City	City No.	County
Cozad	0590	Dawson
Crab Orchard	0595	Johnson
Craig	0600	Burt
Crawford	0605	Dawes
Creighton	0610	Knox
Creston	0615	Platte
Crete	0620	Saline
Crofton	0625	Knox
Crookston	0630	Cherry
Culbertson	0635	Hitchcock
Curtis	0640	Frontier
Cushing	0645	Howard
Dakota City	0650	Dakota
Dalton	0655	Cheyenne
Danbury	0660	Red Willow
Dannebrog	0665	Howard
Davenport	0675	Thayer
Davey	0680	Lancaster
David City	0685	Butler
Dawson	0690	Richardson
Daykin	0695	Jefferson
Decatur	0700	Burt
Denton	0705	Lancaster
Deshler	0710	Thayer
Deweese	0715	Clay
DeWitt	0720	Saline
Dickens	0725	Lincoln
Diller	0730	Jefferson
Dix	0735	Kimball
Dixon	0740	Dixon
Dodge	0745	Dodge
Doniphan	0750	Hall
Dorchester	0755	Saline
Douglas	0760	Otoe
DuBois	0765	Pawnee
Dunbar	0770	Otoe
Duncan	0775	Platte
Dunning	0780	Blaine
Dwight	0785	Butler
Eagle	0790	Cass

Nebraska County, Municipality and City Numbers

* Municipality in multiple counties

(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

Municipality or City	City No.	County
Edgar	0800	Clay
Edison	0805	Furnas
Elba	0810	Howard
Elgin	0815	Antelope
Elk Creek	0820	Johnson
Elkhorn	0825	Douglas
Elm Creek	0830	Buffalo
Elmwood	0835	Cass
Elsie	0840	Perkins
Elwood	0845	Gosper
Elyria	0850	Valley
Emerson	0855*	Dakota
Emerson	0855*	Dixon
Emerson	0855*	Thurston
Emmet	0860	Holt
Endicott	0865	Jefferson
Ericson	0870	Wheeler
Eustis	0875	Frontier
Ewing	0880	Holt
Exeter	0885	Fillmore
Fairbury	0890	Jefferson
Fairfield	0895	Clay
Fairmont	0900	Fillmore
Falls City	0905	Richardson
Farnam	0915	Dawson
Farwell	0910	Howard
Filley	0920	Gage
Firth	0925	Lancaster
Fordyce	0930	Cedar
Fort Calhoun	0935	Washington
Foster	0940	Pierce
Franklin	0945	Franklin
Fremont	0950	Dodge
Friend	0955	Saline
Fullerton	0960	Nance
Funk	0965	Phelps
Gandy	0970	Logan
Garland	0975	Seward
Garrison	0980	Butler
Geneva	0985	Fillmore

Municipality or City	City No.	County
Genoa	0990	Nance
Gering	0995	Scotts Bluff
Gibbon	1000	Buffalo
Gilead	1005	Thayer
Giltner	1010	Hamilton
Glenvil	1015	Clay
Goehner	1020	Seward
Gordon	1025	Sheridan
Gothenburg	1030	Dawson
Grafton	1035	Fillmore
Grainton	1040	Perkins
Grand Island	1045	Hall
Grant	1050	Perkins
Greeley Center	1055	Greeley
Greenwood	1060	Cass
Gresham	1065	York
Gretna	1070	Sarpy
Gross	1075	Boyd
Guide Rock	1080	Webster
Gurley	1085	Cheyenne
Hadar	1090	Pierce
Haigler	1095	Dundy
Hallam	1100	Lancaster
Halsey	1105*	Blaine
Halsey	1105*	Thomas
Hamlet	1110	Hayes
Hampton	1115	Hamilton
Harbine	1120	Jefferson
Hardy	1125	Nuckolls
Harrison	1130	Sioux
Hartington	1135	Cedar
Harvard	1140	Clay
Hastings	1145	Adams
Hay Springs	1155	Sheridan
Hayes Center	1150	Hayes
Hazard	1160	Sherman
Heartwell	1165	Kearney
Hebron	1170	Thayer
Hemingford	1175	Box Butte
Henderson	1180	York
Hendley	1185	Furnas

Nebraska County, Municipality and City Numbers
* Municipality in multiple counties
(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

Municipality or City	City No.	County
Herman	1195	Washington
Hershey	1200	Lincoln
Hickman	1205	Lancaster
Hildreth	1210	Franklin
Holbrook	1215	Furnas
Holdrege	1220	Phelps
Holstein	1225	Adams
Homer	1230	Dakota
Hooper	1235	Dodge
Hordville	1240	Hamilton
Hoskins	1245	Wayne
Howells	1255	Colfax
Hubbard	1260	Dakota
Hubbell	1265	Thayer
Humboldt	1270	Richardson
Humphrey	1275	Platte
Huntley	1280	Harlan
Hyannis	1290	Grant
Imperial	1295	Chase
Indianola	1300	Red Willow
Inglewood	1305	Dodge
Inman	1310	Holt
Ithaca	1315	Saunders
Jackson	1320	Dakota
Jansen	1325	Jefferson
Johnson	1330	Nemaha
Johnstown	1335	Brown
Julian	1340	Nemaha
Juniata	1345	Adams
Kearney	1350	Buffalo
Kenesaw	1355	Adams
Kennard	1368	Washington
Kilgore	1365	Cherry
Kimball	1370	Kimball
Lamar	1375	Chase
Laurel	1380	Cedar
LaVista	1383	Sarpy
Lawrence	1385	Nuckolls
Lebanon	1390	Red Willow
Leigh	1395	Colfax

Municipality or City	City No.	County
Leshara	1400	Saunders
Lewellen	1405	Garden
Lewiston	1410	Pawnee
Lexington	1415	Dawson
Liberty	1420	Gage
Lincoln	1425	Lancaster
Lindsay	1430	Platte
Linwood	1435	Butler
Litchfield	1440	Sherman
Lodgepole	1445	Cheyenne
Long Pine	1450	Brown
Loomis	1455	Phelps
Lorton	1460	Otoe
Louisville	1465	Cass
Loup City	1470	Sherman
Lushton	1475	York
Lyman	1480	Scotts Bluff
Lynch	1485	Boyd
Lyons	1490	Burt
Madison	1515	Madison
Madrid	1520	Perkins
Magnet	1525	Cedar
Malcolm	1530	Lancaster
Malmo	1535	Saunders
Manley	1540	Cass
Marquette	1545	Hamilton
Marsland	1550	Dawes
Martinsburg	1555	Dixon
Maskell	1560	Dixon
Mason City	1565	Custer
Maxwell	1570	Lincoln
Maywood	1575	Frontier
McCook	1495	Red Willow
McCool Jct.	1500	York
McGrew	1505	Scotts Bluff
McLean	1510	Pierce
Mead	1580	Saunders
Meadow Grove	1585	Madison
Melbeta	1590	Scotts Bluff
Memphis	1595	Saunders

Nebraska County, Municipality and City Numbers

* Municipality in multiple counties

(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

Municipality or City	City No.	County
Merriman	1605	Cherry
Milford	1610	Seward
Millard	1615	Douglas
Miller	1620	Buffalo
Milligan	1625	Fillmore
Minatare	1630	Scotts Bluff
Minden	1635	Kearney
Mitchell	1640	Scotts Bluff
Monowi	1645	Boyd
Monroe	1650	Platte
Moorefield	1655	Frontier
Morrill	1660	Scotts Bluff
Morse Bluff	1665	Saunders
Mullen	1670	Hooker
Murdock	1675	Cass
Murray	1680	Cass
Naper	1685	Boyd
Naponee	1690	Franklin
Nebraska City	1695	Otoe
Nehawka	1700	Cass
Neligh	1705	Antelope
Nelson	1710	Nuckolls
Nemaha	1715	Nemaha
Nenzel	1720	Cherry
Newcastle	1725	Dixon
Newman Grove	1730*	Madison
Newman Grove	1730*	Platte
Newport	1735	Rock
Nickerson	1740	Dodge
Niobrara	1745	Knox
Nora	1750	Nuckolls
Norfolk	1755	Madison
Norman	1760	Kearney
North Bend	1765	Dodge
North Loup	1770	Valley
North Platte	1775	Lincoln
Oak	1780	Nuckolls
Oakdale	1785	Antelope
Oakland	1790	Burt
Obert	1795	Cedar

Municipality or City	City No.	County
Octavia	1805	Butler
Odell	1810	Gage
Ogallala	1815	Keith
Ohiowa	1820	Fillmore
Omaha	1825	Douglas
O'Neill	1830	Holt
Ong	1835	Clay
Orchard	1840	Antelope
Ord	1845	Valley
Orleans	1855	Harlan
Osceola	1860	Polk
Oshkosh	1865	Garden
Osmond	1870	Pierce
Otoe	1875	Otoe
Overton	1880	Dawson
Oxford	1885*	Furnas
Oxford	1885*	Harlan
Page	1890	Holt
Palisade	1895*	Hayes
Palisade	1895*	Hitchcock
Palmer	1900	Merrick
Palmyra	1905	Otoe
Panama	1910	Lancaster
Papillion	1915	Sarpy
Pawnee City	1920	Pawnee
Paxton	1925	Keith
Pender	1935	Thurston
Peru	1940	Nemaha
Petersburg	1945	Boone
Phillips	1950	Hamilton
Pickrell	1955	Gage
Pierce	1960	Pierce
Pilger	1965	Stanton
Plainview	1970	Pierce
Platte Center	1975	Platte
Plattsmouth	1980	Cass
Pleasant Dale	1985	Seward
Pleasanton	1990	Buffalo
Plymouth	1995	Jefferson
Polk	2000	Polk

Nebraska County, Municipality and City Numbers
* Municipality in multiple counties
(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

Municipality or City	City No.	County
Ponca	2005	Dixon
Potter	2015	Cheyenne
Prague	2020	Saunders
Preston	2025	Richardson
Primrose	2030	Boone
Prosser	2035	Adams
Ragan	2040	Harlan
Ralston	2045	Douglas
Randolph	2050	Cedar
Ravenna	2055	Buffalo
Raymond	2060	Lancaster
Red Cloud	2065	Webster
Republican City	2070	Harlan
Reynolds	2075	Jefferson
Richland	2080	Colfax
Rising City	2085	Butler
Riverdale	2090	Buffalo
Riverton	2095	Franklin
Roca	2100	Lancaster
Rockville	2105	Sherman
Boelus	1250	Howard
Rogers	2110	Colfax
Rosalie	2115	Thurston
Roseland	2120	Adams
Royal	2125	Antelope
Rulo	2130	Richardson
Rushville	2135	Sheridan
Ruskin	2140	Nuckolls
Salem	2160	Richardson
Santee	2161	Knox
Sargent	2165	Custer
Saronville	2170	Clay
Schuyler	2175	Colfax
Scotia	2180	Greeley
Scottsbluff	2185	Scotts Bluff
Scribner	2190	Dodge
Seneca	2195	Thomas
Seward	2200	Seward
Shelby	2205	Polk
Shelton	2210	Buffalo

Municipality or City	City No.	County
Sholes	2220	Wayne
Shubert	2225	Richardson
Sidney	2230	Cheyenne
Silver Creek	2235	Merrick
Smithfield	2240	Gosper
Snyder	2245	Dodge
South Bend	2250	Cass
South Sioux City	2255	Dakota
Spalding	2260	Greeley
Spencer	2265	Boyd
Sprague	2270	Lancaster
Springfield	2275	Sarpy
Springview	2280	Keya Paha
St. Edward	2145	Boone
St. Helena	2150	Cedar
St. Paul	2155	Howard
Stamford	2285	Harlan
Stanton	2290	Stanton
Staplehurst	2295	Seward
Stapleton	2300	Logan
Steele City	2305	Jefferson
Steinauer	2310	Pawnee
Stella	2315	Richardson
Sterling	2320	Johnson
Stockham	2325	Hamilton
Stockville	2330	Frontier
Strang	2335	Fillmore
Stratton	2340	Hitchcock
Stromsburg	2345	Polk
Stuart	2350	Holt
Sumner	2355	Dawson
Superior	2360	Nuckolls
Surprise	2365	Butler
Sutherland	2370	Lincoln
Sutton	2375	Clay
Swanton	2380	Saline
Syracuse	2385	Otoe
Table Rock	2390	Pawnee
Talmage	2395	Otoe
Tamora	2400	Seward

Nebraska County, Municipality and City Numbers
* Municipality in multiple counties
(These codes are **not** the NBI FPIS codes for NBI Items 3 or 4.)

Municipality or City	City No.	County
Taylor	2410	Loup
Tecumseh	2415	Johnson
Tekamah	2420	Burt
Terrytown	2425	Scotts Bluff
Thayer	2430	York
Thedford	2435	Thomas
Thurston	2440	Thurston
Tilden	2445*	Antelope
Tilden	2445*	Madison
Tobias	2450	Saline
Trenton	2455	Hitchcock
Trumball	2460	Clay
Uehling	2465	Dodge
Ulysses	2470	Butler
Unadilla	2475	Otoe
Union	2480	Cass
Upland	2485	Franklin
Utica	2490	Seward
Valentine	2495	Cherry
Valley	2500	Douglas
Valparaiso	2505	Saunders
Venango	2510	Perkins
Verdel	2515	Knox
Verdigre	2520	Knox
Verdon	2525	Richardson
Virginia	2530	Gage
Waco	2535	York
Wahoo	2540	Saunders
Wakefield	2545*	Dixon
Wakefield	2545*	Wayne
Wallace	2550	Lincoln

Municipality or City	City No.	County
Walthill	2555	Thurston
Washington	2560	Washington
Waterbury	2565	Dixon
Waterloo	2570	Douglas
Wauneta	2575	Chase
Wausa	2580	Knox
Waverly	2585	Lancaster
Wayne	2590	Wayne
Weeping Water	2595	Cass
Wellfleet	2600	Lincoln
West Point	2620	Cuming
Western	2605	Saline
Weston	2615	Saunders
Whitney	2625	Dawes
Wilber	2630	Saline
Wilcox	2635	Kearney
Wilsonville	2640	Furnas
Winnebago	2645	Thurston
Winnetoon	2650	Knox
Winside	2655	Wayne
Winslow	2660	Dodge
Wisner	2665	Cuming
Wolbach	2670	Greeley
Wood Lake	2675	Cherry
Wood River	2680	Hall
Wymore	2685	Gage
Wynot	2690	Cedar
York	2695	York
Yutan	2700	Saunders

QC.1 GENERAL

Examples of Quality Control (QC) activities that participants can use for their work on data, reports and activities for the Bridge Inspection Program (BIP).

QC is simply a check on every document, inspection dataset, or activity completed for the BIP. When QC is completed on the work, ideally there are no errors, omissions or inaccuracies. QC may be done by the organization or another party engaged by the organization to complete QC.

The person who completes QC is called the "QC Officer", in accordance with Quality Management practice. QC review is nearly always completed by an individual with equal or better qualifications than the document/dataset originator. Some BIP documents require a NE professional engineer's seal.

Quality Assurance is done by an independent party, on a small random sample, to assure that QC is attaining the required level of quality. See the BIP Manual for additional information.

QC.2 OWNER RECORDS, BIP MANUAL CHAPTER 2

QC items

- Individual Bridge Records
- Master lists of Critical Findings,
- Master list of Scour Critical Bridges

QC Officer

- Any member of the Bridge Owner's staff who is familiar with the BIP Program

QC examples activities

- Creating and maintaining a record for each structure under a bridge owner's control
- Systematic and regular updates of the information in the records
- Filing new load ratings in the bridge record within one week of receipt from Load Rating Engineer
- Filing a Scour Assessment within one week of receipt from the Hydraulic Engineer
- Filing inspection documents (revised SIA, Pontis print out, fracture critical reports, special reports) within one month of the completion of the inspection
- File information on maintenance/repair work done within one month of completion
- Maintaining a log of critical findings activity as when new reports are filed or closed
- Maintain a log of activities related to monitoring for Plan of Action

QC.3 INSPECTION CODING & REPORTS, MANUAL CHAPTERS 3 & 4

QC items

- Data such as condition codes
- Inspection reports such as fracture critical reports
- Critical Finding reports

QC Officer (must have a working knowledge of the BIP Program)

- An in-house Team Leader (TL) or a TL from a neighboring agency
- The TL's supervisor
- An in-house engineer (PE or EI), or engineering technician
- A consulting engineer
- County highway superintendent
- Local Public Agency Responsible Charge (RC)
- An Assistant Team Leader (ALT) for Pontis input completed by others

QC examples activities

- Including names of inspection Team Leader (TL) and any Assistant Team Leaders (ATL). TL name on every page of the document. The QC reviewer name on first page of the document and initials all pages that are reviewed. Many NDOR forms for inspection include a field for this purpose.
- An additional TL can be present when the inspection is being completed. The additional TL's name and initials should be included on the inspection document.
- Data input from manual field notes is often input by administrative staff. The TL must review the Pontis file when the input has been completed.
- A TL may determine Pontis values in the field, record manually, and then revisit their coding on a later date prior to input into Pontis.
- A TL may determine Pontis values within Pontis in the field, then have another TL or ATL review a Pontis printout of the values against the inspection notes and photos.
- Critical finding reports are reviewed with the TL who originated the report.

QC.4 LOAD RATING, BIP MANUAL CHAPTER 5

QC items

- Load rating Reports
- Load rating calculations, both manual and electronic
- Load Rating Summary Sheets (LRSS) and Load Rating Review Sheets (LRRS)

QC Officer

- A NE PE with experience that equals or exceeds the originator of the work. An engineering intern or a PE can be the originator, but QC must be completed and sealed by the PE.

QC example activities

- Check manual calculations then initial each sheet of the document
- Check software input then initial the first sheet of the document
- Check software output then initial the first sheet of the document
- Check the document then initial the first sheet of any multi-page documentation, such as field measurements documenting the cause for rerating, photos.
- Seal of PE on the LRSS

QC.5 SCOUR, BIP MANUAL CHAPTER 6

QC items

- Scour Assessment Reports
- Hydraulic calculations, both manual and electronic
- DR385 Bridge Scour Report, DR385B Bridge Scour Assessment, DR385C Bridge Scour Plan of Action, DR385D Bridge Scour Worksheet, DR385E POA Monitoring log, DR385F Change in Scour Conditions

QC Officer

- A NE PE with experience that equals or exceeds the originator of the work. An engineering intern or a PE can be the originator, but QC must be completed and sealed by the PE.

QC example activities

- Check manual calculations then initial each sheet of the document
- Check software input then initial the first sheet of the document
- Check software output then initial the first sheet of the document
- Check the document then initial the first sheet of any multi-page documentation, such as channel cross sections, USGS maps, photos.
- Seal of PE the Scour Assessment Report

REFERENCED PUBLICATION

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 Appendix.

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.The references set forth procedures to be used by Bridge Owners in managing their Bridge File and Bridge Records.

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.

The information in this Bridge Inspection Program Manual supplements the information in these references.

Primary Operation (Coding and Records may also be included)	Publisher or Author	Publication	Publication Date
Coding	FHWA	Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, Report No. FHWA-PD-96-001	December 1995 with Errata, March 2004
Inspection	FHWA	Bridge Inspector's Reference Manual (BIRM), FHWA Publication No. FHWA-NHI-12-053	December 2001
Inspection	NCHRP	Synthesis 354: Inspection and Management of Bridges with Fracture-Critical Details	
Inspection, Load Rating	AASHTO	Manual for Bridge Evaluation (MBE), Second Edition with 2013 Edition Interim	
Load Rating	FHWA	Revisions to the Recording and Coding Guide for the Structure, Inventory, and Appraisal of the Nation's Bridges (Coding Guide) Items 63 and 65, Method Used to Determine Operating and Inventory Rating	November 15, 2011
Load Rating	FHWA	Revisions to the Recording and Coding Guide for the Structure, Inventory and Appraisal of the Nation's bridges (Coding Guide) – Item 31, Design Load, and Items 63 and 65, Method Used to Determine Operating and Inventory Ratings	February 2, 2011
Load Rating	FHWA	Revisions to Items 63-66 to Support Load Reporting by Rating Factor	March 22, 2004
Load Rating	AASHTO	Standard Specifications for Highway Bridges, 17th Edition	September 1, 2002
Load Rating	AASHTO	LRFD Bridge Design Specifications, Sixth Edition	2012
Load Rating	FHWA	Bridge Load Ratings for the National Bridge Inventory	October 30, 2006
Load Rating	Nebraska Department of Roads Bridge Division	Bridge Office Policies and Procedures (BOPP), Current version	See NDOR Bridge Division webite.
Load Rating	Joseph A. Yura, and Brett A. Phillips	"Bracing Requirements for Elastic Steel Beams" University of Texas at Austin, Center for Transportation Research, Report No. FHWA/TX-92+1239-1	
Load Rating	Swarnalatha Vegesna, and Joseph A. Yura	"An Ultimate Load Test to Study Bracing Effects of Bridge Decks", University of Texas at Austin, Center for Transportation Research, Report No. FHWA/TX-92+1239-2	
Load Rating	Stuart T. Webb and Joseph A. Yura	"Evaluation of Bridge Decks as Lateral Bracing for Supporting Steel Stringers", University of Texas at Austin, Center for Transportation Research, Report No. FHWA/TX-92+1239-3	
Load Rating	Joseph A. Yura, Brett A. Phillips, Swarna Raju and Stuart T. Webb	"Bracing of Steel Beams in Bridges", University of Texas at Austin, Center for Transportation Research, Report No. FHWA/TX-92+1239-4F	

Primary Operation (Coding and Records may also be included)	Publisher or Author	Publication	Publication Date
Load Rating	National Corrugated Steel Pipe Association (NCSPA), Washington, D C	"Load rating and structural evaluation of in-service, corrugated steel structures" Design Data Sheet No. 19	1995
Load Rating	David C. Cowherd, Vlad G. Perlea, Bowser Morner Associates, Dayton, Ohio	"An Evaluation of Flexible Metal Pipes"	1989
Load Rating	FHWA	Technical Advisory 5140.29, Load-carrying Capacity Considerations of Gusset Plates in Non-load-path-redundant Steel Truss Bridges	January 15, 2008
Scour	FHWA	Technical Advisory T5140 23, Evaluating Scour at Bridges	October 28, 1991
Scour	FHWA	Evaluating Scour at Bridges, Fifth Edition, Hydraulic Engineering Circular, No. 18 (HEC 18)	April 2012
Scour	FHWA	Stream Stability at Highway Structures, Fourth Edition, Hydraulic Engineering Circular, No. 20 (HEC 20)	April 2012
Scour	FHWA	Bridge Scour and Stream Instability Countermeasures, Experience, Selection and Design Guidance, Third Edition, Volume 1, Hydraulic Engineering Circular, No. 23 (HEC 23)	2009
Scour	FHWA	Bridge Scour and Stream Instability Countermeasures, Experience, Selection and Design Guidance, Third Edition, Volume 2, Hydraulic Engineering Circular, No. 23 (HEC 23)	2009
Scour	FHWA	Revision of Coding Guide, Item 113 – Scour Critical Bridges	April 27, 2001
Scour	FHWA	Compliance with the National Bridge Inspection Standards – Plan of Action for Scour Critical Bridges	March 29, 2005
Scour	FHWA	National Bridge Inspection Standards – Scour Evaluations and Plans of Action for Scour Critical Bridges	January 4, 2008
Scour	FHWA	Technical Guidance for Bridges over Waterways with Unknown Foundations	January 9, 2008
Scour	FHWA	Scourability of Rock Formations	July 19, 1991
Scour	FHWA	Frequently Asked Questions – Bridges Over Waterways with Unknown Foundations	June 3, 2009
Scour	FHWA	Additional Guidance for Assessment of Bridges Over Waterways with Unknown Foundations	October 29, 2009

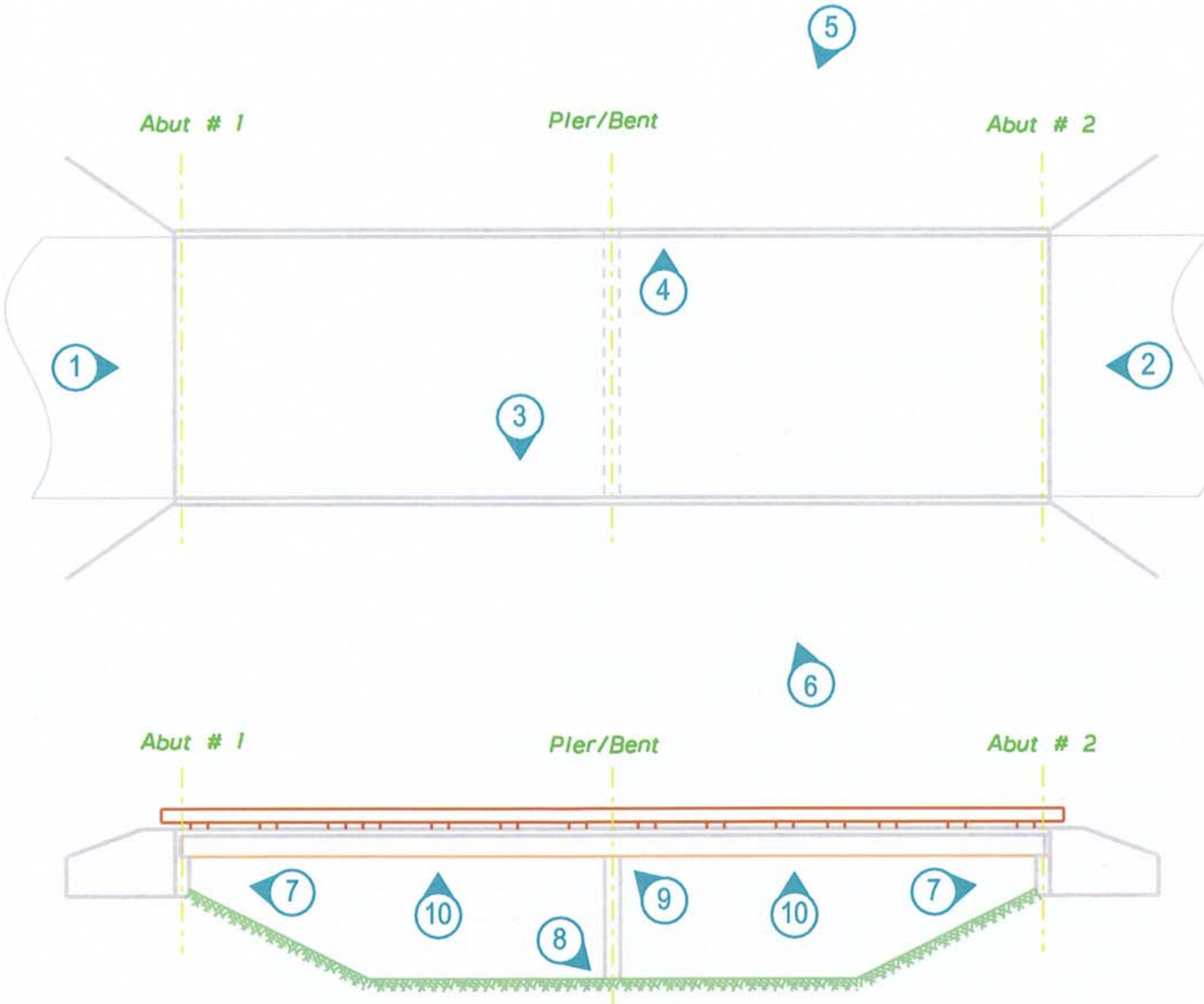
Primary Operation (Coding and Records may also be included)	Publisher or Author	Publication	Publication Date
Scour	NDOR	Hydraulic Analysis Guidelines, Current version	See NDOR Bridge Division webite.

Note to Manual Users:

The AASHTO MBE superseded the AASHTO Manual for Condition Evaluation of Bridge and interims with the AASHTO Guide Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges. Revisions based on approved agenda items from annual AASHTO Highways Subcommittee on Bridges and Structures meetings in 2007 and 2008 are also incorporated into the MBE. The MBE was adopted by the AASHTO Highways Subcommittee on Bridges and Structures in 2005. With the 2008 publication of the MBE, the Subcommittee conferred archive status on the Manual for Condition Evaluation of Bridges, the Guide Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges and all Interim Revisions of both prior bridge evaluation titles.

In December 2009, FHWA updated the NBIS regulation to define the AASHTO Manual in 23 CFR § 650.317 as the MBE, effective January 25, 2010. The AASHTO Manual is included in the NBIS through incorporation by reference (IBR). IBR is a technique used by Federal Agencies to include and make enforceable materials published elsewhere without republishing those materials in full text in the agencies' regulations. The FHWA uses IBR extensively to incorporate documents such as AASHTO design standards into 23 CFR part 625 and to incorporate FHWA's Manual on Uniform Traffic Control Devices into 23 CFR part 655.

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.

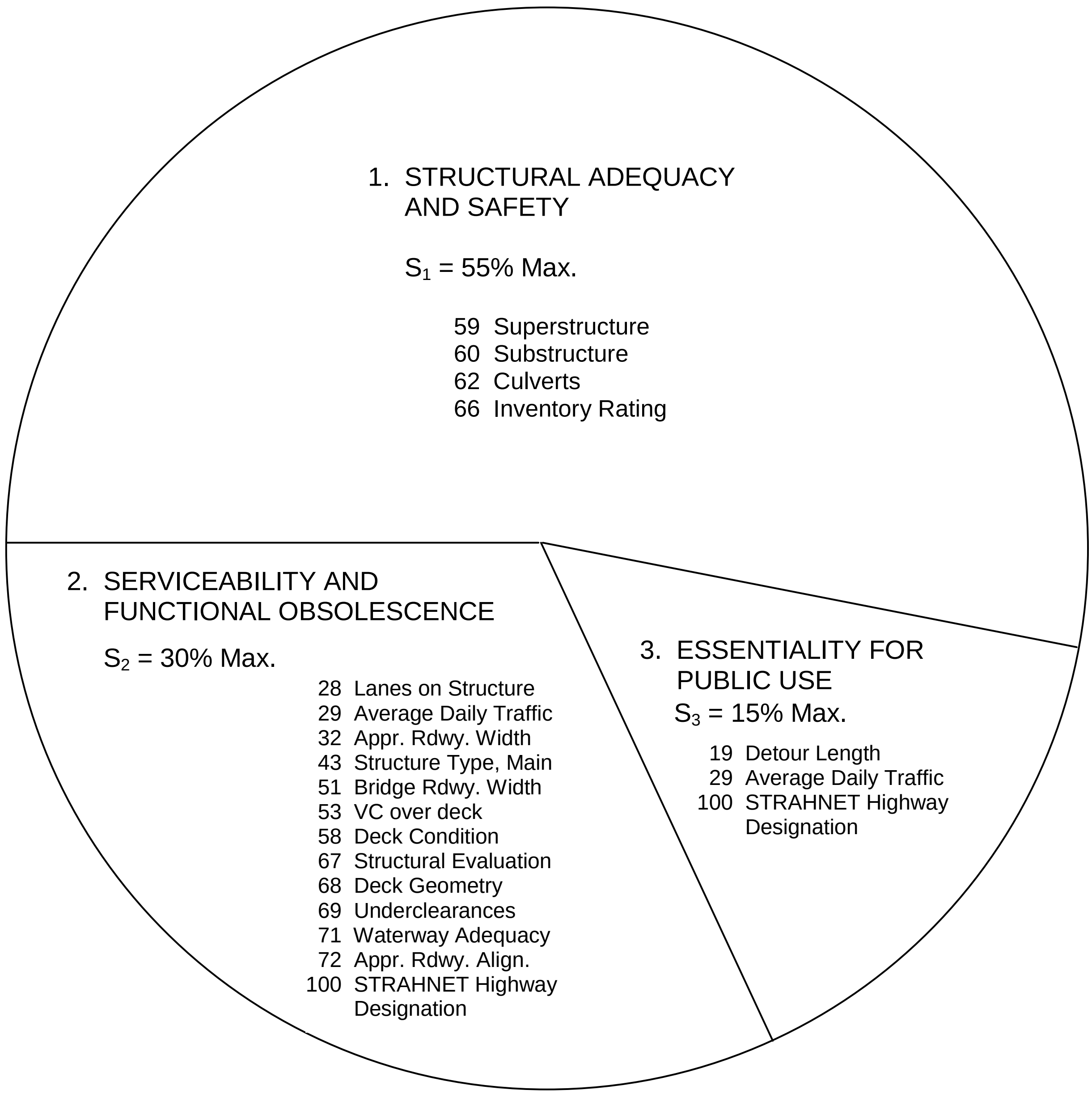
10 Looking at the underside of the bridge in each span. If possible, the photos should be taken to show the entire width of the bridge and all of the girders in a single photo for each span.

Sufficiency Rating Formula and Example

The sufficiency rating formula described herein is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge.

An asterisk prefix is used to identify a sufficiency rating that was calculated even though some essential data was missing or coded incorrectly. The Edit/Update Program will substitute a value for the unusable data (which will not lower the rating) and calculate the sufficiency rating. The asterisk is dropped when the unusable data is corrected. It is normal that all culverts with Bridge Roadway Width, Curb-to-Curb – Item 51 coded '0000' will have an asterisk prefixed sufficiency.

Figure 1. Summary of Sufficiency Rating Factors



4. SPECIAL REDUCTIONS

S_4 = 13% Max.

19 Detour Length
36 Traffic Safety Features
43 Structure Type, Main

SUFFICIENCY RATING = $S_1 + S_2 + S_3 - S_4$

Sufficiency Rating shall not be less than 0% nor greater than 100%

Sufficiency Rating Formula

1. Structural Adequacy and Safety (55% maximum)

   a. Only the lowest code of Item 59, 60, or 62 applies.

If #59 (Superstructure Rating) or #60 (Substructure Rating) is	≤ 2	then	A = 55%
	= 3		B = 40%
	= 4		C = 25%
	= 5		D = 10%

If #59 and #60 = N and #62 (Culvert Rating) is	≤ 2	then	E = 55%
	= 3		F = 40%
	= 4		G = 25%
	= 5		H = 10%

   b. Reduction for Load Capacity:

   Calculate using the following formulas where IR is the Inventory Rating in tons or use Figure 2:

   $I = (36 - IR)^{1.5} \times 0.2778$

   If $(36 - IR) \leq 0$, then B = 0

   “B” shall not be less than 0% nor greater than 55%.

$S_1 = 55 - (A + B + C + D + E + F + G + H + I)$

S_1 shall not be less than 0% nor greater than 55%.

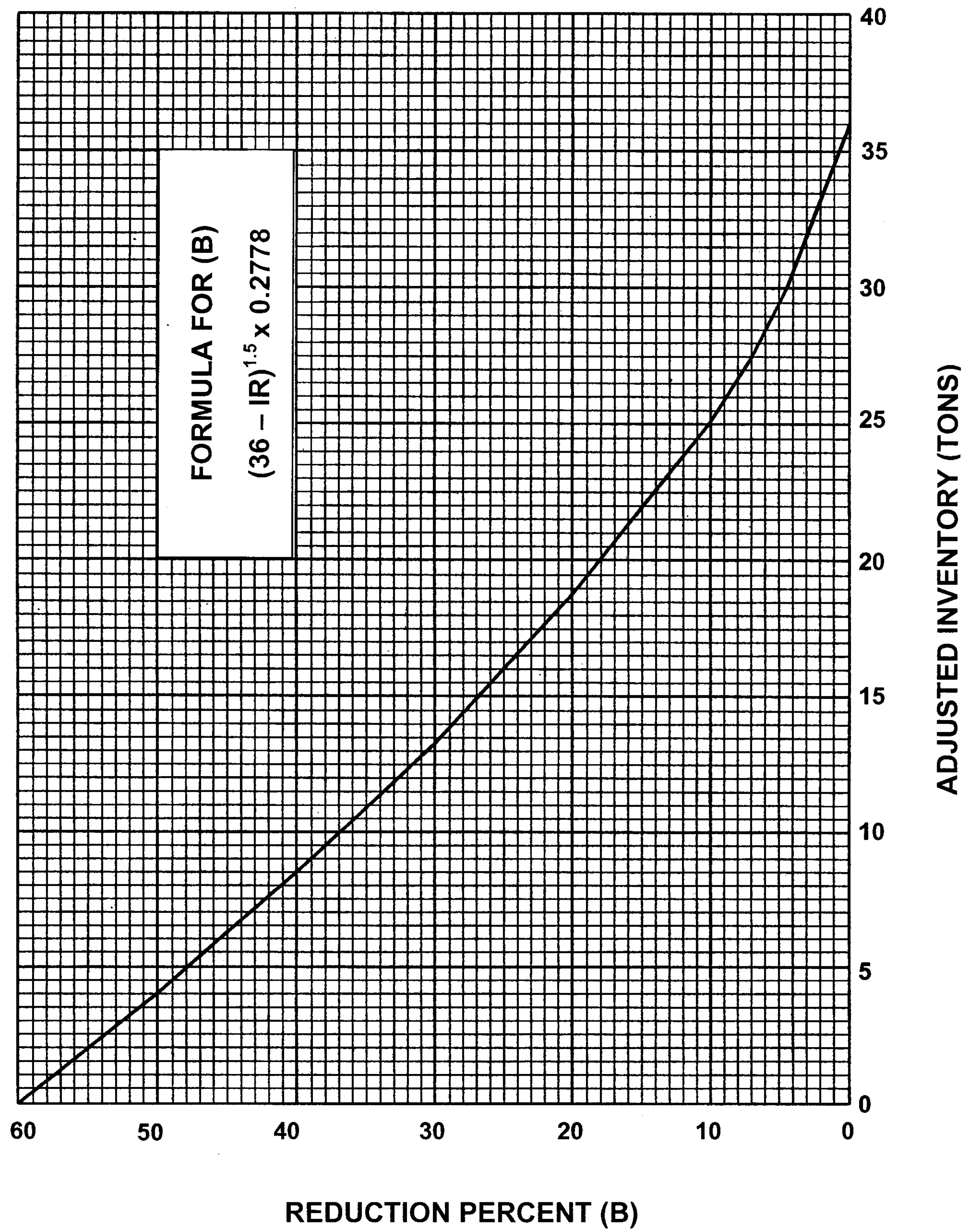


Figure 2. Reduction for Adjusted Inventory Tons

2. Serviceability and Functional Obsolescence (30% maximum)

a. Rating Reductions (13% maximum)

If #58 (Deck Condition) is	≤ 3	then	A = 5%
	= 4		A = 3%
	= 5		A = 1%
If #67 (Structural Evaluation) is	≤ 3	then	B = 4%
	= 4		B = 2%
	= 5		B = 1%
If #68 (Deck Geometry) is	≤ 3	then	C = 4%
	= 4		C = 2%
	= 5		C = 1%
If #69 (Underclearances) is	≤ 3	then	D = 4%
	= 4		D = 2%
	= 5		D = 1%
If #71 (Waterway Adequacy) is	≤ 3	then	E = 4%
	= 4		E = 2%
	= 5		E = 1%
If #72 (Approach Road Alignment) is	≤ 3	then	F = 4%
	= 4		F = 2%
	= 5		F = 1%

J = (A + B + C + D + E + F)

J shall not be less than 0% nor greater than 13%.

b. Width of Roadway Insufficiency (15% maximum)

Use the sections that apply:

(1) applies to all bridges;
(2) applies to 1-lane bridges only;
(3) applies to 2 or more lane bridges;
(4) applies to all except 1-lane bridges.

Also determine X and Y:

X (ADT/Lane) = #29 (ADT) ÷ first 2 digits of #28 (Lanes)

Y (Width/Lane) = #51 (Bridge Rdwy. Width) ÷ first 2 digits of #28

(1) Use when the last 2 digits of #43 (Structure Type) are not equal to 19 (Culvert):

If (#51 + 2 Ft.) < #32 (Approach Roadway Width) G = 5%

(2) For 1-lane bridges only, use Figure 3 or the following:

If the first 2 digits of #28 (Lanes) are equal to 01 and

$Y < 14$	then	$H = 15\%$
$Y \geq 14 < 18$		$H = 15 \left(\frac{18-Y}{4}\right) \%$
$Y \geq 18$		$H = 0\%$

(3) For 2 or more lane bridges. If these limits apply, do not continue on to (4) as no lane width reductions are allowed.

If the first 2 digits of #28 = 02 and $Y \geq 16$, $H = 0\%$
If the first 2 digits of #28 = 03 and $Y \geq 15$, $H = 0\%$
If the first 2 digits of #28 = 04 and $Y \geq 14$, $H = 0\%$
If the first 2 digits of #28 ≥ 05 and $Y \geq 12$, $H = 0\%$

(4) For all <u>except</u> 1-lane bridges, use Figure 3 or the following:

If $Y < 9$ and $X > 50$	then	$H = 15\%$
$Y < 9$ and $X \leq 50$		$H = 7.5\%$
$Y \geq 9$ and $X \leq 50$		$H = 0\%$

If $X > 50$ but ≤ 125 and

$Y < 10$	then	$H = 15\%$
$Y \geq 10 < 13$		$H = 15 \left(\frac{13-Y}{3}\right) \%$
$Y \geq 13$		$H = 0\%$

If $X > 125$ but ≤ 375 and

$Y < 11$	then	$H = 15\%$
$Y \geq 11 < 14$		$H = 15 \left(\frac{14-Y}{3}\right) \%$
$Y \geq 14$		$H = 0\%$

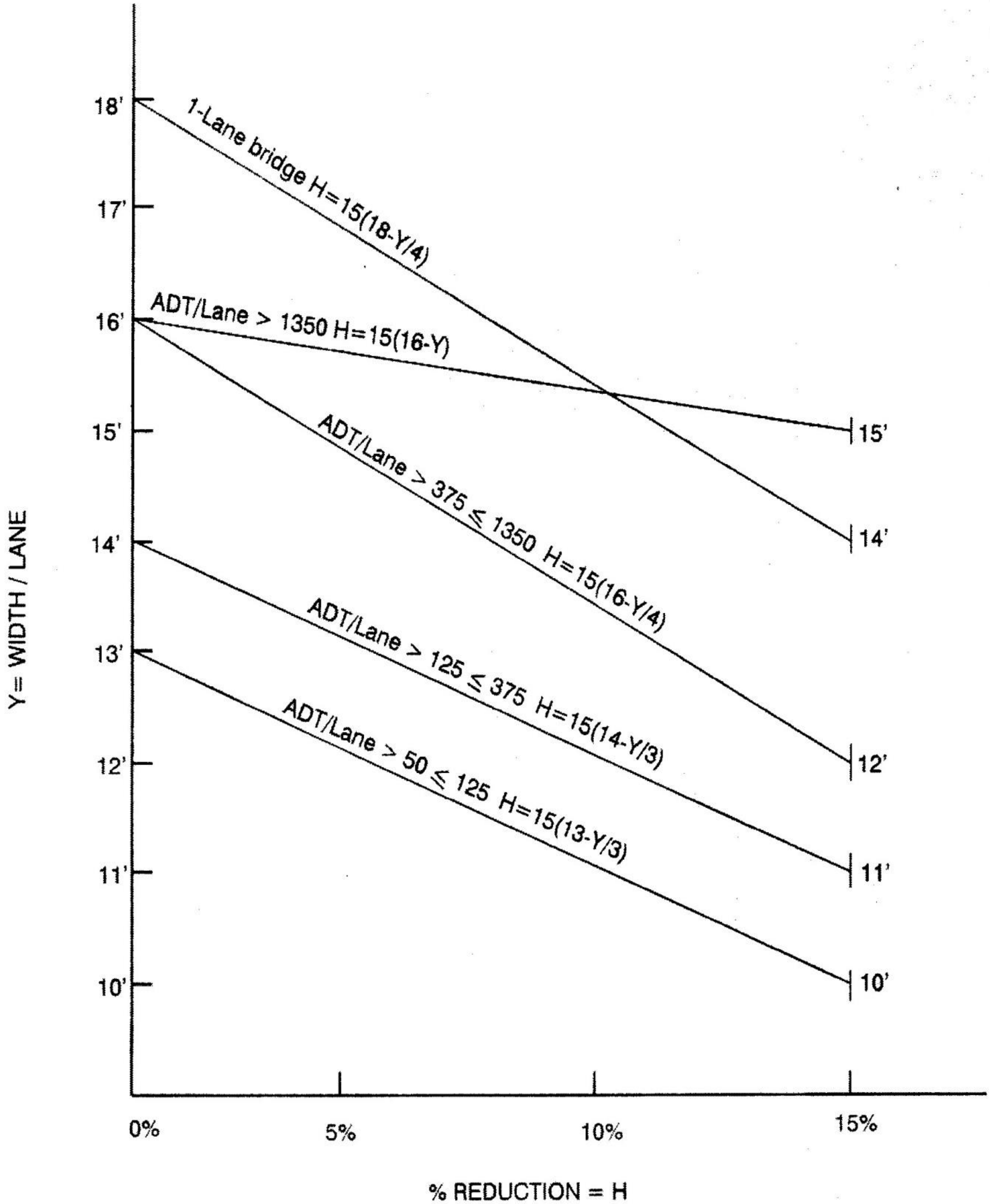


Figure 3. Width of Roadway Sufficiency

If X > 375 but ≤ 1350 and

Y < 12	then	H = 15%
Y ≥ 12 < 16		$H = 15 \left(\frac{16-Y}{4}\right) \%$
Y ≥ 16		H = 0%

If X > 1350 and

Y < 15	then	H = 15%
Y ≥ 15 < 16		H = 15 (16–Y) %
Y ≥ 16		H = 0%

G + H shall not be less than 0% nor greater than 15%.

c. Vertical Clearance Insufficiency – (2% maximum)

If #100 (STRAHNET Highway Designation) > 0 and

#53 (VC over Deck) ≥ 1600	then	I = 0%
#53 < 1600		I = 2%

If #100 = 0 and

#53 ≥ 1400	then	I = 0%
#53 < 1400		I = 2%

$S_2 = 30 – [J + (G + H) + I]$

S_2 shall not be less than 0% nor greater than 30%.

3. Essentiality for Public Use (15% maximum)

a. Determine:

$$K = \frac{S_1 + S_2}{85}$$

b. Calculate

$$A = \frac{\#29\ (ADT) \times \#19\ (Detour\ Length) \times 15}{200{,}000 \times K}$$

"A" shall not be less than 0% nor greater than 15%.

c. STRAHNET Highway Designation:

If #100 is > 0	then	B = 2%
If #100 = 0	then	B = 0%

$S_3 = 15 – (A + B)$

S_3 shall not be less than 0% nor greater than 15%.

4. Special Reductions (Use only when $S_1 + S_2 + S_3 \geq 50$)

a. Detour Length Reduction, use Figure 4 or the following:

$A = (\#19)^4 \times (5.205 \times 10^{-8})$

"A" shall not be less than 0% nor greater than 5%.

b. If the 2nd and 3rd digits of #43 (Structure Type, Main) are equal to 10, 12, 13, 14, 15, 16, or 17; thenB = 5%

c.

If 2 digits of #36 (Traffic Safety Features)	= 0	C = 1%
If 3 digits of #36	= 0	C = 2%
If 4 digits of #36	= 0	C = 3%

$S_4 = A + B + C$

S_4 shall not be less than 0% nor greater than 13%.

Sufficiency Rating = $S_1 + S_2 + S_3 – S_4$

The Rating shall not be less than 0% nor greater than 100%.

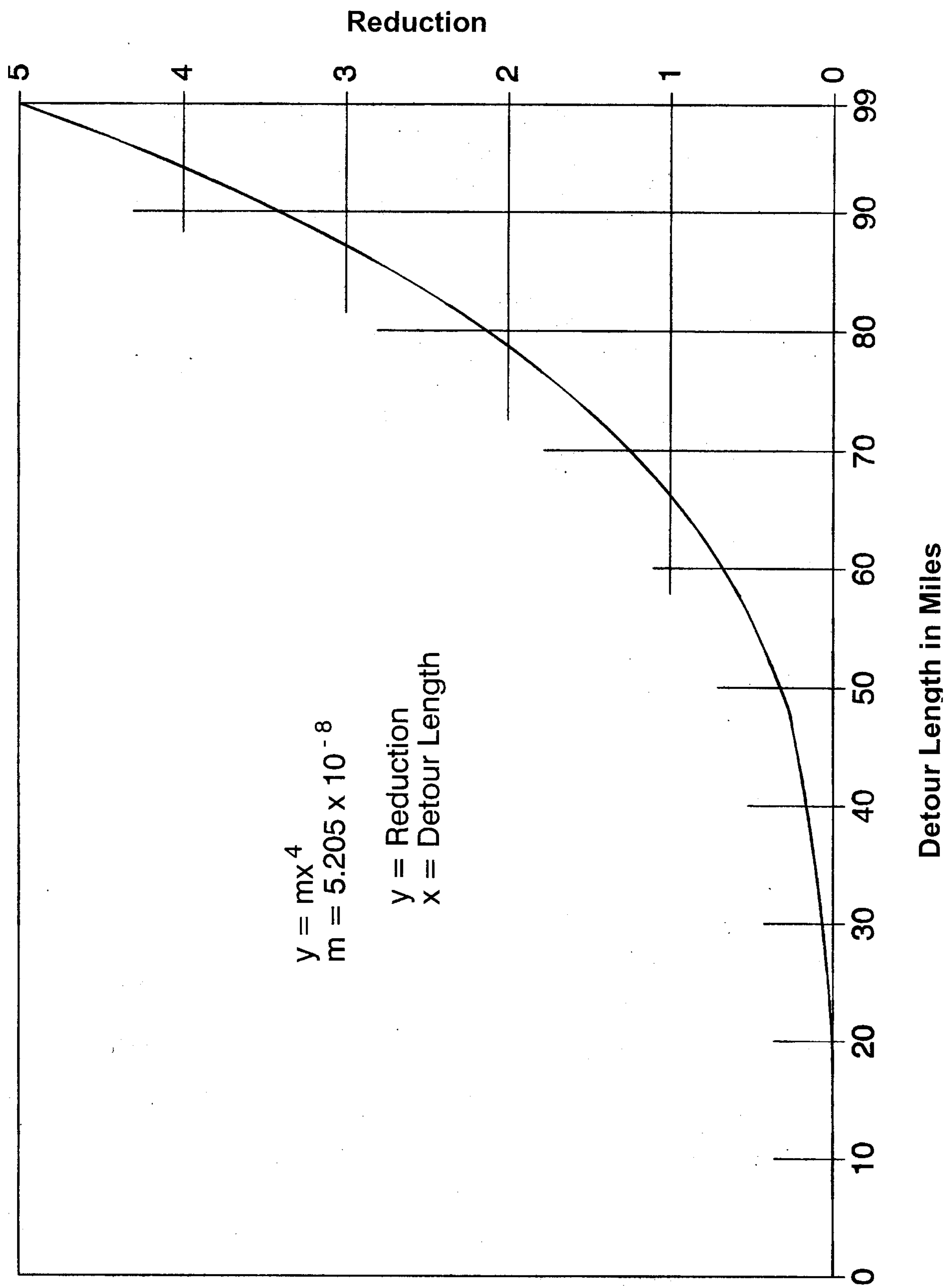


Figure 4. Special Reduction for Detour Length

Example
Calculation of Sufficiency Rating

1. Structural Adequacy and Safety

   A, B, C, E, F, G, H = Not Applicable
   D = 10%
   $I = [36 - (1.00 \times 22)]^{1.5} \times 0.2778 = 14.6$
   $S_1 = 55 - (10 + 14.6) = 30.4$

2. Serviceability and Functional Obsolescence

   A = 3%, B = 1%, C = 4%, D = NA, E = NA, F = NA
   J = (3 + 1 + 4) = 8%
   $X = \frac{18500}{2} = 9250 \qquad Y = \frac{26.0}{2} = 13.0$

   (1) If (26.0 + 2) < 40 then G = 5
   (2) Not Applicable
   (3) Not Applicable
   (4) If X = 9250 and Y = 13.0 then H = 15

   G + H = 5 + 15 = 20 (however, maximum allowable = 15)
   I = 0
   $S_2 = 30 - [8 + (15) + 0] = 7.0$

3. Essentiality for Public Use

   $K = \frac{30.4 + 7.0}{85} = 0.44$

   $A = \frac{18500 \times 8}{200{,}000 \times 0.44} \times 15 = 25.2$ (however, maximum allowable = 15)

   B = 0

   $S_3 = 15 - (15 + 0) = 0$

4. Special Reductions

   $S_1 + S_2 + S_3 = (30.4 + 7.0 + 0.0) = 37.4 < 50$
   S_4 = NA

SUFFICIENCY RATING = 30.4 + 7.0 + 0.0 = 37.4

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