NORTH Dakota | Transportation
Be Legendary.

NDDOT Bridge Inspection Manual

April 19, 2023

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Appended by Reference:

NDDOT Bridge Inspectors Guide for Fracture Critical Bridges and Bridges with Special Features
NDDOT Inspection Vehicle Policy Manual
NDDOT Ancillary Inspection Guide

TABLE OF FIGURES

ABBREVIATIONS

The following is a list of abbreviations used in all Chapters of the Bridge Management Manual:

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
BIRM	FHWA Bridge Inspector's Reference Manual
BrM	AASHTOWare Bridge Management Software
CFR	Code of Federal Regulations
FC	Fracture Critical
FCM	Fracture Critical Member
FHWA	Federal Highway Administration
GPR	Ground Penetrating Radar
GPS	Global Positioning System
LPA	Local Public Agency
LRFD	Load Resistance Factor Design
MBE	AASHTO Manual for Bridge Evaluation
MT	Magnetic Particle Testing
MUTCD	Manual of Uniform Traffic Control Devices
NBI	National Bridge Inventory
NBIS	National Bridge Inspection Standards
NCHRP	National Cooperative Highway Research Program
NDDOT	North Dakota Department of Transportation
NDE	Non-destructive Evaluation
NDT	Non-destructive Testing
NHI	National Highway Institute
NHS	National Highway System
NSTM	Nonredundant Steel Tension Member
PCA	Plan of Corrective Action
POA	Plan of Action
PPE	Personal Protection Equipment
PT	Liquid Penetrant Testing
SFN	State Form Number
SI&A	Structure Inventory and Appraisal
UW	Underwater

DEFINITIONS

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.

Bridge: The National Bridge Inspection Standards published in the Code of Federal Regulations (NBIS 23 CFR §650 Subpart C) includes 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.

The following are examples of structures meeting the above definition:

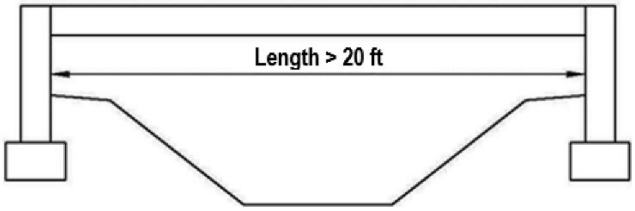


Figure 1: Example of NBI Bridge Length Bridge

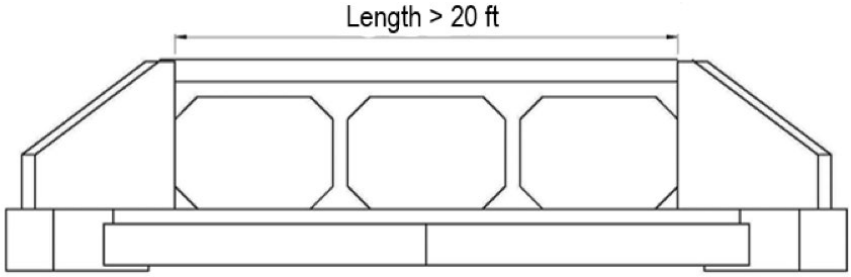


Figure 2: Example of NBI Bridge Length Box Culvert

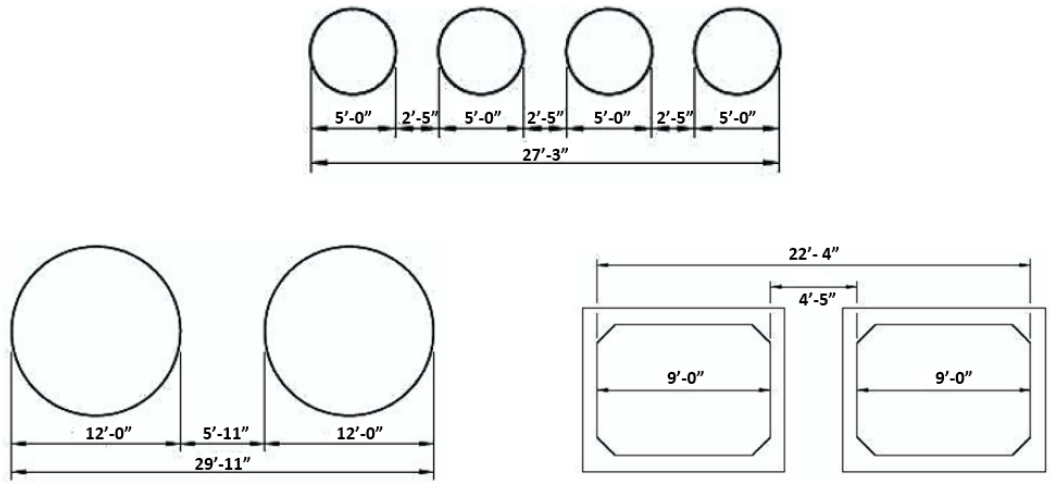


Figure 3: Examples of NBI Bridge Length Multiple Pipe

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 stream bed serving as the bottom of the culvert. Culverts may qualify to be considered "bridge length".

Highway Performance Monitoring System (HPMS): The HPMS is a national level highway information system that includes data on the extent, condition, performance, use and operating characteristics of the nation's highways.

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., Sec. 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.

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 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.

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 15,667 miles (25,215 kilometers) of other non-interstate highways.

STRAHNET Connectors: Roads that connect military installations and ports of embarkation to the STRAHNET. The connector routes represent about 1,890 miles (3,042 kilometers) of roads that complement STRAHNET.

1.1 GENERAL

1.1.1 Federal Regulations

The Code of Federal Regulations (CFR) requires that State Departments of Transportation develop and monitor a bridge inspection program. The inspection program must meet or exceed the requirements of the National Bridge Inspection Standards (NBIS) 23 CFR §650. The CFR requires the inspection of all structures classified as bridges, as defined by NBIS 23 CFR §650 Subpart C.

The CFR also requires the development of statewide inspection policies and procedures, the development of QC/QA procedures, and the preparation and maintenance of a bridge file.

This chapter assists bridge inspectors in the interpretation and implementation of the procedures and practices within the bridge inspection programs.

1.1.2 National Publications

FHWA and AASHTO have published several publications to implement the NBIS. Use the following additional publications in conjunction with this chapter:

For Inspection Procedures:

- *FHWA Bridge Inspector's Reference Manual (BIRM)*
- *AASHTO Manual for Bridge Evaluation (MBE)*

For NBI Coding guidance:

- *FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*

For SNBI Coding guidance:

- FHWA Specifications for the National Bridge Inventory

For Element Inspection guidance:

- *AASHTO Manual for Bridge Element Inspection (MBEI)*

For Fracture Critical/NSTM inspections:

- *FHWA Inspection of Fracture Critical Bridge Members (Report No. FHWA-IP-86-26)*

For Underwater inspections:

- *FHWA Underwater Bridge Inspection Manual*

For NBIS Oversight Program:

- *FHWA Metrics for the Oversight of the National Bridge Inspection Program*

1.1.3 NDDOT Requirements

North Dakota Department of Transportation has additional requirements governing the inspection of structures within the State, which are found throughout the NDDOT Bridge Inspection Manual. In the event of conflicting information or requirements between the NDDOT Inspection Manual and the NBIS, the most restrictive requirements will govern. Use the following additional guidance documents in conjunction with this manual:

For NDDOT Structure Information:

- *North Dakota Department of Transportation Bridge Listing*

For NDDOT Fracture Critical/NSTM inspections:

- *NDDOT Bridge Inspectors Guide for Fracture Critical Bridges and Bridges with Special Features*

For NDDOT Ancillary Inspection Guide:

- *NDDOT Ancillary Inspection Guide*
- *FHWA Guidelines for the Installation, Inspection, Maintenance and Repair of Structural Supports for Highway Signs, Luminaires, and Traffic Signals*

1.1.4 Program Organization, Qualifications, and Responsibilities

Bridge Management is responsible for administering the bridge inspection program in compliance with NBIS 23 CFR §650 Subpart C. Bridge Management is responsible for defining and implementing inspection policies and procedures, reporting, quality assurance and the preparation and maintenance of the bridge file. The organization and qualifications for these positions must meet, at a minimum, the requirements of the NBIS.

1.1.4.1 Bridge Management Engineer

The Bridge Management Engineer will serve as the Bridge Inspection Program Manager for the implementation of the NBIS as defined by NBIS 23 CFR §650 Subpart C.

1.1.4.1.1 Qualifications

The Bridge Inspection Program Manager must meet all of the following:

- Be a registered PE with a Bachelor of Science in Engineering from an ABET accredited college or university, or have a minimum of ten years of bridge inspection experience,
- Successfully complete NHI Course No. 130055 or 130056 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course, and
- Complete a cumulative total of 18 hours of FHWA approved bridge inspection refresher training over each 60-month period.

1.1.4.1.2 Responsibilities

- Provide management of the inspection teams
- Develop, monitor and maintain training programs for state and consultant bridge inspectors
- Maintain documentation supporting the satisfaction of personnel qualifications, certifications, and training

1.1.4.2 Bridge Inspection Engineer

The Bridge Inspection Engineer will assist with operations of the bridge inspection program.

1.1.4.2.1 Qualifications

The Bridge Inspection Engineer must meet one of the two qualifications listed below:

- Be a registered PE with a Bachelor of Science in Engineering from an ABET accredited college or university, and successfully complete NHI Course No. 130055 or 130056 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course,

OR

- Be a graduate from an ABET accredited college or university with a Bachelor of Science in Engineering, successfully completed the F.E. exam, and successfully complete NHI Course No. 130055 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course.

1.1.4.2.2 Responsibilities

- Support the Bridge Management Engineer in fulfilling the requirements of the bridge inspection programs
- Plan, schedule and help prepare information for the field inspection of bridges
- Perform QA reviews and approves inspection reports
- Maintain the bridge inspection schedule and schedule changes
- Coordinate with railroad companies for internal NDDOT bridge inspections over/under railroads

1.1.4.3 Senior Bridge Inspector / Team Leader

1.1.4.3.1 Qualifications

Senior Bridge Inspectors must meet one of the three qualifications listed below:

- Be a registered PE with a Bachelor of Science in Engineering from an ABET accredited college or university, have two years of bridge inspection experience, and have successfully completed NHI Course No. 130055 or 130056 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course

OR

- Be a graduate from an ABET accredited college or university with a Bachelor of Science in Engineering, have four years of bridge inspection experience, and have successfully completed NHI Course No. 130055 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course

OR

- Have an Associate of Science in Engineering Technology from an ABET accredited college or university, have eight years of bridge inspection experience and have successfully completed NHI Course No. 130055 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course

Senior Bridge Inspectors must be certified Bridge Inspection Team Leaders per 23 CFR §650.309(b) and at a minimum meet all the following:

- Successfully complete NHI Course No. 130078 Fracture Critical Inspection Techniques for Steel Bridges or an FHWA approved equivalent course within 12 months,
- Successfully complete NHI Course No. 135046, 135047 or 135047V Stream Stability and Scour at Highway Bridges for Bridge inspectors or an FHWA approved equivalent course within 12 months,
- Complete a cumulative total of 18 hours of FHWA approved bridge inspection refresher training over each 60-month period, and
- Be trained in Inspection Vehicle (Snooper) operation (ASPEN) or complete training with 6 months.

1.1.4.3.2 Responsibilities

- Supports the Bridge Inspection Engineer in fulfilling the requirements of the bridge inspection program
- Provides direction to the bridge inspection team
- Plans, schedules and prepares information for the field inspection of bridges
- Performs bridge inspections
- Processes and signs bridge inspection reports
- Performs QC reviews of bridge inspection reports
- Ensures the general safety of the bridge site
- Verifies that all safety procedures and the proper use of access equipment are followed
- Maneuvers the Snooper for under bridge inspections

1.1.4.4 Assistant Bridge Inspector / Team Leader

1.1.4.4.1 Qualifications

Assistant Bridge Inspectors must meet one of the three qualifications listed below:

- Be a registered PE with a Bachelor of Science in Engineering from an ABET accredited college or university, and have successfully completed NHI Course No. 130055 or 130056 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course

OR

- Assistant Bridge Inspectors without a PE with a Bachelor of Science in Engineering, from an ABET accredited college or university, must have two years of bridge inspection experience and have successfully completed NHI Course No. 130055 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course

OR

- Assistant Bridge Inspectors with an Associate of Science in Engineering Technology from an ABET accredited college or university, must have three years of bridge inspection experience and have successfully completed NHI Course No. 130055 Safety Inspection of In-Service Bridges or an FHWA approved equivalent course

Assistant Bridge Inspectors must be certified Bridge Inspection Team Leaders per 23 CFR §650.309(b) and at a minimum meet all of the following:

- Successfully complete NHI Course No. 130078 Fracture Critical Inspection Techniques for Steel Bridges or an FHWA approved equivalent course within 12 months,
- Successfully complete NHI Course No. 135046, 135047 or 135047V Stream Stability and Scour at Highway Bridges for Bridge inspectors or an FHWA approved equivalent course within 12 months,
- Complete a cumulative total of 18 hours of FHWA approved bridge inspection refresher training over each 60-month period, and
- Be trained in Inspection Vehicle (Snooper) operation (ASPEN), or complete training within 6 months.

1.1.4.4.2 Responsibilities

- Supports the Senior Bridge Inspector in fulfilling the requirements of the bridge inspection program
- Plans, schedules, and prepares information for the field inspection of bridges
- Performs bridge inspections
- Processes bridge inspection reports
- Performs QC reviews of bridge inspection reports
- Follows the requirements for the general safety of the bridge site
- Follows all safety procedures and procedures for the proper use of access equipment

1.1.4.5 Consultants

Consultant bridge inspectors that inspect bridges in North Dakota will need to meet the following training requirements in addition to those of 23 CFR §650.309(b).

Team Leaders must:

- Complete a cumulative total of 18 hours of FHWA approved bridge inspection refresher training over each 60-month period.

Team Leaders performing Fracture Critical/NSTM inspections must:

- Complete NHI Course No. 130078 Fracture Critical Inspection Techniques for Steel Bridges or an FHWA approved equivalent course.

Team Leaders performing inspections over stream crossings must:

- Complete NHI Course No. 135046, 135047 or 135047V Stream Stability and Scour at Highway Bridges for Bridge inspectors or an FHWA approved equivalent course.

1.1.4.6 Underwater Bridge Inspector

Underwater bridge inspections are performed under consultant contract. Underwater inspections must be conducted by or under the direct supervision of Bridge Inspection Team leaders.

1.1.4.6.1 Qualifications

Underwater bridge inspectors must have:

- At least two years' experience in Underwater bridge inspections and
- Meet the diving qualifications required by Occupational Safety and Health Administration (OSHA) regulations, Commercial Diving Operations – CFR 29, §1910 Subpart T and
- Successfully complete NHI Course No. 130091 Underwater Bridge Inspection or an FHWA approved equivalent course and
- Possesses a current commercial diver certification card from ADCI

1.1.4.6.2 Responsibilities

- Same as Assistant Bridge Inspector responsibilities

1.2 CERTIFICATIONS, TRAINING, AND EQUIPMENT

1.2.1 Certifications

The NDDOT requires that bridge inspection staff receive, track, and maintain documentation of training as required by NBIS 23 CFR §650 and relevant NDDOT policies. Bridge Management maintains and performs yearly verification of qualifications for Bridge Inspection Team Leaders, which tracks bridge inspection personnel experience, certification, and training.

1.2.1.1 Bridge Inspection Refresher Training

The NBIS requires comprehensive bridge inspection and refresher training for Program Managers and Team Leaders. The intent of this training is to improve the quality of bridge inspections, introduce new inspection equipment and techniques, and maintain the consistency and reliability throughout the state-wide network of the bridge safety inspection program. Program Managers and Team Leaders must complete a cumulative total of 18 hours of FHWA approved bridge inspection refresher training over each 60-month period. Options for bridge inspection refresher training:

1. NDDOT Bridge Inspection Refresher Training
2. NHI Course 130053 Bridge Inspection Refresher Training
3. Alternative bridge inspection refresher training from another DOT, at the discretion of the Program Manager
4. NHI Courses that introduce new inspection equipment and techniques, and maintain the consistency and reliability throughout the state-wide network of the bridge safety inspection program
    a. NHI 130078 Fracture Critical Inspection Techniques for Steel Bridges
    b. NHI 135046 Stream Stability and Scour at Highway Bridges for Bridge Engineers
    c. NHI 135047 Stream Stability and Scour at Highway Bridges for Bridge Inspectors
    d. NHI 130091 Underwater Bridge Inspection
    e. NHI 130099A Bridge Inspection Nondestructive Evaluation Seminar (BINS)
    f. NHI 130111 Nondestructive Evaluation Fundamentals for Bridge inspection*
    g. NHI 130112A NDE for Concrete Bridge Elements *
    h. NHI 130112B NDE for Steel Bridge Elements*
    i. NHI 130112C NDE for Timber and Other Material Bridge Elements*

*These courses will only count as refresher training once in a 120 month Period

1.2.1.2 Fracture Critical/NSTM Inspection

Team Leaders inspecting bridges with Fracture Critical/NSTM Members must have successful completion of NHI Course No. 130078 Fracture Critical Inspection Techniques for Steel Bridges.

1.2.1.3 Inspections Over Stream Crossings

Team Leaders inspecting bridges over stream crossings must have successful completion of NHI Course No. 135047 or 135047V Stream Stability and Scour at Highway Bridges for Bridge inspectors or an FHWA approved equivalent course.

1.2.1.4 Underwater Inspection

See Section 1.1.4.6.1 Underwater Bridge Inspector for necessary Underwater Inspection certification.

1.2.1.5 Non-Destructive Testing (NDT)

NDT is often used during the inspection of steel structures to determine the internal integrity of structural elements. To ensure proper application of the testing procedures and interpretation of results, inspection personnel are required to have training in the method of NDT used.

1.2.1.6 Operation of Unmanned Aircraft System

All Federal Aviation Administration rules and regulations need to be met and followed in order to operate an unmanned aircraft system for inspections. Consultants must have liability insurance prior to any UAS operations for NDDOT bridge inspections.

1.2.1.7 NDDOT Snooper Inspection Vehicle Operation

The driver of the Snooper must have a current CDL. To operate the Snooper bucket, the individual must be trained in Aspen Aerials Inspection Vehicle (Snooper) operation training. The driver and the operator should be familiar with the *NDDOT Inspection Vehicle Policy Manual*.

1.2.2 Equipment

1.2.2.1 Personal Protective Equipment

All bridge inspectors must carry and use personal protective equipment. All inspections on active construction sites must meet the safety requirements of the construction site that exceed inspection safety
requirements.

1.2.2.2 Bridge Inspection Equipment List

Bridge inspectors should review Section 2.4 “Inspection Equipment” of the FHWA BIRM before an inspection assignment for thorough coverage of recommended requirements. The following is a list of equipment commonly used for bridge inspections:

1. 16 ft. to 20 ft. extension ladder
2. Graduated telescoping sounding rod
3. Tape measure
4. Chipping hammer (geologist type)
5. Putty knife
6. Inspection mirror on extension arm
7. Scriber
8. Vernier calipers
9. Plumb bob and line
10. Carpenter's level
11. Smart Level
12. 100' tape
13. Camera
14. Screwdriver
15. Plier
16. Protractor
17. Flashlight or Miner's helmet with light
18. Pocket knife
19. Wire brush
20. Ice pick
21. Magnifying glass
22. Chest waders
23. Thermometer
24. Infrared thermometer
25. Life vests (if needed)
26. Binoculars
27. Boat with oars or kayak (if needed)
28. Tablet and/or laptop computer
29. Infrared camera
30. Crack card/gage
31. Unmanned Aircraft System (UAS)
32. Rotary percussion
33. Chaining tool
34. Surveyor Level

1.2.3 Traffic Control

The Bridge Inspection Engineer or Senior Bridge Inspector coordinates with the District Maintenance Superintendent to arrange temporary traffic control for the upcoming bridge inspection(s) at least four (4) weeks before traffic control measures are needed. All necessary traffic control must be in place prior to inspection.

For consultant performed bridge inspections, the consultant is responsible for the traffic control and all necessary traffic control must be in place prior to inspection.

1.3 INSPECTION REQUIREMENTS

1.3.1 General

The NBIS requires proper safety inspection and evaluation of all highway bridges (as defined in NBIS 23 CFR §650 Subpart C) located on public roads.

In addition to FHWA requirements, NDDOT has the following inspection requirements for State owned bridges:

System	Structure Type	Inspection Requirements*
STATE HIGHWAY SYSTEM	BRIDGES	All Bridges
	REINFORCED BOX CULVERT	All Box Culverts
	METAL PIPE CULVERTS (SPP)	Nominal Diameter ≥ 8'
	STRUCTURES ON TRANSPORTER ERECTOR (TE) ROUTES	Length ≥ 10'
	BRIDGES CARRYING RAILROADS	State Owned/Maintained
	PEDESTRIAN BRIDGES	State Owned/Maintained

Figure 4: NDDOT Inspection Requirements

*Though the state inspects these bridges, they submit *inspection* data to FHWA for only those meeting the definition of bridges in NBIS 23 CFR §650 Subpart C.
The NDDOT does submit *inventory* data to FHWA for structures carrying non-highway traffic (i.e. railroad and pedestrian) when that structure crosses a public roadway.

1.3.1.1 Border Bridges

North Dakota has border bridges between Minnesota and South Dakota. Maintenance and inspections are covered by agreements between the states. Below is a list of border bridges in ND:

Border Bridges					
Minnesota				**South Dakota**	
ND Bridge ID	***MN Bridge ID***	**ND Bridge ID**	***MN Bridge ID***	**ND Bridge ID**	***SD Bridge ID***
0002-358.090	*9090*	18-146-30.0	*60561*	06-104-23.0	*32-036-001*
0002-911.409	*4700*	39-126-04.0	*84508*	11-115-24.1	*NA*
0005-335.813	*35005*	39-127-10.0	*84520*	11-116-24.0	*07-023-000*
0010-940.666	*14012*	39-127-13.0	*84511*	11-127-24.0	*07-131-000*
0011-182.459	*84001*	39-130-18.0	*84517*	11-140-24.0	*07-266-000*
0013-391.615	*4720*	39-134-33.0	*84512*	41-116-24.0	*46-141-000*
0017-140.372	*5872*	39-135-37.0	*84531*	41-136-24.1	*46-334-000*
0054-009.958	*9100*	49-129-05.0	*7097*		
0059-001.010	*35007*	49-129-10.0	*5767*		
0066-138.720	*35011*	49-130-15.0	*54549*		
0094-352.453 R	*9067*	49-131-28.0	*6676*		
0094-352.457 L	*9066*	FRGO03	*5270*		
0200-415.724	*54004*	FRGO09	*14511*		
0210-002.937	*84002*	FRGO12	*14524*		
09-142-04.0	*54550*	FRGO29	*14539*		
09-142-10.0	*6646*	FRGO30	*14510*		
09-142-18.0	*14525*	FRGO31	*14523*		
09-144-35.0	*14503*	GF02	*60506*		
09-144-40.0	*14501*				

Figure 4: Border Bridges

1.3.1.2 Ancillary Structures

State owned ancillary structures are inspected by the NDDOT. Ancillary structures include high mast poles, light standards, and overhead signs. All information for conducting ancillary inspections can be found in the *Ancillary Inspection Guide*.

1.4 STRUCTURE INFORMATION

1.4.1 Structure Number

The structure number, also known as bridge ID, is unique for each structure within the state. Any structure or structures with a closed median should be considered as one structure. The NDDOT Bridge Management Engineer will assign or approve all newly assigned bridge numbers.

1.4.1.1 State Structures

For a state structure, the first four numbers are the highway number (this may include leading zeros). The next six numbers are the reference point. See the following for example state structure numbers:

Structure Number	Facility
0002-233.427	state bridge
0094-090.110	state bridge
1806-085.052	state bridge
0094-290.803 L	state bridge (Note: 2 spaces between the last number and L or R, N, S, or T)
0029-065.386 B	state bridge (Note: 4 spaces between the last number and B)
0081-931.984 L B	state bridge (Note: 2 spaces between last number and L (or R, N, S, or T) and 1 space between L (or R, etc.) and B

Figure 5: Example State Structure Numbers

Special coding following the structure number help identify the location of the structure and indicate the location of a structure not on the mainline and are as follows:

Code	Item
L	Left roadway or left side
R	Right roadway or right side
N	On right of way, but not on the mainline roadway
M	In median
S	Left service road
T	Right service road
B	Carries non-highway traffic

Figure 6: State Structure Number Coding

1.4.1.2 County Structures

The county bridge numbers are derived from a coordinate system which is unique to each county. Typically, these identifying numbers are made up of the two digit county number first, then a mile number read to the right (east) from the northwest corner of the county, then a mile number read down (south) from the northwest corner of the county. See the following for example county structure numbers:

Structure Number	Facility
01-103-23.0	county bridge
18-127-14.0	county bridge

Figure 7: Example County Structure Number

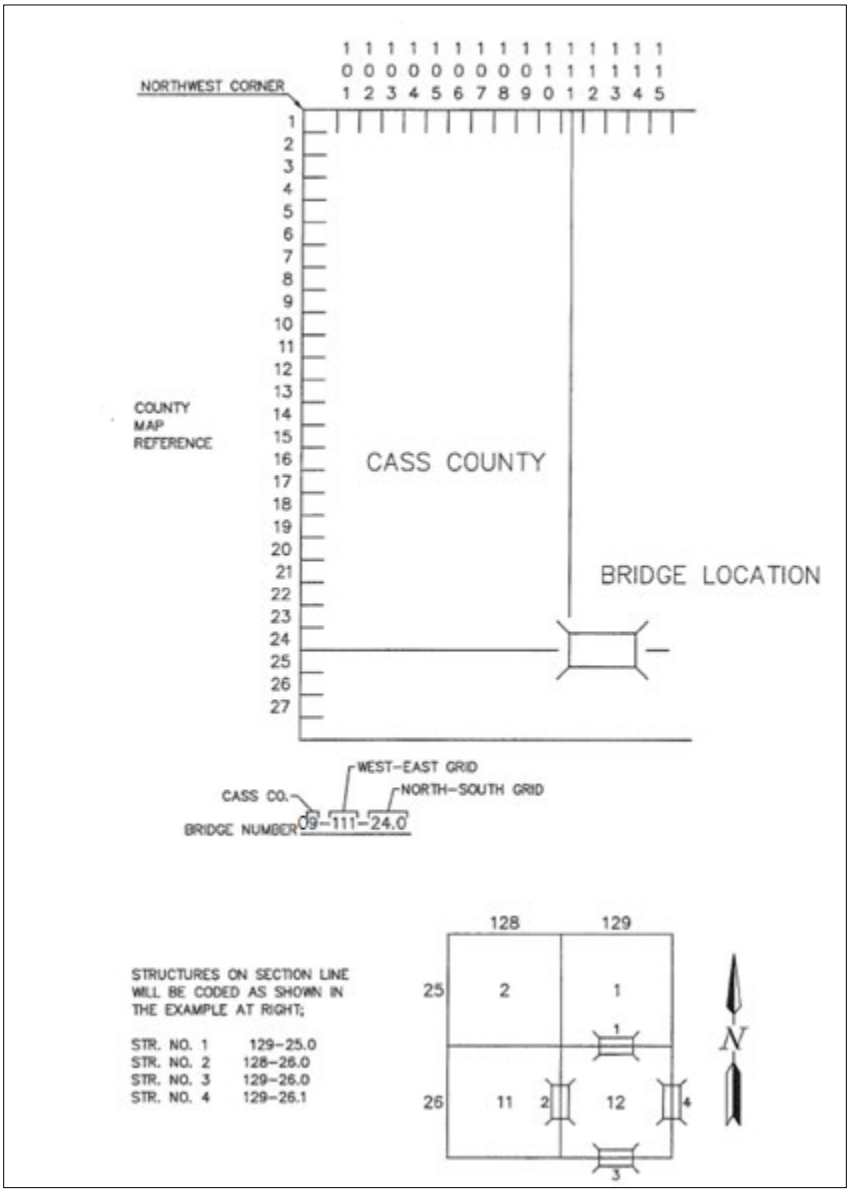


Figure 8: County Bridge Numbering Scheme

North Dakota Counties					
CO. NO.	**COUNTY**	**CO. NO.**	**COUNTY**	**CO. NO.**	**COUNTY**
01	Adams	19	Grant	37	Ransom
02	Barnes	20	Griggs	38	Renville
03	Benson	21	Hettinger	39	Richland
04	Billings	22	Kidder	40	Rolette
05	Bottineau	23	LaMoure	41	Sargent
06	Bowman	24	Logan	42	Sheridan
07	Burke	25	McHenry	43	Sioux
08	Burleigh	26	McIntosh	44	Slope
09	Cass	27	McKenzie	45	Stark
10	Cavalier	28	McLean	46	Steele
11	Dickey	29	Mercer	47	Stutsman
12	Divide	30	Morton	48	Towner
13	Dunn	31	Mountrail	49	Traill
14	Eddy	32	Nelson	50	Walsh
15	Emmons	33	Oliver	51	Ward
16	Foster	34	Pembina	52	Wells
17	Golden Valley	35	Pierce	53	Williams
18	Grand Forks	36	Ramsey		

Figure 9: North Dakota Counties

1.4.1.3 City/Municipal Structures

These structures lie within municipalities but may be owned and/or maintained by the city and/or the county. The identifying numbers are in the "Bridge Listing" and contain no hyphens and decimals. Typically, the structure number includes city designated code first, followed by the bridge number. Single digit bridge numbers must have one leading zero. See the following for example city/municipal structure numbers:

Structure Number	Facility
FRGO31	city/municipal bridge
MNOT01	city/municipal bridge

Figure 10: Example City/Municipal Structure Number

Code	City
BISM	Bismarck
DKSN	Dickinson
FRGO	Fargo
GF	Grand Forks
GRAF	Grafton
JMTN	Jamestown
MAN	Mandan
MNOT	Minot
VC	Valley City
WF	West Fargo

Figure 11: City Designated Code

1.4.1.4 Removed or Replaced Structures

In the Bridge Management System, BrM, structures that are replaced or removed are recoded and retained. When a structure is replaced with an NBI length structure, the old structure number is coded beginning with an 'R' and all dashes and periods are removed from the structure number. When a structure is removed or replaced with a structure that does not meet NBI length, the old structure number is coded beginning with an 'X' and all dashes and periods are removed from the structure number. These structures are coded such that they no longer show up in the active bridge inventory.

1.5 INSPECTION TYPE AND FREQUENCY

1.5.1 General

A bridge inspection Team Leader meeting the qualifications of NDDOT must always be present at the bridge site during a bridge inspection.

1.5.2 Inspection Type

For further guidance on inspection type and interval, see Chapter 4 in the MBE.

1.5.2.1 Initial Inspection

An initial inspection is the first inspection of a new bridge or an existing bridge after a major rehabilitation such as a deck replacement, superstructure replacement, substructure replacement, or widening. During initial inspections ensure that NBI Item 27 is equal to the year opened to traffic (If new bridge), NBI Item 41 is updated, and A-9 is updated. An inspection of a new bridge should be scheduled as a routine inspection in the inspection application as to create a schedule for future inspections.

1.5.2.2 Routine Inspection

Routine inspections are regularly scheduled inspections consisting of observations for all elements of the bridge and measurements needed to determine the physical and functional condition of the bridge, to identify any changes from initial inspection or previously recorded conditions, and to ensure that the structure continues to satisfy present safety requirements.

For routine inspections that cannot be completed due to contract work, the inspection still needs to be performed in the month it is scheduled. During the inspection, inspect as much of the structure as possible and make note in the **General Observations** as to why the inspection was not fully completed. Keep the inspection open until it is fully completed or mark it as complete if the inspection due date is up. If the inspection due date is up, schedule an "other" inspection to complete the inspection once the contract work is completed or the structure can be fully inspected.

1.5.2.3 In-Depth Inspection

An in-depth inspection is a close-up, detailed inspection of one or more bridge components located above or below water, using visual or nondestructive techniques as required to identify any deficiencies not readily detectable using routine inspection procedures.

1.5.2.4 Fracture Critical/NSTM Member Inspection

A fracture-critical member (FCM) is a steel member in tension, or with tension elements, whose failure would probably cause a portion of or the entire bridge to collapse. Document what types of steel bridge components are considered FCMs. Clearly identify FCM components requiring an FCM inspection in the inspection file. Perform a hands-on inspection (inspection within arm’s length of the component using visual or nondestructive techniques as required) of all FCMs and record equipment/procedure used.

1.5.2.5 Underwater Inspection

An underwater inspection is an inspection of the underwater portion of a bridge substructure and surrounding channel which cannot be inspected visually at low water by wading or probing, generally requiring diving or other appropriate techniques.

During an inspection if the inspection team believes an underwater inspection should be performed, submit supporting documentation to the Bridge Management Engineer. The Bridge Management Engineer will make final determination on underwater inspection needs.

1.5.2.6 Special Inspection

A special inspection is an inspection scheduled at the discretion of the NDDOT Bridge Division. It is used to monitor a particular known or suspected deficiency, such as cracks in steel, settlement, or scour. It may also be used to monitor special details or unusual characteristics of a bridge that do not necessarily have defects, such as ultrasonic testing of pins. A special inspection is not required to be performed by a qualified inspection team leader; however, provide a person qualified to perform the specific inspection (for example, qualified nondestructive testing inspector to perform ultrasonic testing of pins).

1.5.2.7 Damage Inspection

A damage inspection is an unscheduled inspection to assess structural damage resulting from environmental events (such as earthquake, flooding, or landslide) or human actions (such as truck impacts or fire).

To accurately assess the safe load-bearing capacity of the structure, the extent of the damage inspection must correspond with the level of detail necessary. This may involve assessing fractured components, measuring the extent of any section loss, checking for member misalignment, and evaluating any loss of foundation support. When conducting an assessment following a severe weather event or bridge impact, the inspector may need to make an on-site determination regarding the need to restrict or close traffic on the structure.

In order to quickly assess damage to a structure, an initial damage inspection is not required to be performed by a qualified inspection team leader. The Bridge Management Engineer may require a certified inspection team leader to perform an additional damage inspection depending on the extent of the damage or if additional information is required.

When using the inspection application to assess damage, enable only those pictures that correspond to the specific damage that is under inspection.

1.5.3 Inspection Interval Schedule and Table

Inspection intervals vary depending on the type of inspection and condition of the bridge. However, there are minimum intervals required by the NBIS for several inspection types. Approval from the NDDOT Bridge Management Section is required for a change of frequency that is not a standard 48, 24, or 12 month interval. Any change to the inspection interval should be documented in the General Observation section of the inspection as to why the change was made. For further guidance on inspection interval, see Chapter 4 in the MBE and the NBIS.

1.5.3.1 Inspection Interval

Inspection Type	Inspection Interval	Inspection Criteria
Initial	No defined inspection interval	New structures or those closed or partially closed for rehabilitation including deck reconstruction, bridge widening or lengthening, or newly added elements, must have an Initial Inspection completed prior to opening to traffic.

Routine	≤ 12 months*	• Structures with a new or unresolved Critical Finding.
		• Critical Findings related to load posting deficiency do not require a frequency reduction to 12 months.
		• Structures with an NBI rating of 3 or less for:
		  • Item 59 – Superstructure
		  • Item 60 – Substructure
		  • Item 62 – Culvert

	24 months	Standard inspection frequency
	48 months	Structure meeting specific written criteria approved by FHWA to be inspected on a 48-month interval.
In-Depth	No defined inspection interval	Detailed inspections scheduled at the discretion of the NDDOT Bridge Division
Fracture Critical/NSTM	24 months	Fracture Critical/NSTM Inspection typically performed during the Routine Inspection.
Underwater	60 months	Underwater Inspection can be performed during the Routine Inspection. May be required at more frequent intervals if conditions warrant.
Special - Pin	96 months	Detailed inspection of Pin and Hanger assemblies
Special - Other	No defined inspection interval	Inspections scheduled at the discretion of the NDDOT Bridge Division for specific items, such as • Monitoring element or component for change • Resolution of Critical Finding
Damage	No defined inspection interval	Event-driven inspection scheduled at the discretion of the NDDOT Bridge Division to assess structural damage
Closure Verification	24 Months	Closure inspections should be completed 24 months from the last routine or closure verification inspection. Closure verifications should be scheduled as an “other” inspection and not as a routine inspection.

Figure 12: Inspection Interval Table

*With approval from the Bridge Management Engineer, the following criteria could warrant an inspection frequency of 12 months:

1. Structures posted at 10 Tons or less,
2. Structures with Item 41 = B, multiple times, historically,
3. Structures with Item 113 - Scour Critical Bridges = 0, 1, 2, 3, 6, or U, or
4. Other bridges at the discretion of the bridge inspector. For example, bridges previously load rated using engineering judgement that currently show signs of distress.

1.5.3.2 Inventory – Timely Updating of Data

Inspection data must be entered into the State's inventory within 90 days of the new inspection date for State owned structures and within 180 days of the new inspection date for all other structures not owned by the State for the following events:

- Routine, in-depth, fracture critical/NSTM member, underwater, damage, and special inspections
- Existing structure modifications that alter previously recorded data and for new structures
- Load restrictions or closure status

All inspections completed by a consultant need to be submitted to the NDDOT within 45 days after the date of the onsite inspection.

1.5.3.3 Delayed Inspections

At times, unusual weather or other conditions may prevent access to part or all of a bridge necessitating the inspection to be delayed until the bridge can be fully accessed. Under these circumstances, FHWA has a process whereby the NDDOT can request a delayed inspection.

If proper supporting data is provided to FHWA, 2 weeks prior to the inspection being delinquent, and FHWA deems the circumstances warrant a delay to the inspection schedule, they may grant a delay such that the DOT will still be fully compliant given that delayed inspections are completed as soon as conditions allow.

If the bridge inspector believes that a delay is necessary, contact the Bridge Management Engineer and follow the procedure below:

1. Provide the bridge ID(s), inspection due date(s), and reason(s) for the delay.
2. Provide at least one current supporting photo of the bridge or circumstance justifying the delay request.
3. Complete as much of the inspection as possible.
    a. Provide updated NBI ratings for all accessible components
    b. Provide element ratings for all accessible elements
    c. Complete all other fields possible
4. In the general observations section, detail the reason for the delay and include the date. Include and date a statement of the conditions and extent of the inspection completed.
5. The approval of the inspection must occur within 90 days from the initial inspection date. The inspection team must return and conduct at least one inspection within the 90-day period as conditions permit. Make note of the date of any return inspection in the general observations section. If the inspection cannot be completed within the given timeframe, the NDDOT Bridge Management Engineer should be informed two weeks prior to the end of the 90 days.

6. If a full inspection was not completed in those 90 days, a return inspection (Other-Non Recurring) inspection must take place at a later date to complete the missing portions that were unable to be inspected. This should be completed as soon as possible.

1.6 INSPECTION PROCEDURES

Bridge Management manages a variety of structure types and performs a variety of inspection types. This section presents the NDDOT's procedures for specific structure and inspection types. The county or city shall be notified for LPA owned structure inspections one week prior to start of work in each area. The District shall be notified for State owned structure inspections one week prior to start of work in each area. Routine and Fracture Critical/NSTM bridge inspections are to be performed between April 1st and November 30th.

1.6.1 General Inspection Procedures

1.6.1.1 Inspection Plans

Inspection plans need to be prepared for fracture critical/NSTM inspections and for any complex bridge inspections. Plans should also be developed for inspections that require the use of the snooper or other specialized equipment, traffic control, or inspections that will take more than one day to complete.

1.6.1.2 Inspection Application

All bridge inspectors must use the NDDOT selected inspection application to submit inspection data.

1.6.1.3 Inspection Report

All inspection reports need to follow the NDDOT inspection report template. The report will identify the Team Leader that was present at the inspection and the person performing QC for the inspection. All inspections completed by a consultant need to be submitted to the NDDOT within 45 days after the date of the onsite inspection.

1.6.1.4 Inspection Photo Procedures

The following items need to be dated and included with inspections:

1. Photos identifying all Critical Findings.
2. Photos of the structure profile taken in each direction.
3. Photos of the structure from the approaching roadway each direction, including approach guardrail and end treatments.
4. Photos of the load limit signs, if bridge is posted for load.
5. Photos of channel upstream and downstream, identified as such and noting the direction looking.
6. Photos of pin assemblies, when applicable.

1.6.1.5 Historical Inspection Notes

Significant historical general inspection notes and element notes should not be deleted. Defect notes should not be deleted until improvement to the element has been inspected. Significant historical notes should be dated and updated as either "corrected", "no change" or noting the current condition. This is a method to track historical information of past issues.

Resolved significant or critical findings should be removed from the significant or critical finding text box in the inspection application. The removed text should be placed in the general observations for historical purposes noting that the issue was resolved

1.6.1.6 General Inspection Notes

Under the general notes, note the weather conditions and other noteworthy site conditions. Inventory notes for the inspection (Inventoried south to north, west to east, beam numberings, spans, etc.) are to be included for reference.

1.6.2 Coding Bridge Inspection Data

FHWA and AASHTO provide rating systems to aid in the inspection of bridges. The two primary rating systems are the NBI rating system and the AASHTO Manual for Bridge Element Inspection. Both rating systems promote uniformity for rating the structural condition of a bridge. Each rating system relates the element distress found at the bridge to the effect on the structure strength and safety. The bridge inspector completes both NBI and element level assessment of each bridge inspected.

The bridge inspector collects NBI data in accordance with the FHWA Recording and Coding Guide. An NBI inspection evaluates the deck, superstructure, substructure, channel, channel protection and culvert and waterway adequacy for each bridge. In addition, a scour condition rating will be recorded at each bridge according to the FHWA Specification of the National Bridge Inventory.

The AASHTO Manual for Bridge Element Inspection describes the element-based rating system. An element level inspection identifies each bridge element separately, based on function and material type. The inspection evaluates each element by subdividing the total quantity into different condition states, or states of physical deterioration or damage.

1.6.2.1 Agency Fields

NDDOT has multiple agency-defined fields. This section contains helpful information on agency-defined fields when performing an inspection.

Deck Overburden: This item indicates the material placed on a bridge deck. This item is a three-digit code; the first digit identifies the type of overburden and the second two digits identify the depth/thickness, in inches, of the overburden. For example, a three-inch gravel overburden will be coded “203”. In the case that the first digit is an “N” or a “1” this item is a one-digit code. See figure below for coding guidance.

Code	Description
N	Not Applicable - code for structures without a deck
1	None - code for decks with no overburden
2	Gravel/dirt
3	Asphalt
4	Other

Figure 13: Overburden Codes

Actual Posting Tons: This Agency Item is used to code the actual tonnage on the Load Limit sign. If the bridge is not posted code 00. This item should be updated as needed during each routine inspection. If the actual posting tons is greater than the tonnage coded in Item A-33, then Item 41 should be coded "B" and a Critical Finding Issued.
Max Allowable Posting Tons: This Agency item reports the max allowable posting tonnage on the bridge. It is determined by the lowest tonnage on the load rating summary sheet of the AASHTO legal vehicles, Emergency Vehicles, and State legal vehicles, when applicable, of the ratings with a rating factor less than 1.0. If no posting is required code 00.

GIS X Coordinate (GPS X): This item is coded for reference and is the UTM (Universal Transverse Mercator) Coordinate for the Easting of the center of the bridge. This coordinate is used to locate the bridge on the State's GIS system.

GIS Y Coordinate (GPS Y): This item is coded for reference and is the UTM (Universal Transverse Mercator) Coordinate for the Northing of the center of the bridge. This coordinate is used to locate the bridge on the State's GIS system.

Structure Notes: These are notes that pertain to the structure but are not inspection related notes. General inspection notes should be made in the Inspection Notes.

Fracture Critical/NSTM Notes: Team Leaders need to be within arm's length of fracture critical/NSTM members when completing the fracture critical/NSTM inspection. All equipment and methods used to get within arm's length needs to be documented in the fracture critical/NSTM portion of the inspection report.

1.6.3 Element Inspection Data

Element inspections are completed on all bridges that are inspected on the NDDOT inventory. When performing an element inspection, the inspection should include the following:

1. Defects must be properly identified for all elements where any quantity is not in Condition State (CS) 1. Dated, descriptive notes that state defect size, quantity and location must be included for each defect.
    a. If there are multiple defects in the same area, code the worst defect and document in that defect note all other existing defect(s).
2. Dated photos including:
    a. Photos of all element defects, including specific location, description of defect, and reference object for scale, as needed.

For items such as protective coatings, a percentage cannot be used to quantify an element. An element needs to be quantified by the unit it is designated. For items such as these, a percentage may be used as a basis for determining the defect quantities.

1.6.3.1 National Bridge Elements

See the figure below for additional information/guidance on National Bridge Elements.

National Bridge Elements			
Element Number	**Element Name**		**Unit of Measure**
330, 331, 332, 333, 334	Railing		LF
	Additional Guidance:	Bridge rail elements that include curb sections of varying material shall have an additional railing element coded for the respective curb material.	

1.6.3.2 Bridge Management Elements

See the figure below for additional information/guidance on Bridge Management Elements.

Bridge Management Elements			
Element Number	**Element Name**		**Unit of Measure**
510	Wearing Surfaces		SF
	Additional Guidance:	For concrete bridge decks that have had a *low slump concrete overlay* (typically only State and Urban structures), this overlay will be considered an integral part of the deck. All associated defects will be coded as Deck Element defects. For concrete decks with a different type overlay (typically polymer, epoxy, etc.) applied simply as a wearing surface, code Element 510 appropriately. An asphalt overlay will be considered a wearing surface For culverts only code a wearing surface if it is in direct contact with the top of the culvert (no embankment or aggregate between the culvert and wearing surface).	

Figure 14: Bridge Management Elements

1.6.3.3 Agency Developed Elements

See the figure below for detailed information on NDDOT Agency Developed Elements.

Agency Developed Elements			
Element Number	**Element Name**		**Unit of Measure**
815	Re Conc Backwall		Ft
	Description:	This element defines reinforced concrete backwall. This element is different than a reinforced concrete abutment as the abutment is a portion of the bridge that supports the superstructure. This may be separate or integral with the abutment. This Element is defined as being above the “bridge seat”. This element is the containment for the embankment at the ends of the bridge. This element may also include endwalls at semi-integral abutments and endwalls on slab decks.	
841	Re Conc Culvert Precast		Ft
	Description:	This element specifically defines precast reinforced concrete culverts, including box, arched, round or elliptical shapes.	
8398	Slope Protection		Ea
	Description:	This element defines loose rock riprap; normally one for each bridge end and at piers. Rock & Oil slope protection is to be included under this element.	
8399	Slope Protection, RC		Ea
	Description:	This element defines reinforced concrete slope protection; normally one for each bridge end.	
8401	Wings		Ea
	Description:	This element defines wing walls on structures.	
8402	Headwalls		Ea
	Description:	Concrete headwalls for metal pipe installations; normally one for each end of the pipe.	
8403	Drop Inlet		Ea
	Description:	This element defines a drop-style structure that can be situated either on or off a larger structure. It does not cover inlets located on the road surface that lead into the structure, nor does it encompass inlets located at the ends of a "Storm Pipe" structure that transport water away from it.	

Figure 15: Agency Developed Elements

1.6.3.4 Agency Developed Defects

See the figure below for detailed information on NDDOT Agency Developed Defects.

Agency Developed Defect			
Defect Number	**Defect Name**		**Unit of Measure**
8001	Erosion		Based on Unit of Measure of Parent Element
	Description:	This defect is used to report erosion for substructure elements that are not located in the stream or overflow channel and approach slabs.	

Figure 16: Agency Developed Defects

1.6.4 Maintenance Recommendations

Bridge maintenance is an essential activity for extending the service life of structures. Maintenance activities assist in protecting the structural and operational performance of structures and in minimizing future repair costs. Bridge inspectors are trained to understand the functionality and importance of bridge components and elements. During the inspection, it is their responsibility to identify deficiencies and make recommendations for maintenance or repair.

Maintenance recommendations include, but are not limited to:

1. Sweep deck and approach slabs
2. Wash deck
3. Clean expansion joints, deck drains, bearings, beams, abutments, or piers
4. Crack seal bridge deck, approach slabs, barriers, abutments, or pier tops
5. Lubricate bearings
6. Repair spalled concrete on bridge deck, approach slabs, beams, substructure, barriers, curbs, or sidewalks
7. Seal joints between deck and approach slabs and between deck and base of barrier, including the front face of joints in barrier and curb.
8. Repair deck drains, expansion joints, bridge railing, or bearings
9. Repair and level approach slabs
10. Repair erosion and correct drainage issues
11. Repair scour, riprap, and slope protection
12. Remove debris, trees, or shrubs, particularly near substructure and abutments
13. Perform spot painting and/or remove graffiti

1.6.4.1 Maintenance Recommendation Priorities

- Normal routine maintenance recommendations should be completed within one year of the recommendation. The timeline of completion may be flexible if work is to be completed through contract.
- High Priority maintenance recommendations should be completed within six months of the recommendation. The timeline of completion may be flexible if work is to be completed through contract.

1.6.4.2 Maintenance Recommendation Process for NDDOT Inspected State Structures

During Routine and other inspections, bridge inspectors are required to make maintenance recommendations based on their findings. The following is the procedure to ensure the maintenance recommendations are communicated to the appropriate people and tracked accordingly

1. Bridge inspectors enter the maintenance recommendations into the Maintenance tab in the inspection application (InspectX).

2. Maintenance recommendations will be made available to district personnel via the inspection application (InspectX).

3. When maintenance recommendation work is completed, district personnel will notify the Bridge inspector that the work has been completed. Notification must include the following.

    a. Bridge Identification Number
    b. Date the work was completed
    c. Description of work performed
    d. Any applicable photos

4. The bridge inspector will complete the Maintenance item by filling out the Date Completed, Comments (Description of work performed) and upload any photos.

1.6.5 Significant Findings

Significant findings are intended to identify specific defects or conditions that warrant further attention, action, or monitoring, but do not require *immediate* attention or action.

Significant findings include, but are not limited to:

1. Unanticipated movement or settlement of a substructure, approach slabs, or other bridge elements, particularly where movement may be ongoing
2. Moderate or major cracks in reinforced concrete where propagation needs to be monitored
3. Advanced decay or cracks in timber
4. Heavy rust on steel members with measurable section loss
5. Exposed rebar on structural members

A maintenance work item is required to be issued for any significant finding.

1.6.6 Critical Findings

A Critical Finding is a structural or safety related deficiency that requires immediate follow-up inspection or action.

After a Critical Finding is found, either during an inspection or at any other time, the NDDOT Bridge Management Engineer, Bridge Inspection Engineer, and/or Local Government Division will document the Critical Finding in the Critical Finding Log spreadsheet. The dates, recommendations, and actions taken to either address or resolve the CF will be tracked in this log. The critical finding remains active and will continue to be reported to FHWA until it is resolved. This log must be kept up to date and is used to provide monthly reports to FHWA of the on the status of Critical Findings.

Addressing a critical finding means that temporary action has been taken to keep the traveling public safe until it is determined how to permanently resolve the deficiency. Measures to address the critical finding may include temporary closure, lane or load restriction, shoring, or a process for monitoring.

Resolving the critical finding includes actions that restore the bridge to a safe condition. Resolution of a critical finding could include re-load rating of the structure and posting, repair or replacement of the structure, removing the structure, or permanent closure of the bridge.

Critical findings are defined in 23 CFR §650.313(q). Examples of critical findings include, but are not limited to:

1. Examples of critical findings for all structures:
    a. Primary structural member(s) with collision damage or deterioration seriously affecting structural capacity.
    b. Substructure units with severe scour and undermining of substructure foundation(s) causing instability. This is defined as the scour condition rating coded 2 or less
    c. Load posting is required, but not implemented (all signs not in-place or not correctly posted).
    d. A bridge coded as closed (item 41 = K) is found to be open.

2. Examples of critical findings for steel structures:
    a. Primary structural member(s) with deteriorated areas that have failed in buckling, crippling, etc.
    b. Non-redundant member subjected to impact damage or severe corrosion in girder flanges, webs, truss members, gusset plates, or connections.
    c. Pin and hanger systems in fracture critical/NSTM members with severe deterioration or severe debris accumulation or pack rust.
    d. NSTM member that has a NBI rating of 3 or less
    e. Primary structural member(s) with fractured tension element due to fatigue.
    f. Structural members with extensive section loss.

3. Examples of critical findings for concrete structures:
    a. Prestressed girder with broken strands or severe section loss of strands at high tension area.
    b. Moderate or major cracks in post-tensioned or prestressed concrete elements where propagation needs to be monitored.
    c. Loss of camber or torsional cracking in post-tensioned or prestressed concrete elements.
    d. Severe loss of girder bearing area affecting the capacity of the girder.
    e. Reinforced concrete girder, column, pier, or pier cap, with damaged or deteriorated primary rebar with severe section loss, with multiple bars affected at the same location.
    f. Concrete pier column or cap with significant structural cracking that is supporting a span with a fracture critical/NSTM member.
    g. Concrete bridge deck with through-hole in a traffic lane, or with spalling that causes a condition rating of the deck of 3 or less.

4. Examples of critical findings for timber structures:
    a. Deck planks with through-hole or that are in danger of failing.
    b. Primary superstructure member with crushing/decay or multiple open cracks (splits) in high stress area.
    c. Piles and pier caps with loss of bearing capacity or soil retention due to crushing, decay, or damage.

1.6.6.1 Critical Finding Procedure

Complete SFN Form 61791 Bridge Critical Finding (CF) for all critical findings using the guidance below.

- Detail the findings
- Indicate changed NBI conditions for the affected components
- Detail recommendations for addressing and/or resolving the finding
- Provide photos of the damage or deterioration prompting the finding
    - Attach the photos to the SFN form and submit as one file
- Note any contacts made from the field

If the structure is a State-owned bridge:

1. The bridge inspector will contact the Bridge Management Engineer immediately and submit the SFN form to the NDDOT Bridge Management Engineer within 24 hours.
2. The NDDOT Bridge Management Engineer will document the critical finding on the Critical Finding Log. If the critical finding is found on a structure that is located on the NHS, the Bridge Management Engineer will notify FHWA within 24 hours of the discovery.
3. The NDDOT Bridge Division will also determine and implement any necessary corrective measures that are needed. These measures will be documented on the Critical Finding Log and the Addressed and/or Resolved dates will be logged.

If the structure is an LPA bridge:

1. The bridge inspector will notify the NDDOT Bridge Management Engineer promptly. The bridge inspector will fill out SFN Form 61791 Bridge Critical Finding (CF) and submit to the NDDOT Bridge Management Engineer and the NDDOT Local Government Division within 24 hours.
2. If any major component of the bridge (deck, superstructure, or substructure) is rated "1 - Imminent Failure" the inspector must contact the owner and the NDDOT Bridge Management Engineer from the field and remain on site until the bridge is effectively closed. For other bridge closure recommendations, the Owner and NDDOT should also be contacted from the field and the bridge owner must effectively close the bridge within 7 calendar days of notification. Documentation of the closure will then be submitted to the NDDOT Bridge and Local Government Divisions.
3. Once NDDOT receives and reviews the SFN Form, the NDDOT Local Government Division will send this form to the owner. This SFN form includes a section to be filled in by the owner on how they plan to address and ultimately resolve the critical finding. Within 30 days, the owner must address the critical finding and respond to the notification form detailing how they plan to resolve the critical finding.
4. In the event that the critical finding is attributed to incorrect load posting, it is required that the issue is addressed within 30 days of the owner receiving notification, by appropriately adjusting the posting for the bridge. Photo evidence of the new posting must be provided as proof to resolve the critical finding. If the problem persists over several inspection cycles, it may necessitate a reduction in the inspection frequency to 12 months or less. If the critical finding is resolved through re-load rating of the structure and posting, permanent closure of the structure, or removal of the structure, picture verification will need to be included when following up with the NDDOT Local Government Division and the NDDOT Bridge Management Engineer.
5. If the critical finding is resolved through shoring, repair, or replacement of the bridge, the owner must submit the Structure Inspection Notification (SIN) form to the NDDOT requesting an inspection. If the bridge is closed or load restricted, the inspection must be completed prior to the bridge being reopened or load restrictions removed.

1.6.7 Structures over Waterways

1.6.7.1 Scour Condition Rating

For all bridges, code B.C. 11 – Scour Condition Rating according to the Specifications of National Bridge Inventory. This field can be found in the Channel/Waterway/Approach section of the Conditions tab in InspectX.

1.6.7.2 Structures with POA's (Plan of Action)

For bridges with POA's, pay particular attention to the channel and other conditions that could indicate scour.

- POA's for bridges with unknown foundations that are high risk need to be updated by the Owner every 6 years.
- If item 113 = 7 – verify that countermeasures installed are still functioning properly
- If item 113 = 3 – pay particular attention to any scour visible or noted in the channel profile
- If item 113 = U and low risk – monitor for changes during the routine and/or underwater inspection. Notify the Bridge Division of any significant changes to scour related items.
- The NDDOT is responsible for the updating of item 113. If the inspection indicates a change is needed, consultation with NDDOT Bridge Division is required prior to making a change to item 113.

1.6.7.3 Channel Profile

For structures over water, channel profiles need to be completed during routine inspections at the frequency identified by NDDOT. NDDOT has three Agency fields relating to channel profiles:

1. Channel Profile Required: Coded Y or N
2. Channel Profile Last Date: Date that the last channel profile was performed (This information may not be correct in the Inspection application)
3. Channel Profile Frequency: How often the structure should have a channel profile performed (follow the guidance below)

The Channel Profile Frequency is based on the criteria below:

- For LPA bridges, perform a channel profile during each routine inspection.
- For State bridges with item 113 of 8 or greater, perform channel profiles every 48 months. For flood events, monitor as appropriate.
- For State bridges with item 113 of 7 or less, perform channel profiles every 24 months. For flood events, monitor as appropriate.

Channel profiles do not need to be performed on box culverts or multiple pipe. When performing a channel profile, fill out and submit the Channel Profile SFN 17336 form in Appendix D. The Channel Profile SFN can be submitted as a photo or a file in the inspection application.

1.6.8 Other Inspection Procedures

1.6.8.1 Steel Culvert Measurements

All steel pipes are to have internal measurements taken at set intervals throughout the pipe. A minimum of three measurements are to be taken (inlet, middle, outlet). Additional measurements are to be taken in areas of pipe deflection/distortion. Fill out the SPP Measurement Log SFN 52137 in Appendix B during each routine inspection. The form can be uploaded in the inspection application as either a photo or a file.

1.6.8.2 Vertical Clearances

On any new or replaced structures that cross over a roadway, District staff, Bridge Division, or consultant inspection staff will measure the vertical clearance and complete the appropriate SFN Vertical Clearance form (SFN 17387 or 17388) as part of the initial inspection. This will be performed before the roadway is opened to traffic to allow the data to be entered into the automated routing system.

On roadwork that changes the vertical clearance under a structure such as an asphalt overlay, NDDOT construction personnel will be required to measure and complete the appropriate Vertical Clearance form prior to opening traffic to allow the data to be entered into the automated routing program. The Bridge Division inspection staff will verify these measurements at the following routine inspection.

For structures that have a gravel roadway under the structure, confirm the vertical under clearance during each routine inspection.

The Vertical Clearance forms can be found in Appendix C.

1.6.8.3 Delamination Surveys – State Structures Only

Delamination surveys need to be completed when a deck reaches an NBI rating of 6 or when the deck reaches the age of 15 years.

1.6.8.4 Expansion Joints

Obtain measurements of the openings at all expansion joints of the structure, which can be taken at the center of each joint. In case the joint is not uniformly open, additional measurements should be taken near the curb on both sides of the joint. Additionally, record the ambient temperature, joint temperature, and temperature of the inside girder beneath the structure. Any problems with the joints should be noted, and the necessary maintenance tasks should be assigned.

1.6.9 Closed Bridges

For bridges that are currently closed, the bridge inspectors, during their scheduled inspection, need to provide verification that the bridge is effectively closed and not being used by vehicular traffic. If effective closure is not in place or there is evidence that vehicles have been using the bridge, this will be reported as a Critical Finding and the inspector needs to remain on-site until the bridge is effectively closed. If it is an LPA bridge, contact the NDDOT Local Government Division and the NDDOT Bridge Management Engineer. If the bridge is a State-owned bridge, contact the NDDOT Bridge Management Engineer.

The Owner is responsible for maintaining positive closure of the structure. If the Owner wishes to reopen the bridge, a full inspection will need to be completed prior to reopening.

A full inspection including a channel profile is required prior to opening a bridge that was closed due to flooding.

1.6.10 Bridges Under Construction

If the bridge is under construction and fully closed at the time of a scheduled routine inspection, there is no need to complete a full inspection at that time. Document the site conditions in the inspection and notify Local Government for LPA bridges or the NDDOT Bridge Management Engineer for state bridges. Upon completion of construction and prior to reopening to traffic, a full inspection needs to be completed.

If any portion of the bridge remains open during construction, that part of the bridge should be inspected during the scheduled inspection to ensure that the bridge remains safe. Upon completion of construction and prior to opening fully to traffic, the bridge needs to be fully inspected.

1.6.11 Railroad Structures

1.6.11.1 Railroad Right of Way

Work within the railroad right of way will require coordination with the railroad. Consultants will be responsible to coordinate and obtain any insurance, flagging, or agreements necessary for inspection of bridges that cross railroad right of way.

1.6.11.2 Inspection Requirements for Railroad Bridges Over State Highways:

The NDDOT inspects railroad bridges that cross over state highways for operational and safety reasons. The NDDOT does not inspect railroad bridges that cross over local government roadways. A cursory inspection is required when the structure carries non-highway traffic. These inspections will be completed at the same interval of a routine inspection. A cursory inspection will not require entering the portion of the railway that would necessitate flagging. The bridge inspector will complete both a general condition rating (NBI) and element level (MBE) assessment of the bridge. The ratings/assessments will be based on observations that can be obtained without entering the railroad's right of way.

1.7 QUALITY CONTROL/QUALITY ASSURANCE

1.7.1 NDDOT Staff Performed Inspections

QC/QA will be performed on all inspections. The QC will be performed by the accompanying Team Leader for each team. Each team will periodically QC the other teams' inspections. This will help ensure the inspections are reviewed by an independent source. The QA will be performed by NDDOT Bridge Management Section office staff, primarily the Bridge Inspection Engineer.

1.7.2 Consultant Performed Inspections

Consultants need to follow the QC/QA plan that was included with the proposal submitted during the Request for Proposal period. If the QC/QA plan changes, contact the NDDOT for approval prior to implementing the change.

Appendix A: Bridge Critical Finding (CF) SFN 61791

BRIDGE CRITICAL FINDING (CF)

North Dakota Department of Transportation, Bridge
SFN 61791 (2-2022)

Bridge Owner	
Structure Number	Facility Carried (Item 7)
Feature Crossed (Item 6)	Location (Item 9)
Inspection Date	Date District & Bridge Division Notified
Type of Inspection	Person Reporting
Team Leader	Telephone Number

Findings / Reasons for Critical Report (Should match findings in Bridge Inspection Report):

CIF #1	Defect / Distress: -----	Material: -----	Reference Feature: -----
CIF #2	Defect / Distress: -----	Material: -----	Reference Feature: -----

Condition Rating (Affected elements only)

Item 58 Deck: ----	Item 59 Superstructure: ----	Item 60 Substructure: ----
Item 61 Channel: ----	Item 62 Culvert: ----	Item 65 Appr. Rdwy.: ----

Inspector's Recommendation to Bridge Owner:

New Load Rating/Analysis Required: ----	Overall Recommendation: ----

Required Actions

Email: criticalfindings@nd.gov

IF EMERGENCY, CLOSE THE BRIDGE, CALL OWNER & BRIDGE DIVISION 701-328-2130 IMMEDIATELY

Appendix B: SPP Measurement SFN 52137

SPP MEASUREMENT LOG

North Dakota Department of Transportation, Bridge
SFN 52137 (7-2016)

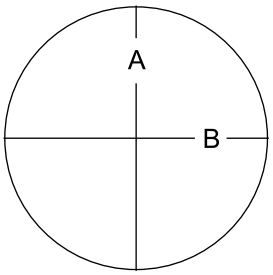
Structure Number	
Barrel Number	Barrel Length

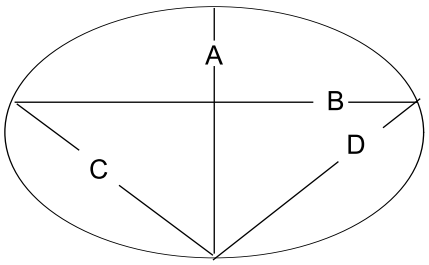
Measurements to be taken in direction of inventory, south to north and west to east. If more than one pipe, the first pipe of the inventory direction shall be number one and second number two, etc.

Use one sheet per pipe.

-All steel pipe are to have internal measurements that are to be taken at intervals throughout the pipe.
-Locations should be marked by paint spots that can aid in future identification.
-Bold heads may be spray painted for location points.

Location Number	Distance From Inlet of Pipe





YEAR	LOCATION	DIMENSIONS				
		A	B	C	D	E

Appendix C: Vertical Clearance SFN 17387 & 17388

VERTICAL CLEARANCE ~ SINGLE SPAN

North Dakota Department of Transportation, Bridge Division
SFN 17387 (Rev. 1-2018)

Structure Number

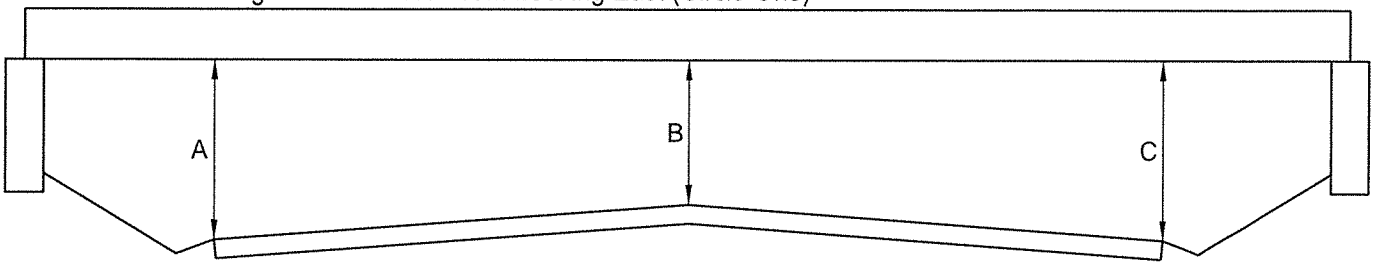
Date

Inspector

Make Sure to Include the Lowest Beam Clearance

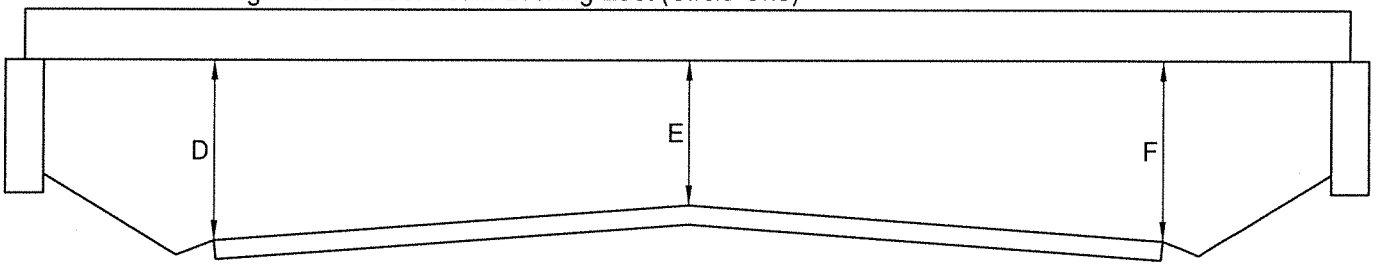
Show measurements in ft - in. to nearest 1/4"

South Beam Looking North or West Beam Looking East (Circle One)



A B C

North Beam Looking North or East Beam Looking East (Circle One)



D E F

Item 10 - Inventory Route, Minimum Vertical Clearance (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 pavement or traveled part of the roadway where the clearance is the greatest shall be recorded and coded in feet and inches. For structures that have multiple openings, clearances for each opening shall be recorded, but only the greatest of the minimum clearance for the two or more openings shall be coded regardless of the direction of travel.

Item 10

VERTICAL CLEARANCE ~ DIVIDED HIGHWAYS

North Dakota Department of Transportation, Bridge Division
SFN 17388 (Rev. 1-2018)

Structure Number

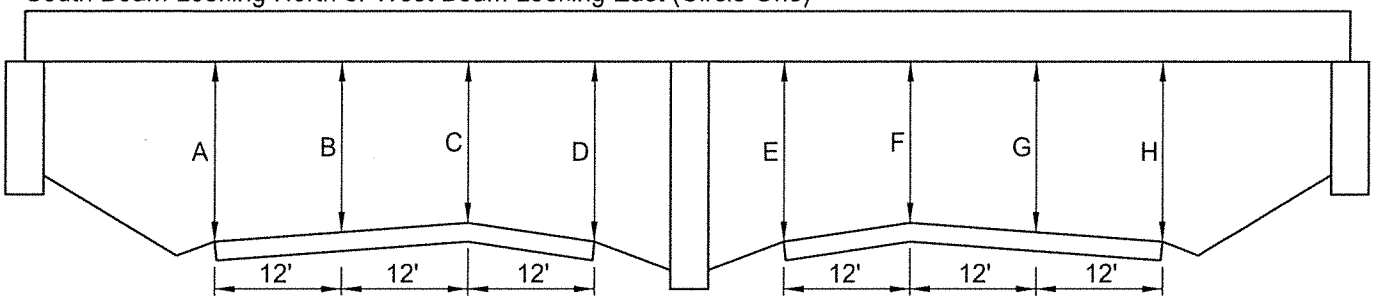
Date

Inspector

Make Sure to Include the Lowest Beam Clearance
For Both Directions of Travel

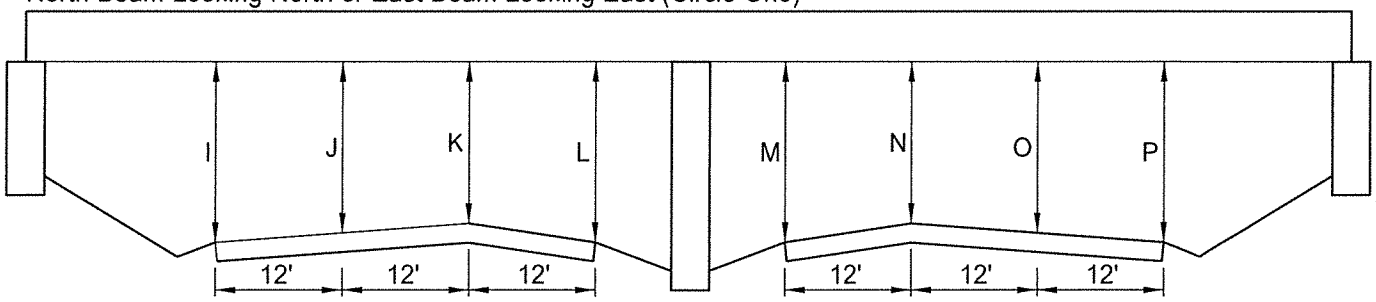
Show measurements in ft - in. to nearest 1/4"

South Beam Looking North or West Beam Looking East (Circle One)



A B C D E F G H

North Beam Looking North or East Beam Looking East (Circle One)



I J K L M N O P

Item 10 - Inventory Route, Minimum Vertical Clearance (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 pavement or traveled part of the roadway where the clearance is the greatest shall be recorded and coded in feet and inches. For structures that have multiple openings, clearances for each opening shall be recorded, but only the greatest of the minimum clearance for the two or more openings shall be coded regardless of the direction of travel.

Item 10

Appendix D: Channel Profile SFN 17336

CHANNEL PROFILE

North Dakota Department of Transportation, Bridge
SFN 17336 (7-2016)

Structure Number	Date	Inspector's Name

STREAM CROSS SECTION

NOTE: Stream profile is to be taken on both sides of **the** bridge. Check appropriate directions.

Profile 1 taken on ☐ N ☐ S ☐ E ☐ W side of bridge, from ☐ N to S ☐ W to E

Measurements taken from top of ☐ Curb ☐ Rail ☐ Deck

Measurements taken at _____ intervals. (ft.)

Measurements are as follows:

Profile 2 taken on ☐ N ☐ S ☐ E ☐ W side of bridge, from ☐ N to S ☐ W to E

Measurements taken from top of ☐ Curb ☐ Rail ☐ Deck

Measurements taken at _____ intervals. (ft.)

Measurements are as follows:

Evidence of Scour at Bridge	Yes	No	NA
Channel slopes washing or sloughing	☐	☐	☐
Scour holes near abutments	☐	☐	☐
Scour holes near piers	☐	☐	☐
Bed deposits downstream	☐	☐	☐
Exposure of footings	☐	☐	☐
Debris collection	☐	☐	☐
Riprap (if any) displaced	☐	☐	☐

Existing Channel Condition	Yes	No	NA
Are channel banks up and downstream of bridge stable?	☐	☐	☐
Is the channel degrading/aggrading up or downstream?	☐	☐	☐
Is the Structure on a channel change?	☐	☐	☐
Are there lakes, reservoirs, dams, etc., near the crossing?	☐	☐	☐
Does the channel appear to be moving laterally in the area of the bridge?	☐	☐	☐

Substructure Condition (Below Waterline)	Yes	No	NA
Is pier/abutment scaling?	☐	☐	☐
Is pier/abutment spalling?	☐	☐	☐
Is there exposed rebar?	☐	☐	☐

Substructure Condition (Below Waterline)	Yes	No	NA
Is there exposed piling below footing?	☐	☐	☐
Are there cracks?	☐	☐	☐
Is there section loss on members?	☐	☐	☐

If yes is answered to any of the questions, measurements should be taken. Also, include sketches along with dimensions when possible. These deficiencies shall be reflected in the rating of item 60. If these questions can not be answered, notify Bridge division.

NOTE: Take pictures or draw sketches of any and all factors contributing to scour or movement of the channel or streambed. Some factors are, but are not limited to, inadequate waterway area, ice jams/floes, debris, and channel/structures alignment. Give scour hole dimensions.

Enter any remarks or explanations for the above items below. Use an additional page if necessary.

Appendix E: Structure Inspection Notification (SIN) Form

Structure Inspection Notification

County	
Structure Number	
Location	
Reason for inspection (new/rehabilitation/repair)	

Who performed the work?			
Was Structure previously closed? (y/n)		**If so, when?**	
Date work was completed		**Curently posted for Load? (y/n)**	

Location of Work Performed

Work performed on the following areas of the Structure			
Deck (y/n)		Pier(s) (y/n)	
Beam/Girder (y/n)		Abutment(s) (y/n)	
Pier/Abutment Caps (y/n)		Channel (riprap) (y/n)	
Other			

Was the work completed due to an Alert Code on the SI&A sheet (y/N)	
If yes, what Alert Code was repaired	

What work was completed on this Structure

Materials used (provide a description of the material properties, size, etc.)

Did you attach any of the following information with these sheet?

Photos		Material Spec info		Alert code		Plans	
Other							

NDDOT use only

Based on work performed, was an inspection required? (y/n)			
If yes, date of inspection		**By who**	
If no, explain reason inspection wasn't required			

Appendix F: ADT Guidance for Local Roads

ADT = 5 Two or no tracks, no appreciable grade raise, little use apparent

ADT = 10 Two tracks, no appreciable grade raise,some continual use apparent

ADT = 20 Two tracks, grade raise apparent, gravelsurface, continual single vehicle use

ADT = 50-100 Well graded and maintained, good gravel or paved surface, tracks indicatethat 2 vehicle operation is normal

Appendix G: Reinforced Concrete Box Culvert 48 Month Inspection Frequency Criteria

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
Criteria for selecting reinforced concrete box culverts for
Four-year re-inspection cycle
Information queried out of BrM (aka Pontis)

1. Main Structure Type

materialmain (NBI item 43) = 1 (concrete) and
designmain (NBI item 43B) = 19 (culvert)

All concrete box culverts in the state, urban, or county system meeting all the following minimum criteria are eligible. This structure type is selected on past experience. Our system has not had any structural failures of concrete box culverts.

2. Age

yearbuilt (NBI item 27)

Age of a structure can be determined from year built. Three years is the minimum age selected. This allows for a history of two inspections (one inspection immediately after construction, and one 2-year routine inspection cycle). All initial distress due to construction problems, settlement, etc., will show up and be resolved in the first three years after construction. A concrete box culvert that has received major rehabilitation will also require two inspections before the structure may return to a four-year inspection cycle. Since it is extremely rare for any rapid condition change to occur with a concrete box culvert, even when they are very old, no maximum age limit is used.

3. Condition Ratings

chanrating (NBI item 61) - channel and channel protection rating
A minimum code = 6 is selected as the minimum criteria.

Channel and Channel Protection criteria = 6 or greater suggests only minor damage may have occurred to river control devices and embankment protection, only minor stream bed movement is evident, or debris is restricting the waterway only slightly.

Culvert rating (NBI item 62)
A minimum code = 6 is selected as the minimum criteria.

The structural rating condition suggests the condition of a concrete box culvert. Low ratings may suggest future maintenance or rehabilitation problems; therefore, the condition rating (chanrating and culvert rating) shall be a "6" or "satisfactory" level.

4. APPRAISAL RATINGS

strrating (NBI item 67 structural rating)
A minimum code = 6 is selected as the minimum criteria.

strrating is coded as the lower of Culvert rating or a value determined by North Dakota Bridge Inspection Procedures Table 1, which includes adttotal (NBI item 29) and irload (item 66 inventory rating). Additional consideration will not be given to truckpct (NBI ADTT) since the traffic load is distributed by the overburden and is not directly on the box culvert.

deckgeom (NBI item 68 - DECK GEOMETRY)

Selection of four-year interval structures will be based on deckgeom = N. This suggests traffic does not directly ride on the surface of a culvert since the culvert has an overburden. In this case roadwidth (NBI item 51 -curb to curb width) = 0000.

underclr (NBI item 69- UNDERCLEARANCE, VERTICAL AND HORIZONTAL)

Selection of four-year interval structures will be based on underclr = N. This indicates that traffic is not present under or in the structure.

wateradeq (NBI item 71 -WATERWAY ADEQUACY)
A minimum code = 5 is selected as the minimum criteria.

This allows for a slight chance of overtopping of roadway approaches (11-100 years) with insignificant traffic delay (Highway passable in a matter of hours). While a slight chance of overtopping may not be appropriate for conventional bridges, experience shows this overtopping of concrete box culverts causes no structural or functional problems.

appralign (NBI item 72- APPROACH ROADWAY ALIGNMENT)

Approach roadway alignment is not considered as selection criteria since a concrete box culvert is not susceptible to damage being done by errant vehicular traffic. Approach roadway alignment is typically inherent in the original design of the roadway or placement of the structure and not subject to deterioration over time nor relieved by frequency of inspection.

5. LIVE LOAD CARRYING CAPACITY (INVENTORY RATING)

Inventory Rating (Item 66) ≥ 36 (load in tons)

Inventory Rating shall be equal to or higher than the state legal load of 36 tons. The frequency and degree of overloading anticipated have also been considered. NDDOT has no history of problems resulting from overloads. NDDOT processed approximately 42000 requests for overload permits within the past 10 years. Because of this number of overloads processed with no evidence of overload stresses in the concrete box culverts overloads will not be a factor.

6. nbi_rating (NBI OBSOLESCENCE STATUS NDDOT item 201- STATUS)

Selection of four-year interval structures will be based on nbi_rating = 0. This shows structure is not structurally deficient or functionally obsolete.

7. suff_rating (NBI SUFFICIENCY RATING)

suff_rating (Federal Sufficiency Rating) must be ≥ 80.

8. scourcrit (NBI Scour Critical item 113)

The rating for this item will be scourcrit = 5,7,8, or 9 which indicates that the structure is not scour critical or has countermeasures installed.