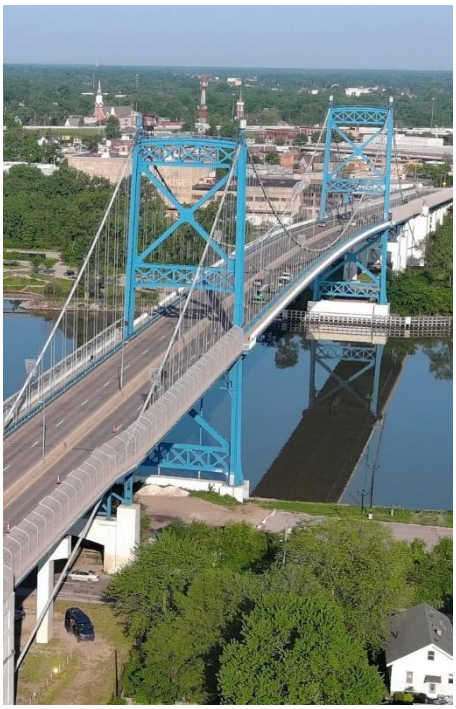
Department of Transportation

Manual of Bridge Inspection and Inventory



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Chapter 1: Introduction

1.1 Purpose

The purpose of this manual is to communicate the regulations, standards and procedures for the professional inspection of bridges. This manual is prepared, maintained and updated by the Ohio Department of Transportation (ODOT) from the Central Office Division of Engineering in the Office of Structural Engineering (OSE) Bridge Inspection Section. The manual is referenced in the Ohio Revised Code (ORC):

ORC5501.47, *"Bridge inspections."* Effective Date: 06-30-2021

(2) The director shall have general responsibility for initiating, developing, and maintaining procedures and practices that provide for and promote professional inspection of bridges. The director shall:

(a) Prepare, maintain, and update a manual of bridge inspection that will provide standards applicable to the inspection of all bridges on, above, or below highways. The manual shall include, but is not limited to, standards relating to frequency of inspection, qualifications of persons inspecting or supervising inspections, procedures and practices facilitating professional inspection of bridges.

This manual provides additional information and guidance to further define bridge inspection requirements found in the Code of Federal Regulations (CFR) and the ORC. This manual does not supersede any requirements stated in the CFR or the ORC. Additional resources to supplement this manual, but not supersede include Bridge Inspector's Reference Manual (BIRM), AASHTO Manual of Bridge Element Inspection (MBEI), and AASHTO Manual for Bridge Evaluation (MBE).

1.2 Applicability

1.2.1 Ohio Bridge Definition

There are roughly 45,000 bridges in Ohio that meet the minimum length and traffic definition set by the Ohio Revised Code (ORC). A bridge in Ohio is a structure that is ten feet or more clear span and supports a highway or spans across a highway. All bridges that meet the state-law definition shall be inspected in accordance with this manual.

ORC5501.47, *"Bridge inspections."* Effective Date: 06-30-2021

"Bridge" means any structure of ten feet or more clear span or ten feet or more in diameter on, above, or below a highway, including structures upon which railroad locomotives or cars may travel.

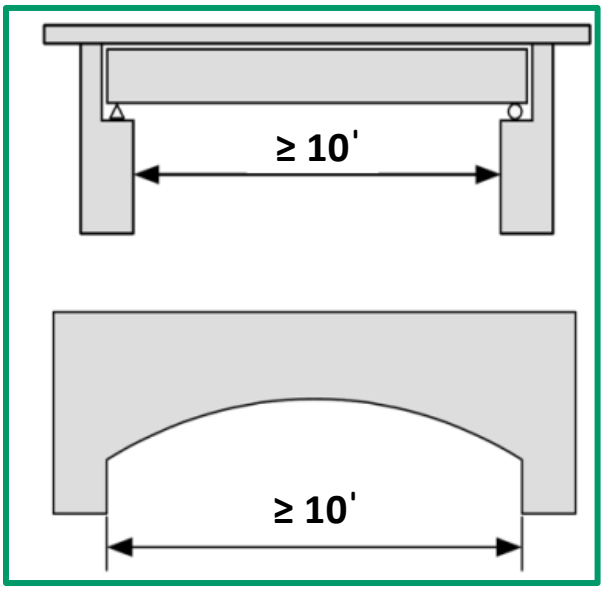

Figure 1-1: Bridge Definition

For purposes of this manual consider the following clarifications:

- A highway is a public road that carries public vehicular traffic.
- The "clear span" is the distance measured parallel to traffic and is the distance between under copings of abutments, spring lines of arches, or substructure units (Figure 1-1). For bridges under fill the extreme ends of openings for single or multiple boxes; pipe-structures with multiple openings will be combined into one clear span when the distance between pipes is less than half of the opening of the smallest pipe (Figure 1-2).
- Clear span is measured parallel to traffic (along the skew) therefore the clear span will often be longer than the span perpendicular to the abutment or wall faces. For example, a pipe diameter of 9 feet with a skew angle of 30 degrees would result in a 10 feet clear span ($\frac{9\ ft}{\cos(30°)}$).

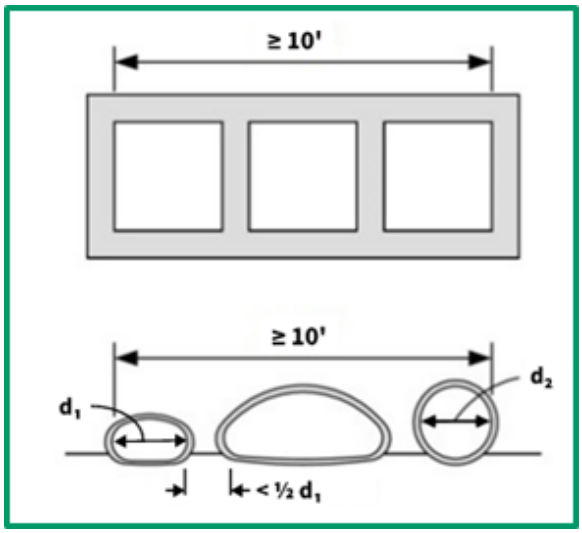

Figure 1-2: Multi-Span Bridge Culvert Clear Span

Examples of structures that do not meet the definition of a bridge are:

- Structures shorter than 10 feet clear span
- Tunnels with through highway traffic, tunnels are inventoried as a separate asset
- Non-highway structures (ex. pedestrian, railroad) not over a public road
- Non-highway private structures not over a public road
- Abandoned or closed structures not on or over a public road
- Sign support structures

1.2.1.1 Non-Highway Bridges over Highways

Non-highway bridges over highways (Figure 1-3) shall be inventoried and inspected to verify the safety of the roadway below the bridge and to ensure the vertical and horizontal clearances are correct and accurate for oversized permit-vehicles on highways. This inspection requirement often results in two inspections every inspection cycle. One inspection is performed by the entity with primary inspection responsibility (ex. railroad company) and a second by the owner of the highway below. The secondary inspection is cursory in nature and performed from the ground within the right-of-way. Any immediate safety concerns are communicated to the bridge owner.

Figure 1-3: Non-Highway (Railroad) Bridge over State Highway

1.2.1.2 Ohio Department of Natural Resource (ODNR) Roads

ODOT, by agreement, will inventory and perform inspections of ODNR bridges on, over, or under a highway. The remaining structures (ex. bike trail structures over a stream) are to be managed by ODNR as a separate asset.

1.2.2 National Bridge Definition

Roughly 60% or 27,000 of the bridges in Ohio also meet the National Bridge Inspection Standards (NBIS) definition of a bridge. Nationally the NBIS bridge definition is as follows:

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

In summary, for a structure to be classified as an NBIS bridge, it must meet all the following criteria:

- The structure must be longer than 20 feet similar to Figure 1-1 and Figure 1-2 with 20 feet replacing 10 feet as shown in the figures.
- The structure must support or carry a public road or a private bridge that is connected to a public road on both ends.
- The public road must be open to public travel.
- The road or street must be under the jurisdiction of and maintained by a public authority.

1.2.3 Other Structures

Structures that do not meet the bridge definitions provided do not fall within the scope of this manual.

1.3 Inspection Responsibility

1.3.1 Bridge Owners

Bridge inspection responsibility includes more than the field inspection. The inspection responsibility encompasses the following:

- Documenting the roles and responsibilities of personnel involved in the bridge inspection program
- Managing bridge inspection reports and files
- Perform quality control activities
- Preparing, maintaining, and reporting bridge inventory and appraisal data
- Producing valid load ratings and when required, implementing load posting or other restrictions
- Collaborating and communicating maintenance needs with shared entities
- Managing the activities and corrective actions taken in response to a critical finding
- Managing scour appraisals and scour plans of action
- Managing other requirements of these standards

All unresolved responsibility matters are to be handled considering public safety and must be resolved in a timely manner. It is of the utmost importance that bridge owners with shared inspection and maintenance

activities are proactive in communicating bridge emergencies, conditions and maintenance needs to each other to ensure public safety.

Each bridge owner is responsible for meeting the staffing, inspection, and reporting requirements necessary to execute the inspection responsibilities in their jurisdiction whether through internal means or by contracting externally. Each bridge owner must also identify one person as the Control Authority. The two primary qualifications for a Control Authority are that they must be an employee of the bridge owner and represent the bridge inspection program as a responsive single-point-of-contact for ODOT Central office.

Bridge inspection responsibilities for each owner as delegated by ODOT include the following:

- Inspect or cause to inspect bridges in bridge owner's jurisdiction.
- Identify bridge needs and safety issues (i.e., bridge closure, posting, critical finding, and overdue inspections) within their jurisdiction.
- Comply with NBIS requirements.
- Enter data into AssetWise (within 3 months after an inspection, newly constructed or rehabilitated bridge is opened to traffic, or changes for load restrictions or closure status) and maintain proper bridge files.
- Review, approve, and maintain bridge posting and clearance restrictions.
- Maintain and keep in good repair each bridge that is open to traffic within their jurisdiction.
- Provide bridge files and inspection reports to ODOT and FHWA when requested for compliance reviews.

Ohio is a Home-Rule state, and the DOT is decentralized. Therefore, bridge inspection responsibility is layered and the functions are delegated to County, City, and Village government agencies. Fortunately, bridge inspection responsibility, per state law, closely aligns with the type of highway on or under the bridge and geography (Table 1-1). In general, bridges on and over state highways are the inspection responsibility of the ODOT District; bridges on and over turnpike routes are the inspection responsibility of the Turnpike Commission unless a written agreement is in place; bridges on county and township routes not over state highways and turnpike routes are the inspection responsibility of the County Engineer and bridges carrying local streets not over state highways are the inspection responsibility of the municipality. Specifically, each bridge owner's bridge inspection responsibilities are outlined in the following sections. Lastly, note that all signed agreements delineating responsibility will supersede state law.

Type of Highway or Feature Under the Bridge	Type of Highway or Feature On the Bridge: County Highway System	State Highway System	Railroad	Local Street (City or Village) Inside a Municipality	Non-Highway Traffic
County Highway System	**County**[1] 23CFR650c & ORC5543.20	**State DOT** 23CFR650c & ORC5501.47	**Railroad**/County 49CFRpart237(FRA) & ORC4907.44	**City or Village** 23CFR650c & ORC723.54	**Owner/ County** 23CFR650c & ORC5543.20
State Highway System	**State DOT** 23CFR650c & ORC5501.47	**State DOT** 23CFR650c & ORC5501.47	**Railroad**/State DOT 49CFRpart237(FRA) & ORC4907.44 & ORC5523.17	**State DOT** 23CFR650c & ORC5501.47	**Owner/State DOT** 23CFR650c & ORC5501.47
Local Street (City or Village) inside Municipality Boundary	**County** 23CFR650c & ORC5543.20	**State DOT** 23CFR650c & ORC5501.47	**Railroad**/City or Village 49CFRpart237(FRA) & ORC4907.44	**City or Village** 23CFR650c & ORC723.54	**Owner/City or Village** 23CFR650c & ORC723.54
Turnpike System	**Turnpike** 23CFR650c & ORC5537.17	**Turnpike** 23CFR650c & ORC5537.17	**Railroad**/Turnpike 49CFRpart237(FRA) & ORC4907.44	**Turnpike** 23CFR650c & ORC5537.17	**Turnpike** 23CFR650c & ORC5537.17
Railroad	**County**/ Railroad 23CFR650c & ORC5543.20	**State DOT**/ Railroad 23CFR650c & ORC5501.47 & ORC5523.17	**Railroad** 49CFRpart237(FRA) & ORC4907.44	**City or Village**/ Railroad 23CFR650c & ORC723.54	Not a bridge ORC 5501.47
Waterway/Other	**County** 23CFR650c & ORC5543.20	**State DOT** 23CFR650c & ORC5501.47	**Railroad** 49CFRpart237(FRA)	**City or Village** 23CFR650c & ORC723.54	Not a bridge ORC 5501.47

[1] Bridge Inspection Primary Responsibility = **Gold**

Table 1-1: Bridge Inspection Responsibility

1.3.1.1 Responsibility Resource: RIMR

ODOT's Roadway Infrastructure Maintenance Responsibility (RIMR) Manual 2023 was referenced in developing Table 1-1. The RIMR is an all-inclusive reference for any person looking to maintain roadway infrastructure in Ohio. A list of references, more recent updates, applicable state laws and Attorney General opinions can be found in the RIMR, ORC and Attorney General website. Lastly, note that all signed agreements delineating responsibility, will supersede state law.

1.3.1.2 Responsibility Resource: TIMS

ODOT's Transportation Information Mapping System (TIMS) is a web-mapping portal where people can discover information about Ohio's transportation system, create maps, and share information. This is updated daily with bridge data and is the primary method in which ODOT shares bridge, roadway and asset information.

1.3.2 ODOT Responsibility

1.3.2.1 ODOT Central Office

ODOT is responsible for ensuring the requirements of the NBIS are followed and is subject to potential withholding of Federal-aid authorizations. The highest degree of action can be taken to maintain the safety of the traveling public.

Central Office, Office of Structural Engineering (OSE) minimum responsibilities are defined by 23 CFR § 650.307 and include the following:

- Develop and maintain procedures and practices that provide for and promote the professional inspection of bridges (ex. prepares, maintains and updates a Manual of Bridge Inspection, develop and furnish inspection forms)
- Compile bridge inventory and inspection data for all bridges in Ohio and make data available to internal and external officials and agencies
- Develop bridge information for statewide planning needs
- Report NBI data to FHWA
- Administer the contract for the bridge software application
- Execute Quality Assurance (QA) for the Bridge Inspection Program
- Maintain a registry of Nationally Certified Bridge Inspectors meeting Ohio requirements
- Provide comprehensive training and periodic refresher training
- Operate and maintain ODOT's bridge inspection under bridge inspection trucks i.e., snooper operation
- Support Districts in load rating in accordance with the ODOT Bridge Design Manual
- Assist and cooperate with governmental units, upon request (such assistance may be in the form of contracts with counties or municipal corporations for transportation department inspection services), with inspection, disseminate information to appropriate governmental officials and agencies regarding responsibility and inspection practices, and confer with public officials and other individuals on inspection of bridges

1.3.2.2 ODOT District

The inspection of bridges on and over the State Highway System shall be the responsibility of the Ohio Department of Transportation (ODOT) District Offices. ODOT is a decentralized agency divided among twelve districts with one Central Office (Figure 1-4).

Figure 1-4: ODOT District Boundaries

1.3.3 Other Owner Responsibility (Non-ODOT)

1.3.3.1 Ohio Turnpike and Infrastructure Commission (OTIC)

The inspection of bridges that are part of a Turnpike Project (those bridges carrying turnpike traffic and those over the turnpike) shall be inspected by the OTIC. Quality Assurance is performed by FHWA and ODOT Central Office.

1.3.3.2 County Engineer

The County Engineer shall inspect all bridges or portions thereof on the County Highway System inside and outside of municipalities, bridges on township roads, and other bridges or portions of bridges for which responsibility for inspection is by law or agreement assigned to the county. The County Highway System includes routes into or through a municipality not on the State Highway System. If the responsibility for inspection of a bridge is not fixed by law or agreement and the county performs the largest share of maintenance on a bridge, inspection shall be made by the County Engineer. The Board of Township Trustees is not prohibited from inspecting bridges within a township.

There are eighty-eight counties in Ohio, each having a County Engineer, and unless delegated to a deputy or capable staff member, the County Engineer will function as the Control Authority for the county bridges inside their jurisdiction. Quality Assurance is performed by FHWA, ODOT Central Office and the County Engineers Association of Ohio (CEAO).

1.3.3.3 Municipality

The legislative authority of a municipality shall designate a municipal official to have responsibility for inspection of all or portions of bridges within such municipality, except for bridges on the State Highway System and the County Highway System. Such municipal official shall be called the Control Authority even when inspection program activities are performed by contract.

A local street is a route not on the state, county or township highway systems. There are more than two hundred and seventy local municipalities (cities and villages) of varying size and capabilities that have at least one bridge. The municipality is not prohibited from inspecting any bridge within its limits. On those bridges where there exists joint maintenance responsibility, the municipality shall furnish a copy of reports to each party responsible for a share of maintenance per ORC 723.54. Quality Assurance is performed by FHWA and ODOT Central Office.

1.3.4 Bridge Inspector Responsibility

Bridge inspectors play an increasingly important role in providing a safe infrastructure for the United States. As Ohio's bridges continue to age and deteriorate, an accurate and thorough assessment of each bridge's condition is critical in maintaining a safe, functional, and reliable highway system. In their daily duties, inspectors ensure public safety and confidence, protect the public investment, identify and assess structure needs, provide accurate structure records and fulfill legal responsibilities.

1.3.5 Consulting Entities

ODOT or other Ohio bridge owners may use engineering consultants to assist with bridge inspection work and/or satisfy NBIS inspection requirements. Engineering consultants performing bridge inspections for ODOT must obtain prequalification in one or more of the following categories as appropriate:

- Level 1 Bridge Inspection
- Level 2 Bridge Inspection
- Underwater Dive Bridge Inspection

Engineering consultants hired directly through non-ODOT contracts much meet the minimum standards outlined by the Federal regulation, Ohio Revised Code, and outlined in this manual to perform tasks within the bridge inspection program.

Chapter 2: Restrictions

Bridge vehicular and non-vehicular emergencies can create threats to public safety and the transportation infrastructure. Events such as overheight vehicular impacts, barrier vehicular impacts, flooding, fires, etc. can result in serious damage to bridges and full or partial bridge closures that significantly affect emergency response crews and the traveling public. Proper notification and response procedures are critical in these situations.

The Ohio Manual of Uniform Traffic Control Devices (OMUTCD) communicates ODOT policies, standards, guidelines, practices and procedures concerning the design, construction, operations, and maintenance of various types of traffic control signing. The OMUTCD provides general information on the design of traffic control signs, including the basic concepts of shape and color. It provides specific information on the application of standard signs, location of signs, including height, lateral offset, and longitudinal placement. The OMUTCD applies to all jurisdictions in the state.

2.1 Emergency Response and Notification

Immediate action shall be taken to ensure that the safety of the traveling public is maintained. The Team Leader on-site has the authority to make obvious emergency bridge or lane closures however they should reach verbal consensus with the Control Authority before closing a bridge or lane of traffic. The initial consensus may be verbal, however, it is recommended that confirmation or follow-up is made in writing.

2.1.1 Critical Findings and Follow-up

The following critical finding flowchart establishes *personnel* and *time frames* for reporting Critical Findings.

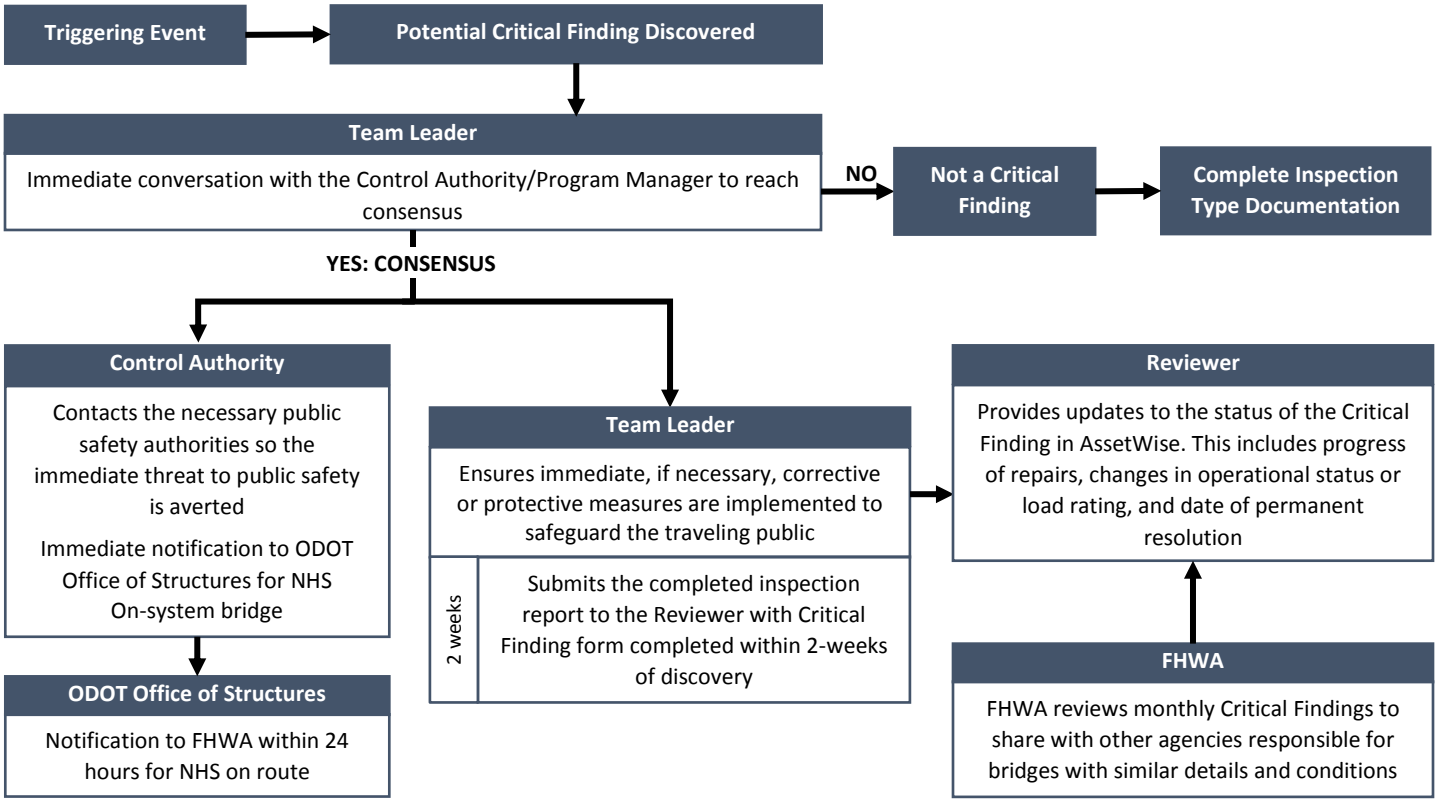

Figure 2-1: Critical Findings Flowchart

The Code of Federal Regulations (23 CFR 650) defines a Critical Finding is a structural or safety related deficiency that requires immediate action to ensure public safety. Critical findings include but are not limited to:

- Bridge Impacts
  - The overhead bridge is closed or restricted after the impact
  - The under route is closed or restricted after the impact
  - If the condition rating of the deck, superstructure, or substructure is lowered to a "2" – Critical Condition or lower after the impact
  - A new load rating is required for the bridge
  - Emergency funds are or will be used to address the bridge impact
- Full or partial closure of any bridge
- Substantial problem (crack, tearing, missing connections, abrupt change in condition etc.) with a Non-Redundant Steel Tension Member and/or lowering NSTM Condition Rating to "3-Serious" or less
- Serious scour or hydraulic problem and/or Channel Condition Rating or Scour Condition Rating items coded as "2-Critical" or less
- Deck, Superstructure, or Substructure Condition Rating item coded as "2-Critical" or less
- Substantial traffic safety hazard
- Immediate repair work to a bridge, including shoring, in order to remain open

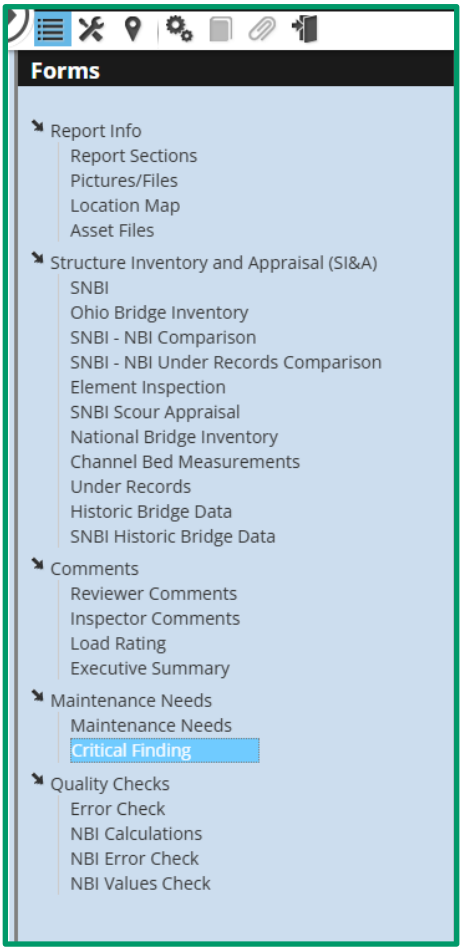

Figure 2-2: Location of Critical Finding form in an AssetWise Report

Critical Findings should be thoroughly documented using the Critical Finding form in AssetWise (see Figure 2-2) and include the location, extent, and possible consequence(s) of the deficiency along with the redundancy of the member affected. Overall and detailed photographs shall be added to the Critical Finding form (report) in AssetWise.

Within the AssetWise Critical Finding form, Ohio Items 274 through 281 should be completed by the Team Leader, which documents the following:

- Item 274 – Date of the critical finding discovery
- Item 275 – Reason
- Item 276 – Description
- Item 277 – Immediate actions
- Item 278 – Updated bridge condition rating
- Item 279 – Possible cause(s)
- Item 280 – Defect caused by
- Item 281 – Specific design detail defect

In addition, several of the fields have text boxes allowing for additional information when "Other" is selected.

The Control Authority shall review these fields for accuracy and update the field as more information is determined.

Once an initial response has been completed to ensure the public is safe from the defect, Ohio Item 283 – Critical Finding Resolved, should be filled in by the Control Authority. The initial response might be closing the bridge or under route temporarily or permanently, installing temporary shoring, removing the defect, etc.

Item 282 – Response Type, Resolution, Timelines and Item 285 – Date of Permanent Resolution shall be updated by the Control Authority as decisions are made and plans developed to address the critical finding.

Item 284 – Date Resolved shall be filled out when the critical finding is to be closed and all permanent repairs have been completed, temporary shoring or restrictions have been removed, or the bridge has been permanently closed and no safety hazards remain.

2.1.2 Actions

When a bridge is no longer able to carry its intended loads, or an unsafe condition exists at the site, it is imperative to prevent further damage or collapse by controlling traffic on and/or below the bridge.

Protective or corrective actions will vary depending upon many factors. The remedy may involve several steps to regain the serviceability of the structure.

- Examples of appropriate "Immediate" actions may include, but are not limited to, any combination of the following:
    - Immediate permanent closure
    - Immediate temporary bridge or lane closure
    - Emergency repairs
    - Prohibiting trucks (fire trucks, buses etc.) from using the bridge
    - Establishing interim inspection intervals
- Examples of appropriate "Short Term" actions may include, but are not limited to, any combination of the following:
    - Load rating with posting for reduced loads
    - Temporary shoring
    - Emergency repairs
    - Contract for permanent repairs
    - Follow up inspections

2.1.3 Closing a Bridge

In some extreme cases, the team leader may need to close the bridge to traffic such as if the structure is in imminent danger of full or partial collapse. The procedure for personnel on site and Control Authority may be the following:

- To close the bridge, the Team Leader can use their inspection vehicle, traffic devices or other means necessary until proper bridge closure signs and barricades are installed. The Team Leader could contact local and/or state law enforcement for assistance.
- The Team Leader shall immediately notify the Control Authority.

- The Control Authority will designate someone to act as the designated delegate. The delegate shall coordinate the appropriate traffic restrictions to ensure public safety.
- The delegate may make a site visit along with other appropriate personnel to evaluate the Critical Finding.
- The delegate has the ultimate responsibility to determine the appropriate course of action and shall determine if the bridge shall remain closed, open with restrictions or open without restrictions.
- The delegate shall determine if repairs can be made by maintenance crews or if there is need for load rating and possible load posting.
- The delegate will see that immediate maintenance repairs are made, if possible and reopen the bridge. Otherwise, the delegate will ensure that the load rating/analysis is executed and based on the inspection, reopen the bridge at a reduced posting, or to keep the bridge closed until future analysis or repairs can be made. When the bridge load rating is load carrying capacity is below 3 tons, the bridge should remain closed until repairs can be made.

If the bridge is closed, the Control Authority is responsible for the coordination of information released to the necessary public, private officials, and local stakeholders upon bridge closure.

2.1.4 Bridge Impacts and Natural Events

Inspections following a vehicular impact, marine impact, flood event, wind event, earthquake event or other natural event will be classified as a Damage Inspection, see Chapter 4.5.

2.2 Load Rating and Load Posting

Each bridge or structure carrying vehicular traffic requiring inspection under this Manual shall be rated to determine its safe load carrying capacity in accordance with the *Ohio Bridge Design Manual Section 900*. The structure be rated, by or supervised by a Professional Engineer, to determine its safe load carrying capacity in accordance with the Ohio Bridge Design Manual. If it is determined that the maximum legal load configurations exceeds the load allowed at the Operating Rating level, then the structure shall be posted for load restriction. Load rating and posting data is regularly checked to ensure bridges are properly posted to carry the maximum load determined by load rating. Any bridges found not to be able to carry at least 3 tons for any of the legal loads must be closed immediately and correctly entered into AssetWise.

For an in-service bridge, the bridge shall be load rated based on current dead loads and the last field inspection report. The current operating status, inspection comments, photographs, and condition rating of structural elements shall also be considered in the load rating. It is imperative that the actual field conditions are represented in the analysis. The inspector and the load rater must communicate the actual conditions explicitly and quantitatively.

The load rating of a bridge should be revised when:

- Deterioration occurs where capacity reduction is in question
  - There is a physical change in the condition of a structural member of the bridge, which may change the capacity of the structural member
  - Deterioration to a slab, beam, girder or other structural element that has resulted in section loss
- There is structural damage to steel, such as a hit by a vehicle, excessive deflection, or elongation under temperature or highway loads
- Item B.C.02 – Superstructure Condition Rating of a bridge drops below "5-Fair" and every time it drops any step below this

- The superstructure is replaced
- There is an addition of a new beam or girder
- Existing deck is replaced with new deck or the existing deck width is changed
- There is a change in the dead load on the superstructure like addition or removal of wearing surfaces, addition or removal of sidewalks, parapets, railings, etc.
- When exposed or broken prestressing strands are discovered. For each broken or exposed strand, consider the adjacent strand(s) in the same row as ineffective
- When a bridge is rated based on "Field evaluation and documented engineering judgment" (B.LR.04 – Load Rating Method is coded "EJ") and Item B.C.13 – Lowest Condition Rating drops a step

The load rating of a bridge does not need to be revised when:

- The change in the thickness of external wearing surface is less than 1/2 inch
- The change in the dead load on a beam member is not more than 10 pounds per foot

Inspectors shall verify that the restriction signing is visible at the bridge site, correctly represented in the inventory, and effective. To be effective, a traffic control device should meet five basic requirements:

1) Fulfill a need;
2) Command attention;
3) Convey a clear, simple meaning;
4) Command respect from road users; and
5) Give adequate time for proper response.

When the necessary information is not communicated to the traveling public or the posting recommended in the inventory by the load rating engineer is less than the actual field conditions i.e., no signs exist when a posting is recommended or the posting in the field does not match with the inventory, the inspector shall ensure proper action is taken as soon as possible. When the posting is correct, but the sign is noncompliant or out-of-date with the Ohio Manual of Uniform Traffic Control Devices (OMUTCD), the weight restriction signs shall be remedied at the bridge site no later than 90 days from the date of discovery. It will be the responsibility of the Program Manager (Reviewer of the Inspection Report) to verify that posting signs are in place and the inspector will update Item B.PS.01 – Load Posting Status at the next regularly scheduled inspection.

Missing or illegible posting signs shall be corrected as soon as possible but not later than 30 days after inspection or other notification determines a need.

Weight Limit signs shall be located at the bridge and in advance of the applicable section of highway or structure (see Figure 2-3). If used, the Weight Limit sign with an advisory distance ahead legend should be placed at approach road intersections or other points where prohibited vehicles can detour or turn around. When advanced warning signs are needed and not present, the inspector shall notify the Program Manager and recommend installation of an advance warning sign.

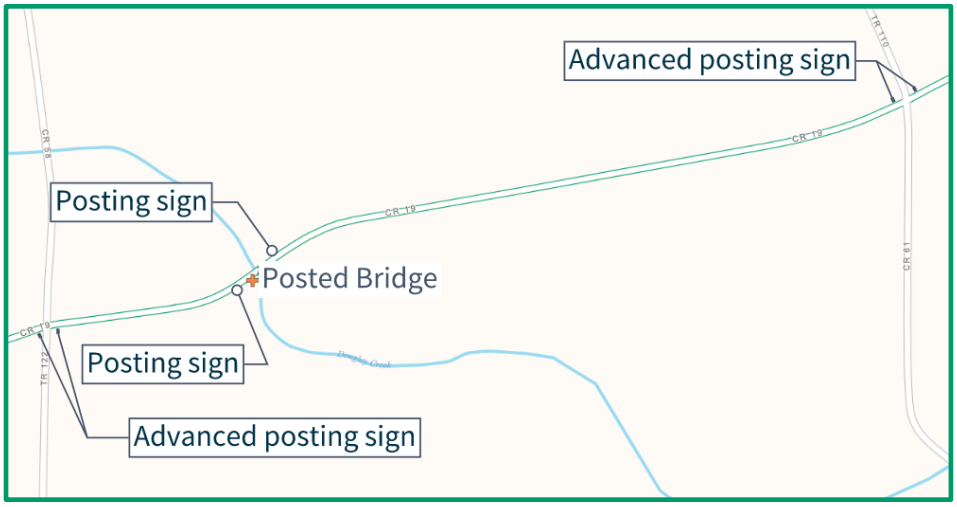

Figure 2-3: Locations of load posting signs at the bridge and in advanced of a posted bridge.

2.2.1 Load Posting Signs for State Bridges

Bridges shall be posted when the maximum load effects under Ohio law and AASHTO MBE exceed the load carrying capacity of a bridge. The load posting must be considered following ODOT's policy, to ensure the safety of the traveling public. ODOT's policy can be found in the most current version of ODOT's Bridge Design Manual.

https://www.transportation.ohio.gov/working/engineering/structural/bdm

The bridge posting policy shall be per the Ohio Revised Code, Section 5591.42. Any bridge carrying public highway traffic shall be posted when:

- A bridge, not posted already, shall be posted for reduced commercial legal loads when the controlling rating factor of the legal loads (minimum of rating factors of all legal loads) is below the posting threshold of 1.08.
- For bridges on the interstate system and all ODOT bridges not on interstate system, if a bridge is not posted for commercial legal loads, and the rating factor of any of the emergency vehicles (EV2 or EV3) is below 1.00, it will be posted for reduced loads of Emergency Vehicles only.
- The posting load for any vehicle shall not be more than the legal gross vehicle weight (GVW).
- The minimum load posting value is 3 tons. Bridges not capable of carrying a minimum gross legal weight of 3 tons shall be closed.

Where posting of a bridge is deemed necessary and no unusual or special circumstance at the bridge dictates otherwise:

- Standard regulatory signs (as per the Ohio Manual of Uniform Traffic Control Devices (OMUTCD)) shall be used. Sign placement shall be in accordance with OMUTCD Section 2B.59. An example of the standard wording to be used on the signs is given in Figure 2-4

- Bridge Ahead signs shall be erected at intersecting state roads located just prior to the bridge to allow approaching vehicles to by-pass the bridge or turn around safely with a minimum of interference to other traffic.
- Bridge Weight Limit signs shall be erected at each end of the structure.

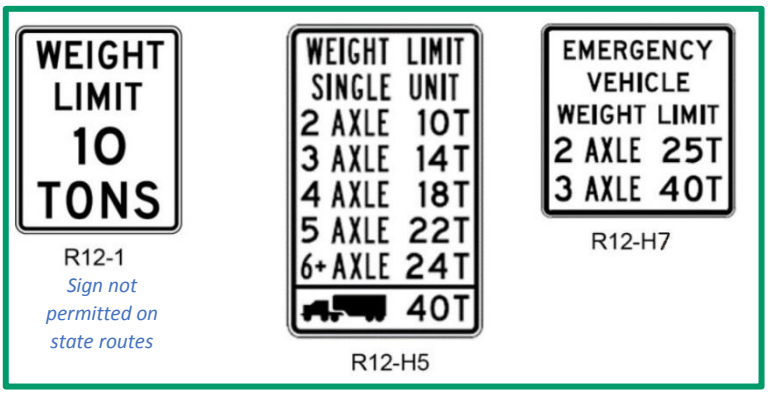

Figure 2-4: Weight Limit Sign Examples

The Weight Limit signs with one-tonnage number, for example R12-1, are not an option for bridges on State routes (see Figure 2-4). A bridge posted with a Weight Limit sign (e.g., R12-H5) shall not be signed simultaneously with the R12-H7 sign (see Figure 2-4).

2.2.2 Load Posting Signs for Local Agency Bridges

Local authorities in their respective jurisdictions shall place and maintain weight restriction signs in accordance with the OMUTCD to regulate, warn, or guide traffic (O.R.C. 4511.11). Bridges that are posted for weight restrictions must be in compliance or achieve timely compliance with the weight restriction signs in the OMUTCD.

The purpose of weight restriction signs is to communicate that the bridge, in accordance with standard engineering principles, is no longer capable of carrying legal loads. Weight Limit signs with silhouetted trucks are recommended, but not required, on local routes as they communicate the rating factor for each truck from the Load Rating Engineer to the traveling public. The OMUTCD has a selection of signs (R5-2, R5-2a, R12-1 through R12-4 and R12-H5) that entities may use to convey regulatory restrictions (see Figure 2-5).

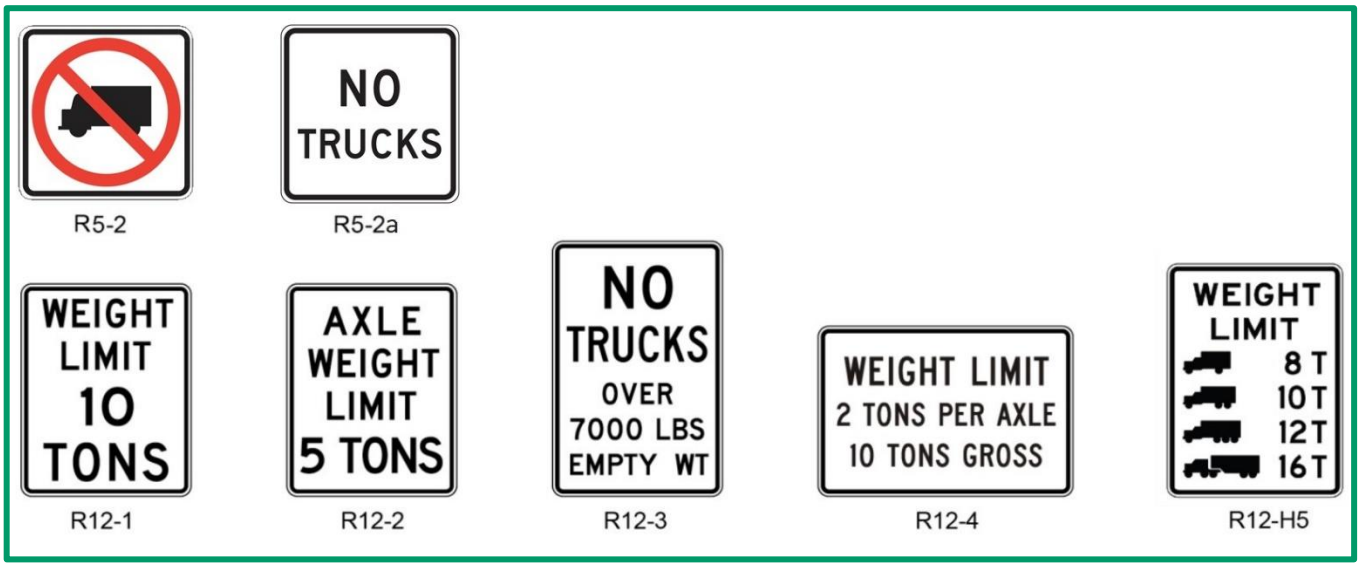

Figure 2-5: Sign Examples from the OMUTCD

Load posting sign requirements for weight limits are changing in July 2025 as the Ohio Supplement to the new MUTCD is released. Any new load posting sign after July 15, 2025, shall follow the new guidance in the MUTCD and Ohio Supplement and all existing load posting signs shall be replaced by December 31, 2028.

To achieve timely compliance with the OMUTCD, local Control Authorities are to replace current non-compliant signs/series of signs when:

- The bridge is replaced or strengthened; or
- The load rating of the bridge is revised; or
- The weight restriction sign is damaged, missing, or no longer serviceable for any reason.

County engineers shall refer to the following text from relevant ORC regulations:

ORC 5577.071, "*Reduction of weight of vehicle or load or speed on deteriorated or vulnerable bridge.*" Effective Date: 05-31-1988

(A) When deterioration renders any bridge or section of a bridge in a county insufficient to bear the traffic thereon, or when the bridge or section of a bridge would be damaged or destroyed by heavy traffic, the board of county commissioners may reduce the maximum weight of vehicle and load, or the maximum speed, or both, for motor vehicles, as prescribed by law, and prescribe whatever reduction the condition of the bridge or section of the bridge justifies. This section does not apply to bridges on state highways.

(B) A schedule of any reductions made pursuant to division (A) of this section shall be filed, for the information of the public, in the office of the board of county commissioners in each county in which the schedule is operative. A board of county commissioners that makes a reduction pursuant to division (A) of this section shall, at least one day before a reduction becomes effective, cause to be placed and retained on any bridge on which a reduction is made, at both ends of the bridge, during the period of a reduced limitation of weight, speed, or both, signs of substantial construction conspicuously indicating the limitations of weight or speed or both which are permitted on the bridge and the date on which these limitations go into effect. No person shall operate upon any such bridge a motor vehicle whose maximum weight or speed is in excess of the limitations prescribed. The cost of purchasing and erecting the signs provided for in this division shall be paid from any fund for the maintenance and repair of bridges and culverts.

(C) Except as otherwise provided in this division, no reduction shall be made pursuant to division (A) of this section on a joint bridge as provided in section 5591.25 of the Revised Code unless the board of county commissioners of every county sharing the joint bridge agrees to the reduction, the amount of the reduction, and how the cost of purchasing and erecting signs indicating the limitations of weight and speed is to be borne. A board of county commissioners may make a reduction pursuant to division (A) of this section on a section of a joint bridge, without the agreement any other county sharing the bridge, if the section of the bridge on which the reduction is to be made is located solely in that county.

ORC 5591.42, *"Carrying capacity of bridges - warning notice."* Effective Date: 11-02-1989

The board of county commissioners together with the county engineer or an engineer to be selected by the board, or the director of transportation, may ascertain the safe carrying capacity of the bridges on roads or highways under their jurisdiction. Where the safe carrying capacity of any such bridge is ascertained and found to be less than the load limit prescribed by sections 5577.01 to 5577.12 of the Revised Code, warning notice shall be conspicuously posted near each end of the bridge. The notice

shall caution all persons against driving on the bridge a loaded conveyance of greater weight than the bridge's carrying capacity.

2.3 Clearances

2.3.1 Horizontal Clearances

In accordance with the OMUTCD Chapter 2C, narrow bridges shall be identified using the NARROW BRIDGE sign (W5-2) (see Figure 2-6) for:

- A bridge or culvert having a two-way roadway clearance width of 16 to 18 feet
- A bridge or culvert having a roadway clearance less than the width of the approach roadway

A NARROW BRIDGE sign may be used in advance of a bridge or culvert on which the approach shoulders are narrowed or eliminated.

The ONE LANE BRIDGE (W5-3) (see Figure 2-6) sign should be used in accordance with Chapter 2C of the OMUTCD on two-way roadways in advance of any bridge or culvert:

- Having a clear roadway width of less than 16 feet; or
- Having a clear roadway width of less than 18 feet when commercial vehicles constitute a high proportion of the traffic; or
- Having a clear roadway width of 18 feet or less where the approach sight distance is limited on the approach to the structure.

Figure 2-6: Narrow and One Lane Bridge Signs

OBJECT MARKERS (OM3) (see Figure 2-7) - Objects not actually in the roadway may be so close to the edge of the road that they need a marker to warn the driver of a potential danger. These include underpass piers, bridge abutments, handrails, ends of traffic barriers, and culvert headwalls. When used for marking obstructions within the roadway or obstructions that are 8 feet or less from the shoulder or curb, the minimum mounting height, measured from the bottom of the object marker to the elevation of the near edge of the traveled way, should be 4 feet. When used to mark obstructions more than 8 feet from the shoulder or curb, the clearance from the ground to the bottom of the object marker should be at least 4 feet. OM3-L markers shall be placed on the left of approaching traffic, OM3-C in the center for center obstructions, and OM3-R shall be placed on the right.

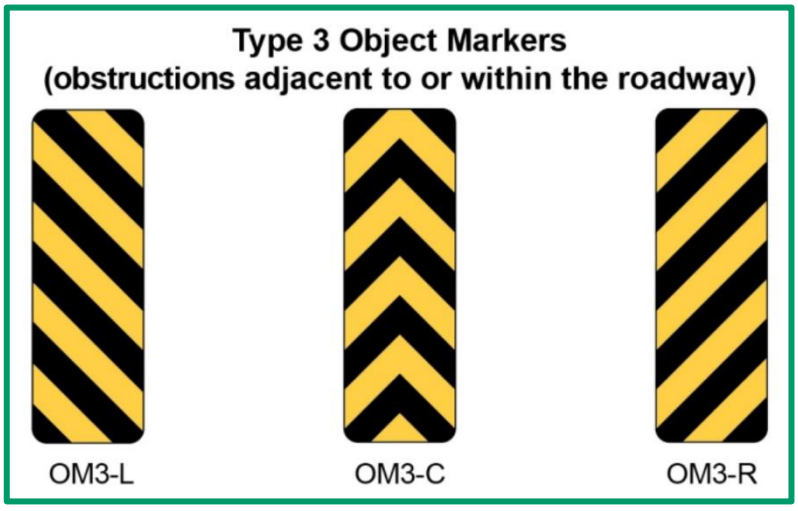

Figure 2-7: Object Marker Signs

2.3.2 Vertical Clearances

No vehicle shall exceed 13-feet and 6-inches vertical height, with or without load (ORC 5577.05(D)). Recommendations on Posting Low Clearance and Advance Warning Low Clearance Signs are found in the OMUTCD per ORC 4511.09 and ORC 4511.11.

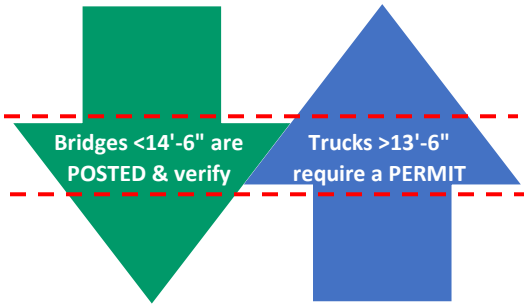

Figure 2-8: The one foot "No-Fly" Zone
Note that 14'-6" moves up to 16'-6" for certain routes (interstates, other freeways, expressways, and arterials).

- All bridges, tunnels, overhead obstructions, and openings for traffic that have the *actual minimum vertical clearance of **14'-6"** (or **16'-6"** for certain interstates, other freeways, expressways, and arterials) or less* (rounded down to the nearest 1") shall have Advance Warning Low Clearance signs (W12-2). The structure-mounted low clearance signs (W12-2a) shall be used for clearances of 13'-6" or less, and may be used for clearances greater than 13'-6" (see Figure 2-9) as per the guidelines of the Traffic Engineering Manual (TEM) and OMUTCD to warn the road users. The actual clearance should be shown on the Low Clearance sign to the nearest 1" not exceeding the actual clearance. However, in areas that experience changes in temperature causing frost action, a reduction, not exceeding 3", should be used for this condition.

- Where the clearance is less than the legal maximum vehicle height, the W12-2 sign with a supplemental distance plaque should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.
- In the case of an arch or other structure under which the clearance varies greatly, two or more signs should be used as necessary on the structure itself to give information as to the clearances over the entire roadway (see Figure 2-10).

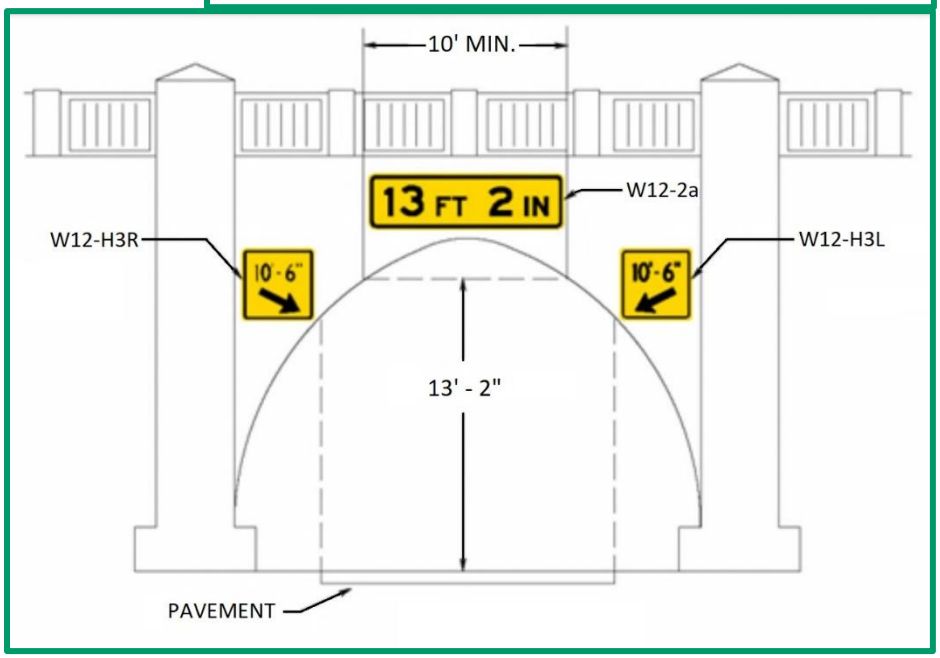

Figure 2-10: Example of Clearance Signs on a Low Clearance Structure

- Ground posted Low Clearance signs (W12-2) may be used near the bridge in addition to structure-mounted low clearance signs (W12-2a).

- All the Low Clearance signs (W12-2 & W12-2a) should display the same clearance height.
- Side Low Clearance signs (W12-H3) shall be used as per the guidelines of the TEM and subtract 3" from the actual clearance (rounded down to nearest 1") to display on the Low Clearance signs.
- On bridges, tunnels, overhead obstructions and openings for traffic, which have actual vertical under-clearance more than 14'-6" and get frequent hits, have special needs, or if requested, Low Clearance signs per these guidelines may be used.
- Always input the actual clearance measurements in the appropriate AssetWise data fields.
- The Department's Permit Office relies on the bridge clearance information in AssetWise for safe and uninterrupted operation. Bridge clearances shall be verified when performing routine inspections and updated accordingly.
- Vertical clearance sign requirements are changing in July 2025 as the Ohio Supplement to the new MUTCD is released. Any new vertical clearance sign after July 15, 2025, shall follow the new guidance in the MUTCD and Ohio Supplement and all existing load posting signs shall be replaced by December 31, 2028.

2.3.2.1 Strategic Highway Network (STRAHNET)

The STRAHNET is a system of highways and connectors that provides defense access, continuity and emergency capabilities for movements of personnel and equipment in both peace and wartime. To meet the demands of military traffic on the Interstate System, ODOT has adopted FHWA standards for vertical clearance. A vertical clearance over the entire roadway width, including the useable width of shoulder, should be 16' for the rural interstate. In urban areas, the 16' clearance is applied to a single route, with other interstate routings in the urban area having at least a 14'-1" vertical clearance.

Chapter 3: Bridge Files

3.1 Purpose

Complete information, in good usable form, is vital to the effective management of bridges. This information includes data that does not typically change over the life of a bridge, data that is updated from field inspections, and data that is derived or calculated. Such information provides a record that may be important for inventory, repair, rehabilitation, replacement, and future planning of the bridges. Items that should be assembled as part of the bridge record are discussed in this chapter.

Control Authorities are to maintain complete, accurate, accessible, and up-to-date records for each of their bridges. These records are needed to:

- Meet regulation
- Establish an inventory of infrastructure assets
- Document the condition and functionality of infrastructure, including the need and justification for bridge restrictions, for public safety
- Identify improvement and maintenance needs for planning and programming
- Document improvements and maintenance repairs performed
- Meet documentation requirements for work performed using Federal and State funding
- Provide available information in a timely manner for inspections

The information in a bridge file may exist electronically, on paper, or in external documents that are appropriately referenced within each bridge file.

3.2 Software

3.2.1 AssetWise

Ohio Bridge Inventory and Specifications for the National Bridge Inventory (SNBI) data is warehoused by the department's AssetWise system, an online centralized reporting and management database.

The SNBI data is forwarded to Federal Highway Administration (FHWA) on a regular basis for compliance verification. Per federal law, State Agencies (including NBIS bridges under the jurisdiction of Local Authorities) have a maximum of 3 months after the month when the field portion of the inspection is completed to submit and approve bridge inspection reports (i.e. if a bridge is inspected in the month of January, the inspection report needs to be submitted and approved within AssetWise by the end of April). In order to effectively collect, process and update SNBI data, State and Local governments use the centralized online AssetWise to not only satisfy Federal and State regulation but to also manage bridge assets. All personnel performing inspection work for entities must establish a user account in AssetWise.

Non-ODOT employees may retrieve a username and password through the ODOT AssetWise website landing page under *User Change Requests*.

People, who sign (or log into AssetWise) inspection reports fraudulently or without meeting the minimum NBIS qualifications or the minimum qualifications in this manual, may be subject to prosecution for forgery under Section 2921.11 of the Ohio Revised Code or other applicable state or federal laws.

3.3 The Structure File Number (SFN)

3.3.1 SFN Description

The Structure File Number (Item B.ID.01 – SFN) is the identification number for the data file of a structure. It is seven (7) digit numeric, which is assigned by the AssetWise Administrator in the ODOT Central Office. The Structure File Number is a permanent number assigned to the structure when the bridge is first conceived and remains so until the entire structure is demolished or removed from the system. The first two (2) digits are the county number of the Ohio County (see Item B.L.02 – County Code) in which the structure is located. The last five (5) digits make up the specific number for that structure. The specific structure number (digits three through seven) will be assigned by an AssetWise Administrator.

3.3.2 Changing, Retiring or Creating a New SFN

If a structure is transferred from one (1) jurisdiction to another, such as County to State or vice versa, it will not be given a new Structure File Number. Instead, you will change the Maintenance Responsibility (B.CL.02 – Major Maintenance Responsibility) code to match the new owner.

A SFN is retained to maintain the history of the structure. The SFN of a bridge should usually not change when work is performed, or the portions of a structure are reconstructed except in unusual circumstances. In case it is deemed necessary to retire the existing SFN and assign a new SFN to the bridge, the retired SFN shall be coded as the Previous Bridge Number (B.ID.03 – Previous SFN) in the file corresponding to the new SFN in AssetWise.

The existing SFN of a bridge should be retired and a new SFN shall be assigned when a completely new structure is built to replace the old structure or when a structure is rehabbed with a new superstructure type. See Table 3-1 for additional typical situations and whether a new SFN is needed or not.

Situation	Need New SFN?
Deck replacement	No
Superstructure replaced with same type	No
Widening	No
Replacing superstructure with same type and modifying piers and abutments	No
Replacing complete bridge including foundations	Yes
New superstructure of different type	Yes
Replacing wearing surface	No
Replacing superstructure and substructure except piles	Yes
Repairing, replacing or removing joints, bearings, railings, parapets, sidewalks, etc.	No

Table 3-1: SFN Example Situations

For other complex or unique situations not covered here, the bridge owner should contact the Office of Structural Engineering, Inventory Section.

3.3.2.1 AssetWise New and Retired SFN Requests

Owners may request a new SFN or retire an SFN by navigating to the ODOT AssetWise website landing page AssetWise | Ohio Department of Transportation and following the appropriate link under the *SFN Change Request* section.

The creation or addition of a bridge asset in AssetWise is the first step in establishing existence of the bridge in the system. This is a one-time entry and must be done before any updating (changes, inspection entries, etc.) can be performed. When a new SFN is created to a new bridge, it is in “Proposed” state and acts as a

placeholder in the system. Once a bridge or a section of bridge is built, it shall be inventoried and made "Active" in AssetWise within 3 months after the month of opening to traffic (i.e. if the bridge was open to traffic in May, the SNBI inventory shall be updated in AssetWise and the bridge made "Active" by the end of August). The bridge must have corresponding SNBI and Ohio inventory items coded in AssetWise before changing its status to "Active" in AssetWise. Duplicate bridge records, i.e., Structure File Numbers, shall not be allowed in the system.

Note that a new SFN will not become active until requested through the appropriate link under the *SFN Change Request* section. Once an SFN is made active it is immediately subject to State and Federal Quality Control Metrics. Therefore, it is essential that all directions and steps on the website are followed.

Currently, only the Office of Structural Engineering, Inventory Section can retire an SFN from the system for security reasons. When an SFN is retired from the System, its records do not get deleted but get frozen. Retired bridges are stored as archived assets. No further additions/deletions/changes can be made to retired bridge records. A retired SFN cannot be reassigned to any other bridge.

3.4 Record Contents and Retention

Some or all of the information pertaining to a bridge may be stored in electronic format, including AssetWise, as part of a file management system. Bridge files are prepared to maintain and record the following:

- Significant bridge file components
- Results of bridge inspections together with notations of any action taken to address the findings of such inspections
- Relevant maintenance and inspection data to allow assessment of current bridge condition
- Measurements and observations to allow assessment of physical and functional bridge condition
- Record of changes from the initial or recorded conditions on file

Bridge files are kept current through regularly scheduled bridge inspections. A bridge file should contain a full history of the structure.

3.4.1 Organization Unit File

The Control Authority is to maintain a general file of their organization for bridge safety inspection. The file shall define the scope of their jurisdiction. The organization file should contain:

- List of bridges and structures
- List of posted bridges with date of most recent signing verification
- List of NSTM bridges
- List of bridges with special features and/or conditions that necessitate special or more frequent inspections
- List of bridges that require underwater inspection
- List of bridges to be inspected during/after high water events
- Contact list for key staff during bridge emergencies
- Inspection organization
- Organizational Chart listing key staff, Program Managers, and Inspectors
- Certification credentials for the Program Manager, Inspectors, and key staff
- List of Quality Control tools utilized by the entity (Metric 20)

- Latest findings from the Quality Assurance Review
- List of inspection equipment
- List of bridge design and inspection reference materials
- Past results of QA Reviews

3.4.2 Record Retention Period

Unless otherwise noted, one copy (or the original) of each document in the bridge inspection file must be maintained for the life of the structure. The following documents may be destroyed after the indicated retention period:

- Routine Inspections older than 10 years for bridges in service
- Retain all inspections, load ratings, design computations and maintenance records for 3 years after a bridge is replaced
- Retain all load ratings for 3 years after a new rating is complete
- For Department bridges that are turned back, given, or sold to local municipalities or private/public organizations, all bridge inspection file information should be given to its new owner. The District needs only a file with contents similar to other local bridges. A record of the ownership transfer should be maintained in the bridge file.

3.4.3 Individual Bridge File Contents

The file for each bridge/structure typically consists of a wide variety of information from several sources to ensure sufficient information is readily available for safety inspections, overall bridge management, and QA. Because sources for most of the bridge information is more short lived than the bridge structure itself, the inspection file is the final repository from which information on the bridge's design, construction, and maintenance can be retrieved to evaluate current conditions. The inspection information for individual bridges or set of bridges need not be located in a single central file, but it is preferred. **FOR THE PURPOSES OF THIS SECTION, THE GENERIC TERM "BRIDGE FILE" IS INTENDED TO ENCOMPASS ALL OF THESE RECORDS WHEREVER THEY ARE PHYSICALLY STORED.**

An index of the information available is critical to enable the inspector to quickly access information needed to evaluate a structure. A good index for each bridge should identify the types of records available, their format, storage location, and date of record. This index must be a document that is readily available to the Control Authority, Program Manager, inspectors, and key staff.

Complete, accurate, and current records are maintained for each bridge under their jurisdiction. Records of recent and past bridge inspections, including all inspection types listed in Chapter 4 – Inspection Types of this manual, must be legible, accurate, and accessible. Inspection reports and records must be filed in an orderly manner. All state-owned bridge files must be stored at the district offices. Locally owned bridge files must be stored under the authority of the County Engineer or City Engineer. Where bridge plans, repair plans, and/or rehabilitation plans are available, a set must be placed in the file folder with all other information about the bridge. Additional information such as correspondence, agreements, memos, etc. must also be placed in the bridge file.

3.4.3.1 Inspection Report

Bridge Control Authorities are to keep track of the type of inspections performed during the Routine Inspection cycle. Each bridge shall be inspected every 12 or 24 months as determined by Ohio's Reliability Based Inspection policy. The bridge inspection report should be reviewed and submitted within 3 months after the month when

the field portion of the inspection is completed for all agencies (i.e. inspection is completed in the month of March, the inspection report shall be uploaded by the end of June). Include any special access or requirements needed to fulfill the inspection of the structure for its remaining useful life.

Bridge inspection reports document the findings of a field inspection. All bridge documentation must be written in a professional manner. Any document created is a potential record for the public's request. The quality of bridge inspection notes will reflect the professionalism of the bridge inspector, the quality of the bridge inspection, and the value of the Municipality/ County/ District/ State bridge inspection program. Many professionals in the bridge inspection process rely on the accuracy of the inspection report to make important proactive and reactive decisions.

It is considered good practice to include an appropriate description for components in all conditions. Appropriate justification of determined ratings means the lower the value of the condition code, the amount of report-time and documentation increases to thoroughly describe its location, extent, and severity. While a condition code of 6 normally warrants a fairly brief narrative, as the condition worsens, more thorough documentation is required. This should include photos, sketches, measurements, etc., to fully document the identified deficiencies and support the assigned condition rating.

Supporting comments and documentation must be saved in an accessible bridge file for convenient and consistent monitoring. AssetWise may be utilized as the one-stop location bridge file. However, regardless of the storage location, inspection comments are required in AssetWise when: *Any 9-0 SNBI component is rated **"5-Fair" or worse** OR any element condition state is rated **Condition State 2 or worse**.*

Photos and/or sketches should be placed in the bridge file and available to the next inspector. Notes, photos, and sketches should convey the location, extent, and severity of the deficiency.

Write comments in AssetWise using language that is readily understood by the inspectors, engineers, planners, and maintenance staff. Comments must be sufficiently detailed for those in the inspection process to prioritize maintenance, scope repairs, perform preservation and monitor the rate-of-change. Avoid the use of language that is confusing. An example of good comments is provided in Figure 3-1 below. Component comments are

Superstructure

BEAMS/GIRDERS

BEAMS ARE NUMBERED LEFT TO RIGHT LOOKING NORTH, 9 BEAMS TOTAL, EACH FASCIA BEAM IS 3' WIDE WHILE INTERIORS ARE 4' WIDE. GENERALLY, BEAMS ARE IN GOOD CONDITION WITH ISOLATED LEAKING DURING RAIN, EFFLORESCENCE BUILDUP AND DELAMINATION. SPECIFIC DEFICIENCIES INCLUDE:

1. 2-FT DIAMETER **SPALL** BEAM 4 UNDERSIDE NEAR REAR ABUTMENT (WITHIN 6-FT)
2. 2-FT DIAMETER **SPALL** BEAM 5 UNDERSIDE NEAR FORWARD ABUTMENT (WITHIN 6-FT)
3. 12" X 4" **SPALL** IN THE LEFT WEB OF THE LEFT FASCIA BEAM (B1) IN SPAN 1
4. BUILDUP OF **EFFLORESCENCE** OVER P1 BETWEEN BEAMS 7 AND 8. BUILDUP HAS INCREASED ~1" (2017-2020), ISOLATED DELAMINATION AND RUST STAINING HAS INITIATED AT PIER 1 CAP.
5. BUILDUP OF **EFFLORESCENCE** OVER P2 BETWEEN BEAMS 7 AND 8. ISOLATED DELAMINATION AND RUST STAINING HAS INITIATED AT PIER 2 CAP.
6. ACTIVE **LEAKING** BETWEEN SHEAR KEYS (RAINING AT TIME OF 2019 INSPECTION) IN FOUR LOCATIONS: SPAN 2 B6-9, SPAN 1 B8-9. ACTIVE LEAKING ALONG REAR ABUTMENT UNDER JOINT AND BETWEEN KEYS. ACTIVE LEAKING THROUGH UTILITY CONDUIT IN BEAM 9 AT PIER 1 IN SPAN 2.

Figure 3-1: Example Component Rating Inspection Comments for Prestressed Box Beam Bridge

accessed through the Inspector Comments form in each bridge report in AssetWise. The memo boxes in AssetWise provide a variety of formatting features to help organize notes.

Other items that are useful to note are:

- Timeline - Communicating the year the inspector lowers a rating is helpful to future inspectors and can be used to track changes
    - Example: SNBI Deck rating was lowered from 6 to 5 in 2021 due to in-depth inspection revealing 9% spalling on the underside of deck.
- Performance - The inspector should indicate how a component is performing if it is not degrading as anticipated or worsening more than normal. Important trends can often be concealed within component ratings. Comments can help highlight important tendencies.
    - Examples: 2008 OZEU has 60% top coat failure; Spalling in deck edges only
- Modifications - If a structure has had structural modifications such as bridge widening, bridge redecking, or a culvert extension, a brief note should describe the modifications and when they were performed. This is especially important for modifications that are not explicitly tracked in the inventory.
    - Examples: 5 stringers added in 2020; Pier 1 Column 3 fiber wrap first noted in 2023 routine inspection
- Abbreviations - Abbreviations may be used for field inspection notes. Typical abbreviations can be found in the FHWA Bridge Inspectors Reference Manual (BIRM).

The Element Comments are required in AssetWise within the View Hyperlink >Details tab (see Figure 3-2) for every Element quantity in Condition State 2 or worse. Condition State definitions are detailed in the latest version of the AASHTO Manual for Bridge Element Inspection. The comments must explain the rating in enough detail for the next inspector to quickly identify the location, extent, and severity of the defect to monitor change. Element notes should not be duplicated in the inspection comments memo box. The Element notes text

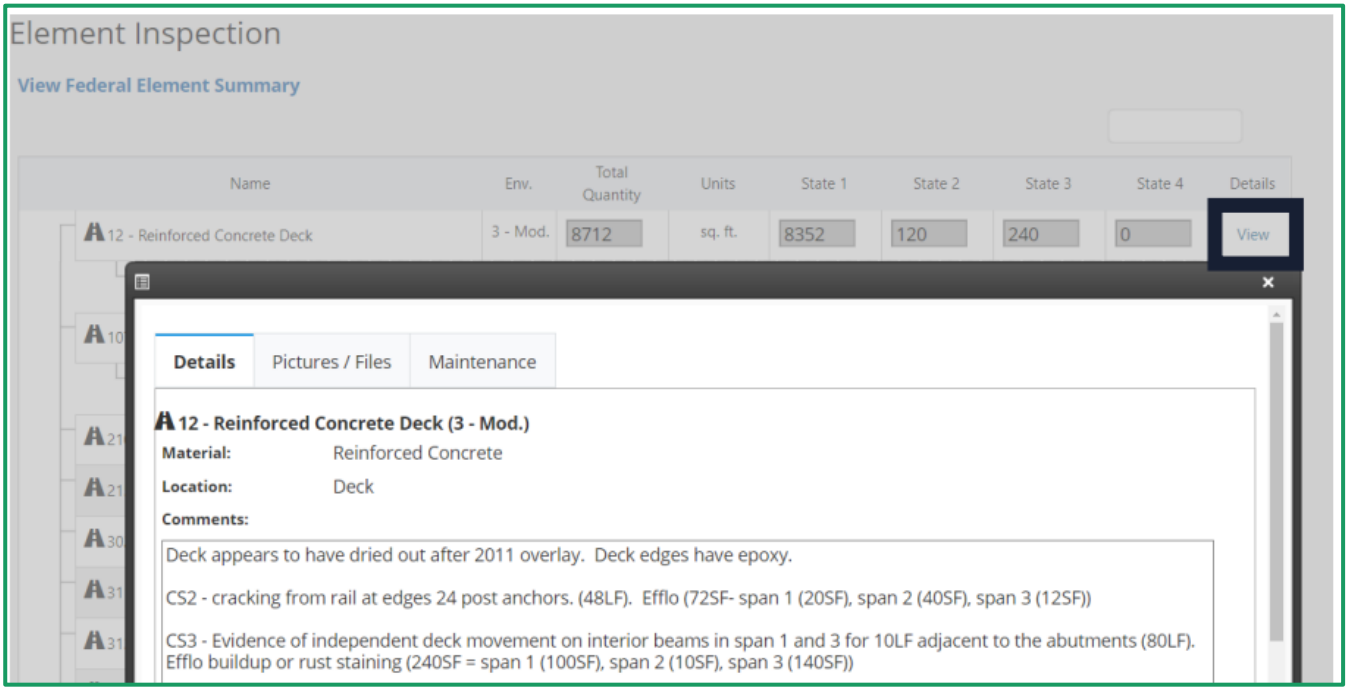

Figure 3-2: Element Notes are typed into AssetWise on the "Element Inspection Form" within the "View" Hyperlink for each Individual Element

box should take precedent. Comments must be separated into distinct sections, each separated with the CS2, CS3 or CS4 heading. Each section must clearly describe the defect, the severity, and the location of the defect. Short comments not specific to a condition state may be added at the top portion of the text box.

Example element comments can be found in Figure 3-3 and Figure 3-4. In the example note:

- Each Condition State (CS) is described separately
- Labeling and standard abbreviations are used appropriately
- Each element has a brief description of relevant general information before the condition state descriptions
- Succinct non-defect related comments are added to the top of the text box to help monitor performance

Following the standard nomenclature and labelling standards will help future inspectors quickly monitor element defects succinctly and comprehensively. This will help all bridge personnel better allocate, plan, scope, and preserve bridge performance over time.

	Environment	Total Quantity	Units	Condition State 1	Condition State 2	Condition State 3	Condition State 4
12 - Reinforced Concrete Deck	3 - Mod.	8712	sq. ft.	8352	120	240	0
	Deck appears to have dried out after 2011 overlay. Deck edges have epoxy. CS2 - cracking from rail at edges 24 post anchors. (48LF). Efflo (72SF- span 1 (20SF), span 2 (40SF), span 3 (12SF)) CS3 - Evidence of independent deck movement on interior beams in span 1 and 3 for 10LF adjacent to the abutments (80LF). Efflo buildup or rust staining (240SF = span 1 (100SF), span 2 (10SF), span 3 (140SF))						
510 - Wearing Surfaces		8597	sq. ft.	7409	1188	0	0
	SDC 2011 overlay with Project 155(11). Some areas of uneven finish with variable depth in grooving. CS2 - Two 25-ft long .016" wide longitudinal cracks. One in Span 1 EB lane and the other in Span 2 in WB lane (50SF). Cracking overlaps with some saturation in the floor but it does not directly correlate.						

Figure 3-3: Example Deck and Wearing Surface Element Comments

107 - Steel Open Girder/Beam	3 - Mod.	1188	ft.	871	249	68	0
	6 beams, two bolted splices per beam line in span 2, welded cover plates over both piers each beam line. Span 1 bay 1, one bent X-frame. CS2 - Failed paint at fascia beams along the outboard face. CS3 - 1/8" deep section loss at each fascia beam in the end spans. Span 1: B1-4LF, B6-4LF, Span 3: B1-30LF, B6-30LF.						
515 - Steel Protective Coating		10544	sq. ft.	1600	5684	1900	1360
	Beam perimeter is 8.88FT. CS1 - First 15LF of beams ends at each abutment were painted in 2011 (2X 15LF X 6 beams X 8.88LF = 1600SF). Remaining PCS is original						

Figure 3-4: Example Steel Beam and PCS Element Comments

3.4.3.2 Photographs

At a recommended minimum, these photographs should be stored within AssetWise but shall be required to be stored in the bridge file.

- **END VIEW** – From the rear, looking forward or upstation, stand back far enough to catch the entire width of the bridge plus 20 feet of approach guardrail. It is important to include warning signs and restriction signs at the bridge.
- **ELEVATION** – Stand back far enough to catch the entire length of the bridge and, where applicable, show any poor alignment of stream.
- **ABUTMENT** – Verify that flash works on camera, show as much of the abutment and bearings as possible, show areas of major deterioration if possible, try to show typical overall conditions. Take additional photos to include all utilities on the bridge.
- **UNDERSIDE** – Include as much of the beams, slab, and deck bottom as possible and include areas of major deterioration if possible.
- **EXAMPLE DEGRADATION** of controlling primary members with a condition rating of 5-Fair or worse
- **RESTRICTION SIGNAGE** – Load Posting, Vertical Clearance, One-lane, No Trucks, Closed, etc.
- **CHANNEL PHOTOGRAPHS** – see Chapter 3.4.3.6.
- **SAFETY HAZARDS** that control a Condition Rating or effect the traveling public and should address.

3.4.3.3 Plans and Measurements

Information generated during the design of the bridge that should be incorporated into the permanent inspection file includes:

- Design plans for original construction or rehabilitation
- Design computations
- Design Exception Approval letters (Used in Rating Appraisal Items)
- Foundation report
- Surveys

3.4.3.4 Inventory Data

Include current SNBI data sheets, previous SI&A (Structure Inventory and Appraisal) Sheets, and any other inventory data forms for a cumulative record that displays all the data for the bridge. Additional information on inventory data can be found in Chapter 7 – Bridge Inventory Coding and Condition Inspection.

For temporary bridges open to traffic greater than 24 months, inventory data must be collected. For modifications to existing bridges that alter previously recorded inventory data and for newly constructed bridges, enter the inventory data into AssetWise within 3 months after the month of opening to traffic.

3.4.3.5 Load Rating, Posting, and Permit Load Documentation

Entities are to maintain in AssetWise accurate and up-to-date load capacity information for all bridges and structures that carry public traffic. The Load Rating Analysis is part of the safety inspection of a bridge which includes:

- Analysis and Rating (All calculations, and computer output and input files and supporting calculations)
- Justification for an Engineering Judgment must include documentation of the condition of the bridge and date of the inspection that the load rating is based upon

- Bridge load rating & posting recommendations, including load rating calculations or load test data, dates, and signing recommendations. The relevant posting information must be kept on file. Examples include:
    - Posting evaluation
    - Posting recommendation data sheets
    - Posting approval letter
    - Pertinent correspondence
    - Commissioner resolution

3.4.3.6 Channel Information

Include current channel cross-sections, soundings, stream profiles and any other records pertaining to the channel for a cumulative record of the bridge and channel. Refer to Chapter 4.3.5 and Appendix I for procedures and requirements. Any bridges requiring underwater dive inspection (B.IR.03 – Underwater Inspection Required is coded Y) and any bridges with Scour Vulnerability (B.AP.03 – Scour Vulnerability) coded as C or D shall have a channel cross-section performed and on file. Channel cross sections shall be updated at the same interval of the dive inspection. More frequent measurements should be taken when, for example, channel condition worsens or changes abruptly.

For other bridges that do not require channel cross sections baseline channel photographs shall be included in the file. Channel cross sections should be taken when baseline photographs are inadequate or not feasible. Bridges over waterways shall, at a minimum, have baseline channel cross section photographs that are readily available for monitoring change. It is required that these photos exist and are on file. It is required that the baseline photos are uploaded into the bridge file in AssetWise as “Channel Inspection Photos”. Bridge staff shall be able to effectively compare channel conditions with the baseline photos. When Public Entities opt to perform baseline photographs, they are also agreeing to the respective global statement in Appendix C. If the responsibility statements do not best represent the bridges in the entity’s jurisdiction, the staff must perform a channel cross section instead of the baseline photographs.

A minimum of two photographs shall be taken. At least one upstream looking toward the bridge and one looking downstream. The photographs shall be taken from a far enough distance as to include all substructure units that are in and adjacent to the channel. Additional photographs are recommended in order to adequately monitor the changes in channel alignment, stream aggradation and stream degradation.

3.4.3.7 Scour Appraisals

Scour Appraisals are the risk-based and data-driven determination of a bridge’s vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated through a scour evaluation or a scour assessment.

Information that assists in evaluating the waterway opening and the bridge’s resistance to scour must be included in the individual structure file and on AssetWise. This may include:

- Channel cross sections, soundings, and stream profiles
- Hydrology and Hydraulics Reports (H+H)
- Scour depth computations (may be part of H+H or standalone calculations)
- Flood data, waterway adequacy, often shown on Bridge Site Plan
- Observed Scour Ratings
- Scour Evaluation or Assessment

- A plan of action (POA) shall be prepared to monitor known and potential deficiencies and to address critical findings for all bridges determined to be scour critical. The bridges that are scour critical must be monitored in accordance with the plan. Documentation should include post-event inspection and/or follow-up actions taken.

Scour Appraisals include both observed scour and estimated scour must be performed to determine the least stable result. All observed scour results are recorded in the inspection report(s). All estimated scour results must be recorded on the Scour Appraisal form in AssetWise.

Scour Appraisals are:

1. Observed Scour

AND

2. Estimated Scour
    a. Scour Evaluation

    OR

    b. Scour Assessment

The scour evaluation is intended to calculate depth of scour to assist in determining the stability and capacity of the structure. Calculate the depth of scour and plot stream cross sections showing the scour depth at the bridge site in accordance with the procedures documented in the current FHWA publication HEC-18 (*Evaluating Scour at Bridges*). The analysis includes an assessment of the effects of long-term changes in the streambed. In accordance with FHWA publication HEC-18, this effort should include the evaluation of long-term bed elevation changes and the determination of the proper scour analysis method. Computations should be performed for the magnitude of contraction scour, local scour at piers, and local scour at abutments. Refer to the latest ODOT Location & Design Manual, Volume 2 – Drainage Design, Section 1008.10 *Bridge Foundations* for ODOT's scour evaluation process.

Calculations performed should include contraction and local scour values for discharge events per the StreamStats, a USGS web-based application. Based upon the results of the calculations and evaluations, scour depth cross-sections should be developed for each discharge event which illustrate: the general configuration of the bridge, the location and depth of bridge foundations, and depths of various scour components (long-term, contraction, local, etc.). Based upon these cross-sections, the existing substructure units can be evaluated and analyzed for horizontal and vertical stability. The depths of scour should be evaluated and analyzed for reasonableness based upon actual records for storms and/or scour holes, and the potential effect of lateral stability of the waterway.

In the absence of a documented scour evaluation, a scour assessment must be completed and documented in the Scour Appraisal form in AssetWise.

There are three level of Scour Assessment, as follows:

- Level 1 – Stability Screening: Performed by bridge engineer and/or bridge inspection team leader familiar with scour assessments.
- Level 2 – Susceptibility Screening Score: Performed by bridge engineer, hydraulic engineer, geotechnical engineer, and/or bridge inspection team leader familiar with scour assessments. An active PE license is mandatory for the individual performing or supervising the assessment, and their PE number must be recorded in AssetWise.
- Level 3 – Scour Vulnerability Screening: Performed by bridge engineer, hydraulic engineer, geotechnical engineer, and/or bridge inspection team leader familiar with scour assessments. An active PE license is

mandatory for the individual performing or supervising the assessment, and their PE number must be recorded in AssetWise.

Each assessment level is a progressive screening process, comprised of questionnaires, that affectively documents the scour and directs the bridge engineer, bridge inspector, or scour appraisal team in coding the Scour Appraisal. Legacy assessment checklists will be accepted; however, it is recommended that the new screen process is completed. When completing the scour assessment, the following fields are required to be recorded in AssetWise:

- Scour Assessment Level Performed
- Scour Assessment Date
- Scour Assessment PE Number (Required for Level 2 and Level 3)
- Countermeasure Type
    - Countermeasures are material, devices, or structures designed to prevent, slow, or stop the occurrence of scour. Refer to HEC 23 – *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance; 3rd Edition, Volume 1 & 2*

Refer to the Appendix D for the questionnaires for each assessment level, and any additional information.

3.4.3.8 Construction and Maintenance Documents

Construction and maintenance records considered to be important for the bridge inspection file include:

- As-built drawings
- Shop drawings
- Pile hammer approvals and pile driving records
- Field change orders
- Jacking and/or demolition schemes
- Documentation of latent defects
- Maintenance work orders, sketches
- Repair records

One of the functions of the bridge (and structure) inspection program is to identify the needs of bridges for repairs, maintenance, preservation, reconstruction, and replacement. Control authorities need this information to respond to those critical deficiencies warranting immediate attention and for the long-term management of these critical infrastructure assets. The FHWA requires reporting of the major improvement needs of NBIS bridges for nation-wide planning. If a history is not available, then place a description in the file of how it is maintained.

3.4.3.9 Significant Correspondence

Correspondence and agreements regarding inspection responsibility, ownership, maintenance responsibilities with other agencies, or other issues that have an impact on the ability to ensure that thorough and timely inspections are completed should be stored in the Bridge File.

Critical findings and follow-up actions taken should be documented (see Chapter 2.1.1).

3.4.3.10 Special Procedures or Requirements

Preparation requirements for the field phase of an inspection vary greatly. Variations may be due to structure type, site accessibility, traffic volume, or channel conditions. Documenting field preparation requirements can

reduce budgets by maximizing mobilization efficiency. These areas of preparation, where applicable, are to be documented for each bridge.

Procedures lay out what should be done, looked at, etc. Bridges that require an NSTM, underwater inspection, or special inspection must have a unique inspection procedure associated with the bridge. The required procedures are often found in the report, as an introductory section. The procedures should:

- Identify any specialized tool or piece of equipment necessary that is not ordinarily carried by the bridge inspector. Example tools might be extendable ladders, special non-destructive testing equipment, power tools, lights, special safety equipment, special underwater tools, or diving gear.
- Record any special services that are required. Example services might be traffic control, structure cleaning operations, inspection access such as structure rigging, an under-bridge inspection vehicle, or special working platforms such as a barge.
- Document specific scheduling needs for non-routine inspections. This includes manpower needs for larger structures that require an extended duration inspection effort with multiple Inspectors, bridges subject to seasonal flooding conditions, NSTM bridges where special services are required, and underwater bridge inspections.
- Identify unique site conditions that require more than routine preparation. Unique site conditions include railroad property right of way restrictions, navigable waterway restrictions, high voltage transmission lines, unusually heavy vegetation, mud, pollution, insect or animal droppings, unusually high-water level, or unique traffic safety procedures.
- Other documents that may be maintained as part of the inspection file include Public Utilities Commission of Ohio (PUCO) documents, confined space permits, bridge-related correspondence, and cost estimates for improvements.

NSTM plans, scour assessments, underwater inspection procedures, complex inspection procedures, and special inspection procedures must all be stored in AssetWise in the Files tab under the appropriate File Type (see Figure 3-5). Additional files such as plans, load rating files, etc. are also recommended to be stored on AssetWise. Inspection Procedures for unique structures (a detailed list may be found in Chapter 4 – Inspection Types within the specific “Inspection Type”) should include the following specifics based on the inspection type:

- NSTM Bridges: The identification of all steel members in tension that are non-load-path-redundant shall be in the bridge file for every NSTM bridge. Additionally, locations of AASHTO E and E’ details (category examples may be found in Appendix F), retrofits, and other poor connections should be identified. Consideration should be given to include AASHTO D details. This plan must be available for all inspectors at each NSTM inspection. An example Identification Plan is available in Appendix E. The procedures shall include the location of fatigue details, how inspectors should access the NSTMs, and who needs to be contacted.
- Underwater Inspection Procedures: Each bridge requiring an underwater dive inspection must have the underwater elements identified, the location of the underwater elements, the inspection frequency, and any procedures described in the records. Those elements requiring underwater inspections must be inspected according to the procedure. A checklist is available in Appendix G.

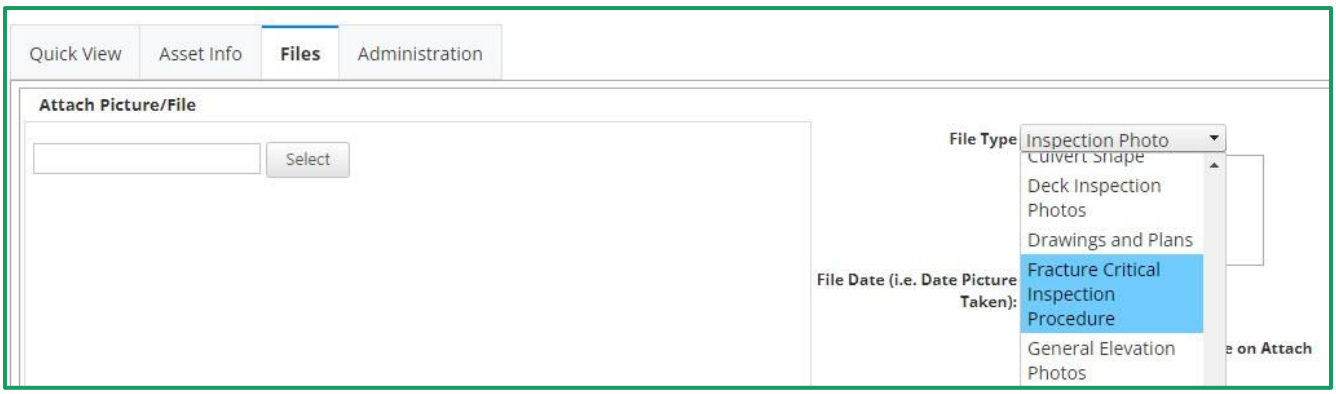

Figure 3-5: Image of AssetWise File Type selection

Chapter 4: Inspection Types

The scope, intensity, and interval of bridge safety inspections are discussed here to provide a better understanding of the purpose and use of each inspection type and to assist in the development of scope of inspection work for individual inspections. An inspection event, particularly for large, complex, or deficient structures, often requires that a variety of inspection types be performed, using a variety of methodologies.

Inspection types include Initial, Routine, Underwater, NSTM, Damage, In-depth, Special, Scour Monitoring, Service, and Ohio cursory. Each of these inspections may occur individually or several inspections may occur concurrently. When multiple inspection types occur concurrently, each inspection type should be selected and data recorded in the appropriate fields under Chapter 7.6.

All vehicular carrying bridges owned or maintained by the state or bridges carrying NHS routes (B.H.03 – NHS Designation is coded "Y" for route carried on the bridge) element data is required to be completed for the bridge including the total quantities and condition state quantities. See Chapter 7.7.2 for additional information.

4.1 Initial Inspection

NBIS Definition: The first inspection of a new, replaced, or rehabilitated bridge. This inspection serves to record required bridge inventory data, establish baseline conditions, and establish the intervals for other inspection types.

An initial inspection is the first inspection of a new structure, a structure that has changed ownership or a reconstructed structure. It is a close-up hands-on inspection of the structure to document its baseline condition.

4.1.1 Purpose of Initial Inspections

The purpose of the initial inspection is to verify the safety of the bridge, in accordance with the NBIS and Department standards, and establish baseline conditions. It also serves to provide required inventory information of the as-built structure type, size, and to document its structural and functional conditions by:

- Providing quality NBIS inventory data per the SNBI required by Federal regulations along with all other data required by Department standards.
- Determining baseline structural conditions
- Eliminating deficiencies recorded under previous inspections after reconstruction.
- Documenting clearance envelopes (for features carried and those intersected) and bridge waterway openings are to be documented at this time.
- Identifying maintenance needs, including preventative maintenance activities or uncompleted construction items.
- Noting the existence of elements or members requiring special attention, such as NSTM, fatigue-prone details, and underwater members.
- Verifying construction/rehabilitation contracts.
- Compiling documents, including but not limited to, photographs, drawings (design, as-built and shop drawings), scour analysis, foundation information, hydrologic and hydraulic data are to be inserted into the bridge file. Selected construction records (e.g. pile driving records, field changes, etc.) may also be of great use in the future and should be included.

In the event that inspection or maintenance responsibility of a bridge changes, an email notifying ODOT Central Office – Office of Structural Engineering, shall be written by the initial Control Authority of the structure. The

email shall outline the inspection and maintenance responsibilities of all parties. The SFN will remain the same, however the program responsibilities will change. This documentation should be added to the bridge file.

4.1.2 Scope and Interval of Initial Inspections

The level of effort required to perform an initial inspection will vary according to the structure's type, size, design complexity, and location. An initial inspection is to be a close-up inspection of all members of the structure to document the baseline conditions. Traffic control and special access equipment may be required.

Initial inspections are performed for each new, replaced, rehabilitated, and temporary bridge as soon as practical, but within 3 months of the bridge opening to traffic. For phased construction of the bridge, initial inspections should be completed for each stage when traffic is placed on any newly constructed portion of the bridge within 3 months of the phase open to traffic. Bridges open to traffic during construction operations are required to be inspected on their regular interval. Anytime ownership changes, the bridge shall receive an initial inspection.

For bridges requiring NSTM or underwater inspections, the respectable inspection type shall be completed within 12 months of opening to traffic following the guidance in Section 4.3 Underwater Inspection or Section 4.4 NSTM Inspection.

4.2 Routine Inspection

NBIS Definition: Regularly scheduled comprehensive inspection consisting of observations and measurements needed to determine the physical and functional condition of the bridge and identify changes from previously recorded conditions.

Routine inspections provide documentation of the existing physical and functional conditions of the structure. All changes to the inventory since the previous inspection are to be documented and updated. The written report will include appropriate photographs and recommendations for major improvements, maintenance needs (preservation, preventative maintenance or on-demand repairs), and follow-up inspections. Load capacity analyses are re-evaluated only if changes in structural conditions or pertinent site conditions have occurred since the previous analyses.

4.2.1 Purpose of Routine Inspections

Routine inspection shall satisfy the requirements of the NBIS and Department standards. Routine inspections serve to document sufficient field observations/measurements and load ratings needed to:

- Determine the physical and functional condition of the structure.
- Ensure that the structure continues to satisfy the present service and safety requirements.
- Determine the need for establishing or revising a weight restriction on the bridge.
- Determine improvement and maintenance needs.
- Identify any inventory changes from the previous inspection.

4.2.2 Scope of Routine Inspections

The level of scrutiny and effort required to perform a routine inspection will vary according to the structure's type, size, design complexity, existing conditions, and location. Routine inspections are generally conducted from the deck, ground and/or water levels. Generally, every element in a bridge does not require a hands-on inspection during each routine inspection but requires a visual view to provide an acceptable level of assurance of the bridge's ongoing safety. Routine inspection may require the use of ladder, lift, snooper, boat, waders, rope access, UAV (drones), dive inspection, traffic control, confined spaces, or other method(s) to adequately

determine the condition of the bridge. During routine inspections, particular attention should be given to scour, erosion, (new rock fields, debris) and overall stability of the substructure.

For bridges over waterways and when B.IR.03 – Underwater Inspection Required is code N (underwater inspection not required), the routine inspection should include probing of the substructure units unless the water level or velocity do not allow with an interval not to exceed as specified in Chapter 4.3.2. The probing of the substructure units shall be performed in accordance with Chapter 4.3.3.1. Additionally, channel photos shall be documented for each routine inspection per Chapter 4.3.5.3.

Areas that should have a hands-on inspection during each routine inspection, include, but are not limited to:

- Those areas explicitly determined by previous inspections
- Load carrying members in poor condition, critical sections of controlling members on posted bridges
- Substructure units vulnerable to scour
- Areas determined by the Program Manager, for example:
    - End regions of steel girders or beams under deck joints
    - Cantilever portions of concrete piers or bents
    - Ends of prestressed concrete beams at continuity diaphragms
    - Pin and hanger/hinge assemblies
    - Redundancy retrofit systems

Increased routine inspection intervals or level of inspection are at the discretion of the Control Authority or Program Manager.

4.2.3 Interval of Routine Inspections

The Ohio Revised Code requires routine inspection intervals to be established by the Director of Transportation, but not to exceed 24 months. The inspection interval criteria will be recognized as the ***Reliability Based Inspection interval***, or RBI.

It must be emphasized that the objective is to select the most appropriate routine inspection intervals using a reliability-based procedure. As a result, some bridges may have longer intervals while some must be shorter. Bridges that meet any one of the six criteria below must receive a routine inspection every 12 months. Bridges that do not meet the criteria listed may extend the RBI interval, not to exceed 24 months.

Criteria for the 12-month Routine Bridge Inspection interval:

- B.C.13 – Lowest Condition Rating coded lower than “7 – Good”
- Non-Redundant Steel Tension Member (NSTM) bridges
- Scour vulnerable bridges
- Load posted or restricted bridges
- Newly constructed or rehabilitated within 3 years
- Other additional bridges determined by the Control Authority

4.2.3.1 Routine Inspection Interval Tolerance

For routine inspections on a 12-month interval, there is an acceptable tolerance for the next inspection of ***up to 2 months after the month in which the inspection is due.*** For example, if the routine inspection date of a 12-month RBI bridge is in the month of July, the next routine inspection must be completed by the end of September the following year.

For routine inspections on a 24-month interval, ***there is no additional routine inspection tolerance as the ORC states that routine bridge inspections will not exceed 24 months.***

4.2.3.2 Routine Inspection Interval Updates in AssetWise

The routine inspection interval will be updated in AssetWise based on the above RBI criteria. This update will be performed continually by ODOT Central Office.

4.3 Underwater Inspection

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

Underwater inspections provide documentation of the existing condition of portions of the structure which are submerged in water.

4.3.1 Purpose of Underwater Inspections

The purpose of the underwater inspection is to provide information on underwater portions of a bridge to evaluate their overall degradation, safety, and to assess the risk of scour.

4.3.2 Interval of Underwater Inspections

Bridges crossing waterways that can receive underwater inspections using visual, wading, or probing techniques will not require Underwater Dive inspections. This type of underwater inspection should be done at every routine inspection. If a visual, wading, or probing techniques cannot be completed within the last two inspection cycles, the next cycle an underwater inspection shall be completed within 60 months of the last probe inspection. This level of inspection and findings shall be reported as a routine inspection and documented within the routine inspection report and notes.

Structures over water that cannot receive a probing inspection shall be placed on the Underwater Dive list and receive Underwater Dive Inspections. First underwater inspections are completed within 12 months of bridge opening to traffic or a bridge rehabilitation including repairs to a portion of the structure underwater. All structures requiring underwater dive inspections shall be scheduled at intervals of 60, 24, or 72 months per the updated NBIS Method 1 criteria.

- 60 Month Underwater Dive Inspection Interval - This is the regular underwater dive inspection interval unless a bridge meets the criteria for a reduced or extended interval.
- 24 Month Underwater Dive Inspection Interval - Bridges meeting **ANY** of the following criteria **SHALL** be inspected at 24-month intervals:
    - B.C.15 – Underwater Inspection Condition Rating of 3 or less
    - B.C.09 – Channel Condition Rating of 3 or less
    - B.C.10 – Channel Protection Condition Rating of 3 or less
    - B.C.11 – Scour Condition Rating of 3 or less
- 72 Month Underwater Dive Inspection Interval - Bridges meeting **ALL** the following criteria can be inspected at 72-month intervals:
    - B.C.15 – Underwater Inspection Condition Rating of 6 or greater
    - B.C.09 – Channel Condition Rating of 6 or greater
    - B.C.10 – Channel Protection Condition Rating of 6 or greater

- B.C.11 – Scour Condition Rating of 6 or greater
- B.AP.03 – Scour Vulnerability coded stable for scour, A or B

The 72-month Underwater Dive Inspection interval is optional and at the discretion of the Program Manager, given the bridge meets the above 72-month criteria.

4.3.2.1 Underwater Inspection Interval Tolerance

For all underwater inspections, there is an acceptable tolerance for the next inspection of ***up to 3 months after the month in which the inspection is due***. For example, if the underwater inspection completion date is in the month of July, the next underwater inspection must be completed by the end of October of the year due.

4.3.3 Scope of Underwater Inspections

There are three levels of underwater inspection. All bridges over water must receive one of the below underwater inspection levels.

Non-destructive technology, including ground sensing radar, ultrasonic techniques, remote video recorders, and others are useful aids to supplement, but not replace, underwater inspections of substructure foundations.

4.3.3.1 Routine Visual, Wading, or Probing Inspection

Visual inspections combined with probing of substructure units should be performed during each routine inspection. Active scouring, undermining, or substructure deterioration below the water line must be regularly monitored. Because scour can vary significantly from one end of a footing to the other, a single probing reading is not sufficient. Multiple probing readings must be taken across each substructure unit in the water. This is required to establish a baseline condition for future scour monitoring. In addition to probing for scour, steel piles not encased shall be inspected by visual and tactile means to check for areas of corrosion and section loss below the waterline. A routine visual, wading, or probing inspection will be coded in B.IR.03 – Underwater Inspection Required as N (underwater inspection not require) and B.IE.01 – Underwater Inspection Type will not be checked.

4.3.3.2 Underwater Dive Inspection

Structures which cannot be inspected visually at low water or by wading, probing, or B.IR.03 – Underwater Inspection Required is coded as Y (underwater inspection required) will require diving techniques. The typical threshold is for substructure units in water deeper than 5 feet, but may vary based on numerous factors including access, tools available, visibility, and safety. Key information to be determined in every underwater dive inspection is the top of streambed relative to the elevation of the substructure foundations. Baseline streambed conditions should be established by waterway opening cross sections and by a grid pattern of probing readings around the face of a substructure unit. The baseline information is essential for future monitoring and assessment. The current streambed conditions and changes since the last inspection are critical inputs to the bridge scour assessment.

Each bridge should have a local reference point established near each substructure unit to enable inspectors to quickly and accurately determine the depth of adjacent scour. These can be as simple as a painted line or PK nail driven into the wall in a place visible during high water. The location of these scour-monitoring benchmarks should be referenced in the inspection records and bridge file. Use previously established benchmarks when possible, to provide a long-term record of scour conditions. If new benchmarks need to be established, provide conversion from new to old datum.

Underwater inspections are intended to investigate two critical issues regarding the condition of bridge substructures located in water:

- The condition of structural components (including pier shaft, abutment walls, footings, etc.) under water.
- The integrity of substructure foundation (including underlying soil, piles, caissons, etc.) against scour at each substructure unit in water.

The inspection of the foundation of a substructure unit and the determination of its ongoing resistance to scour is critical for the overall safety of the bridge because the integrity of the foundation against scour can suddenly and dramatically change in a relatively short time.

There are three levels of Dive Inspections, described below. A regularly scheduled Underwater Dive Inspection normally includes a 100% Level I inspection and a 10% Level II inspection. It may also include additional Level II inspection and a Level III inspection, if necessary, to determine the structural condition of the submerged substructure elements with certainty.

4.3.3.2.1 Level I Underwater Dive– Visual/Tactile Inspection

Level I inspections include a close visual examination of the entire submerged portions of a bridge. They should include, but are not limited to, the following:

- Written Inspection Procedures specific to the bridge
- Steel, concrete, stone, and timber abutments, piers, fenders, and dolphins
- Identify and describe any scour adjacent to the above-mentioned items
- Identify and describe any damage to the substructure items as may have been caused by collision (ice, debris, vessels, vehicles, etc.)
- Identify and describe any footings or support elements which may be exposed
- If bottoms of footings are exposed, include measurements describing the sizes of voids under the footings. In addition, describe the condition of any piling exposed in the void area
- Identify and describe the condition of all piling of pile supported structures from the waterline to channel bottom, and identify and describe the condition of any pile protection
- Identify and describe any cracks, scaling, tilting, or spalling of concrete or masonry piers and abutments
- Probing of the soil adjacent to any substructure unit is required
- Cross Channel Profile (refer to Chapter 4.3.5)
- Scour Appraisal (refer to Chapter 3.4.3.7)

4.3.3.2.2 Level II Underwater Dive– Detailed Inspection with Partial Cleaning

Level II inspections may be required whenever serious deterioration is found during a Level I inspection. A Level II inspection shall include field measurements and substructure cleaning below the waterline to document the extent of unsatisfactory structural condition. The inspector must report in full detail giving all dimensions of size, shape, and exact location. Effective methods shall be utilized for testing and measuring sound or unsound concrete; sound or unsound timber; section loss of steel; or sound or unsound masonry in piers, piles, bents, cribs, or other types of substructure construction; presence of scour, alterations, or other conditions; and/or any other conditions that may affect the integrity of substructure units. For example, if concrete encased steel piles of a bridge bent were in water, and they were found to have areas of advanced section loss, a Level II inspection would involve cleaning a representative number of piles and taking measurements of the steel shell thickness.

4.3.3.2.3 Level III Underwater Dive – Detailed Inspection with Non-Destructive Testing (NDT)/Partially-Destructive Testing (PDT)

A Level III inspection is a highly detailed inspection of a critical structure or structural element of a member where extensive repair or replacement is contemplated. The purpose is to detect hidden or interior damage or loss in cross sectional area and to evaluate the material. It includes extensive cleaning, detailed measurements, and selected non-destructive and/or partially destructive techniques, including ultrasonic, sample coring or boring, physical material sampling, and in-situ hardness testing. The use of testing techniques is generally limited to key structural areas, suspect areas, or areas which may be representative of the entire underwater structure.

4.3.4 Underwater Dive Inspection Procedures

Acceptable written procedures are those that communicate to the inspection team leader what is necessary to ensure a successful inspection. Each bridge with elements requiring underwater diving inspection must have written inspection procedures specific to each bridge which address items unique to that bridge. The prior inspection report, by itself, does not suffice for the required procedures. It is valuable to review for previous inspection findings, but it does not serve the same purpose as the inspection procedures. The inspection report records what inspectors actually did, what was looked at, and what was found. Procedures lay out what should be done, looked at, etc.

Underwater Dive Inspection procedures MUST be on file in AssetWise for every bridge marked Y (Underwater inspection required) for B.IR.03 – Underwater Inspection Required.

The underwater inspections must be planned and prepared for, considering, but not limited to:

- Identified underwater elements
- Physical scour countermeasures
- Required access locations (including contacts for property owners, etc.)
- Required or suggested inspection equipment
- Structural details
- Hydraulic features and characteristics
- Unique inspection methods or frequencies if within 60 months
- Required qualifications of inspection personnel
- Scheduling factors (dry time, vessel traffic, etc.)
- Notice to relevant contacts (Coast Guard, maritime traffic controller, etc.)
- Risk factors

Risk factors and unique conditions/circumstances shall be identified in the inspection procedures. Proper development of adequate inspection procedures, and concerted attention to follow these procedures, will mitigate most risks. In addition, the risk of scour for scour critical bridges, or bridges with unknown foundations, is mitigated by development and implementation of a scour plan of action (POA) for each applicable bridge. Specific risk factors include waterway features, such as rapid stream flows, debris accumulation, constricted waterway opening, soft or unstable streambeds, meandering channels, etc., which may promote scour and undermining of substructure elements. Water conditions which may affect the inspection, such as black water or rapid steam flows, should also be identified and accounted for in the inspection methods. Water environment and structural systems or materials which may combine for accelerated deterioration of the bridge elements should be identified, such as highly corrosive water, unprotected steel members, timber piling in the presence of

teredos or limnoria, etc. By identifying these conditions or risk factors, the underwater inspectors can appropriately prepare for and perform a thorough inspection. The underwater inspection procedures developed for the bridge should adequately address these items, and whether the inspection reports adequately address them, as appropriate.

4.3.5 Channel Cross Section

Channel cross section profile measurements are to be taken on bridges over waterways to track the rate-of-change of stream alignment and scour.

4.3.5.1 Requirements for Channel Cross Sections

Measurements to obtain channel cross section shall be documented at maximum intervals not to exceed B.IE.05 – Inspection Interval for Underwater Inspection. Measurements are used to determine change due to general channel scour, channel migration, aggradation, or degradation. Measurements should capture scour, degradation, or other channel properties which may cause distress to the structure foundation. Bridges requiring dive inspections, or bridges which are deemed *Scour Vulnerable,* shall require channel cross sections.

- Underwater Inspection: Bridges that are coded "Y" for Item B.IR.03 – Underwater Inspection Required shall have a channel cross section performed and on file in AssetWise. Channel cross sections may be done separately from the underwater inspection or made part of the underwater inspection scope.
- Scour Vulnerability: Bridges with B.AP.03 – Scour Vulnerability coded C or D shall have a channel cross section performed and on file in AssetWise

More frequent measurements shall be taken as necessary. Examples of situations where additional measurements shall be collected include, but are not limited to:

- Following an extreme hydraulic event, or
- The reduction of condition codes below a 6 for:
    - Items B.C.03 – Substructure Condition Rating;
    - B.C.04 – Culvert Condition Rating;
    - B.C.09 – Channel Condition Rating;
    - B.C.10 – Channel Protection Condition Rating;
    - B.C.11 – Scour Condition Rating; or
    - B.C.15 – Underwater Inspection Condition.

Consideration to increase the channel cross section frequency should be given if the scour vulnerability of the structure is adjusted, as reported under Item B.AP.03 – Scour Vulnerability.

4.3.5.2 Channel Cross Sections Procedure

The channel cross section is intended to monitor the horizontal and vertical movement of the channel over time, identify depth and size of scour holes, and to monitor flow line. Channel cross sections shall be compared with previous measurements to monitor any changes. Priority for selecting a side for the channel cross section is as follows:

1) The side exhibiting the most scour, degradation, or other channel properties that may cause distress to the foundation units.
2) The same side as the previous channel cross section.
3) The upstream side of the channel.
4) Both sides.

Flowline characteristics that could directly affect the stability of the substructure must be entered into the bridge file. The results of the channel cross section may lead to additional underwater (dive) inspections, soil sampling, robust channel profiles, and/or LIDAR scanning to perform scour analysis.

Channel cross sections must contain objective and repeatable dimensions. Performing a channel cross section can be done from beneath, or most often, above from the top of deck. At a minimum, the horizontal distance from the rear abutment (X-axis) and the vertical "drop" distance from a reference point to the ground (Y-axis) must be collected. In lieu of an in-depth fathometer sounding, the following is an example of a repeatable and objective procedure:

1) Obtain necessary tools for measuring from either the top or bottom.
2) Measure the vertical distance, vertical offset, between the reference location and the underside of the superstructure. Describe the offset dimension or provide a sketch. This measurement is the vertical distance, relatively simple to obtain, and should be accessible during floods or other high-water events.
3) Mark and document where the vertical measurements will be taken on the bridge and on the form. Using a measuring wheel or fixed objects, walk up-station away from the rear abutment on the appropriate side of the bridge, and mark on the bridge railing, wearing surface, or sidewalk where the vertical drop will be taken. For structures 50 feet in length or greater, the following locations must be included at a minimum:
   (a) Both abutments
   (b) Every pier
   (c) Half-span points and fields
   (d) Location susceptible to change, including but not limited to:
      (i) Top and bottom of a channel cut/slope change
      (ii) Edge of water
      (iii) Maximum water depth or channel bottom
      (iv) Scour holes
      (v) Edges and highpoints of debris
   (e) On structures less than 50 feet in length, or structures with active channel misalignment, smaller distances between measurements are required (ex. 5-foot increments, or every railing post).
4) At each drop-point, lower a weighted end of a 100-foot measuring tape attached to a rope supporting a 5 - 10 lb weight until the weight touches the ground.
5) Record the dimension on the tape at the reference point and the horizontal distance.
6) Upload all documentation to the bridge file.

If it is easier to record vertical measurements from beneath, they can be obtained with a survey rod or laser distance measure from the groundline to the underside of the superstructure. The same horizontal measurements and vertical drop locations described above shall be documented. Additional information can be found in Appendix I.

4.3.5.3 Requirements for Baseline Photographs

All bridges over water not meeting the above requirements for channel cross sections must have baseline channel photographs on file. Channel cross sections should be taken when baseline photographs are inadequate or not feasible. Bridges over waterways shall, at a minimum, have baseline channel cross section photographs

that are readily available in AssetWise for monitoring changes. Bridge staff shall be able to effectively compare channel conditions with the baseline photos.

A minimum of two photographs shall be taken looking toward the bridge: at least one upstream, and one downstream. The photographs shall be taken from a far enough distance as to include all substructure units within the channel. Additional photographs are recommended in order to adequately monitor changes in channel alignment, stream aggradation, and stream degradation.

When public entities opt to perform baseline photographs, they shall agree to the global statement in Appendix C. If the statements do not best represent the bridges in the entity's jurisdiction, a channel cross section must be performed.

4.3.5.4 Performing Baseline Photographs Procedure

When taking baseline photographs, it may be difficult to access a suitable location for the required photos. In this case, additional photos shall be taken to show the channel or channel degradation more accurately. If this is not feasible, a channel cross section shall be taken.

The photos should be taken at a perpendicular angle to the bridge, or at an angle which shows all substructure units. The photos should be timestamped for documentation and future comparison. It is recommended that photos be taken when the water level is at its lowest point, as allowable.

4.4 NSTM Inspection

NBIS Definition: A hands-on inspection of all non-redundant steel tension members (NSTMs) on a bridge.

Bridges with NSTMs must carry public vehicular traffic and have at least one NSTM. A NSTM must meet all of the following:

- Must be steel
- Must be in partial tension (i.e. bottom flange of a flexure member) or total tension (i.e. axial)
- Must be without load path redundancy, system redundancy or internal redundancy. The loss of the NSTM would result in a partial or total collapse of the structure. Structures or individual members will be considered Load Path Redundant if they have three (3) or more primary load paths. In order to justify that a member has system or internal redundancy and is no longer a NSTM, the control authority must follow the guidance in the Ohio Bridge Design Manual sections 312.2.2 and 312.2.3. If an NSTM is reclassified as a system redundant member (SRM) or internal redundant member (IRM), documented analysis that proves the members system or internal redundancy must be in the bridge file. For inspection procedures of reclassified SRM and IRMs see Chapter 4.7.3.

4.4.1 Purpose of NSTM Inspections

The purpose of an NSTM inspection is to verify the safety of bridge members whose failure may lead to partial or total collapse of a structure. Identifying fatigue sensitive details and monitoring these and other deficiencies may prevent catastrophic failure of a bridge with NSTMs.

4.4.2 Interval of NSTM Inspections

All structures requiring NSTM inspections shall be scheduled at intervals of 24, 12, or 48 months per the NBIS Method 1 criteria.

- ***24-month NSTM Inspection Interval*** – All vehicular carrying structures with NSTMs shall receive an NSTM inspection every 24 months unless the NSTMs meet 12- or 48-month NSTM inspection criteria.
- ***12-month NSTM Inspection Interval*** – If the NSTM condition rating (B.C.14 – NSTM Inspection Condition) is rated a "4 – poor" or lower, the structure **SHALL** receive an NSTM inspection every 12 months.
- ***48-Month NSTM Inspection Interval*** – A 48-month NSTM inspection interval can be allowed by request only. A formal request must be sent to ***ODOT Central Office – Office of Structural Engineering*** detailing that the NSTM bridge meets all the following seven (7) conditions:
    1) Bridge was constructed after 1978 and fabricated in accordance with a fracture control plan
    2) All NSTMs have no fatigue details with finite life
    3) All NSTMs have no history of fatigue cracks
    4) B.C.14 – NSTM Inspection Condition is rated "6 – satisfactory" or higher
    5) The bridge inventory rating is greater than or equal to the standard AASHTO HS-20 or HL-93 loading with B.LR.05 – Inventory Load Rating Factor coded greater than or equal to 1.0.
    6) Routine permit loads are not restricted or not carried/issued, as recorded in B.LR.08 – Routine Permit Loads and coded A – Bridge carries routine permit loads or N – Bridge does not carry routine permit loads.
    7) All NSTMs do not include pin and hanger or hinge assemblies.

4.4.2.1 NSTM Inspection Interval Tolerance

For 12-month NSTM inspections, there is an acceptable tolerance for the next NSTM inspection of ***up to 2 months after the month in which the inspection is due***. For example, if the NSTM inspection date of a 12-month NSTM bridge is in the month of July, the next NSTM inspection must be completed by the end of September the following year.

For 24-month or 48-month NSTM inspections, there is an acceptable tolerance for the next NSTM inspection of ***up to 3 months after the month in which the inspection is due***. For example, if the NSTM inspection completion date is in the month of July, the next NSTM inspection must be completed by the end of October of the year due.

4.4.3 Scope of NSTM Inspections

NSTMs must be inspected "hands-on", and at an arm's-length distance, meaning 18"-35" away. All sides of the NSTM member must receive a hands-on inspection, including any inside portions of a NSTM (if applicable). Structures that do not carry highway traffic do not necessitate an NSTM inspection. This close up inspection promotes the inspectors' ability to discover and document deficiencies on NSTM members such as areas of distress and initiated small cracks in the steel faces in the tension zone(s). The inspection generally uses visual methods supplemented by non-destructive testing. The team leader and team members must meticulously implement the inspection methods defined in the NSTM inspection procedure.

4.4.2.1 NSTM Inspection Procedures

Bridges with NSTMs must have written inspection procedures which clearly identify the location of all NSTMs, specify the interval of inspection, describe any specific risk factors unique to the bridge, and clearly detail inspection methods and equipment to be employed. Acceptable written procedures are those that communicate to the inspection team leader what is necessary to ensure a successful NSTM inspection. The prior inspection report is valuable to review for inspection findings but most often does not serve the same purpose as inspection procedures. These inspections must be planned and prepared for, considering special

circumstances or conditions of which the inspector needs to be aware. Appendix E includes an example NSTM plan and minimum of what is required to fulfill NSTM inspection procedures. The NSTM inspection procedure shall be on file in AssetWise.

4.4.4 Common NSTM Bridge and Member Types

Any steel superstructure with only 2 primary load paths is a NSTM bridge. The following are examples of non-load path redundant steel superstructures:

- Steel truss – the primary members are made of steel that carry axial tension and they often have two primary load paths (two truss lines)
- Steel twin girder – the primary members are made of steel, are non-load path redundant, and have tension zones
- Steel tied arch – the lower horizontal members (i.e. tie girders) are made of steel, are non-load path redundant and have tension zones

The following bridge members are considered NSTMs unless they are proven by analysis to be either system or internally redundant:

- Steel floorbeams – these are transverse members typically found on bridges with 2 primary load paths.
- Steel pier caps or cross girders
- Steel pin and hanger assemblies – these will be considered NSTMs when 3 or fewer beam lines exist.
- Steel arch ties – tension hangers supporting the roadway

4.5 Damage Inspection

NBIS Definition: An unscheduled inspection to assess structural damage resulting from environmental factors or human actions.

Damage inspections are performed following extreme events such as earthquakes, vandalism, fires, and vehicular/marine traffic crashes. When major damage has occurred, the inspectors will need to evaluate fractured or failed members, determine the amount of section loss, take detailed measurements for misalignment of members, check for any loss of foundation support, etc.

4.5.1 Purpose of Damage Inspections

Damage inspections serve to determine the nature, severity, and extent of structural damage following an extreme event. Damage inspection findings shall be used to determine the immediate need to place an emergency restriction on a bridge (e.g. weight restriction or closure) for vehicular traffic. If a bridge is closed to vehicular traffic, the need to close it to pedestrian traffic shall also be determined. The inspection may also be used to collect information for designing needed repairs.

The findings of a damage inspection may be used to re-coup the costs of inspection and needed repairs or reconstruction from involved parties or other governmental agencies. Accordingly, documentation of the inspection may be critical in these efforts. For Department bridges, the extent of damage and estimated costs of repair should be reported to the District damage coordinator. Photographs, videos, and sketches can be extremely helpful. See Appendix J for additional information regarding reporting ODOT District bridge emergencies in accordance with SAC4SR7 emergency funds.

4.5.2 Scope and Interval of Damage Inspections

A damage inspection is an unscheduled inspection to assess the structural damage resulting from environmental factors or human actions. Damage inspections do not have a defined interval. They are performed on an as-needed basis.

The amount of effort expended on this type of inspection will vary significantly depending upon the extent of the damage, the volume of traffic encountered, the location of the damage on the structure, and documentation needs. The scope of a Damage Inspection must be sufficient to determine the need for emergency load restrictions or closure of the bridge to traffic, and to estimate the level of effort necessary to accomplish repairs. The capability to make an on-site determination of the need to establish emergency load restrictions may be necessary.

4.5.2.1 Damage Inspection Procedures

Prior to approaching the bridge, the inspection team shall determine from a safe distance if the bridge exhibits any signs of instability or undue safety hazards which would prevent safe access. Personnel should be mindful that the events causing a damage inspection may create uncommon hazards, such as compromised load-carrying members reducing capacity, hazardous cargo spills, or large or unstable debris. If the bridge is determined to be unsafe to access – from above or beneath – the District Bridge Engineer and bridge owner shall be immediately notified and public access to the bridge shall be prevented; local law enforcement and maintenance personnel should be notified to assist.

If it is determined that the bridge may be safely accessed, a thorough inspection of any damaged areas, as well as areas (secondary, adjacent, etc.) which may have residual damage, shall be performed. The damage inspection should be treated similar to an NSTM or in-depth inspection but will focus solely on the damaged and other relevant areas. The inspection team shall perform the following:

- Document the bridge number, route carried, crossing beneath, minimum vertical clearance (if applicable), and any other pertinent information describing the bridge
- Document the date, time, and inspectors performing the damage inspection
- Document the reason for the damage inspection (i.e., vehicle strike, fire, natural disaster), as well as the approximate date and time of the event
- Identify and photograph any damaged members
- Determine the limits (with reference points) of any damage
- Document and photograph any loss of section, misalignment, distortion, deformation, cracks, spalls, or missing elements
- Document remaining section at damaged area
- If possible, document the as-built condition and dimensions of similar, non-damaged members (i.e., adjacent girder size; reinforcement size, etc.) for the purposes of any analysis which may be required.

The District Bridge Engineer or bridge owner should be immediately notified of any findings (structural or safety related) which warrant further investigation, analysis, or closure of the bridge. If the bridge has not yet been closed, equipment and personnel should be on site or available in the event a partial or full closure is deemed necessary.

Damage inspection follow up may include submission of critical findings, structural analysis, load rating, recommendations for repair, estimated repair costs, or follow up Special inspections, if warranted.

4.6 In-Depth Inspection

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

An in-depth inspection is a close-up, hands-on inspection of one or more members and a close visual of all members above or below the water level to identify any deficiency not readily detectable using routine inspection procedures. An in-depth inspection may be limited to certain elements, span group(s), or structural units of a structure, and need not involve the entire structure. Conversely, in-depth inspections may include all elements of a structure. in-depth inspections can be conducted by itself or as part of a routine or other type of inspection.

4.6.1 Purpose of In-Depth Inspections

In-depth inspections serve to collect and document data to sufficient detail needed to quantify the physical condition of a bridge or select members. This data is more detailed than data collected during a routine inspection.

In-depth inspections should be routinely scheduled for selected bridges or members based on their size, complexity and/or condition. Major or complex bridges represent large capital investments and warrant closer scrutiny to ensure that maintenance work is identified and completed in a timely manner. These bridges tend to be more critical to local and area transportation because of the usual lack of suitable detours. It may be more difficult to provide a complete snapshot of the bridge conditions when access difficulties limit the scope of routine inspections.

4.6.2 Scope and Interval In-Depth Inspections

The level of effort required to perform an in-depth inspection will vary according to the structure's type, size, design complexity, existing conditions, and location. Traffic control and special equipment, such as under-bridge inspection units (snoopers), rigging, or staging may be needed for in-depth inspections. Personnel with special skills such as divers and riggers may be required. Non-destructive field tests and/or material tests may be performed to fully ascertain the existence of or the extent of any deficiency.

For large or complex structures, these inspections may be data driven or scheduled separately for defined segments of the bridge or for designated groups of elements, connections or details that can be efficiently addressed by the same or similar inspection techniques. If the latter option is chosen, each defined bridge segment and/or each designated group of elements, connections or details should be clearly identified as a matter of record and should be assigned an interval for re-inspection. The activities, procedures, and findings of in-depth inspections shall be completely and carefully documented more than those of routine inspections. Stated differently, In-Depth Inspection reports will generally be detailed documents unique to each structure that exceed the documentation of routine inspection forms.

A structural analysis for load carrying capacity may be required with an in-depth inspection to fully evaluate the effect of the more detailed scrutiny of the structure condition.

An in-depth inspection can be scheduled in addition to a routine inspection, though generally at a longer interval, or it may be a follow-up to a previous inspection. An in-depth inspection that includes all elements of the structure will satisfy the requirements of the NBIS and take the place of the routine inspection for that cycle and should be documented such that both routine and in-depth Inspection types are selected under item B.IT.01 – Inspection Type.

In-depth inspections do not reduce the level of scrutiny for routine inspections. Program Managers shall schedule in-depth inspection based upon condition and importance. Increased intervals are up to the discretion of the Control Authority or Program Manager.

4.6.3 Complex Bridges

Complex bridges shall receive an in-depth inspection on an interval not to exceed 60 months. Complex bridges include the following:

- Suspension Bridges - Bridges in which the floor systems are supported by catenary cables that are supported upon towers and are anchored at their extreme ends.
- Cable Stayed Bridges - Bridges in which the superstructures are directly supported by cables, or stays, passing over or attached to towers located at the main piers.
- Movable Bridges - Bridges having one or more spans capable of being raised, turned, lifted, or slid from their normal service location to provide a clear navigation passage.
- Any other bridge designated by the Program Manager

Every complex bridge should have its own operating and maintenance manual and inspection procedure in the bridge file. Due to the size and/or complexity of the bridge, a good field inspection plan is necessary to ensure historical continuity, track deficiencies, and communicate nomenclature. A good inspection plan should include most of the following:

- The type of inspection(s) to be completed
- A brief historical statement about the bridge type and condition
- Confirmation that the bridge has been properly cleaned for the type of inspection planned
- Copies of essential plans
- A mapped route to the site
- Keys for any locked access points
- Specialized inspection procedures which clearly identify the complex features
- Interval of inspection of those features
- Describe any specific risk factors unique to the bridge
- Clearly detail inspection methods and equipment to be employed
- Identification of non-redundant steel tension members and any E/E' fatigue-prone details
- Identification of access equipment and arrangements for them to be on-site
- Identification of required nondestructive testing (NDT) equipment and arrangements for it to be on-site
- Identification of traffic control requirements and arrangements for on-site implementation
- Press releases, if necessary
- Inspection time estimate
- Coordination with the owner and other agencies as required

In addition to an operation and maintenance manual and inspection procedure, the inspection team leader will have additional qualifications. The NBIS Team Leader who leads the In-Depth inspection of a complex bridge must meet the following requirements:

- NBIS Team Leader

- Familiarity with the type of complex bridge to be inspected
- Understanding of how the bridge functions and where possible defects might occur
- Understanding and ability to perform testing or recommend advanced testing procedures at problem areas
- Familiar with the operating and maintenance manual for the bridge inspected and in charge with developing and implementing the unique inspection procedure

4.7 Special Inspection

NBIS Definition: An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency, or to monitor special details or unusual characteristics of a bridge that does not necessarily have defects.

4.7.1 Purpose of Special Inspections

Special inspections are for inspecting specific areas of a bridge with unique details or to inspect areas where problems were previously reported or where problems are suspected. Special inspections are for certain areas of a bridge and cannot replace a routine inspection.

4.7.2 Scope and Interval of Special Inspections

The Program Manager defines the scope and interval of the special inspections. For any bridge receiving a special inspection, a Special Inspection Procedure must be on file in AssetWise. This procedure should include, but is not limited to:

- The location of the member(s) to be inspected
- The inspection method required (hands on, visual, etc.)
- Risk factors specific to the bridge
- Inspection personnel and equipment needed

The personnel performing a special inspection should be carefully instructed regarding the nature of the known deficiency and its functional relationship to satisfactory bridge performance. Guidelines and procedures on what to observe and/or measure must be provided. The determination of an appropriate scope and interval for a Special inspection should consider the nature, severity and extent of the known deficiency, as well as age, traffic characteristics, public importance, and maintenance history.

4.7.3 Special Inspection Requirements for Reclassification of NSTMs to System Redundant Members (SRM) or Internally Redundant Members (IRM)

The following applies to NSTMs that have been reclassified and approved as having system or internal redundancy per the Ohio Bridge Design Manual sections 312.2.2 and 312.2.3.

The SRM(s) or IRM(s) will no longer require an NSTM inspection but will require a special inspection. These special inspections will have Special Inspection Procedures on file in AssetWise. The special inspection procedures shall include visual inspection of interior members and connections (i.e. box girders) at a prescribed interval, and the inspection interval for which internally redundant members shall be inspected. The special inspection will occur at the following intervals:

- A special inspection of applicable SRMs or IRMs shall occur within 24 months after a newly constructed bridge is opened to traffic.

- A special inspection of applicable SRMs or IRMs not to exceed 60 months. Increased special inspection intervals are at the discretion of the bridges Control Authority or Program Manager.
- In cases where the applicable SRM or IRM controls a superstructure or substructure rating of "4 – poor" or less, a hands-on special inspection shall occur every 24 months.

Reevaluation of SRMs or IRMs may be required to include updating existing analysis or performing new analysis. If the analysis shows that the member is no longer SRM or IRM, then the bridge should be placed back on the NSTM bridge list and follow all requirements for NSTM bridges. The following may require reevaluation:

- The bridge requiring a new or updated load rating;
- Repairs or retrofits to the SRM or IRM;
- Major rehabilitation to the bridge such as a deck replacement;
- Cracks, signification corrosion, fire, or impact damage to a SRM or IRM.

4.8 Service Inspection

NBIS Definition: An inspection to identify major deficiencies and safety issues, performed by personnel with general knowledge of bridge maintenance or bridge inspection.

This type of inspection will not be used in Ohio since it is intended for bridges with routine inspection intervals greater than 48 months. ORC 5501.47 requires that bridge inspections in Ohio occur at a maximum, at least once every 24 months.

4.9 Scour Monitoring Inspection

Scour monitoring inspections are performed to determine the safety of a bridge after a hydraulic event or as determined by a Scour Plan of Action (POA). A Scour monitoring inspection includes a data review, field inspection, and may require a new engineering evaluation or scour appraisal (updating B.AP.03 – Scour Vulnerability). See Chapter 3.4.3.7 for information regarding scour appraisal and the required components. The scour monitoring inspection can be utilized to update the Scour Condition Rating (B.C.11 – Scour Condition Rating) (observed scour) if the conditions have changed since the previous routine or scour monitoring inspection. The level of effort at each site will depend on the availability of information collected.

4.9.1 Data Review

Prior to performing a Scour Monitoring Inspection, the bridge file shall be reviewed with a focus on B.AP.03 – Scour Vulnerability code and scour appraisal or evaluation documentation. Additional items to review include but not limited to the bridge foundation type, history of overtopping, and condition ratings for scour, channel, channel protection or underwater inspection.

4.9.2 Purpose of Scour Monitoring Inspections

Scour monitoring inspections serve to determine the severity and extent of structural damage or instability following a high-water event. Inspection findings shall be used to determine the immediate need to place an emergency restriction on a bridge (e.g. full closure) for vehicular traffic. If a bridge is closed to vehicular traffic, the need to close it to pedestrian traffic shall also be determined. The inspection may also serve as a precursor to a scour assessment following a high-water event.

4.9.3 Scope and Interval of Scour Monitoring Inspections

To combat the loss of bridges from the transportation system and protect our valued infrastructure, Program Managers should assess and prioritize a bridge's vulnerability to scour so that scour vulnerable bridges can be identified for closer monitoring and possible implementation of scour countermeasures.

The Program Manager is to establish an internal procedure to monitor bridges that are vulnerable to damage or scour during, or immediately after, periods of high water. The following elements are recommended for consideration as part of the procedure:

- A list of bridges that are to be monitored during periods of high water.
- A map of bridges that are to be monitored during periods of high water.

Bridges vulnerable to scour include, but are not limited to:

- Bridges with Scour POA (scour critical);
- Bridges with previously documented scour;
- Bridges that have a history or are susceptible to degradation and/or aggradation; or
- Bridges that have been overtopped or inundated.

Because high stream flows can be localized and information about its severity and extent may not be immediately available, a method of reporting the occurrence and extent of high water is needed. Many times, the first responders are maintenance forces; they can be trained to report high water events to the Program Manager. This method is useful for prioritizing structures to be checked by bridge inspectors.

Local benchmarks established at bridges can enable non-bridge inspectors to record and report the height of water. The list of bridges should also indicate the location of the benchmarks and the water heights at which scour inspections are warranted. In addition, the benchmarks enable inspectors to quickly gauge the progress of scour at a substructure.

4.9.3.1 Scour Monitoring Inspection Procedures

Following a high-water event, the bridge shall be inspected prior to reopening. Before approaching the bridge, the inspection team should determine if the bridge can be safely accessed. If at any point the bridge is deemed unsafe to access, the District Bridge Engineer or bridge owner shall be notified, and the bridge shall remain closed until it can be inspected in a safe manner.

At a minimum, the following information should be collected and included in the report:

- Bridge description
- Existing condition of the bridge
- Substructure type(s)
- Substructure location and alignment relative to stream
- Depth of foundation
- Depth of scour (if any)
- Condition or absence of scour countermeasures
- Existing condition of stream (including any aggradation, degradation, or lateral movement)
- Stability of channel
- Presence (or potential) of debris

- Streambed and embankment material
- Current freeboard level
- Storm duration (if possible)
- Total rainfall (if possible)
- Estimated flow rate (if possible)

Additionally, photo documentation should be collected. At a minimum, photos should be taken of:

- Bridge deck from roadway
- Bridge elevation
- Bridge underside
- Roadway profile
- Approach roadways
- Each substructure unit
- Upstream and downstream channel configurations looking towards the bridge
- Any deficiencies noted which may adversely affect the bridge

The following guidance, at a minimum, should be used to determine if an inundated bridge can be reopened:

- Evidence of settlement
  - Sight down both bridge rails for horizontal or vertical differential
  - Abnormal cracks, spalls, or damage in deck, superstructure, substructure, or approaches
- Evidence of rotation or shifting
  - Check superstructure elements are plumb and free of distortion
  - Check substructure units are plumb and free of distortion
  - Check bearings to ensure they are properly seated on the substructure, and that the superstructure elements are properly seated on the bearing
  - Check expansion joints for vertical differential, uneven joint opening across the length of the joint, or varying opening across multiple joints (over-compressed vs. abnormal openings)
- Debris accumulation
  - Check for hazardous amounts of debris on the roadway surface
  - Check for impacted debris within the superstructure, bearings, or substructure units; and
    - If debris is discovered, insure it has not caused any damage
  - Check points of drainage (scuppers, drain openings, etc.) for clogging
- Check approach roadways
  - Check for evidence of washout or erosion at approaches
  - Check for settlement or sliding of approach embankments and roadway
- Safety hazards
  - Check for uneven roadway or washout of roadway and shoulders
  - Check for bridge rail and approach guardrail instability or damage
  - Check for unsafe hazards within the roadway limits (at bridge and approaches)
- Condition of channel and stream

- Check for instability of the channel embankments
- Check for debris which may adversely affect the bridge
- Check for any abnormal water movement (i.e., whirlpools, abnormal flow rate, etc.).

In addition, Figure 4-1 can be used as guidance to determine if an inundated bridge may be reopened. Note that there are different criteria for bridges with slow/stagnant or fast-moving water beneath. If anything outside of the aforementioned criteria is discovered or is suspicious, the bridge shall remain closed and the District Bridge Engineer or bridge owner shall be notified.

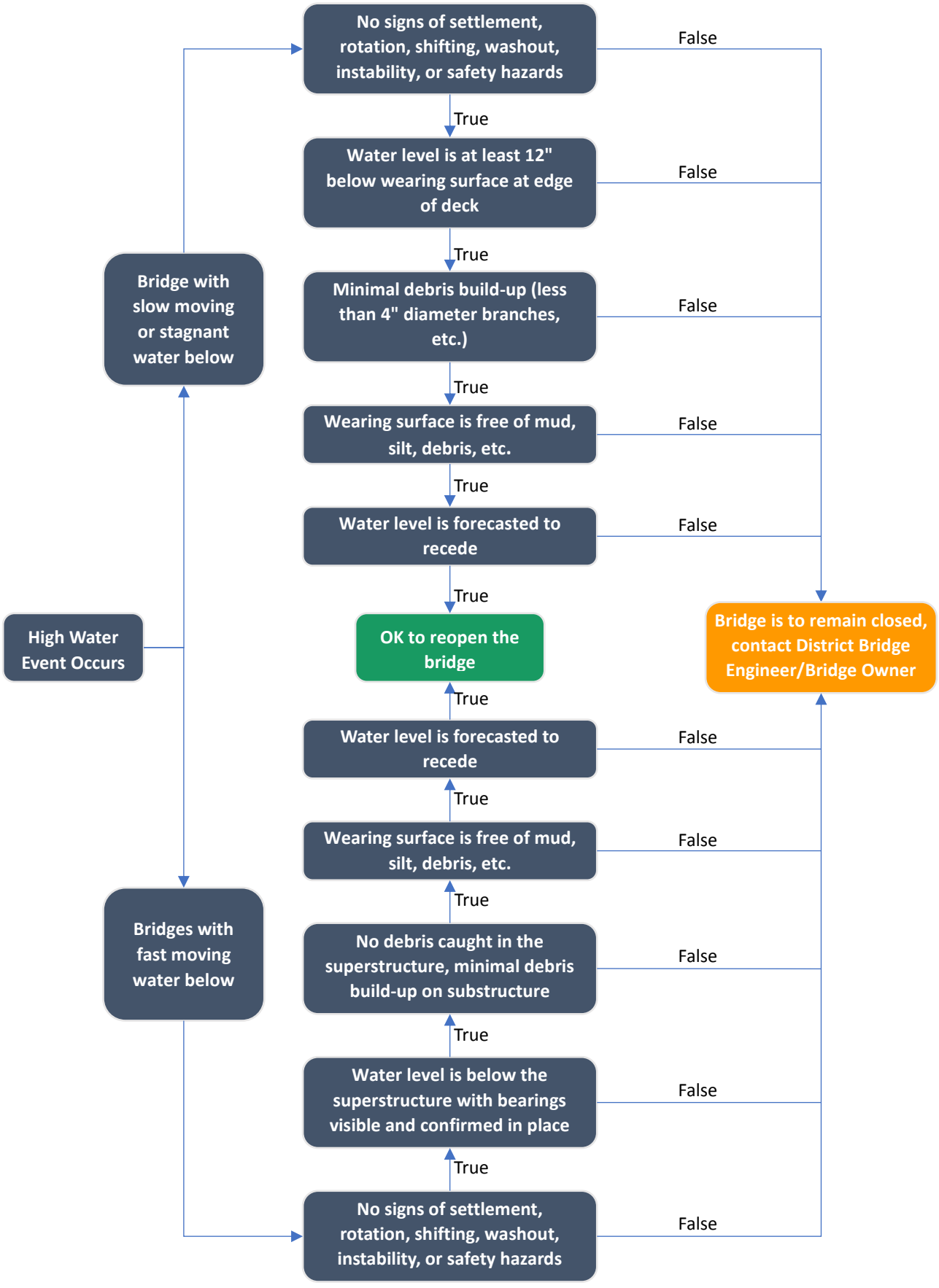

Figure 4-1: Inundated bridge inspection flow chard to reopen a bridge.

4.10 Ohio Cursory Inspection

Cursory inspections are performed on non-vehicular structures over public highways or closed bridges. They are secondary inspections performed by entities that do not have primary inspection responsibility per state regulation but have a vested interest in the safety of the traveling public on or under the structures. Cursory inspections only apply as a secondary inspection to routine inspection types and are not intended or allowed to replace federally mandated inspection cycles.

4.10.1 Non-Highway Bridges over Highway

Non-vehicular bridges or overhead structures (excluding ancillary sign structures) with public routes underneath shall be inventoried and inspected to ensure such structures do not pose an unacceptable safety risk to the traveling public. Such inspections should only consist of those portions of the structure which would directly affect the right-of-way beneath the structure. Any deficiencies requiring immediate attention should be relayed to the bridge owner or responsible authorities in writing.

4.10.2 Closed Bridges

When a public road is closed to vehicular traffic but not removed, continued cursory inspections are required to assure adequate safety to the public having access on or beneath the structure. It is important to verify that necessary barricades for vehicles and/or pedestrians are in place.

The Operational Status in the bridge file (AssetWise) must be coded “C” for B.PS.01 – Load Posting Status to indicate the structure is closed.

4.10.3 Railroad Bridges over Highway

Cursory inspections shall be performed by the public authority with jurisdiction of the highway to ensure safety of the traveling public. This includes an inventory of the portion of the structure within the right-of-way. The cursory railroad inspection will consist of the portion of the bridge that is over public right of way.

4.10.3.1 Notification to Railroad of Required Action

Per chief legal, under no circumstances will bridge owners take any remedial maintenance actions on a railroad bridge. Given this ruling, ODOT has created a standardized document for notifying the railroads of emergency remedial action or non-emergency condition rating. This document can be found in Appendix K. This document details the railroad contact procedures when an emergency issue is found over public right of way. It also details contact procedures for when a cursory inspection dictates a GA rating of 4 or lower for the railroad bridge.

Railroad track owners are responsible for routine inspections per Federal Regulation (49 CFR part 237 eff. July 15, 2010). Routine inspection reports shall be submitted to the Public Utility Commission of Ohio (PUCO) and the public authority with jurisdiction of the highway (ORC 4907.44) when dangerous conditions exist. In the event reports are not submitted to the public authority, a request may be filed with the track owner in order to receive such reports.

Track owners are responsible for inspection and maintenance (ORC 5523.17 eff. September 28, 1973; OFC 4955.20 eff. October 1, 1953). Track owners are required to report to the PUCO unsafe structures that require speed reductions (ORC 4907.45 eff. October 1, 1953), and routine inspection reports (ORC 4907.44 eff. June 11, 1968).

4.10.4 Interval of Ohio Cursory Inspections

The Ohio Revised Code requires inspection intervals to be established by the Director of Transportation, but not to exceed 24 months. The inspection interval for Ohio cursory inspections will be recognized as the ***Reliability Based Inspection interval***, or RBI and match the requirements of Chapter 4.2.3.

4.11 Quality Assurance (QA) Review

Established QA inspections are regularly performed on bridges by representatives from FHWA, CEAO, or ODOT central office to promote accuracy and consistency, and to ensure NBIS compliance. The Control Authority of each entity is encouraged to perform sample inspections in addition to independent field reviews.

Chapter 5: Qualifications

The Federal Highway Administration (FHWA) has identified the Ohio Department of Transportation (ODOT) as the agency responsible for managing the Bridge Inspection Program within the State of Ohio for all bridge owners. When issues of compliance arise, it is ODOT that must demonstrate to FHWA that the bridge inspection program satisfies the requirements of the National Bridge Inspection Standards. ODOT will be the only agency in Ohio who approves qualified personnel and certifies them to inspect bridges in Ohio. The qualifications of personnel shall, at a minimum, meet the National Bridge Inspection Standards (NBIS) contained in the *Code of Federal Regulations (23 CFR 650C.309)*.

5.1 Bridge Inspection Training

ODOT and FHWA both require mandatory inspection training courses prior to becoming an NBIS bridge inspection Program Manager, Routine Team Leader, NSTM Team Leader, or Underwater Diver. Additionally, ODOT requires mandatory training courses prior to becoming an Underwater Team Leader or Scour Assessment Team Leader. Attendance at 100 percent of the training course and a score of 70 percent or greater on the end-of-course assessment is required in order to pass as referenced in the NBIS and the BIRM.

5.1.1 Bridge Inspection Experience

Bridge inspection experience. Active participation in bridge inspections in accordance with this subpart, in either a field inspection, supervisory, or management role. Some of the experience may come from relevant bridge design, bridge load rating, bridge construction, and bridge maintenance experience provided it develops the skills necessary to properly perform a NBIS bridge inspection.

5.1.2 NHI Training

The National Highway Institute (NHI) offers various FHWA-approved bridge inspection training courses. The most common courses are:

- #130053 Bridge Inspection Refresher Training
- #130055 Safety Inspection of In-Service Bridges
- #130056 Safety Inspection of In-Service Bridges for Professional Engineers
- #130078 Bridge Inspection Techniques for Nonredundant Steel Tension Members (NSTM)
- #130078A Bridge Inspection Techniques for Nonredundant Steel Tenison Members Refresher
- #130091 Underwater Bridge Inspection
- #130101 Introduction to Safety Inspection of In-Service Bridges – Web-Based
- #130101A Prerequisite Assessment for Safety Inspection of In-Service Bridges – Web-Based

Registration for courses is through the NHI web site https://www.nhi.fhwa.dot.gov/.

5.1.3 ODOT Training

The Department has an in-house FHWA approved comprehensive training course meeting the requirements to become an NBIS Team Leader within the State of Ohio. Inspectors may choose instead to take the National Highway Institute (NHI) courses at their own discretion. The ODOT comprehensive course consists of two separate 5-day sessions (Level 1 and Level 2). 100% attendance for both Level 1 and Level 2 courses and a 70% or higher exam grade for both courses is required in order to pass the "Comprehensive Training Course" referenced in the NBIS. The Department presents the courses to all Department, local, and consultant inspectors who work in Ohio. The purpose is to provide consistent and accessible training to communicate National and State issues as they relate to the bridge inspection profession in Ohio.

Each class will be offered depending upon availability of instructors and demand around the state. For locations, dates, and times, refer to the Office of Structural Engineering Training Catalog online or the Local Technical Assistance Program (LTAP) course offerings. It is the responsibility of the attendee to keep and store the course certificates, which can be done in the ODOT AssetWise System. Request for transcripts for LTAP courses can be sent to LTAP@dot.ohio.gov. Request for transcripts for NHI courses should be sent to NHI.

5.1.3.1 ODOT Level 1 Bridge Inspection Training

This 5-day course provides new bridge inspectors in Ohio with the first half of training needed to satisfy NBIS bridge inspection comprehensive training requirements. This course is intended for new bridge inspectors who represent public and private entities (County, City, Village, ODOT, etc. and Consultant Firms).

5.1.3.2 ODOT Level 2 Bridge Inspection Training

This 5-day course provides Ohio bridge inspectors with the second half of training needed to satisfy NBIS bridge inspection comprehensive training requirements. Successful completion of both Level 1 and Level 2 is required to meet FHWA comprehensive inspection training requirements.

5.1.3.3 Historic ODOT Bridge Inspection Training

ODOT Bridge Inspection Training courses offered between 1997 to 2021 satisfy NBIS comprehensive training requirements for initial qualification as a routine team leader if the inspector has successfully completed the basic and advanced or Level 1 and Level 2 Bridge Inspection Training courses. However, other courses previously offered such as the ODOT Load Rating course, do not satisfy the NBIS requirements.

5.1.4 ODOT Team Leader Training Requirements

Descriptions and qualification requirements for personnel are described in detail in Chapter 5.2. *A list of the approved comprehensive and refresher training classes is listed below.*

FHWA Approved Comprehensive Training Class List:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges (10 days)
- FHWA-NHI-130056 Comprehensive Inspection for P.E.s (5 days)
- Ohio DOT Level 1 - Basic (3-day) and Ohio DOT Level 2 - Advanced (3-day) 1997-2020
- Ohio DOT Level 1 (5-day) 2021 and Ohio DOT Level 2 (5-day) 2021-June 6, 2024
- Any alternate FHWA-approved comprehensive training after June 6, 2024, in accordance with September 6, 2022, FHWA Memorandum

FHWA Approved Refresher Class List (must total 18 hours over 60-month period):

- FHWA–NHI–130053 Bridge Inspection Refresher Training (3 days)
- Any alternate FHWA-approved refresher training after June 6, 2024 in accordance with September 6, 2022 FHWA Memorandum

5.2 Inspection Personnel Qualifications

5.2.1 Program Manager

The Program Manager has the overall responsibility to ensure the program conforms to the Department's standards and requirements of the NBIS. The Program Manager oversees the organizational unit responsible for bridge inspection, reporting, and inventory in their jurisdiction. The primary inspection responsibility is delegated to the primary entity such as County, City, Village, Turnpike, etc.

In addition, the Program Managers may make or assist with important decisions ranging from suggestions regarding the allocation of scarce rehabilitation dollars to the decision to close a major structure. Therefore, it is

important that Program Managers are highly experienced and adept individuals who understand the mechanics, behavior trends, and economics of a wide variety of structure types. An ODOT Inspection Program Manager is equivalent to an NBIS Program Manager as defined in 23CFR 650.309 (a). FHWA will hold the ODOT ultimately responsible for ensuring the requirements of the NBIS are followed and subject to potential withholding of federal-aid authorizations.

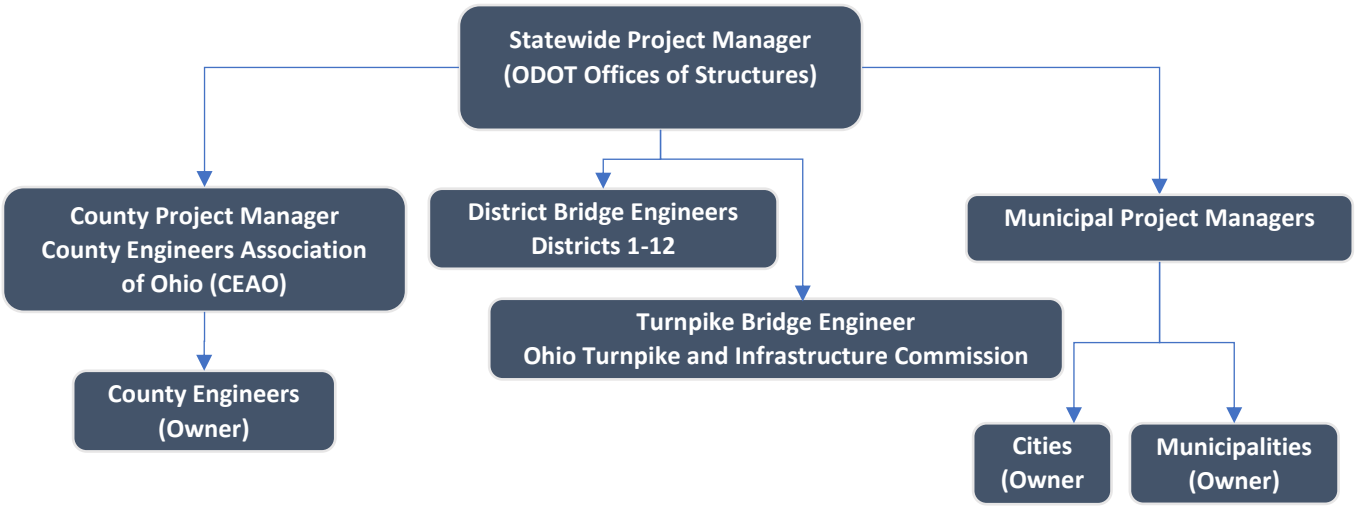

Figure 5-2: Various Project Managers and bridge owners.

A Program Manager must, at a minimum:

1) Be a registered Professional Engineer in Ohio and 6 months of bridge inspection experience **OR** have 10 years of bridge inspection experience; **AND**
2) Complete and pass an FHWA-approved comprehensive bridge inspection training course; **AND**
3) Complete a cumulative total of 18 hours of FHWA-approved bridge inspection refresher training over each 60-month period; **AND**
4) Maintain documentation satisfying Program Manager requirements (1), (2), and (3)

Per Ohio law, a Program Manager is typically a registered Professional Engineer in Ohio and performs the Quality Control (QC) reviews. The Program Manager does not have to be a Professional Engineer, and the Program Manager and QC Reviewer can be filled by two different people.

Any person serving as a Program Manager who was qualified under FHWA regulations prior to June 6, 2022, must satisfy the minimum requirements of Program Manager listed above by June 6, 2024.

5.2.2 Ohio Reviewer

An Ohio reviewer has Program Manager Credentials and a current Ohio Professional Engineering license. **ALL INSPECTIONS ARE TO BE REVIEWED BY AN OHIO REGISTERED PROFESSIONAL ENGINEER.** Counties, municipal corporations, or other bridge owners may contract with Consulting Engineers for inspection services. If such Engineers are retained to perform the inspection, the work need not be reviewed by the governmental authority (Control Authority) providing the inspection is made in conformance with this document, the findings are recorded on approved forms, and the Bridge Inspection Report is submitted in accordance with the agreed-upon contract.

5.2.3 Team Leader

The Inspection Team Leader is responsible for leading the structure inspection team and planning, preparing, and performing structure inspections as well as reporting. This is the person who is in the field at all times for each initial, routine, in-depth, non-redundant steel tension member, and underwater inspection and in charge of the field activities.

A Team Leader should be capable of climbing fences, accessing bridges in their jurisdiction, traversing slopes, and crawling inside confined spaces as small as 48 inches without difficulty. They should have the ability to print legibly and to read plans, visualize details, draw technical sketches, and operate a camera. They should possess a mechanical aptitude and a working knowledge in the use of measuring devices such as rules, tapes, levels, and calipers. The inspector shall have an awareness of potential hazards and exhibit a serious attitude toward safety precautions to be taken while entering and inspecting. The inspector must approach each task sincerely and with the proper motivation since their judgment and thoroughness is relied upon to guarantee public safety and to protect public investment.

The Team Leader shall take the technical lead on the inspection and is responsible for the content of the written inspection report. The Team Leader shall be familiar with this Manual and background in such areas as structural engineering, structure behavior trends, bridge maintenance, and rehabilitation techniques. The Team Leader is also responsible for the general safety of the work site. Safety items can include obtaining and monitoring any required traffic control, ensuring each Team Member complies with safety procedures, proper use of access equipment, and more. There must be at least one Team Leader at the structure site at all times during each field inspection. A Team Leader may qualify under several of the types listed in the following subsections.

5.2.3.1 Team Leader – Routine (RTL) / NBIS Team Leader

A Routine Team Leader (RTL) is equivalent to an NBIS Team Leader as defined in 23CFR 650.309 (b). An RTL must, at a minimum:

1) Meet one of the following four options:
    a. Be a registered Professional Engineer **AND** have 6 months of bridge inspection experience;
    b. Have 5 years of bridge inspection experience;
    c. Have a bachelor'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** Successfully passed the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering examination **AND** 2 years of bridge inspection experience;
    d. 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** 4 years of bridge inspection experience

AND

2) Complete and pass an FHWA-approved comprehensive bridge inspection training course; **AND**
3) Complete a cumulative total of 18 hours of FHWA-approved bridge inspection refresher training over each 60-month period; **AND**
4) Provide documentation supporting the satisfaction of Team Leader requirements (1), (2), and (3) to Program Manager of the State

Bridge inspection experience should be defined as the predominate amount (i.e., more than 50 percent) of experience should come from involvement in NBIS bridge safety inspections. The remaining experience should be obtained from bridge design, bridge load rating, bridge maintenance, or bridge construction.

Any person serving as a Team Leader who was qualified under FHWA regulations prior to June 6, 2022, must satisfy the minimum requirements of Team Leader listed above by June 6, 2024.

5.2.3.2 Team Leader - Non-Redundant Steel Tension Member (NTL)

A Team Leader for an NSTM inspection (NTL) is equivalent to an NBIS Team Leader on NSTM inspections as defined in 23CFR 650.309 (C). An NTL must, at a minimum:

1) Satisfy the requirements of Team Leader in Chapter 5.2.3.1; **AND**
2) Complete and pass an FHWA-approved training course on the inspection of NSTM

Approved NTL Training Class List:

- FHWA-NHI-130078 Bridge Inspection Techniques for Nonredundant Steel Tension Members (NSTM) (3 day) – including precursor Fracture Critical Inspection Techniques for Steel Bridges (3.5 day)
- Any Alternate FHWA-approved NSTM training after June 6, 2024, in accordance with September 6, 2022 FHWA Memorandum

Any person serving as an NSTM Team Leader who was qualified under FHWA regulations prior to June 6, 2022, must satisfy the minimum requirements of NSTM Team Leader listed above by June 6, 2024.

5.2.3.3 Team Leader – Underwater (UTL)

An Underwater Team Leader (UTL) must, at a minimum:

1) Satisfy the requirements of Team Leader in Chapter 5.2.3.1; **AND**
2) Complete and pass an FHWA-approved training course on underwater dive inspection, **AND**
3) Holds a commercial diver certification

Approved UTL Training Class List:

- FHWA-NHI-130091 Underwater Bridge Inspection (4-day)
- Any Alternate FHWA-approved Underwater Dive training after June 6, 2024 in accordance with September 6, 2022 FHWA Memorandum

Any person serving as an Underwater Team Leader who was qualified under FHWA regulations prior to June 6, 2022, must satisfy the minimum requirements of Underwater Team Leader listed above by June 6, 2024.

5.2.3.4 Team Leader – Damage Inspections

A Damage Inspection Team Leader must at a minimum meet the requirements of a Routine Team Leader as defined in Chapter 5.2.3.1. If the inspection includes a NSTM the Team Leader must at a minimum meet the requirements of a NSTM Team Leader as defined in Chapter 5.2.3.2.

5.2.3.5 Team Leader – Special Inspections

A Special Inspection Team Leader must at a minimum meet the requirements of a Routine Team Leader as defined in Chapter 5.2.3.1. If the inspection includes a NSTM, IRM, or SRM the Team Leader must at a minimum meet the requirements of a NSTM Team Leader as defined in Chapter 5.2.3.2.

5.2.4 Inspection Team Member

The team member assists the Team Leader in the field. It is expected that this person, at a minimum, is familiar with appropriate parts of this Manual and has a sufficient competency level to follow the directives of the Team

Leader. To ensure competency, all Team Members (TM) are preferred to have comprehensive bridge inspection training such as ODOT Level 1 & 2 or an NHI equivalent. TMs are essentially apprentices and should have the goal of becoming a Team Leader. Team Leaders and supervisors should provide appropriate training and guidance to assure the TMs progress towards this goal. TMs do not have the authority to sign inspection forms and should never do so. However, TMs should place their name on the inspection form to document their participation and experience. They should also keep a log of their experience for future reference.

A team member should be capable of climbing fences, accessing bridges in their jurisdiction, traversing slopes, and crawling inside confined spaces as small as 48 inches without difficulty. They should have the ability to print legibly and to read plans, visualize details, draw technical sketches, and operate a camera. They should possess a mechanical aptitude and a working knowledge in the use of measuring devices such as rules, tapes, levels, and calipers. The inspector should have an awareness of potential hazards and exhibit a serious attitude toward safety precautions to be taken while inspecting.

5.2.5 Underwater Bridge Inspection Diver

An Underwater Bridge Inspection Diver not serving in the role of Underwater Dive Team Leader must, at a minimum:

1) Complete and pass an FHWA-approved comprehensive underwater bridge inspection training course and be a certified commercial diver.

5.2.6 Scour Assessment

This is an ODOT created role for persons completing Level 2 or Level 3 SNBI Scour Appraisal Form in AssetWise.

To perform Scour Assessment one must, at a minimum:

1) Be a registered Professional Engineer in Ohio, performing duties of a Bridge Engineer, Hydraulic Engineer, or Geotechnical Engineer, and familiar with Scour Assessments;

OR

2) Satisfy the requirements of Routine Team Leader (non-professional engineer) in Chapter 5.2.3.1

AND

3) Complete and pass an FHWA-approved training course on stream stability and scour

Approved STL Training Class List:

- NHI 135047 Stream Stability and Scour at Highway Bridges for Bridge Inspectors

5.2.7 Load Ratings

Load ratings must be performed by, or under the direct supervision of, a registered Professional Engineer in Ohio, and in accordance with the latest edition of the ODOT Bridge Design Manual.

5.2.8 Nondestructive Testing Technician

Inspectors using NDT should be familiar with the procedures and limitations of the various types. Unless specified otherwise, certification is not required for basic visual inspection applications such as using NDT to aid in identifying the visual termination of a crack or obtain the thickness of a section.

For more advanced applications to determine the integrity of structural steel elements an individual performing NDT on structural steel members of in-service bridges, must a minimum meet the following requirements:

1) Have a Level II Certification from the American Society for Nondestructive Testing (ASNT) in the particular method being utilized.

2) Have 2 years of NDT experience in the particular method being used
3) Be an American Welding Society (AWS) Certified Weld Inspector (CWI) for weld inspection assignments

5.2.9 Summary of Requirements for Inspection Personnel

A summary of the required initial and refresher training courses is provided in Table 5-1 for the Team Leader and Program Manager roles.

Course Name/ Number	Course Description	Training Length (days)	Continued Education Units (CEU)	Continued Professional Development (Hours)	Qualification Type I = initial qualification R = refresher training					
					Team Leader				Program Manager	
					NBIS/Routine		**NSTM	**Underwater		
					I	R	I	I	I	R
FHWA-NHI-130055	Safety Inspection of In-Service Bridges	10	6.7	67	✓				✓	
FHWA-NHI-130056	Safety Inspection of In-Service Bridges for Professional Engineers	5	3.4	34	✓				✓	
FHWA-NHI-130053	Bridge Inspection Refresher Training	3	1.8	18		✓				✓
FHWA-NHI- 130078	Bridge Inspection Techniques for Nonredundant Steel Tension Members (NSTM)	3	2	20			✓**			
FHWA-NHI-130091	Underwater Bridge Inspection	4	2.4	24				✓**		
ODOT Level 1 (2021 or later)	ODOT Level 1 Advanced Bridge Inspection Training (2021 or later)	5	3.4	34	✓*					
ODOT Level 2 (2021 or later)	ODOT Level 2 Advanced Bridge Inspection Training (2021 or later)	5	3.4	34						
Basic/ Ohio Level 1 (1997-2020)	ODOT Level 1 Basic Bridge inspection Training (between 1997-2020)	3	2	20	✓*					
Advanced/ Ohio Level 2 (1997-2020)	ODOT Level 2 Basic Bridge Inspection Training (between 1997-2020)	3	2	20						

* - Indicates completion of both Level 1 & Level 2 are needed to satisfy the requirement, if only one is completed it will not qualify
** - Indicates that the requirement of the Routine Team Leader is required in addition to the specified course.

Table 5-1: Training Requirements for Team Leaders and Program Managers

5.3 Certified Bridge Inspector Tracking and Status

A database of Certified Bridge Inspectors is maintained within AssetWise. Typical items such as employer, address, phone number, email address, years of inspection experience, education, and professional endorsements are recorded. Attendance and successful completion of all applicable trainings must be documented by the user within their AssetWise profile. Applicable trainings include, comprehensive bridge inspection training, NSTM inspection training, underwater inspection training, stream stability and scour training, approved bridge inspection refresher training, etc. Lastly, the database records those people who have met the training and experience requirements to become a certified bridge inspector. Eighteen hours of approved bridge inspection refresher training is required every 60 months for team leaders and Program Managers to stay compliant. Inspectors with Pending Status will have 12 months to take another refresher. The refresher training shall be aimed to improve the quality of inspections, introduce new techniques, and maintain consistency in the inspection program. To be considered an applicable refresher training, it must be from the list of FHWA approved refresher trainings listed above in Chapter 5.1.4.

5.3.1 National Certified Bridge Inspector (NCBI) Number

A unique national certified bridge inspector (NCBI) number will be assigned by ODOT to a person who has either met or is in the process of meeting the requirements for certification as a bridge inspector in Ohio. NCBI numbers themselves do not indicate whether a person is certified.

5.3.2 AssetWise Tracking of Bridge Inspection Certification

Every inspector in the state has an individual AssetWise account which allows them to view, add, change, and delete bridge records within their inventory. AssetWise users can review their information and make any necessary updates or corrections under the Main>My Account menu. Periodically, requests for updates will be sent by email as well. Certifications need to be added accurately and timely by users to ensure their qualifications can be checked. AssetWise users should follow the rules below when adding a certification to their account:

1) The “begin date” and “end date” fields are the dates that the certification is valid. These are important when tracking refresher training dates. The begin date field is the date that the course ended, and the user has successfully completed the training. The end date is for when the courses applicability period expires (60-month period for approved refresher training). If the certification is for a one-time class (i.e. comprehensive training, NSTM training, or underwater training), the course does not require an end date.
2) The second set of dates, “date taken from” are the dates that the course took place.
3) A certificate or proof of completion needs to be attached to every certification.

5.4 ODOT Consultant Prequalification

ODOT prequalifies engineering firms for three categories of inspection work:

1) Level 1 Bridge Inspection
2) Level 2 Bridge Inspection
3) Underwater Bridge Inspection

Resources regarding consultant prequalification with the Department are available online within the Office of Consultant Services website:

https://www.transportation.ohio.gov/working/engineering/consultant-services

Non-DOT agencies, at their discretion, may use the prequalification procedures or even view the available list of prequalified consultants, for bridge inspection work within their jurisdiction.

Chapter 6: Quality Control & Quality Assurance Bridge Inspection Procedures

Bridge inspection data is the foundation for the entire bridge management operation and the structure management system. To maintain an accurate and thorough condition assessment of each bridge structure, the NBIS requires bridge owners to establish a Quality Control and Quality Assurance (QC/QA) Program as part of their Bridge Inspection Program. The accuracy and consistency of the inspection and documentation is vital because affects public safety, but also impacts programming and funding appropriations. For the Quality Control and Quality Assurance Program to be effective, the procedures outline in this section need to be integrated into all aspects of the bridge inspection program and followed by all personnel. The program will be updated routinely by memos and directives from the ODOT Office of Structural Engineering.

Discussion of QC/QA procedures related to the load rating program are not covered in this section. Instead, refer to the latest edition of the ODOT *Bridge Design Manual*.

The Ohio Revised Code delegates inspection and maintenance responsibility to agencies within their jurisdiction, as shown in Figure 6-1. The agencies report upward through the State to FHWA, which holds the State DOT responsible for ensuring the requirements of the NBIS are followed.

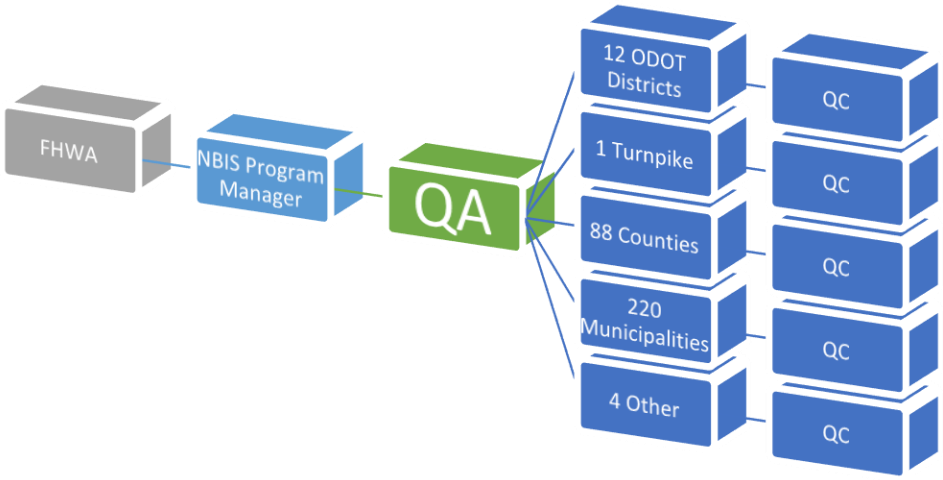

Figure 6-1: QA Bridge Inspection Organization for Public Entities with Bridges Carrying Public Vehicular Traffic

Entities and Quality Assurance:

- ODOT – ODOT Central Office and FHWA
- Turnpike – ODOT Central Office and FHWA
- County – County Engineers Association (CEAO) contract, ODOT Central Office, and FHWA
- Municipality – ODOT Central Office and FHWA
- Other – ODOT Central Office, FHWA, PUCO, and FRA for Railroads

6.1 Quality Assurance (QA)

Quality Assurance (QA) is the use of sampling and other measures to assure the adequacy of Quality Control (QC) procedures to verify or measure the quality level of the entire bridge inspection, inventory, and load rating program. *Quality Assurance is performed by FHWA, ODOT Central Office, and* County Engineers Association (*CEAO) to ensure that their individual programs comply with State and Federal regulations. Program compliance is achieved by fulfilling legal requirements and updating AssetWise data in accordance with the Manual of Bridge Inspection, Specifications for the National Bridge Inventory, Bridge Design Manual Section 900 and the 23 NBIS Metrics from FHWA. In short, the inspection program entails more than just the field inspection.*

6.1.1 FHWA Metrics

A bridge safety initiative was introduced by the Federal Highway Administration (FHWA) in 2011 (with subsequent revisions) to systematically measure the quality of a bridge inspection program. This established the 23 Metrics, a data-driven, risk-based review, and analysis that determine how States are performing their bridge inspection programs.

FHWA determines the following Compliance Levels for each of the 23 Metrics by sampling and data-mining bridge inspection and inventory information across the entire state:

- Compliant
- Substantially Compliant
- Conditionally Compliant
- Noncompliant

Each entity is responsible for maintaining Compliance for the staff and bridges in their jurisdiction. The 23 Metrics each have a direct reference to the NBIS and are grouped into five categories: Organization, Qualifications of Personnel, Inspection Frequency, Inspection Procedures, and Inventory (Table 6-1). Updates to the Metrics and more detail may be found on the ODOT Office of Structural Engineering\Bridge Inspection website within the NBIP PY Metrics 1-23 document.

Category	Metric	Title
Organization	1	Bridge Inspection Organization
Qualifications of Personnel	2	Program Manager
	3	Team Leader(s)
	5	Underwater Bridge Inspection Diver
	New 1	Damage, Special, and Service Inspection Types
Inspection Frequency	6	Routine
	8	Underwater
	10	Nonredundant Steel Tension Member (NSTM)
	New 2	Special, In-Depth, and Service
	11	Interval Criteria
Inspection Procedures	12	Quality Inspections
	13	Load Rating
	14	Post or Restrict
	15	Bridge Files
	16	Nonredundant Steel Tension Member (NSTM)
	17	Underwater
	18	Scour
	19	Complex Feature
	New 3	In-Depth
	20	QC/QA
	21	Critical Findings
Inventory	22	Bridge Data Quality
	23	Timely Updating of Data

Table 6-1: FHWA 23 compliance metrics

6.1.2 Quality Assurance Schedule

In-depth bridge file and field reviews are conducted by Federal Highway Administration (FHWA), ODOT Central Office and the County Engineers Association (CEAO) according to the following timetable:

- *Statewide:* FHWA completes QA review of a random sampling of NBIS bridges yearly.
- *State:* Each ODOT District and the Turnpike Commission once every three years.
    - In addition to the visit ODOT utilizes a NBIS QAR decal placed on random ODOT bridges within each District for inspectors to find and report upon discovery (Figure 6-2).
- *County:* Each County Engineers Office once every five years
- *Municipality:* ODOT OSE will perform a QA Bridge File and Field Review on each consulting firm awarded Local Bridge Inspection Task Order Contract. QA reviews will be performed on those municipalities who do not opt into the program.
- *Consultants:* Engineering firms who perform inspection program activities for public entities are encouraged to attend the QA reviews when invited by the public entity receiving the QA.

Figure 6-2: NBIS Quality Assurance review sticker example from District 07 in 2020

Railroad: The Federal Railway Administration (FRA) and the Public Utilities Commission of Ohio (PUCO) coordinate QA for track owners carrying freight. The Federal Transit Authority (FTA) coordinates QA for passenger freight track owners.

Bridge File Reviews: The review will largely encompass an assessment on whether the bridge file is complete and meets the requirements of this manual (Chapter 3 – Bridge Files) and all requirements outlined in the 23 Metrics.

Field Reviews: The field reviews shall be performed, at a minimum, by a qualified Program Manager with bridge inspection experience. Several bridges will be either independently reviewed or assessed as a team. The current inspection report and inventory data form will be compared to the field review to determine if the ratings are consistent with this manual and SNBI standards.

6.2 Quality Control (QC)

Quality Control (QC) procedures are intended to maintain the quality of a bridge inspection and inventory data at or above a specified level at the time the inspections are performed, and reports are being prepared. Public entities (ex. County Engineer, ODOT District, Consultant, Municipality) shall implement their own quality control measures to maintain the accuracy and consistency of inspections and inspection data.

6.2.1 QC of Ohio Bridge Inspection Policy

When written measures are not available, the following will be the default list of minimum **QC in place according to Ohio bridge inspection policy or regulation**.

- Professional Engineering (P.E.) license on every bridge inspection report. When the inspector does not have a P.E. license, this P.E. assessment serves as a second independent office review.
- Independent review of load rating calculations, Section 900 of the BDM.

6.2.2 QC of Documentation and Data within AssetWise

The QC of documentation and data entered in AssetWise includes the review of each individual component of the inspection report in accordance with this Manual. The quality of the documentation review is accomplished with efforts from members of the inspection team and the Professional Engineer approving the report. Review is completed in two phases, the first phase pertains to review procedures carried out by the inspection team, while the second phase occurs once the inspection team submits the inspection report within AssetWise.

The QC review process includes the review of all inspection documentation by the team leader or another inspection member which participated on a particular inspection. Final QC review and approval of the inspection report shall be completed by a Professional Engineer licensed in Ohio. The QC review will encompass all aspects of the report and include the following:

- Verify inspection dates are updated based on the inspection type(s) performed along with the dates for inspection begin and completion, QC, and inspection data update.
- Proper recording of field conditions with clear, clean, and complete field notes and summaries are found within the Element Inspection and Inspector Comments sections in accordance with this Manual (see Chapter 3.4.3.1).
- Ensure that standard photographs along with photos of deficient areas have been obtained in accordance with this Manual (see Chapter 3.4.3.2).
- Cross-reference and confirm that load ratings are current, and any required postings match the load rating, posting signs, and values within AssetWise (see Chapter 7.5).
- Verify NSTM, underwater, special, and or in-depth inspection procedures and plans have been followed, updated as necessary and are uploaded to AssetWise, if applicable.
- Ensure that documentation of access and inspection equipment required for inspection has been provided, if applicable (B.IE.12 – Inspection Equipment).
- Review and confirm SNBI data updates based upon observed inspection findings, recent rehabilitation, or modifications to the bridge (ex. bridge widening, paving projects).
- Review and confirm that assigned element (if applicable) and condition ratings match conditions observed during the inspection (see Chapter 7.7).
- When a condition rating is rated “4 – Poor” or lower, a Professional Engineer shall determine if follow-up actions are required.
- Confirm that Critical Findings have been documented and communicated properly.

6.2.3 QC Best Practices

The following are QC tools not adopted statewide but are models of **best practices**:

- Professional Engineer field review of 2-10% of bridges within the jurisdiction.
- No team leader inspects the same bridge two years/cycles in a row.
- Meeting with maintenance superintendent upon completion of inspections within their jurisdiction.
- Independent inspection by a peer inspection team.
- Inspection of control bridges as part of periodic workshop or training.
- Always work in teams of 2 or more.
- Control Authority or Program Manager visit each bridge with a Summary Rating of a “4 – Poor”.

- Professional Engineer performs all NSTM Inspections in the jurisdiction.
- Photos uploaded to AssetWise.

Chapter 7: Bridge Inventory Coding and Condition Inspection

The data items in this chapter have been grouped into sections and subsections with like characteristics as presented in the SNBI. The following list of sections and subsections in the order that they are presented within this chapter.

- 7.1 Bridge Identification
  - 7.1.1 Border Bridges
  - 7.1.2 Non-Vehicular Bridges
  - 7.1.3 Identification
  - 7.1.4 Location
  - 7.1.5 Classification
- 7.2 Bridge Material and Type
  - 7.2.1 Span Material and Type
  - 7.2.2 Substructure Material and Type
  - 7.2.3 Roadside Hardware
- 7.3 Bridge Geometry
  - 7.3.1 Geometry
- 7.4 Features
  - 7.4.1 Feature Identification
  - 7.4.2 Routes
  - 7.4.3 Highways
  - 7.4.4 Railroads
  - 7.4.5 Navigable Waterways
- 7.5 Loads, Load Rating, and Posting
  - 7.5.1 Loads and Load Rating
  - 7.5.2 Load Posting (Operational) Status
  - 7.5.3 Load Evaluation and Posting
- 7.6 Inspection Requirements and Inspection Events
  - 7.6.1 Inspection Requirements
  - 7.6.2 Inspection Events
- 7.7 Bridge Condition
  - 7.7.1 Component Condition Ratings
  - 7.7.2 Element Identification
  - 7.7.3 Element Level Condition States
  - 7.7.4 Appraisal
  - 7.7.5 Work Events

In most subsections, each data item has a single value associated with the reported bridge record. These items are referred as having a “one-to-one” relationship with the bridge.

In some cases, multiple values may apply but are still reported in a single instance. For these items, shown below, multiple values are delimited by the pipe character (|). Not additional spaces should be used in conjunction with the pipe character.

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

The first many-to-one category includes data items where multiple events occur in a reporting period (year). Each event is reported as a separate sub-record associated with the bridge record. These items may include load posting status, inspection events, and work events.

The second many-to-one category includes data items where multiple values may apply to a bridge that are not event related. The first item in the subsection defines a sub-record for each unique value associated with the reported bridge record; all other related items are reported as part of each sub-record. The subsections that contain items in this category are span material and type, substructure material and type, feature identification, routes, highways, railroads, navigable waterways, load evaluation and posting, and element identification and condition states,

7.1 Bridge Identification

This section has data items that have been grouped by the following three categories: Chapter 7.1.3 Identification, Chapter 7.1.4 Location, and Chapter 7.1.5 Classification. The data items in these subsections identify, locate, and classify bridges.

7.1.1 Border Bridges

For the purposes of the NBI, only bridges that cross a State border are considered border bridges.

When a bridge crosses a border between two or more states, the Designated Lead State submits a full bridge record, including all features associated with the bridge, regardless of the location of the feature on either side of the border.

The Neighboring State reports an abbreviated bridge record that includes feature records for all highway features carried on or passing above the bridge. The Neighboring State does not report non-highway features. Features that pass below the bridge are reported only by the Designated Lead State. The Designated Lead State is determined through agreement between the bordering States.

Concurrence as to the accuracy of the items associated with the border bridge occurs between the bordering States prior to submittal. Submittal of the border bridge data signifies such concurrence. The data reported by the Designated Lead State for a border bridge is incorporated into the Neighboring State's bridge inventory upon acceptance into the NBI, except for the data contained in the abbreviated bridge record submitted by the Neighboring State.

The Neighboring State reports only the 23 items listed, as values for these items may vary between States. Additional data items reported by the Neighboring State are not processed. It is essential that Item B.F.01 - Feature Type values be assigned to the same features by both States so that the Designated Lead State's submitted feature data are assigned to the correct feature records in the Neighboring State's inventory.

The 23 items listed for Border Bridges are as follows:

Item ID	Data Item
B.ID.01	Structure File Number (SFN)
B.ID.03	Previous SFN
B.L.01	State Code
B.L.02	County Code
B.L.03	Place Code
B.L.04	Highway Agency District
B.L.07	Border Bridge Number
B.L.08	Border Bridge State Code
B.L.09	Border Bridge Inspection Responsibility
B.L.10	Border Bridge Designated Lead State
B.L.12	Metropolitan Planning Organization

Item ID	Data Item
B.F.01	Feature Type
B.F.02	Feature Location
B.F.03	Feature Name
B.RT.01	Route Designation
B.RT.02	Route Number
B.RT.03	Route Direction
B.RT.04	Route Type
B.RT.05	Service Type
B.H.03	NHS Designation
B.H.06	LRS Route ID
B.H.07	LRS Milepoint
B.H.18	Crossing Bridge Number

7.1.2 Non-Vehicular Bridges

For the purpose of the manual, non-vehicular bridges include structures that carry railroads, pedestrians, or utilities over highways. While these bridges are not considered NBIS structures, the inventories of these structures need to be maintained per this section. At a minimum the following items shall be entered and maintained for non-vehicular bridges. Additional items may be entered at the discretion of the control authority.

Item ID	Data Item
B.ID.01	Structure File Number (SFN)
B.ID.02	Bridge Name
B.ID.03	Previous SFN
B.L.01	State Code
B.L.02	County Code
B.L.03	Place Code
B.L.04	Highway Agency District
B.L.05	Latitude
B.L.06	Longitude
B.L.11	Bridge Location
B.L.12	Metropolitan Planning Organization
B.CL.01	Owner
B.CL.02	Major Maintenance Responsibility
B.CL.02.02	Routine Maintenance Responsibility
B.CL.02.03	Inspection Program Responsibility
B.CL.02.04	Shared Written Agreement
B.CL.04	Historic Significance
B.RH.01.04	Fence
B.F.01	Feature Type
B.F.02	Feature Location
B.F.03	Feature Name
B.RT.01	Route Designation
B.RT.02	Route Number
B.RT.03	Route Direction
B.RT.04	Route Type
B.RT.04.01	Interstate Mile Marker
B.RT.05	Service Type
B.H.01	Functional Classification
B.H.02	Urban Code
B.H.03	NHS Designation
B.H.04	National Highway Freight Network
B.H.05	STRAHNET Designation
B.H.06	LRS Route ID
B.H.07	LRS Milepoint

Item ID	Data Item
B.H.08	Lanes on Highway
B.H.09	Annual Average Daily Traffic
B.H.10	Annual Average Daily Truck Traffic
B.H.11	Year of Annual Average Daily Traffic
B.H.12	Highway Maximum Usable Vertical Clearance
B.H.13	Highway Minimum Vertical Clearance
B.H.14	Highway Minimum Horizontal Clearance, Left
B.H.15	Highway Minimum Horizontal Clearance, Right
B.H.16	Highway Maximum Usable Surface Width
B.H.17	Bypass Detour Length
B.H.18	Crossing Bridge Number
B.RR.01	Railroad Service Type
B.RR.02	Railroad Minimum Vertical Clearance
B.RR.03	Railroad Minimum Horizontal Offset
B.IE.13.01	Ohio Cursory Interval
B.IE.13.02	Ohio Cursory Description
B.IE.13.03	Ohio Cursory Inspection Date
B.C.01	Deck Condition Rating
B.C.01.01	Wearing Surface Condition Rating
B.C.02	Superstructure Condition Rating
B.C.02.01	Protective Coating System Condition Rating
B.C.03	Substructure Condition Rating
B.C.04	Culvert Condition Rating
B.C.05	Bridge Railings Condition Rating
B.C.06	Bridge Railing Transitions Condition Rating
B.C.07	Bridge Bearing Condition Rating
B.C.08	Bridge Joint Condition Rating
B.C.09	Channel Condition Rating
B.C.10	Channel Protection Condition Rating
B.C.11	Scour Condition Rating
B.C.12	Bridge Condition Classification
B.C.13	Lowest Condition Rating Code
B.C.13.01	Ohio General Appraisal
B.W.01	Year Built

7.1.3 Identification

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

The following data items are included in this section:

Item ID	Data Item
B.ID.01	Structure File Number (SFN)
B.ID.01.01	SFN Creation Date
B.ID.01.02	New SFN Replacing the Retired Bridge
B.ID.01.03	Date Built
B.ID.01.04	Date Open to Traffic
B.ID.01.05	SFN Retire Date
B.ID.01.06	SFN Retiring Reason
B.ID.02	Bridge Name
B.ID.03	Previous SFN

Structure File Number (SFN)		
Item ID	B.ID.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 7	

Specification

Report the unique structure file number (SFN) assigned according to State policy for each bridge meeting the Ohio bridge definition that is fully or partially located within the State's boundaries, Federal agency's responsibility or jurisdiction, or Tribal government's responsibility or jurisdiction; regardless of inspection or financial responsibility.

Do not change the SFN once it has been assigned and recorded, except for a rare or unusual circumstance that requires a one-time change.

When an SFN is changed, report the previous SFN under B.ID.03 – Previous SFN.

Report all spans from abutment to abutment as one bridge.

Commentary

Each bridge within the State is required to have a unique SFN and be recorded. Once established the SFN should preferably never change for the life of the bridge.

A new and unique SFN should be assigned when a bridge is replaced. When any portion of the existing bridge is retained for rehabilitation or partially replaced, it is preferable to retain the existing SFN (see Chapter 3.1).

All spans of a superstructure spanning from one abutment to another shall be recorded as one bridge, per the NBIS bridge definition, and not as multiple bridges.

For mainline bridge and the ramp that connects to the mainline bridge, when the ramp has at least one distinct abutment and is greater than 10 feet in length (per Ohio Revised Code), a separate bridge number shall be reported for each. Separate SFN should be reported for a bridge that divides into two or more separate bridges, or two or more bridges that merge into one single bridge. In both cases, the separating point between bridges should be the closest deck joint, or substructure unit to the separating point, or other logical and reasonable location as determined by the bridge State.

Any bridge with a closed median, where the area between the two roadways on the bridge is bridged over and can support traffic, should be reported as one SFN. Closed medians may have either mountable or non-mountable curbs or barriers. Separate superstructures with an open median (separated by more than 3 inches) sharing a common substructure unit or units should be reported as two unique SFNs.

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

Structure File Number (SFN) - Continued		
Item ID	B.ID.01	SNBI
Commentary – Continued		
Consult with the ODOT Central Office for questions concerning assigning SFNs to unique or complex bridges. For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.		

SFN Creation Date		
Item ID	B.ID.01.01	Previously ODOT Item 259
Frequency	Initial	
Format	YYYYMMDD	
Specification		
Report the date when an SFN is made active for the first time.		
Commentary		
This item is coded by an AssetWise Administrator in the ODOT Central Office.		

New SFN Replacing the Retired Bridge		
Item ID	B.ID.01.02	Previously ODOT Item 253
Frequency	Initial	
Format	Alphanumeric Max characters: 7	
Specification		
Report the seven-digit SFN of the new bridge (B.ID.01 – Structure File Number of the new bridge) which is replacing this bridge when this bridge is being retired.		
Commentary		
This item should be coded by ODOT Central Office when the bridge is retired due to replacement.		

Date Built		
Item ID	B.ID.01.03	Previously ODOT Item 263
Frequency	Initial	
Format	YYYYMMDD	
Specification		
Report the actual day, month, and year the bridge was completed. If unknown, code 07/01/1900. For phased construction, report the date in which the first phase was completed, and the bridge was open to traffic.		

Date Open to Traffic		
Item ID	B.ID.01.04	Previously ODOT Item 258
Frequency	Initial	
Format	YYYYMMDD	
Specification		
Report the date when the bridge was first opened to traffic.		
Commentary		
For part-width construction or phased construction, code the date any part of the bridge is first opened to traffic.		

SFN Retire Date		
Item ID	B.ID.01.05	Previously ODOT Item 260
Frequency	Initial	
Format	YYYYMMDD	
Specification		
Report the date when the SFN is retired.		
Commentary		
This item is coded by an AssetWise Administrator in the ODOT Central Office.		

SFN Retiring Reason		
Item ID	B.ID.01.06	Previously ODOT Item 257
Frequency	Initial	
Format	Alphanumeric	Max digits: 1

Specification

Code the reason to retire the SFN based on the following list:

Code	Description
1	Replaced (≥ 50% Sufficiency Rating)
2	Replaced (< 50% Sufficiency Rating)
3	Abandoned (not on public route)
4	Collapsed, not to be replaced
5	Closed, not to be replaced
7	Collapsed and replaced
0	Other

Commentary

This item is coded by the ODOT AssetWise Administrator in the ODOT Central Office at the time of retiring a SFN (B.ID.01.04 – Date Open to Traffic).

Bridge Name		
Item ID	B.ID.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 300	

Specification

Code the asset name as provide by the three-digit County abbreviation, five-digit route number, and the four-digit milepost formatted as: County-Route-Milepost (ex. DEL-03-0692). If there is a commonly known name(s), add following the Asset Name.

Report additional names separated by pipe (|) delimiters.

Commentary

If the bridge has no official or commonly known name record only the Asset Name.

Within AssetWise commonly known names were recorded under previous ODOT Item 203 – Bridge Name (Dedicated Name). These names should follow the asset name Item B.ID.02.

Examples

Bridge SFN 1812521 Asset Code is CUY-00480-1842L and has a commonly known name of Union Workers Bridge and Valley View Bridge.

- **Report as CUY-00480-1842L|Union Workers Bridge|Valley View Bridge**.

Previous SFN		
Item ID	B.ID.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 7	

Specification

Report the SFN previously associated with the bridge that has been replaced by the inventoried bridge, or when the inventoried SFN has changed.

Report 0 if there is no previous bridge number.

Commentary

The purpose of this item is to retain a link to data for the previous SFN associated with this bridge in the NBI.

For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Examples

Bridge SFN 1560671 is constructed after Bridge SFN 1560670 is closed and demolished as a planned replacement project. When the new bridge is opened:

- **Report 1560670**.

7.1.4 Location

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

The following data items are included in this section:

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

State Code					
Item ID	B.L.01				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	2	Decimal places:	0

Specification

Report the FIPS code for States. Report 39 for bridges located in Ohio.

Commentary

State codes are derived from the FIPS Standard Codes for States (FIPS PUB 5-2).

This item is coded by an AssetWise Administrator in the ODOT Central Office at the time of activation of the SFN.

Bridges which cross State borders need to choose a State code to report here and the bordering State's code in Item B.L.08 – Border Bridge State Code. For border bridges, the neighboring State reports this item as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

County Code

Item ID	B.L.02			SNBI
Frequency	Initial			
Format	Numeric	Max digits: 3	Decimal places: 0	

Specification

Report the Ohio county code in which the bridge is located.

Code	Description	FIPS	Code	Description	FIPS	Code	Description	FIPS
01	Adams	001	31	Hamilton	061	61	Noble	121
02	Allen	003	32	Hancock	063	62	Ottawa	123
03	Ashland	005	33	Hardin	065	63	Paulding	125
04	Ashtabula	007	34	Harrison	067	64	Perry	127
05	Athens	009	35	Henry	069	65	Pickaway	129
06	Auglaize	011	36	Highland	071	66	Pike	131
07	Belmont	013	37	Hocking	073	67	Portage	133
08	Brown	015	38	Holmes	075	68	Preble	135
09	Butler	017	39	Huron	077	69	Putnam	137
10	Carroll	019	40	Jackson	079	70	Richland	139
11	Champaign	021	41	Jefferson	081	71	Ross	141
12	Clark	023	42	Knox	083	72	Sandusky	143
13	Clermont	025	43	Lake	085	73	Scioto	145
14	Clinton	027	44	Lawrence	087	74	Seneca	147
15	Columbiana	029	45	Licking	089	75	Shelby	149
16	Coshocton	031	46	Logan	091	76	Stark	151
17	Crawford	033	47	Lorain	093	77	Summit	153
18	Cuyahoga	035	48	Lucas	095	78	Trumbull	155
19	Darke	037	49	Madison	097	79	Tuscarawas	157
20	Defiance	039	50	Mahoning	099	80	Union	159
21	Delaware	041	51	Marion	101	81	Van Wert	161
22	Erie	043	52	Medina	103	82	Vinton	163
23	Fairfield	045	53	Meigs	105	83	Warren	165
24	Fayette	047	54	Mercer	107	84	Washington	167
25	Franklin	049	55	Miami	109	85	Wayne	169
26	Fulton	051	56	Monroe	111	86	Williams	171
27	Gallia	053	57	Montgomery	113	87	Wood	173
28	Geauga	055	58	Morgan	115	88	Wyandot	175
29	Greene	057	59	Morrow	117			
30	Guernsey	059	60	Muskingum	119			

County Code - Continued		
Item ID	B.L.02	SNBI
Commentary		
Ohio records a two-digit code, based on the county code used to define the Structure File Number. AssetWise will calculate and report the FIPS County Code for this item based on the County selected in the drop-down menu. The FIPS codes referenced in the SNBI, can be found in the current version of the Census of Population and Housing – Geographic Identification Code Scheme to determine the appropriate code if required for a Border Bridge. For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.		

Place Code

Item ID	B.L.03			SNBI
Frequency	Initial			
Format	Numeric	Max digits: 5	Decimal places: 0	

Specification

Report the FIPS place code for the city, town, township, village, and other census-designated place where the bridge is located.

All highway bridges in Ohio must have a FIPS code assigned based on the start point or rear abutment of the bridge.

Commentary

Report a municipal FIPS code when any part of a bridge is within its boundaries. When a bridge is within two municipal FIPS boundaries report the FIBS code where the majority of the bridge is located.

TIMS can be utilized by selecting the Cities and Villages and Township layers under Boundaries. Within the Cities and Villages or Township layers, click on the map at the location of the bridge and record the value listed for FIBS_CITY_CD if in a city or village or FIPS_CODE for all others locations under the township layer.

https://tims.dot.state.oh.us/tims/map/sid/lR8qBP

The FIPS codes can be found in the current version of the Census of Population and Housing – Geographic Identification Code Scheme to determine the city, town, township, village, or other census-designated place code, regardless of ownership.

FIPS place codes can be found through a link at the following web site: https://www.census.gov/library/reference/code-lists/ansi.html

For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Examples

Columbus, OH, code 18000.

- **Report 18000**.

North Canton, OH, code 56294.

- **Report 56294**.

Steubenville, OH code 74608.

- **Report 74608**.

Washingtonville, OH code 81732.

- **Report 81732**.

Highway Agency District

Item ID	B.L.04				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	2	Decimal places:	0

Specification

Report the two (2) digit code of the ODOT District in which the bridge is located.

Code	ODOT District	District Headquarters Location
01	District 1	Lima
02	District 2	Bowling Green
03	District 3	Ashland
04	District 4	Akron
05	District 5	Jacksontown
06	District 6	Delaware
07	District 7	Sidney
08	District 8	Lebanon
09	District 9	Chillicothe
10	District 10	Marietta
11	District 11	New Philadelphia
12	District 12	Garfield Heights

Commentary

The ODOT District in which the bridge resides is reported regardless of the bridge owner.

Federal agencies and Tribal governments may report their district or region code where the bridge is located or use ODOT District codes.

For border bridges, the Neighboring State reports this item as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Latitude					
Item ID	B.L.05				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 9		Decimal places: 6	

Specification

Report the latitude of the bridge in decimal degrees.

Commentary

Report the latitude on the centerline of the route on the bridge at the start of the bridge in the increasing direction of the Straight-Line Mileage (SLM) or the County Log Point (CLP).

For structures with approach slab, the point where the baseline or centerline of the roadway intersects the end of the rear approach slab is the location for latitude. For structures without approach slabs, the point where the baseline or centerline of the roadway intersects the end of the Rear Abutment backwall is the location for the latitude (see Figure 7-1).

For culverts/frames under fill, the latitude shall be measured at the back of the first wall or edge of pipe when travelling in the increasing direction of the SLM or CLP.

For overhead bridges, the latitude shall be measured on the centerline of the inventory route under the bridge at the first bridge edge travelling in the increasing direction of the SLM or CLP.

This coordinate is used by the mapping systems to plot the structure.

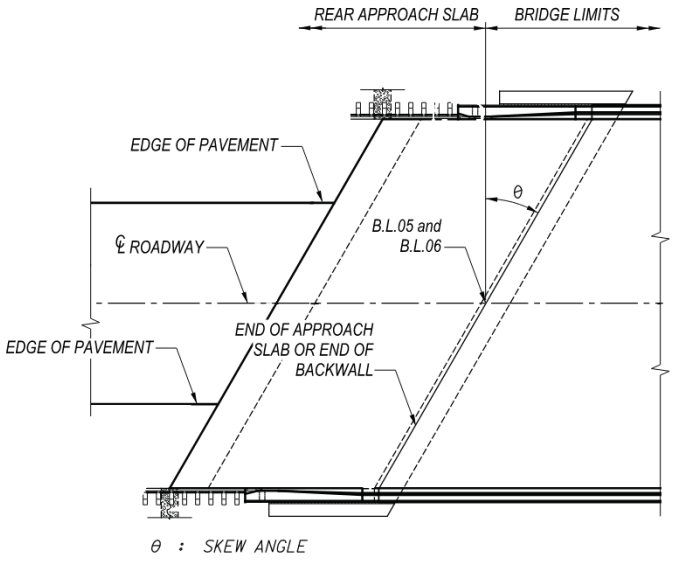

Figure 7-1: Location of B.L.05 – Latitude taken along the centerline of the road and end of the approach slab or end of the backwall.

Longitude					
Item ID	B.L.06				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 9		Decimal places: 6	

Specification

Report the longitude of the bridge in decimal degrees.

Commentary

Report the longitude on the centerline of the route on the bridge at the start of the bridge in the increasing direction of the Straight-Line Mileage (SLM) or the County Log Point (CLP).

For structures with approach slab, the point where the baseline or centerline of the roadway intersects the end of the rear approach slab is the location for longitude. For structures without approach slabs, the point where the baseline or centerline of the roadway intersects the end of the Rear Abutment backwall is the location for the longitude (see Figure 7-2).

For culverts/ frames under fill, the longitude shall be measured at the back of the first wall or edge of pipe when travelling in the increasing direction of the SLM or CLP.

For overhead bridges, the longitude shall be measured on the centerline of the inventory route under the bridge at the first bridge edge travelling in the increasing direction of the SLM or CLP.

This coordinate is used by the mapping systems to plot the structure.

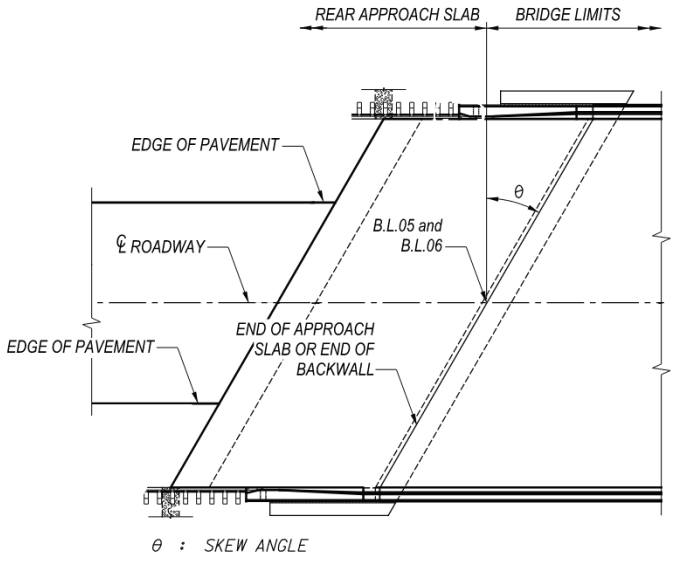

Figure 7-2: Location of B.L.06 – Longitude taken along the centerline of the road and end of the approach slab or end of the backwall.

Border Bridge Number		
Item ID	B.L.07	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 15	

Specification

Report the neighboring State's exact bridge number as used in their SNBI Item B.ID.01 – Structure File Number.

Report N when the bridge does not cross a border with another State.

Commentary

This item is reported when Ohio is the Designated Lead State or the Neighboring State.

Examples

HAM-00071-0010 (Brent Spence Bridge), the Ohio bridge number is 3107787 and the Kentucky bridge number is 059B00046N.

- **Report 059B00046N.**

BEL-00470-0654, the Ohio bridge number is 7006397 and the West Virginia bridge number is 00000000035A123.

- **Report 00000000035A123.**

Border Bridge State Code		
Item ID	B.L.08	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

Report the Neighboring State code.

Code	State
18	Indiana
21	Kentucky
26	Michigan
42	Pennsylvania
54	West Virginia

Do not report this item when the bridge does not cross a border with another state.

Commentary

This item is reported when Ohio is Designated Lead State or the Neighboring State.

Examples

HAM-00071-0010 (Brent Spence Bridge), the bridge crosses from Ohio to Kentucky.

- **Report 21.**

BEL-00470-0654, the bridge crosses from Ohio to West Virginia.

- **Report 54.**

Border Bridge Inspection Responsibility		
Item ID	B.L.09	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

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

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

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

Commentary

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

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

This item is reported when Ohio is Designated Lead State or the Neighboring State.

Examples

SCI-00023-0000 carries Route 23 between Ohio and Kentucky. Ohio has full bridge inspection responsibility.

- **Report 2.**

WAS-00077-0000 carries I-77 between Ohio and West Virginia. West Virginia has full bridge inspection responsibility.

- **Report 0.**

Border Bridge Designated Lead State					
Item ID	B.L.10				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 2		Decimal places: 0	

Specification

Report the State code for the State that has been determined to be the Designated Lead State for reporting the border bridge full record.

Code	State
18	Indiana
21	Kentucky
26	Michigan
39	Ohio
42	Pennsylvania
54	West Virginia

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

Commentary

The intent of this item is to capture the State which has been designated by agreement between the two bordering states to report a full bridge record for the border bridge.

This item is reported when Ohio is Designated Lead State or the Neighboring State.

Examples

SCI-00023-0000 carries Route 23 between Ohio and Kentucky. Ohio is the lead state.

- **Report 39.**

HAM-00071-0010 (Brent Spence Bridge) carries I-71 between Ohio and Kentucky. Kentucky is the lead state.

- **Report 21.**

Bridge Location		
Item ID	B.L.11	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 25	
Specification		
Report a narrative description of the bridge location.		
Commentary		
The location should be keyed to some recognizable feature on the official highway map, (county map for county, township, or municipal structures), such as road junctions and topographical features (using meaningful abbreviations when necessary).		
Examples		
• **1.82 miles south of US-36** • **286 ft west of Bradley Rd** • **500 ft north of I-480/SR-176 interchange**		

Metropolitan Planning Organization		
Item ID	B.L.12	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 300	

Specification

Report the name of the Metropolitan Planning Organization (MPO) in which the bridge is located, regardless of bridge owner or maintenance responsibility.

Report each MPO when the bridge is located on a boundary between MPOs. Report multiple MPOs separated by pipe (|) delimiters.

Report N if the bridge is not located in an MPO.

Code	Location
AMATS	Akron
BHJ	Steubenville
BOMTS	Wheeling
Eastgate	Youngstown
KYOVA	Huntington
LCATS	Newark
MORPC	Columbus
NOACA	Cleveland
OKI	Cincinnati
SCATS	Canton
MVRPC	Dayton
LACRPC	Lima
RCRPC	Mansfield
CCSTCC	Springfield
TMACOG	Toledo
WWW	Parkersburg
ERPC	Sandusky

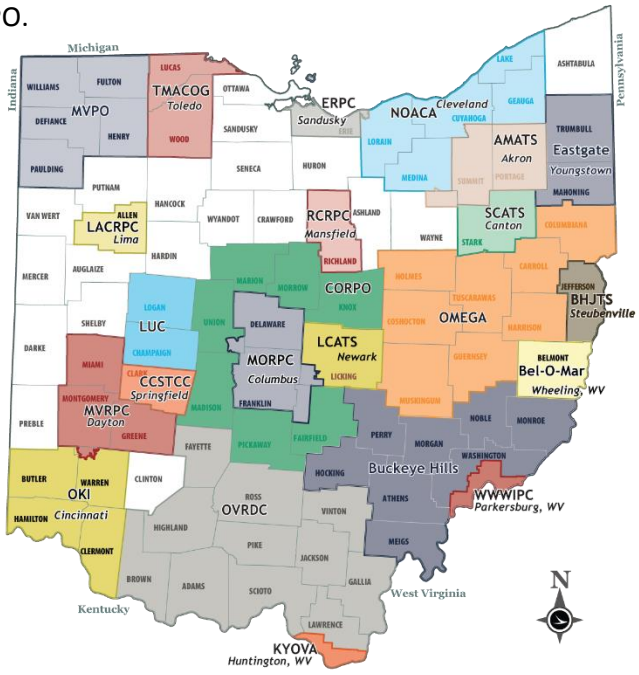

Figure 7-3: Map of MPO's and RTPO's in Ohio.

Commentary

For a map of current MPO's: https://www.transportation.ohio.gov/programs/stip/mpo-rtpo-tip-info

This item only needs to be reported if a highway carried by the bridge is on the National Highway System as indicated in SNBI Item B.H.03 – NHI Designation.

Report this item when any part of the bridge is within the boundaries of an MPO.

The names of Regional Transportation Planning Organizations (RTPOs) or single county planning organizations do not need to be reported for this item.

This item is reported when Ohio is Designated Lead State or the Neighboring State.

Metropolitan Planning Organization - Continued		
Item ID	B.L.12	SNBI
Examples		

Bridge is located within the Cleveland MPO.

- **Report NOACA.**

Bridge is located within the OMEGA RTPO and the owner would like to report the RTPO within the bridge inventory.

- **Report OMEGA.**

The bridge is not located within a MPO.

- **Report N.**

The bridge crosses between the Akron and Stark County MPOs.

- **Report AMATS | SCATS.**

7.1.5 Classification

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

The following data items are included in this section:

Item ID	Data Item
B.CL.01	Owner
B.CL.01.01	Major Bridge
B.CL.01.02	Governmental Accounting Standards Board
B.CL.02	Major Maintenance Responsibility
B.CL.02.02	Routine Maintenance Responsibility
B.CL.02.03	Inspection Program Responsibility
B.CL.02.04	Shared Written Agreement
B.CL.03	Federal or Tribal Land Access
B.CL.04	Historic Significance
B.CL.05	Toll
B.CL.06	Emergency Evacuation Designation
B.CL.07.01	NBIS Bridge
B.CL.07.02	Scenic River

Owner

Item ID	B.CL.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 4	

Specification

Report the agency that has ownership of the bridge using one of the following codes.

Code	Description	Previous Code
S01	State Highway Agency (ODOT)	01
S02	State Park, Forest, or Reservation Agency (ODNR)	11
S03	State Toll Agency (OTIC)	31
SX	Other State Agencies	21
L01	County Highway Agency	02
L02	Town or Township Highway Agency	03
L03	City or Municipal Highway Agency	04
L04	Local Park, Forest, or Reservation Agency	12
L05	Local Toll Agency	32
LX	Other Local Agencies	25
F04	National Aeronautics and Space Administration (NASA)	75
FX	Other Federal Agency	60
FL01	Bureau of Indian Affairs (BIA)	62
FL02	Bureau of Land Management	68
FL03	Bureau of Reclamation	69
FL04	U.S. Fish and Wildlife Service (FWS)	63
FL05	National Park Service	66
FL06	U.S. Army Corps of Engineers (USACE)	70/71
FL07	U.S. Forest Service (USFS)	64
I	Indian Tribal Government	61
D01	Air Force	72
D02	Army	74
D03	Navy/Marines	73
T	Transit Agency/Authority	-
P	Private (other than railroad)	26
R	Railroad	27
U	Unknown	80
X	Other	-

Commentary

Use code S01 for bridges owned by ODOT (typically bridges on and over state routes and interstates).

Use code S03 for bridges owned by OTIC (typically bridges on and over the Ohio Turnpike).

Use code L01 for bridges owned by the county.

Use code L02 or L03 for bridges owned by towns or townships and cities or municipalities.

Owner - Continued		
Item ID	B.CL.01	SNBI
Commentary - Continued		
Use code T for transit agency or authority for air, bus, light rail, and port regardless of whether the entity is considered State, local, or private. Use code P for private owners other than railroad or transit. Use code R for highway bridges owned by railroad entities that are not considered a transit agency or authority.		

Major Bridge		
Item ID	B.CL.01.01	Previously ODOT Item 218
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

Report the code based on the owner of the bridge and if it meets the criteria of a major bridge.

Code	Description
SY	State major bridge
LY	Local major bridge
N	Not a major bridge

Commentary

A major bridge is defined as meeting one or more of the following criteria:

- Bridge is more than 1,000 feet in total length
- Single bridge with a deck area ≥81,000 square feet
- Twin bridges with a deck area ≥135,000 square feet
- Spans over the Ohio River
- Moveable bridge
- Continuous/ cantilever truss bridge
- Suspension bridge
- Cable stay
- Arch
- Segmental

A state bridge is defined as B.CL.01 – Owner coded as S01, S02, or SX.

A local bridge is defined as B.CL.01 – Owner coded as L01, L02, L03, L04, or LX.

For all other bridges regardless of meeting the definitions of a major bridge, report as not a major bridge.

This item must be coded for each bridge.

Governmental Accounting Standards Board (GASB)		
Item ID	B.CL.01.02	Previously ODOT Item 227
Frequency	Initial	
Format	Alphanumeric Max characters: 1	
Specification		
Report a Y or N to indicate if the bridge meets the GASB definition.		
Commentary		
GASB Bridge – All state system bridges excluding Major Bridge as defined in Item B.CL.01.01 – Major Bridge, ODNR, OTIC, and non-highway bridges not maintained by ODOT.		

Major Maintenance Responsibility		
Item ID	B.CL.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 4	

Specification

Report the agency that has the primary maintenance responsibility for the bridge using one of the codes listed in Item B.CL.01 – Owner.

For bridges with multiple agencies responsible for major maintenance, report the lead agency in item B.CL.02 and any secondary agency in B.CL.02.01 (previously ODOT item 21B).

Commentary

This item must be coded.

Matrix of Bridge Responsibilities can be found at:
https://www.transportation.ohio.gov/programs/maintenance-operations/rimr/rimr#BridgeResponsibilitiesMatrices

Any maintenance agreement supersedes the responsibilities as shown in the matrices.

If more than one agency has equal major maintenance responsibility, code one agency in the hierarchy of State, Federal, county, city, railroad, and other private.

For bridges in Ohio, the agency legally responsible for the maintenance of the bridges should be coded in accordance with the *Ohio Revised Code*, *Roadway Infrastructure Maintenance Responsibility Manual* or by legal agreement.

If there is no secondary agency responsible for major maintenance, then leave Item B.CL.02.01 blank.

Routine Maintenance Responsibility		
Item ID	B.CL.02.02	Previously ODOT Item 225
Frequency	Initial	
Format	Alphanumeric Max characters: 10	

Specification

Report the agency that has the routine maintenance responsibility for the bridge using one of the codes listed in Item B.CL.01 – Owner.

For bridges with multiple agencies responsible for routine maintenance, report the lead agency in the first box, followed up with the secondary agency in the second box.

Commentary

This item must be coded.

Matrix of Bridge Responsibilities can be found at:
https://www.transportation.ohio.gov/programs/maintenance-operations/rimr/rimr#BridgeResponsibilitiesMatrices

Any maintenance agreement supersedes the responsibilities as shown in the matrices.

If more than one agency has equal routine maintenance responsibility, code one agency in the hierarchy of State, Federal, county, city, railroad, and other private.

For bridges in Ohio, the agency legally responsible for the maintenance of the bridges should be coded in accordance with the *Ohio Revised Code*, *Roadway Infrastructure Maintenance Responsibility Manual* or by legal agreement.

If there is no secondary agency responsible for routine maintenance, then leave the second box blank.

Inspection Program Responsibility		
Item ID	B.CL.02.03	Previously ODOT Item 221
Frequency	Initial	
Format	Alphanumeric Max characters: 10	

Specification

Report the agency that has the inspection responsibility for the bridge using one of the codes listed in Item B.CL.01 – Owner.

For bridges with multiple agencies responsible for inspection program, report the lead agency in the first box, followed up with the secondary agency in the second box.

Commentary

This item must be coded.

Matrix of Bridge Responsibilities can be found at:
https://www.transportation.ohio.gov/programs/maintenance-operations/rimr/rimr#BridgeResponsibilitiesMatrices

Any inspection program agreement supersedes the responsibilities as shown in the matrices.

If more than one agency has equal inspection responsibility, code one agency in the hierarchy of State, Federal, county, city, railroad, and other private.

For bridges in Ohio, the agency legally responsible for the maintenance of the bridges should be coded in accordance with the *Ohio Revised Code*, *Roadway Infrastructure Maintenance Responsibility Manual* or by legal agreement.

If there is no secondary agency responsible for the inspection program, then leave the second box blank.

Shared Written Agreement		
Item ID	B.CL.02.04	Previously ODOT Item 221H
Frequency	Initial	
Format	Alphanumeric Max characters: 200	

Specification

Report the type of agreement that is on file for the bridge.

Code	Description
1	Not Applicable
2	Bridge Maintenance Only
3	Bridge Inspection Only
4	Bridge Maintenance and Inspection
5	Bridge Other

Commentary

If no agreement is present, leave the field blank.

This item includes any agreement between two separate entities regarding inspection or maintenance of a bridge that crosses jurisdictions.

Federal or Tribal Land Access

Item ID	B.CL.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 30	

Specification

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

Report multiple codes separated by pipe (|) delimiters.

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

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

Commentary

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

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

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

Examples

GUE-00574-0018 carries SR 574 over the Senecaville Dam that is owned and operated by the U.S. Army Corps of Engineers (USACE).

- **Report USACE.**

SUM-00082-0000 carries SR 82 over the Cuyahoga Valley National Parks.

- **Report NPS.**

Historic Significance

Item ID	B.CL.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the historic significance of the bridge using one of the following codes.

Code	Description
1	Bridge is on the National Register
2	Bridge is eligible for the National Register
3	Bridge is in a historic district that is on or eligible for the National Register, and contributes to the eligibility of the district
4	Bridge is in a historic district that is on or eligible for the National Register, but does not contribute to the eligibility of the district
5	Bridge is potentially eligible for the National Register, or potentially contributes to a historic district, but has not been evaluated according to the criteria for listing
6	Bridge is on a State or local historic register, but is not eligible for the National Register
7	Historic significance of the bridge has not been determined
N	Bridge is not eligible for the National Register, and is not in a historic district eligible for the National Register

Commentary

This item is used to report the historic significance of bridges and additional information can be found in the SNBI.

This field is updated by the Office of Structural Engineering or Historic Bridges Group within ODOT.

Use code 2 when the bridge has been determined to be eligible for listing on the National Register even though the nomination and listing process have not concluded or are not being pursued.

Use code 5 when the bridge has attributes that may make it historically significant as indicated by the National Register criteria for evaluation and listing. This code may also apply when a bridge was previously evaluated but requires reevaluation because its current attributes, such as age, may make it historically significant.

Use code 6 when a bridge has local historic value but has been determined to be not eligible for the National Register. Undertakings may be subject to the Section 4(f) process, but without the same level of consultation as prescribed by Section 106.

Use code N when the other codes do not apply.

Toll		
Item ID	B.CL.05	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the toll status of the bridge using one of the following codes.

Code	Description
1	Toll bridge not under FHWA Toll Agreement
2	Toll bridge under FHWA Toll Agreement
3	Bridge carries a toll road not under FHWA Toll Agreement
4	Bridge carries a toll road under FHWA Toll Agreement
N	Bridge does not carry a toll road and is not a toll bridge

Report this item if any portion of the bridge is tolled, such as if an HOV Toll lane is on the same bridge as the freeway.

Commentary

Use code 1 when tolls on a toll bridge are paid specifically to use the bridge and not part of a facility which requires an FHWA Toll Agreement (23 U.S.C. 129).

Use code 2 when an interstate highway toll bridge is under a FHWA Toll Agreement (23 U.S.C. 129). Bridge has a separate agreement from the highway segment.

Use code 3 when the tolls on a toll road are paid to use the facility, which includes the roadway and the bridge. No FHWA Toll Agreement or unknown whether a toll agreement exists.

Use code 4 when the bridge is on an Interstate toll highway segment under a FHWA Toll Agreement (23 U.S.C. 129). Bridge is a part of the toll segment.

Emergency Evacuation Designation		
Item ID	B.CL.06	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether the route carried on the bridge is an emergency evacuation route using one of the following codes.

Code	Description
N	Not an emergency evacuation route
Y	Emergency evacuation route

Commentary

This item is used by FHWA with other items, as per 23 U.S.C. 144(b), to classify bridges according to serviceability, safety, and essentiality for public use and considers the potential impacts to emergency evacuation routes and to regional and national freight and passenger mobility if the serviceability of the bridge is restricted or diminished.

Emergency evacuation routes may be designated for various events such as earthquakes, dam failure, and other hazardous events.

Ohio does not have designated emergency evacuation routes, but individual Districts, Counties, or Cities/Municipalities/Towns may have designated emergency evacuation routes.

NBIS Bridge		
Item ID	B.CL.07.01	Previously ODOT Item 112
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report if the bridge meets the requirements defining an NBIS Bridge using one of the following codes.

Code	Description
N	Not an NBIS Bridge
Y	Is an NBIS Bridge

Commentary

A NBIS Bridge is a structure, including supports, erected over a depression or an obstruction, such as water, a highway, or a railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or spring lines of arches, or extreme ends of the openings for multiple boxes; it includes multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening. For additional information on NBIS bridges see Chapter 1.2.2.

Scenic River		
Item ID	B.CL.07.02	Previously ODOT Item 651
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report if the feature reported in Item B.F.01 – Feature Type is coded as W## (waterway).

Report if the waterway is classified as a Scenic River in accordance with the Ohio Department of Natural Resources (ODNR).

Code	Description
Y	Classified as a Scenic River
N	Not classified as a Scenic River

Commentary

Portions of the following rivers are considered Scenic Rivers per the Ohio Department of Natural Resources (ODNR):

- Ashtabula River
- Big and Little Darby Creek
- Chagrin River
- Conneaut Creek
- Grand River
- Greenville Creek
- Kokosing River
- Little Beaver Creek
- Little Miami River
- Maumee River
- Mohican River
- Olentangy River
- Pymatuning Creek
- Sandusky River
- Stillwater River System
- Upper Cuyahoga River

An updated list and limits of each scenic river can be found on ODNR's website at: https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/nature-preserves/scenic-rivers/list-ohio-scenic-rivers

7.2 Bridge Material and Type

This section has data items that have been grouped by the following three subsections: Chapter 7.2.1 Span Material and Type, Chapter 7.2.2 Substructure Material and Type, and Chapter 7.2.3 Roadside Hardware. The data items in these subsections identify the structural materials, structure types, and structural configurations that make up a bridge.

7.2.1 Span Material and Type

The data items in the Span Material and Type group identify the bridge configuration based on material(s), type(s), and continuity. These items are considered part of the Span Data Set and have a many-to-one relationship with a bridge when applicable. The data for items in this section typically remain static once a bridge has been inventoried.

The following data items are included in this section:

Item ID	Data Item
B.SP.01.1	Span Type Selection
B.SP.01	Span Configuration Designation
B.SP.02	Number of Spans
B.SP.03	Number of Beam Lines
B.SP.04	Span Material
B.SP.04.01	Structural Member Steel Type
B.SP.05	Span Continuity
B.SP.06	Span Type
B.SP.07	Span Protective System
B.SP.07.01	Protective Coating System Type
B.SP.07.02	Protective Coating System Date
B.SP.08	Deck Interaction
B.SP.09	Deck Material and Type
B.SP.09.01	Deck Concrete Type
B.SP.10	Wearing Surface
B.SP.10.01	Wearing Surface Description
B.SP.10.02	Wearing Surface Thickness
B.SP.10.03	Wearing Surface Date
B.SP.11	Deck Protective System
B.SP.12	Deck Reinforcing Protective System
B.SP.13	Deck Stay-In-Place Forms
B.SP.14.01	Deck Drainage Type
B.SP.14.02	Joint Trough
B.SP.15.01	Approach Slab Type
B.SP.15.02	Approach Slab Roadway Termination Type
B.SP.16.01	Culvert Type
B.SP.16.02	Culvert Length Inlet-to-Outlet
B.SP.16.03	Fill Depth Over Culvert
B.SP.16.04	Rise
B.SP.16.05	Shape

Span Type Selection

Item ID	B.SP.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the assigned span type selection using one of the following codes.

Code	Description
M	Main
A	Approach
C	Culvert
V	Culvert extension
W	Widening

Commentary

This item captures how spans of the reported bridge configuration are classified and designated.

Except for culverts, each bridge has at least one main span. Main spans include all spans of most bridges or the major span(s) of a sizable bridge.

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

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

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

Use code C for spans designed as buried structures (greater than 24" fill depth over the top).

Use code M for spans conveying water under a roadway embankment with less than 24" fill depth over the top.

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

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

Span Configuration Designation		
Item ID	B.SP.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

The Span Type selected in Item B.SP.01.1 – Span Type Selection will be automatically populated starting with 01 and continuing with sequential numbering for each span type selected. The first instance of each code shall be 01.

Commentary

Except for culverts, each bridge has at least one main span. Main spans include all spans of most bridges or the major span(s) of a sizable bridge.

Replacing the "##" characters in the codes with a sequential number (e.g., M01, A01, A02, etc.) identifies each unique span configuration present on the bridge.

For additional information as to when a feature needs to be added see Item B.SP.01.1 – Span Type Selection.

Examples

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

- **Report M01**.

Double-leaf bascule bridge with four box girder approach spans. This bridge has two span data sets.

- **Report M01** for the bascule data set.
- **Report A01** for the steel box girder data set.

Six-span bridge with two continuous steel plate girder main spans and four simply supported steel plate girder approach spans. This bridge has two span data sets.

- **Report M01** for the continuous steel plate girder data set.
- **Report A01** for the simply supported steel plate girder data set.

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

- **Report C01** for the steel pipes data set.
- **Report C02** for the HDPE pipes data set.

Steel truss main span bridge with three prestressed concrete multi-beam approach spans at the north end, and two steel multi-beam approach spans at the south end. This bridge has three span data sets.

- **Report M01** for the steel truss data set.
- **Report A01** for the north approach data set.
- **Report A02** for the south approach data set.

Span Configuration Designation - Continued		
Item ID	B.SP.01	SNBI
Examples - Continued		

Single span reinforced concrete tee-beam bridge widened with prestressed concrete box beams. This bridge has two span data sets.

- **Report M01** for the reinforced concrete tee-beam data set.
- **Report W01** for the prestressed concrete box beams data set.

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

- **Report C01** for the three-sided frame culvert data set.
- **Report V01** for the four-sided box culvert data set.

Single-span steel beam bridge widened using the same superstructure/deck construction. This bridge has one span data set.

- **Report M01**.

Number of Spans					
Item ID	B.SP.02				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 0	

Specification

Report the number of spans.

Commentary

This item captures the number of spans of the configuration(s) designated in Item B.SP.01 – Span Configuration Designation.

If the number of barrels or spans varies, report the maximum number.

Examples

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

- **Report 4**.

Double-leaf bascule bridge with four steel box girder approach spans. This bridge has two span data sets.

- **Report 1** for the bascule main span data set.
- **Report 4** for the box girder approach span data set.

Six-span bridge with two continuous steel plate girder main spans and four simply supported steel plate girder approach spans. This bridge has two span data sets.

- **Report 2** for the main span data set.
- **Report 4** for the approach span data set.

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

- **Report 4** for the steel pipes data set.
- **Report 4** for the HDPE pipes data set.

Three steel girder spans with concrete vaulted/cellular abutments that enclose a reinforced concrete slab span at each end of the bridge. This bridge has two span data sets.

- **Report 3** for the steel girder main span data set.
- **Report 2** for the reinforced concrete approach span data set.

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

- **Report 4**.

Number of Spans - Continued		
Item ID	B.SP.02	SNBI
Examples - Continued		

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

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

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

- **Report 4**.

Number of Beam Lines

Item ID	B.SP.03				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	3	Decimal places:	0

Specification

Report the number of principal beam lines.

Report 1 for bridges where Item B.SP.06 – Span Type is F01, F02, S01, or S02.

Report 0 for bridges where Item B.SP.06 – Span Type is P01 or P02.

Commentary

Principal beam lines include the main longitudinal load-carrying members of the superstructure such as beams, girders, trusses, and arches or arch ribs, but do not include stringers of a floorbeam system or spandrel walls of an arch.

Use the average number of beam lines for bridges with variable number of beams lines within a span configuration, rounded down.

Examples

Timber multi-beam bridge with 12 beams.

- **Report 12**.

Steel through truss bridge with two trusses and ten stringers.

- **Report 2**.

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

- **Report 14** as an average of the beam lines.

Steel arch bridge with three arch ribs.

- **Report 3**.

Concrete arch bridge with masonry spandrel walls.

- **Report 1**.

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

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

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

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

Span Material

Item ID	B.SP.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the principal span material type using one of the following codes.

Code	Description
A01	Aluminum
C01	Reinforced concrete – cast-in-place
C02	Reinforced concrete – precast
C03	Prestressed concrete – pre-tensioned
C04	Prestressed concrete – cast-in-place post-tensioned
C05	Prestressed concrete – precast post-tensioned
CX	Concrete – other
F01	FRP composite – aramid fiber
F02	FRP composite – carbon fiber
F03	FRP composite – glass fiber
FX	FRP composite – other
I01	Iron – cast
I02	Iron – wrought
M01	Masonry – block
M02	Masonry – stone
P01	Plastic – Polyethylene
PX	Plastic – other
S01	Steel – rolled shapes
S02	Steel – welded shapes
S03	Steel – bolted shapes
S04	Steel – riveted shapes
S05	Steel – bolted and riveted shapes
SX	Steel – other
T01	Timber – glue laminated
T02	Timber – nail laminated
T03	Timber – solid sawn
T04	Timber – stress laminated
TX	Timber – other
X	Other

Commentary

A principal span member includes the main longitudinal load-carrying members of the span such as beams, girders, trusses, arches, or pipes, but does not include the floor system.

Use code C04 or C05, as applicable, for prestressed concrete superstructures that utilize both pre-tensioning and post-tensioning.

Use code M01 for masonry made from bricks or concrete blocks. Use code M02 for natural stone.

Use code P01 for plastics that include HDPE and PE materials typically used for pipes.

For lined culverts code the predominate structural material type.

Examples

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

- **Report C05**.

Stress laminated timber slab.

- **Report T04**.

Span Material - Continued		
Item ID	B.SP.04	SNBI
Examples - Continued		

Concrete encased steel rolled beam.

- **Report S01**.

Bolted steel truss with timber stringers.

- **Report S03**.

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

- **Report C01**.

Corrugated steel pipes with bolted seams.

- **Report S03**.

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

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

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

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

Terra cotta pipes.

- **Report X**.

Structural Member Steel Type

Item ID	B.SP.04.01	Previously ODOT Item 487
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the predominate type of structural steel used for the bridge from the table.

Code	Description
1	A588 (weathering steel)
2	A572
3	A441
4	A440
5	A373
6	A242
7	A36
8	A7
9	A6
0	Other
A	Wrought iron
B	Hybrid (A572 or A588 flanges with A36 webs)
C	Hybrid (A709 grade 70W flanges with 50W webs)
D	A709 grade 50
E	A709 grade 50W
F	A 514 Grade 100 (T1 or A517 Steel)
G	Unknown Steel – Plans not available
H	A 709 Grade 36
N	None – No Structural Steel on the Bridge
U	Unknown

Report N when B.SP.04 – Span Material is not coded as S01 to SX.

Commentary

This item is used to convey the predominate type of structural steel comprising the bridge. This item shall be coded as identified on design plans, year of construction, or through material testing.

Examples

Cast-in-place reinforced concrete slab.

- **Report N**.

Welded steel plate girder bridge constructed of 50 ksi, A588 (weathering steel) with painted beam ends, per the bridge design plans.

- **Report E**.

Steel corrugated pipe culvert constructed in 1956.

- **Report N**.

Span Continuity

Item ID	B.SP.05	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the span continuity using one of the following codes.

Code	Description
1	Simple or single span
2	Continuous
3	Continuous for live loads only
4	Cantilever
5	Cantilever with pin and hanger
6	Frame
7	Buried (≥24" fill depth)

Commentary

This item captures the continuity of the span(s) in the configuration.

Use code 2 for bridges with designed continuous for permanent (dead) loads and live loads. Also, use code 2 for cable stayed and suspension bridges, and for multi-span arches.

Use code 3 for bridges designed as simple spans for permanent (dead) loads and continuous for live loads. Generally, this will apply to prestress concrete superstructures where the deck is continuous over the piers. When it is unknown if the superstructure was designed as continuous for live loads, code this item consistent with the assumption used in the load rating calculations.

Use code 6 for three-sided and four-sided frames that are not buried (less than 24" of fill).

Use code 7 for pipe culverts and other structures that rely on soil-structure interaction to support vertical loads (greater than 24" of fill).

Examples

Two prestressed concrete girder simple spans that have one span data set.

- **Report 1**.

Three-span bridge with cantilevered end spans that are unsupported at the extreme ends. There are two span data sets, one for the center span and one for the end spans.

- **Report 2** for the center span.
- **Report 4** for the end spans.

Steel rigid K-frame that has one span data set.

- **Report 6**.

Span Continuity - Continued		
Item ID	B.SP.05	SNBI

Examples - Continued

Two prestressed concrete girder simple spans with a continuous deck designed to provide continuity for live load over the pier and have one span data set.

- **Report 3**.

Three-span concrete girder bridge with cantilever and suspended center span. There are two span data sets, one for the center span and one for the end spans.

- **Report 4** for the center span.
- **Report 2** for the end spans.

Three-span steel girder bridge with cantilever and suspended pin and hanger center span. There are two span data sets, one for the center span and one for the end spans.

- **Report 5** for the center span.
- **Report 2** for the end spans.

Three-barrel monolithic concrete frame bridge that is not buried and has one span data set.

- **Report 6**.

Four-barrel corrugated steel pipe culvert with 48" of fill over the culvert.

- **Report 7**.

Span Type

Item ID	B.SP.06	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the span type using one of the following codes.

Code	Description
A01	Arch – under fill without spandrel
A02	Arch – open spandrel
A03	Arch – closed spandrel
A04	Arch – through
A05	Arch – tied
B01	Box girder/beam – single
B02	Box girder/beam – multiple adjacent
B03	Box girder/beam – multiple spread
B04	Box girder/beam – segmental
F01	Frame – three-sided
F02	Frame – four-sided
F03	Frame – K-shaped
F04	Frame – delta-shaped
G01	Girder/beam – I-shaped adjacent
G02	Girder/beam – I-shaped spread
G03	Girder/beam – tee-beam
G04	Girder/beam – inverted tee-beam
G05	Girder/beam – double-tee adjacent
G06	Girder/beam – double-tee spread
G07	Girder/beam – channel adjacent
G08	Girder/beam – channel spread
G09	Girder/beam – girder & floorbeam
G10	Girder/beam – through girder
GX	Girder/beam – other
L01	Cable – suspension
L02	Cable – cable-stayed
L03	Cable – extradosed
LX	Cable – other
M01	Movable – vertical lift
M02	Movable – bascule
M03	Movable – swing
MX	Movable – other
P01	Pipe – rigid
P02	Pipe – flexible
S01	Slab – solid
S02	Slab – voided
T01	Truss – deck
T02	Truss – through
T03	Truss – pony
X01	Other – railroad flat car
X02	Other – ferry transfer
X03	Other – floating
X	Other

Commentary

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

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

Span Type - Continued		
Item ID	B.SP.06	SNBI
Commentary - Continued		

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

Use code F01 for three-sided rigid frames, regardless of fill depth.

Use code F02 for rigid four-sided concrete box bridges, regardless of fill depth.

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

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

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

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

Span Protective System

Item ID	B.SP.07	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

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

Code	Description
0	None
A01	Admixture – internally sealed
A02	Admixture – low permeability
A03	Admixture – polymer impregnated
A04	Admixture – corrosion inhibitor
A05	Admixture – ASR inhibitor
AX	Admixture – other
C01	Coating – paint
C02	Coating – sealer
C03	Coating – methacrylate
C04	Coating – hot dip galvanizing
C05	Coating – metalizing/thermal spray
CX	Coating – other
E01	Encasement – concrete
EX	Encasement - other
M01	Membrane – built-up
M02	Membrane – sheet
M03	Membrane – liquid applied
MU	Membrane – unknown
MX	Membrane – other
P01	Patina – uncoated weathering steel
S01	Sacrificial – cathodic, passive
S02	Sacrificial – cathodic, active
SX	Sacrificial – other
T01	Treated – timber preservative
U	Unknown
X	Other

Commentary

Code this item consistent with the material reported for Item B.SP.04 – Span Material.

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

Use code 0 when the span is unprotected.

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

Non-protective anti-graffiti and aesthetic coatings are not considered when coding this item.

Use code C01 for weathering steel that has been painted.

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

Use code P01 only for weathering grades of steel.

Span Protective System - Continued

Item ID	B.SP.07	SNBI

Commentary - Continued

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

Use the appropriate code for span members under fill that have a protective system.

For bridges with prestressed concrete members, B.SP.04 – Span Material coded C03, C04, or C05, and constructed per ODOT specifications use the guidance below when no other information is known.

ODOT Specific Coding for Prestressed Concrete Members:

Year of Construction	Code	Description
Prior to 1997	0	None
1997-2007	A04	Admixture – corrosion inhibitor
2008-Present	A02	Admixture – low permeability

Examples

Low permeability concrete slab bridge with waterproofing sheet membrane.

- **Report M02**.

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

- **Report P01**.

Protective Coating System Type

Item ID	B.SP.07.01	Previously ODOT Item 482
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

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

Code	Description
1	Red lead
2	Unpainted weathered steel
3	Paint system A
4	Paint system B
5	Paint system OZEU
6	Galvanized
7	Metalized (Alum/Zinc)
8	Paint system A with intermediate tie coat
9	Paint system IZEU
0	Other paint
A	EEU
B	Epoxy – urethane sealers
C	Non-epoxy sealers
N	None/Not Applicable
U	Unknown

Commentary

This item is used to convey the type of protective coating system used on the bridge. In cases where the span configuration may have a combination of protective coating system, use the code for the predominant protective system based on protected area. In cases where multiple systems protect the same area, use the code for the outermost protective coating system type.

Protective Coating System Date		
Item ID	B.SP.07.02	Previously ODOT Item 483
Frequency	Initial	
Format	YYYYMMDD	
Specification		
Report the most recent date the protective coating system was applied to the bridge.		
Commentary		
Do not report this item if Item B.SP.07.01 – Protective Coating System Type is coded N–None/Not Applicable or U–Unknown. For date of protective coating system unknown or not painted on the bridge, enter the date of construction.		

Deck Interaction

Item ID	B.SP.08	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

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

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

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

Commentary

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

Use code CS to indicate that the deck acts composite with the superstructure, but without the deck the superstructure requires shoring to carry its own self-weight, the weight of the deck concrete prior to curing, or both. Generally shoring details will be shown in the plans.

Use code CU to indicate that the deck acts composite with the superstructure, and that the superstructure can carry its own self-weight, plus that of the deck concrete prior to curing. Bridges in Ohio are generally constructed utilizing unshored construction.

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

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

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

Examples

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

- **Report NC**.

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

- **Report CU**.

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

- **Report CU**.

Deck Interaction - Continued		
Item ID	B.SP.08	SNBI
Examples - Continued		

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

- **Report CS**.

Cast-in-place tee-beam bridge.

- **Report IM**.

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

- **Report IM**.

Steel box girder with orthotropic deck. Deck plate acts as top flange of the box section.

- **Report IM.**

Deck Material and Type

Item ID	B.SP.09	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the deck material and type for the span configuration using one of the following codes.

Code	Description
0	None
A01	Aluminum
C01	Reinforced concrete – cast-in-place
C02	Reinforced concrete – precast
C03	Prestressed concrete – pre-tensioned
C04	Prestressed concrete – cast-in-place post-tensioned
C05	Prestressed concrete – precast post-tensioned
CX	Concrete – other
F01	FRP composite – aramid fiber
F02	FRP composite – carbon fiber
F03	FRP composite – glass fiber
FX	FRP composite – other
S01	Steel – open grid
S02	Steel – filled or partially filled grid
S03	Steel – plate
S04	Steel – orthotropic
S05	Steel – corrugated
SX	Steel – other
T01	Timber – glue laminated
T02	Timber – nail laminated
T03	Timber – solid sawn
T04	Timber – stress laminated
TX	Timber – other
X	Other

Commentary

In cases where the superstructure configuration may have a combination of deck materials and/or types, code the predominant deck material and type based on the deck area.

Use the applicable code for superstructure types with integral top flanges that serve as the deck, such as concrete tee-beams and box beams/girders.

For slabs, and for the slab portion of three-sided and four-sided concrete rigid frame bridges (less than 24" of fill) and culverts not under fill (less than 24" of fill), use the same applicable material code as used in Item B.SP.04 – Span Material.

Use code 0 for the following bridge and culvert types when under fill (greater than 24"), as these do not have a deck component: slabs, arches without spandrels, closed spandrel arches, pipes, and three-sided or four-sided rigid frames.

Use code C02, C03, or C05, as applicable, for full depth precast panels only. Use code C01 or C04, as applicable, for cast-in-place concrete on partial depth structural panels that are not just considered stay-in-place forms.

Deck Concrete Type

Item ID	B.SP.09.01 Previously ODOT Item 411
Frequency	Initial
Format	Alphanumeric Max characters: 1

Specification

Report the type of concrete comprising the deck using one of the following codes.

Code	Description
1	Class C
2	Class S superstructure
3	Class S superstructure using shrinkage compensating cement
4	Class S superstructure with Type 2 cement
5	High performance concrete superstructure, Type 3
6	High performance concrete superstructure, Type 4
7	Super-plasticized concrete
8	Pre-cast concrete (5,000 psi minimum)
0	Other
A	QC1 – Substructure concrete
B	QC2 – Superstructure concrete
C	QC3 – Project specific
D	QC2 – Concrete (4500 psi)
N	Not applicable
U	Unknown

Commentary

Report this item when B.SP.09 – Deck Material and Type is coded C01, C02, C03, C04, C05, or CX.

Codes A, B, and C are no longer ODOT standard concrete types used during construction.

This item is used to convey the type of concrete comprising the deck on the bridge.

Wearing Surface

Item ID	B.SP.10	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the predominant wearing surface material type protecting the deck or slab for the span configuration using one of the following codes.

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

Code	Description	Ohio Description
0	None	
B01	Bituminous (asphalt)	Asphalt or chip and seal
C01	Concrete – monolithic	*Monolithic concrete (concurrently placed with structural deck)
C02	Concrete – unmodified	Not used under ODOT standards
C03	Concrete – latex modified	**Latex concrete or similar additive
C04	Concrete – low slump	**Low slump concrete
C05	Concrete – fiber reinforced	**Macro-fibers (District 8)
C06	Concrete – microsilica	**Micro-silica modified concrete - overlay
C07	Concrete – polyester	Not used under ODOT standards
CX	Concrete – other	**Super-plasticized dense concrete (SDC) **Ultra-high performance concrete (UHPC)
CU	Concrete – unknown	
E01	Earth – gravel or soil	
P01	Polymer – epoxy	**Epoxy overlay
P02	Polymer – polyester	**Polyester
PX	Polymer – other	
S01	Steel	
T01	Timber – running planks	
X	Other	

* ODOT standard on all new bridge decks since 1995
** ODOT standard overlays

All concrete bridge decks should have a wearing surface coded.

Wearing Surface - Continued

Item ID	B.SP.10	SNBI

Commentary - Continued

When a span configuration has a combination of wearing surface types, code the predominant wearing surface type based on the deck or slab area.

Do not consider patching materials when coding this item.

Use code 0 when no additional sacrificial concrete thickness or wearing surface is included on the deck or slab.

Use codes C01 through CU for all overlays that are Portland cement based with admixtures.

Use code C01 when there is an additional sacrificial thickness cast concurrently with the structural deck or slab.

Use code C02 when an additional placement of concrete of the same concrete material as the deck or slab is placed after the deck or slab has cured.

Use code CU when a concrete wearing surface exists, but the specific material composition is unknown.

Use code S01 when a steel grid deck is fabricated with an additional sacrificial thickness. Code S01 is not intended for temporary steel plates.

Use code T01 where running planks or any additional planks are added on timber decks or slabs.

Examples

Bridge with 2" asphalt wearing surface over a sheet waterproofing membrane.

- **Report B01**.

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

- **Report P01**.

Bridge with asphalt roadway surface over a filled arch structure.

- **Report 0.**

Wearing Surface Description

Item ID	B.SP.10.01	Previously ODOT Item 108A.01
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the additional information regarding the type of the wearing surface on the bridge using one of the following codes.

Code	Description
1	Super-plasticized dense concrete (SDC)
2	Ultra-high performance concrete (UHPC)
3	Chip and Seal
4	Asphalt
N	Not Applicable

Commentary

This item is to provide additional information regarding the type of wearing surface when multiple wearing surface types are included in Item B.SP.10 – Wearing Surface. This item allows ODOT to track the performance of the wearing surface material type.

If none of these options apply, then code it as N – Not Applicable.

Examples

B.SP.10 – Wearing Surface is coded CX – Concrete other and the plans call out a super-plasticized dense concrete overlay (SDC).

- **Report 1**.

Wearing Surface Thickness					
Item ID	B.SP.10.02				Previously ODOT Item 423
Frequency	Initial				
Format	Numeric	Max digits:	3	Decimal places:	1

Specification

Code the total thickness of the wearing surface on the bridge to the nearest tenth of an inch. This item can be obtained from available design plans, previous load ratings, or through field measuring or field coring. Leave this item blank if not applicable.

Commentary

For decks with monolithic concrete wearing surface, code a nominal 1" thickness.

Where there are multiple layers of wearing surface materials of different types on the structure, code the total thickness of all materials including any monolithic concrete.

When the wearing surface has been replaced or an additional overlay applied, the thickness shall be updated following the placement.

Examples

Bridge with a concrete deck with a 1-1/2" thick monolithic wearing surface per the design plans.

- **Report 1.5**.

Bridge with a concrete deck with a 1-1/2" thick monolithic wearing surface per the design plans and field inspection reveals a 2" thick bituminous overlay (does not appear monolithic wearing surface depth removed).

- **Report 3.5**.

Wearing Surface Date		
Item ID	B.SP.10.03	Previously ODOT Item 422
Frequency	Initial	
Format	YYYYMMDD	
Specification		
Code the date of the most recent wearing surface application on the structure (i.e., concrete overlay, bituminous overlay, etc.).		
Commentary		
Leave this item blank if not applicable. If unknown, enter the date of construction.		

Deck Protective System

Item ID	B.SP.11	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the deck protective system for the span configuration using one of the following codes.

Code	Description
0	Deck is unprotected
A01	Admixture – internally sealed
A02	Admixture – low permeability
A03	Admixture – polymer impregnated
A04	Admixture – corrosion inhibitor
A05	Admixture – ASR inhibitor
AX	Admixture – other
C01	Coating – paint
C02	Coating – sealer
C03	Coating – methacrylate
C04	Coating – hot dip galvanizing
C05	Coating – metalizing/thermal spray
CX	Coating – other
M01	Membrane – built up
M02	Membrane – sheet
M03	Membrane – liquid applied
MU	Membrane – unknown
MX	Membrane – other
P01	Patina – uncoated weathering steel
T01	Treated – timber preservative
U	Unknown
X	Other

C02, C03, M01, and M02 are typical deck protective systems that are used bridges built to ODOT standards.

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

Commentary

Code this item consistent with the predominant material reported in Item B.SP.09 – Deck Material and Type.

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

Use code 0 when the deck is unprotected.

Use code A01 for internally sealed concrete systems that use wax beads in the concrete. After the concrete cures, it is heated to melt the wax and seal the concrete.

Use code A02 when low permeability concrete is used with admixtures such as fly ash, microsilica, or slag.

Use code A05 when admixtures are used to inhibit alkali-silica reactivity (ASR).

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

Deck Protective System - Continued

Item ID	B.SP.11	SNBI

Commentary - Continued

Do not use codes C02 and C03 when the material is applied for localized crack repair.

Use code M01 when the membrane is built up using combined layers of liquid and preformed/sheet membranes.

Use code MU when a membrane exists, but the type is unknown.

Use code MX when a membrane type is known but does not match the types specified for codes M01, M02, or M03.

Examples

Prestressed concrete multiple adjacent box beam bridge with 3" asphalt wearing surface over a sheet waterproofing membrane.

- **Report M02**.

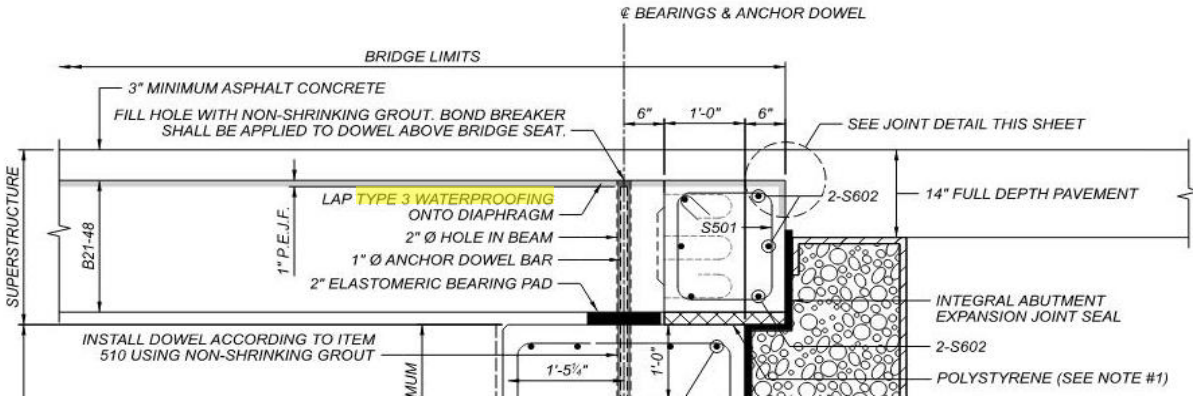

Figure 7-4 – Construction plan details of a deck protective system.

Bridge deck constructed with polymer impregnated concrete and sealed with a flood coat of methacrylate.

- **Report C03**.

Deck Reinforcing Protective System

Item ID	B.SP.12	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

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

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

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

Commentary

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

Per the ODOT Bridge Design Manual deck reinforcing protective systems options available based on the year of design or year of construction are:

Years	Code	Description
Prior to 1974	0	None
1976-1982	0	None
	C01	Coating - epoxy coated
	C02	Coating - galvanized
1982-2020	C01	Coating - epoxy coated
2020 to Present	C01	Coating - epoxy coated
	C02	Coating - galvanized
	R01	Reinforcing - stainless, solid
	R03	Reinforcing - high chromium
	R06	Reinforcing - FRP, glass fiber

Commentary - Continued
Use code 0 when steel reinforcement is unprotected, such as with black steel. Use codes C01 to CX and R01 to RX when any (e.g., top mat only) or all the reinforcing steel in the deck is protected by the selected steel type. Do not consider bar chairs or other reinforcing steel supports when coding this item. Use code S02 when impressed currents are used as the cathodic protection system.
Examples
Bridge deck constructed with black reinforcing bars, later widened with a top mat of epoxy coated bars and bottom mat of black bars. This bridge has two span data sets. • **Report 0** for the original deck data set. • **Report C01** for the widened deck data set.

Deck Stay-In-Place Forms

Item ID	B.SP.13	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the type of deck stay-in-place form for the span configuration using one of the following codes.

Code	Description
0	None
C01	Concrete – reinforced
C02	Concrete – prestressed
F01	FRP composite
M01	Metal
T01	Timber
X	Other

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

Commentary

Use this item to identify forms used in construction that remain in place by design or owner preference.

When a span configuration has a combination of stay-in-place form types, code the predominant type based on the deck area.

Use code C01 when a precast reinforced concrete panel (partial depth) is used with a cast-in-place reinforced concrete placement on top.

Use code C02 when a precast prestressed concrete panel (partial depth) is used with a cast-in-place reinforced concrete placement on top.

This item is not intended to be used for materials installed only for debris shielding, or when Item B.SP.09 – Deck Material and Type is S05 (Steel – corrugated).

Examples

Bridge constructed using 3" thick prestressed concrete form panels. Completed deck is 8" thick.

- **Report C02.**

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

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

Deck Drainage Type

Item ID	B.SP.14.01 Previously ODOT Item 409
Frequency	Initial
Format	Alphanumeric Max characters: 1

Specification

Report the type of drainage system which most nearly describes that in the span configuration using one of the following codes.

Code	Description
0	Other (natural off the bridge ends)
1	Over the side (without drip strip)
2	Opening thru curbs or wheel guards
3	Scuppers and downspouts
4	Inlets with drain pipes
5	Drainage trough under open joints
6	Over the side (with drip strip)
N	None

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

Commentary

When multiple forms of deck drainage exist, report the predominate drainage system or the system that conveys the most water off the bridge.

Joint Trough		
Item ID	B.SP.14.02	Previously ODOT Item 421
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report if an expansion joint with a trough is present using one of the following codes.

Code	Description
Y	Joint trough present
N	Joint trough not present

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

Commentary

Joint troughs are typically used with open expansion joints to collect water and direct it into the bridge drainage system. The main purpose is to protect and preserve the underlying superstructure and substructure.

If a joint trough was originally designed to be in place but is missing, code Y.

Approach Slab Type					
Item ID	B.SP.15.01				Previously ODOT Item 404
Frequency	Initial				
Format	Alphanumeric	Max digits:	1	Decimal places:	0

Specification

Report the approach slab type for the structure using one of the following codes.

Code	Description
1	Reinforced Concrete
2	Prestressed Concrete
3	None
4	Unknown

Commentary

The approach slab acts as an intermediate bridge to span the portion of embankment directly behind the abutment/backwall.

Use code 3 when approach roadway extends up the abutment/backwall or the end of the deck/slab.

Approach Slab Roadway Termination Type		
Item ID	B.SP.15.02	Previously ODOT Item 410
Frequency	Initial	
Format	Alphanumeric Max characters: 100	

Specification

Use one of the following codes to report the type of approach slab roadway termination type.

Code	Description
1	No Approach Slab
2	Type C (Sleeper slab support with backwall and armor-less expansion joint)
3	Type C - Armored (Sleeper slab support with backwall and armored expansion joint)
4	Type A - PMJ (Sleeper slab with Polymer Modified Asphalt Pavement Joint)
5	Type A - No PMJ (Sleeper slab support with joint sealer pavement joint)
6	Type B (Buried Approach Slab Under Asphalt)
7	Asphalt Pressure relief joint (Typically 4-ft. wide in Approach with Sleeper Slab)
8	Asphalt Roadway Paved to Abrupt Concrete Approach Slab (Typical until 2015)
9	2015 or newer – Unknown Termination
10	Approach Slab – Unknown Termination

Commentary

Refer to the current ODOT Standard Drawing AS-2-15 (https://www.dot.state.oh.us/SCDs/Pages/structural.aspx) for more information when selecting the appropriate approach slab roadway termination type.

Code 10 if the type of approach slab roadway termination cannot be determined visually or there are no plans available.

Culvert Type

Item ID	B.SP.16.01	Previously ODOT Item 575
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

If Item B.SP.01 – Span Configuration Designation is coded as C## Culvert, use one of the following codes to report the type of culvert.

Code	Description
1	Slab Top
2	4-Sided Box (Cast-in-Place Concrete)
3	3-Sided Frame (Cast-in-Place Concrete)
4	Pipe – Circular
5	Pipe – Arch
6	Pipe – Elliptical
7	Arch – (Multi-plate)
8	4-Sided Box (Precast Concrete)
9	3-Sided Frame (Precast Concrete)
0	Other
A	4-Sided Box (Aluminum)
B	4-Sided Box (Other)
C	3-Sided Frame (Aluminum)
D	Conspan (Concrete pre-cast)
E	Bebo-type (Concrete pre-cast)
F	Metal Arch on concrete pedestal wall

Commentary

When multiple culvert types are utilized, code the predominant culvert type that is under the highway.

If the bridge is not a culvert, leave this item blank.

Culvert Length Inlet-to-Outlet					
Item ID	B.SP.16.02				Previously ODOT Item 578
Frequency	Initial				
Format	Numeric	Max digits:	9	Decimal places:	3

Specification

Report the length of the culvert to the nearest tenth of a foot measured along the centerline of the culvert.

Measure along the culvert centerline from the inlet to the outlet. Do not include the length of any aprons that extend beyond the headwall or endwall.

Commentary

If there is a bend or curve along the length of the culvert, record the length along the bend or curve.

The length of the culvert will include all culvert types present (including any extensions).

When the length of the culvert is greater than 30.0 feet, the value for this item may be estimated from plans or drawings.

If the bridge is not a culvert, leave this item blank.

Fill Depth Over Culvert					
Item ID	B.SP.16.03				Previously ODOT Item 580
Frequency	Initial				
Format	Numeric	Max digits:	9	Decimal places:	3

Specification

Report the depth of fill over a culvert to the nearest tenth of a foot.

Commentary

The depth of fill shall be measured from the top of the structure to the top of the pavement. Do not subtract for the depth of the pavement. If the depth of fill over the structure varies, report the maximum value.

If the fill depth exceeds 99 feet, code 99.0.

This item must be coded for all filled culverts.

If the bridge is not a culvert, leave this item blank.

Rise					
Item ID	B.SP.16.04				Previously ODOT Item 587
Frequency	Initial				
Format	Numeric	Max digits:	10	Decimal places:	2
Specification					
Report the rise of the culvert to the nearest inch.					
Commentary					
The rise of a culvert refers to the maximum inside height (diameter) of the culvert. If the bridge is not a culvert, leave this item blank.					

Shape			
Item ID	B.SP.16.05		Previously ODOT Item 588
Frequency	Initial		
Format	Numeric	Max digits: 2	Decimal places: 0

Specification

Report the shape of the culvert using one of the following codes.

Code	Description
01	Circular
02	Elliptical – Horizontal
03	Elliptical – Vertical
04	Pipe Arch
05	Pipe Arch, Sect. Plate
06	Arch
07	Box Culvert
08	Slab Top Culvert
99	Other

Commentary

This item applies to corrugated steel or aluminum culverts.

The overall general shape of the culvert should be considered for this item.

7.2.2 Substructure Material and Type

The data items in the Substructure Material and Type group identify the bridge substructure and foundation material(s) and type(s). These items are considered part of the Substructure Data Set and have a many-to-one relationship with a bridge when applicable. The data for items in this section typically remain static once a bridge has been inventoried.

The following data items are included in this section:

Item ID	Data Item
B.SP.01.1	Substructure Type Selection
B.SB.01	Substructure Configuration Designation
B.SB.02	Number of Substructure Units
B.SB.03	Substructure Material
B.SB.04	Substructure Type
B.SB.05	Substructure Protective System
B.SB.06	Foundation Type
B.SB.07	Foundation Protective System
	Examples of Pile Substructures
	Example of Straddle Bent Substructure

Substructure Type Selection

Item ID	B.SB.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

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

Code	Description
A	Abutment
P	Pier or Bent
W	Widening

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

Commentary

This item captures how the reported substructure configuration is designated.

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

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

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

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

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

Substructure Configuration Designation		
Item ID	B.SB.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

The Substructure Type selected in B.SB.01.1 – Substructure Type Selection will be automatically populated starting with 01 and continuing with sequential numbering for each type selected. The first instance of each code shall be 01 for each substructure configuration.

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

Commentary

This item captures how the reported substructure configuration is designated.

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

For additional information as to what a substructure unit is see Item B.SB.01.1 – Substructure Type Selection.

Examples

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

- **Report A01.**

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

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

Single span concrete, four-sided, rigid frame culvert.

- **Report A01.**

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

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

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

- **Report P01.**

Substructure Configuration Designation - Continued		
Item ID	B.SB.01	SNBI

Examples - Continued

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

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

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

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

Number of Substructure Units					
Item ID	B.SB.02				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	3	Decimal places:	0

Specification

Report the number of substructure units.

Commentary

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

Examples

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

- **Report 2** for the abutment data set.
- **Report 1** for pier data set.

Single span concrete, four-sided, rigid frame culvert. This bridge has one substructure data set.

- **Report 2.**

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

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

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

- **Report 2.**

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

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

Number of Substructure Units - Continued		
Item ID	B.SB.02	SNBI
Examples - Continued		
Five-span girder bridge with concrete stub abutments and concrete wall piers. Bridge is widened with concrete stub abutments and concrete column piers. This bridge has three substructure data sets. • **Report 2** for the stub abutments (including the widening) data set. • **Report 4** for the concrete wall piers data set. • **Report 4** for the concrete columns data set.		

Substructure Material

Item ID	B.SB.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the principal substructure material type by using one of the following codes.

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

Code	Description
0	None
A01	Aluminum
C01	Reinforced concrete – cast-in-place
C02	Reinforced concrete – precast
C03	Prestressed concrete – pre-tensioned
C04	Prestressed concrete – cast-in-place post-tensioned
C05	Prestressed concrete – precast post-tensioned
CX	Concrete – other
E01	Earth – reinforced soil mass
F01	FRP composite – aramid fiber
F02	FRP composite – carbon fiber
F03	FRP composite – glass fiber
FX	FRP composite – other
I01	Iron – cast
I02	Iron – wrought
M01	Masonry – block
M02	Masonry – stone
P01	Plastic – Polyethylene
PX	Plastic – other
S01	Steel – rolled shapes
S02	Steel – welded shapes
S03	Steel – bolted shapes
S04	Steel – riveted shapes
S05	Steel – bolted and riveted shapes
S06	Steel – pipe
SX	Steel – other
T01	Timber – glue laminated
T02	Timber – nail laminated
T03	Timber – solid sawn
T04	Timber – stress laminated
TX	Timber – other
X	Other

Commentary

This item reflects the material which provides the support for the transfer of the superstructure load to the foundation. In cases where the substructure unit(s) may have a combination of materials, use the code for the predominant material that transfers load to the foundation.

When Item B.SB.04 – Substructure Type equals B03 (Bent – pile) report the applicable material of the cap.

When Item B.SB.04 – Substructure Type equals B04 (Bent – straddle) report the applicable material of the cap or crossgirder.

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

Substructure Material - Continued

Item ID	B.SB.03	SNBI

Commentary - Continued

Use code C04 or C05, as applicable, for prestressed concrete substructure unit(s) that utilize both pre-tensioning and post-tensioning.

Use code E01 when the superstructure rests directly on the reinforced soil mass. Code E01 is not intended to be used for MSE walls when the superstructure does not rest directly on the reinforced soil mass.

Use code M01 for masonry made from bricks or concrete blocks. Use code M02 for natural stone.

Use code S06 for filled or unfilled steel pipe piles.

Examples

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

- **Report C01**.

Reinforced concrete full height cantilever abutment.

- **Report C01.**

Pile bent pier with timber piles, timber lagging, and concrete cap.

- **Report C01.**

Pile bent pier with steel H-piles, and concrete cap.

- **Report C01.**

Pile bent pier with steel H-piles, and steel cap.

- **Report S01.**

Reinforced concrete stub abutment on steel piles with an MSE wall.

- **Report C01.**

GRS (Geosynthetic Reinforced Soil) abutment with precast, prestressed concrete box beams placed directly on the reinforced soil mass.

- **Report E01.**

Substructure Type

Item ID	B.SB.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

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

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

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

Commentary

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

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

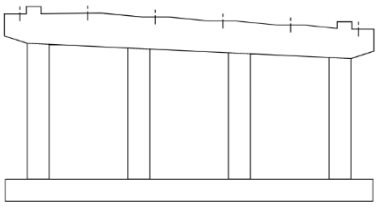

Figure 7-5: – Pier with one single foot (spread footing).

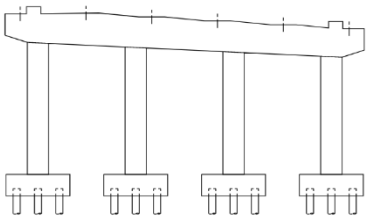

Figure 7-6: – Bent with separate footings for each column (piles with pile cap).

Substructure Type - Continued		
Item ID	B.SB.04	SNBI

Commentary - Continued

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

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

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

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

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

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

Use code P06 for piers that support moveable bridges and the equipment needed to open and close the bridge.

Use code P07 for towers of complex bridges such as cable-stayed and suspension bridges.

Substructure Type - Continued		
Item ID	B.SB.04	SNBI

Examples

Two span concrete, three-sided, rigid frame culvert under 48" of fill. This bridge has two substructure data sets.

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

Reinforced concrete stub abutment on steel plies with an MSE wall.

- **Report A02**.

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

- **Report A08**.

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

- **Report A12**.

Single-span timber beams resting on concrete grade beam.

- **Report A12**.

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

- **Report 0**.

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

- **Report B03**.

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

- **Report P01** for the pier data set.
- **Report P02** for the widened data set.

Substructure Protective System

Item ID	B.SB.05	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

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

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

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

Do not report this item when Item B.SB.04 – Substructure Type is 0.

Commentary

Code this item consistent with the predominant material reported in Item B.SB.03 – Substructure Material.

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

When Item B.SB.04 – Substructure Type equals B03 (Bent – pile) report the applicable protective system of the cap.

When Item B.SB.04 – Substructure Type equals B04 (Bent – straddle) report the applicable protective system of the cap or crossgirder.

Use code 0 when the substructure is unprotected.

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

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

Substructure Protective System - Continued		
Item ID	B.SB.05	SNBI

Commentary - Continued

Use code C01 for weathering steel that has been painted.

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

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

Use code P01 only for weathering grades of steel.

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

Code 0 – None when the encasement E01 or EX protective system is no longer effectively providing protection to the substructure item (i.e. the encasement no longer extends below the mudline and the original pile is exposed).

Examples

Painted weathering steel pier cap.

- **Report C01**.

Pile bent with preservative treated timber piles and concrete cap sealed with siloxane.

- **Report C02**.

Pile bent type abutment with painted steel H-pile foundation, timber lagging, and reinforced concrete cap with active cathodic protection.

- **Report S02.**

Foundation Type

Item ID	B.SB.06	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the foundation type using one of the following codes.

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

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

Commentary

When available, utilize existing plans and field investigation to determine each foundation type.

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

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

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

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

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

Foundation Type - Continued

Item ID	B.SB.06	SNBI

Commentary - Continued

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

Use code P02 for steel pipe, driven corrugated, fluted, or spiral-welded shell-cased piles that are filled with unreinforced concrete or unfilled.

Use code P02 for steel pipe piles when the concrete fill is unknown if the concrete is reinforced or unreinforced.

Use code P03 for steel pipe, driven corrugated, fluted or spiral-welded shell-cased concrete piles with reinforcement in the concrete fill.

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

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

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

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

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

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

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

Examples

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

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

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

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

Foundation Type - Continued

Item ID	B.SB.06	SNBI

Examples - Continued

Closed spandrel arch founded on spread footings on bedrock.

- **Report F02**.

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

- **Report P01**.

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

- **Report P01**.

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

- **Report P01**.

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

- **Report P05**.

GRS (Geosynthetic Reinforced Soil) abutment with precast, prestressed concrete box beams placed directly on the reinforced soil mass.

- **Report E01**.

Four corrugated steel circular pipes placed on crushed stone bedding.

- **Do not report this item.**

Foundation Protective System

Item ID	B.SB.07	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

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

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

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

Commentary

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

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

Use code 0 when the foundation is unprotected.

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

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

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

Use code E01 for steel piles of pile bents that are encased in concrete or corrugated plastic regardless of the steel coating.

When Item B.SB.06 – Foundation Type equals P04 (pile – concrete, cast-in-place) and a steel encasement is present on the reinforced concrete pile use code EX.

Foundation Protective System - Continued		
Item ID	B.SB.07	SNBI

Commentary - Continued

Use code P01 only for weathering grades of steel.

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

Examples

Closed spandrel arch founded on spread footings on bedrock.

- **Report 0.**

Pile bent abutment with timber piles treated with creosote, timber lagging, and concrete cap.

- **Report T01.**

Pile bent with painted steel H-piles and rolled steel cap.

- **Report C01.**

GRS (Geosynthetic Reinforced Soil) abutment with precast, prestressed concrete box beams placed directly on the reinforced soil mass.

- **Report 0.**

Three-sided concrete frame culvert with a spread footing keyed into bedrock, modified by adding a four-sided box culvert placed on crushed stone bedding to the end of the barrel to widen the bridge. The four-sided box was constructed with high performance concrete that provides for low permeability.

- **Report 0** for the three-sided concrete frame culvert set.
- **Report A02** for the four-sided box culvert data set.

Precast, reinforced concrete arch bridge constructed on cast-in-place concrete footing with unpainted steel H-pile foundation.

- **Report 0.**

Examples of Pile Substructure

Examples

Bridge with steel H-piles and corrugated plastic encasement with a reinforced concrete cap for the pier substructure units.

Figure 7-7: H-pile with reinforced concrete cap example.

Report:

SNBI Item	Code	
B.SB.03 – Substructure Material	C01	Reinforced concrete – cast-in-place
B.SB.04 – Substructure Type	B03	Bent - pile
B.SB.05 – Substructure Protective System	C02	Coating - sealer
B.SB.06 – Foundation Type	P01	Pile – steel H-shape
B.SB.07 – Foundation Protective System	E01	Encasement – concrete

Bridge with weathering steel H-piles and a reinforced concrete pier cap for the pier substructure units.

Figure 7-8: H-pile with reinforced concrete cap example.

Report:

SNBI Item	Code	
B.SB.03 – Substructure Material	C01	Reinforced concrete – cast-in-place
B.SB.04 – Substructure Type	B03	Bent - pile
B.SB.05 – Substructure Protective System	0	None
B.SB.06 – Foundation Type	P01	Pile – steel H-shape
B.SB.07 – Foundation Protective System	P01	Patina – uncoated weathering steel

Examples of Pile Substructure - Continued

Examples - Continued

Bridge with steel spiral-welded piles filled with reinforced concrete (found in plans) and a reinforced concrete cap for the pier substructure units.

Figure 7-9: Steel spiral-welded piles with a reinforced concrete cap.

Report:

SNBI Item	Code	
B.SB.03 – Substructure Material	C01	Reinforced concrete – cast-in-place
B.SB.04 – Substructure Type	B03	Bent - pile
B.SB.05 – Substructure Protective System	C02	Coating - sealer
B.SB.06 – Foundation Type	P03	Pile – concrete, cast-in-place
B.SB.07 – Foundation Protective System	Ex	Encasement – other

Bridge with steel fluted piles filled with unreinforced concrete and a reinforced concrete pier cap for the pier substructure units.

Figure 7-10: Steel fluted pile filled with unreinforced concrete and a reinforced concrete cap.

Report:

SNBI Item	Code	
B.SB.03 – Substructure Material	C01	Reinforced concrete – cast-in-place
B.SB.04 – Substructure Type	B03	Bent - pile
B.SB.05 – Substructure Protective System	0	None
B.SB.06 – Foundation Type	P02	Pile – steel pipe
B.SB.07 – Foundation Protective System	C01	Coating - paint

Example of Straddle Bent Substructure

Examples - Continued

A bridge contains two column reinforced concrete piers with a reinforced concrete cap on drilled shafts, and a steel straddle bent with reinforced concrete columns on multiple drilled shafts.

Figure 7-11: Steel straddle bent supported by reinforced concrete columns.

Report for the straddle bent:

SNBI Item	Code	
B.SB.03 – Substructure Material	S02	Steel – welded shapes
B.SB.04 – Substructure Type	P05	Pier – straddle or c-shaped
B.SB.05 – Substructure Protective System	C01	Coating - paint
B.SB.06 – Foundation Type	S02	Drilled shafts – multiple
B.SB.07 – Foundation Protective System	0	None

Report for the concrete piers:

SNBI Item	Code	
B.SB.03 – Substructure Material	C01	Reinforced concrete – cast-in-place
B.SB.04 – Substructure Type	B01	Bent – column or open
B.SB.05 – Substructure Protective System	C02	Coating - sealer
B.SB.06 – Foundation Type	S01	Drilled shaft - single
B.SB.07 – Foundation Protective System	0	None

7.2.3 Roadside Hardware

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

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

Item ID	Data Item
B.RH.01.01	Bridge Railing Material
B.RH.01.02	Bridge Railing Type
B.RH.01.03	Bridge Railing Measured Height
B.RH.01	Bridge Railings
B.RH.01.04	Fence
B.RH.01.05	Fence Height on Bridge
B.RH.02.01	Bridge Terminal/ BTA Type
B.RH.02	Transitions

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

Table 7-1 contains the applicable crash testing codes used for all the roadside hardware items in this section for reference. The applicable code may be based on an approved analytical equivalency evaluation.

Refer to the FHWA Office of Highway Safety website for policy and guidance on roadside hardware https://highways.dot.gov/safety/rwd/reduce-crash-severity.

Also, refer to the Task Force 13 – Hardware Guide website for roadside hardware, system specifications, and individual component details.

Additional information and guidance can be found within AssetWise Documentation under the Help menu in the file “Bridge Railing and BTA Guide” which provides information regarding the various standard railing types that have been utilized in Ohio.

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

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

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

Table 7-1: Roadside hardware codes (for reference).

Note that YY, for codes in Table 7-1, represents the last two digits of the year for the crash testing publication, AASHTO Specifications, or agency approved standards.

Bridge Railing Material		
Item ID	B.RH.01.01	ODOT
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

Report the bridge railing material using one of the following codes.

Code	Description
1	Concrete
2	Steel
3	Wood
4	Masonry
5	Other (non-Ohio standard railing with testing level)
6	Other (railing is present but without test level)
7	None (railing required but not present)
8	Not applicable (railing is not required)
9	Other (pedestrian railings)

When multiple material types exist report the material type associated with the lowest crash test rating level.

Commentary

This item addresses all types and shapes of bridge railings (parapets, median barriers, or structure mounted) located on the bridge or that cross over buried structures.

Do not consider pedestrian railings when coding this item, except to the extent that the pedestrian railing is integral to the traffic barrier.

Use Code 5 or 6 for railing types that are not standards in Ohio but may have a standard in another state or jurisdiction.

Use Code 8 when the edge of the bridge or culvert is outside the limits of the clear zone.

When a bridge railing and median are present and constructed of different materials, report the railing with the lowest crash test rating level.

Additional information and guidance can be found within AssetWise Documentation under the Help menu in the file “Bridge Railing and BTA Guide” which provides information regarding the various standard railing types that have been utilized in Ohio.

Examples

Three-sided concrete frame culvert under 48" of fill with the headwall and endwall located outside the clear zone.

- **Report 8.**

42" single slope concrete bridge railing.

- **Report 1.**

Bridge Railing Material - Continued		
Item ID	B.RH.01.01	ODOT
Examples - Continued		

Concrete post and rail with a metal handrail along top edge. Per design plans the railing is per California Department of Transportation Concrete Barrier Type 80SW with a MASH TL-2 rating.

- **Report 5**

Figure 7-12: Concrete post and rail with metal handrail along top edge.

Concrete railing with twin steel tube railing on top.

- **Report 1.**

Figure 7-13: Concrete railing with twin steel tube railing.

Bridge Railing Material - Continued		
Item ID	B.RH.01.01	ODOT
Examples - Continued		

Concrete post with steel railing based on the retired ODOT standard drawing 304J_1919.

- **Report 1.**

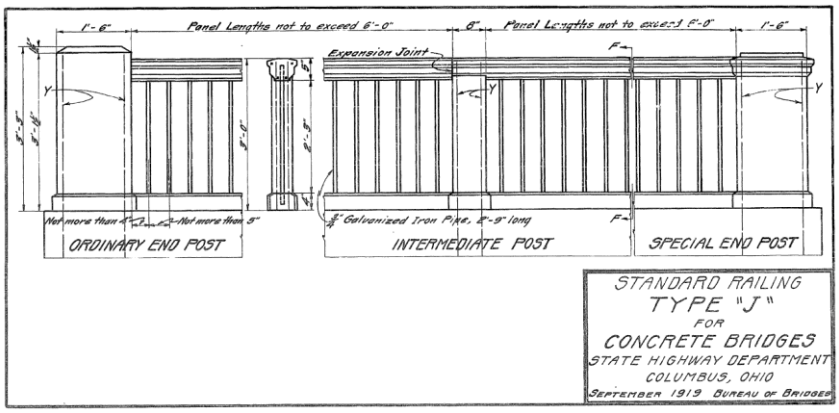

Figure 7-14: Concrete end and intermediate post with steel railing.

Bridge Railing Type		
Item ID	B.RH.01.02	ODOT
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

Report the bridge railing type of the railing coded in B.RH.01.01 Bridge Railing Material using one of the following codes.

B.RH.01.01 – Bridge Railing Material coded as **1 - Concrete**

Code	Description
01	36" single slope concrete railing
02	42" single slope concrete railing
03	57" reinforced single slope concrete median railing
04	57" unreinforced single slope concrete median
05	Concrete parapet with aluminum rail, or no rail
06	Concrete parapet with steel tubular rail
07	Concrete post with concrete panel or parapet wall
08	Concrete post with steel panel
09	Concrete post with wood panel
10	GM deflector type 32" (GM barrier prior to 1979)
11	NJ deflector type 32" (replaced GM barrier in 1979)
12	NJ deflector type 36"
13	NJ deflector type 42"
14	NJ deflector type 50"
15	Portable concrete barrier (fully anchored)
16	Portable concrete barrier (unanchored)
29	Other railing
30	Not applicable
43	Railing meets other test criteria
45	Wall parapet

B.RH.01.01 – Bridge Railing Material coded as **2 - Steel**

Code	Description
17	Deep beam retrofit railing
18	Deep beam railing (single or double), no tubular backup
19	Deep beam railing (single) with tubular backup
20	Thrie beam railing
21	Thrie beam retrofit railing
22	Twin steel tube railing
23	Three steel tube railing
24	Long span guardrail across culvert (nested or tubes)
25	Steel post railing with steel rail
26	Steel post with wooden railing
30	Not applicable
43	Railing meets other test criteria

Bridge Railing Type - Continued

Item ID	B.RH.01.02	ODOT

Specification - Continued

B.RH.01.01 – Bridge Railing Material coded as **3 - Wood**

Code	Description
27	Wooden post and wooden railing
43	Railing meets other test criteria

B.RH.01.01 – Bridge Railing Material coded as **4 - Masonry**

Code	Description
28	Masonry railing
43	Railing meets other test criteria

B.RH.01.01 – Bridge Railing Material coded as **5 - Other (non-Ohio w/TL)**

Code	Description
29	Other railing
31	Other railing meets AASHTO TL1
32	Other railing meets AASHTO TL2
33	Other railing meets AASHTO TL3
34	Other railing meets AASHTO TL4
35	Other railing meets AASHTO TL5
36	Other railing meets AASHTO TL6
37	Other railing meets NCHRP 350 TL1
38	Other railing meets NCHRP 350 TL2
39	Other railing meets NCHRP 350 TL3
40	Other railing meets NCHRP 350 TL4
41	Other railing meets NCHRP 350 TL5
42	Other railing meets NCHRP 350 TL6
43	Railing meets other test criteria

B.RH.01.01 – Bridge Railing Material coded as **6 - Other (w/out TL)**

Code	Description
29	Other railing
43	Railing meets other test criteria

B.RH.01.01 – Bridge Railing Material coded as **7 – None (railing required but not present)**

Code	Description
27	Wooden post and wooden railing
43	Railing meets other test criteria

Bridge Railing Type - Continued

Item ID	B.RH.01.02	ODOT

Specification - Continued

B.RH.01.01 – Bridge Railing Material coded as **8 – Not applicable (railing not required)**

Code	Description
30	Not applicable

B.RH.01.01 – Bridge Railing Material coded as **9 – Other (pedestrian railing)**

Code	Description
44	Pedestrian handrails and fence

Commentary

This item addresses all types and shapes of bridge railings (parapets, median barriers, or structure mounted) located on the bridge or that cross over buried structures.

Do not consider pedestrian railings when coding this item, except to the extent that the pedestrian railing is integral to the traffic barrier.

Use Code 30 when the edge of the bridge or culvert is outside the limits of the clear zone.

When the bridge railing meets the standards from another jurisdiction and meets a crash test standard, use the appropriate code based on the crash test level from Codes 31 to 42.

When a bridge railing and median are present and constructed of different materials, report the primary bridge railing material type.

Additional information and guidance can be found within AssetWise Documentation under the Help menu in the file “Bridge Railing and BTA Guide” which provides information regarding the various standard railing types that have been utilized in Ohio.

Examples

Three-sided concrete frame culvert under 48" of fill with the headwall and endwall located outside the clear zone.

- **Report 30.**

42" single slope concrete bridge railing.

- **Report 02.**

Bridge Railing Type - Continued		
Item ID	B.RH.01.02	ODOT
Examples - Continued		

Concrete post and rail with a metal handrail along top edge. Per design plans the railing is per California Department of Transportation Concrete Barrier Type 80SW with a MASH TL-2 rating.

- **Report 32.**

Figure 7-15: Concrete post and rail with metal handrail along top edge.

Concrete railing with twin steel tube railing on top.

- **Report 06.**

Figure 7-16: Concrete railing with twin steel tube railing.

Bridge Railing Type - Continued		
Item ID	B.RH.01.02	ODOT
Examples - Continued		

Concrete post with steel railing based on the retired ODOT standard drawing 304J_1919.

- **Report 08.**

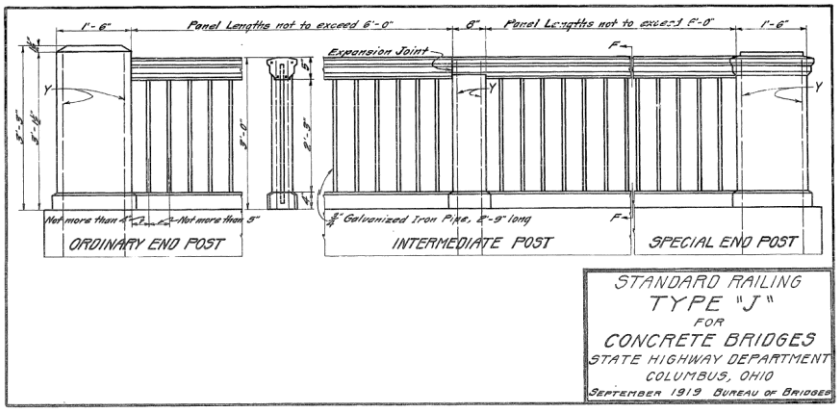

Figure 7-17: Concrete end and intermediate post with steel railing.

Bridge Railing Measured Height					
Item ID	B.RH.01.03				ODOT
Frequency	Initial				
Format	Numeric	Max digits:	4	Decimal places:	2

Specification

Report the principal bridge railing height to the nearest inch above the wearing surface on the bridge.

The bridge railing height shall correspond to the bridge railing material and type coded in B.RH.01.01 – Bridge Railing Material and B.RH.01.02 – Bridge Railing Type.

Commentary

When wearing surface overlays have been installed, field measure the railing height and updated value as needed.

For sloped barriers, measure the vertical distance the barrier extends above the deck.

For post and rail type barriers, measure the vertical distance to the edge of the topmost rail.

Examples

Single sloped 42" barrier based on Standard Drawing SBR-1-20.

- **Report 42.00.**

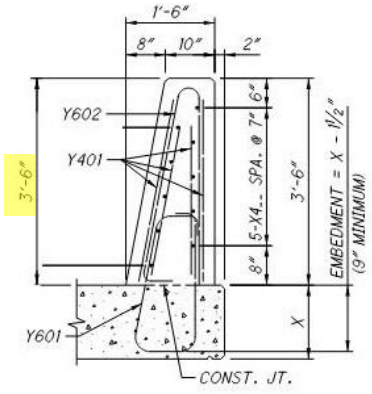

Figure 7-18: ODOT standard single sloped reinforced concrete barrier.

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Bridge Railing Measured Height - Continued		
Item ID	B.RH.01.03	ODOT
Examples - Continued		

Thrie beam retrofit railing based on Standard Drawing TBR 1-11.

- **Report 35.50.**

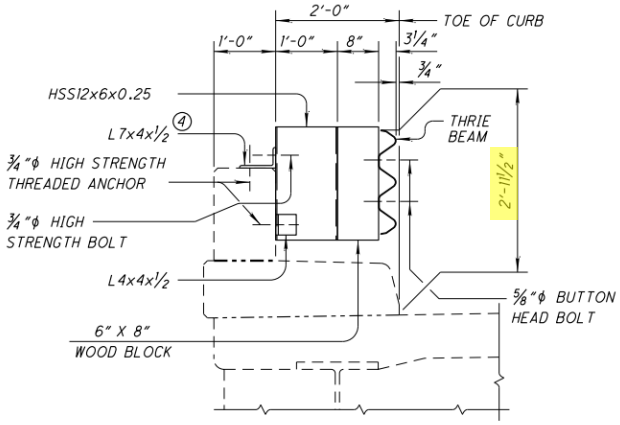


Figure 7-19: ODOT Thrie beam retrofit railing.

Concrete post and rail with a metal handrail along top edge. Per design plans the railing is per California Department of Transportation Concrete Barrier Type 80SW with a MASH TL-2 rating. Top of sidewalk to top of concrete medal rail is 36".

- **Report 36.00.**

Figure 7-20: Concrete post and rail with metal handrail along top edge.

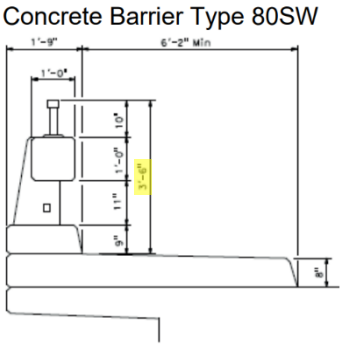


Figure 7-21: Railing details.

Bridge Railings		
Item ID	B.RH.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max digits: 4	
Specification		
This item will be calculated based on the inputted values of B.RH.01.01 – Bridge Railing Material, B.RH.01.02 – Bridge Railing Type, and B.RH.01.03 – Bridge Railing Height. The calculated value will correspond to the crash-test level of the bridge railings using one of the codes in Table 7-1.		

Fence		
Item ID	B.RH.01.04	Previously ODOT Item 431
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether a fence is present on the bridge by using one of the following codes.

Code	Description
Y	Fence is on the bridge
N	Fence is not on the bridge

Commentary

Code Y if the ODOT Standard VPF-1-24 Vandal Protection Fencing exists at the structure.

Code Y for any non-standard fence types that exist at the structure.

Code Y if a fence is present on the bridge and does not extend the full length of the bridge (i.e. over a railroad).

Fence Height on Bridge					
Item ID	B.RH.01.05				Previously ODOT Item 432
Frequency	Initial				
Format	Numeric	Max digits:	3	Decimal places:	1

Specification

Report the average height, to the nearest tenth of a foot, of the fencing material at the bridge from the point of anchorage to the top of the fence.

Do not report if B.RH.03 – Fence is coded N.

Commentary

When multiple fence types exist on the bridge report the highest fence present on the bridge.

Examples

The ODOT Standard VPF-1-24 is 9'-11 7/8" high from the base plate to the top of the rail.

- **Report 10.0**.

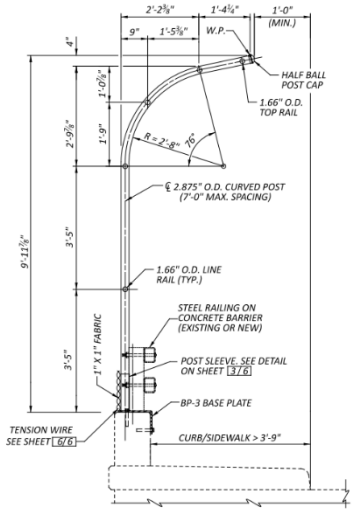


Figure 7-22: ODOT standard drawing VPF-1-24.

Bridge Terminal/ BTA Type		
Item ID	B.RH.02.01	ODOT
Frequency	Initial	
Format	Alphanumeric Max digits: 5	

Specification

Report the transition railing type using one of the following codes.

Code	Description
BTA-01	MGS Type 1 (MASH TL3) (13 posts)
BTA-02	MGS Type 2 (State Standard, no TL data)
BTA-03	MGS Type 3 TST-2 (MASH TL3) (10 posts)
BTA-04	Type 1 retrofit (MASH TL3) (3 posts)
BTA-05	Type 3 (NCHRP-350 TL3) (9 posts)
BTA-06	Type 4 or Type B (NCHRP-350) (10 posts)
BTA-07	Type 3 (NCHRP-350) (6 posts)
BTA-08	Type 3 (NCHRP-230 TL3) (4 posts)
BTA-09	Type 1 (NCHRP-350 TL3) (5 posts)
BTA-10	Type 3 (NCHRP-230 TL3) (3 posts)
BTA-11	Non-standard BTA (no TL data)
12	None (BTA required but not installed)
13	Other BTA meets AASHTO TL1
14	Other BTA meets AASHTO TL2
15	Other BTA meets AASHTO TL3
16	Other BTA meets AASHTO TL4
17	Other BTA meets AASHTO TL5
18	Other BTA meets AASHTO TL6
19	Other BTA meets NCHRP 350 TL1
20	Other BTA meets NCHRP 350 TL2
21	Other BTA meets NCHRP 350 TL3
22	Other BTA meets NCHRP 350 TL4
23	Other BTA meets NCHRP 350 TL5
24	Other BTA meets NCHRP 350 TL6
25	Other BTA meets NCHRP 230 TL1
26	Other BTA meets NCHRP 230 TL2
27	Other BTA meets NCHRP 230 TL3
28	Other BTA meets NCHRP 239 TL1
29	Other BTA meets NCHRP 239 TL2
30	Other BTA meets NCHRP 239 TL3
31	Other BTA meets AASHTO Standard Specifications TL1
32	Other BTA meets AASHTO Standard Specifications TL2
33	Other BTA meets AASHTO Standard Specifications TL3
34	Other (BTA without TL)
35	Not applicable (BTA is not required)
36	Blank
37	Other (BTA meets other test criteria)

Bridge Terminal/ BTA Type - Continued		
Item ID	B.RH.02.01	SNBI

Commentary

This roadside hardware serves as the transition from the roadside approach railing to the bridge railing and is firmly attached and anchored to the bridge railing to provide sufficient tension in the transition rail upon impact.

If multiple transitions are present code the transition with the lowest crash test level.

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

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

Additional information and guidance can be found within AssetWise Documentation under the Help menu in the file “Bridge Railing and BTA Guide” which provides information regarding the various standard railing types that have been utilized in Ohio.

Examples

Three-sided concrete frame culvert under 48" of fill with the headwall and endwall located outside the clear zone.

- **Report 35.**

Steel corrugated pipe culvert with a long span guardrail across the culvert.

- **Report 35.**

Transitions		
Item ID	B.RH.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max digits: 4	
Specification		
This item will be calculated based on the inputted values of B.RH.02.01 – Bridge Terminal/ BTA Type. The calculated value will correspond to the crash-test level of the bridge transition using one of the codes in Table 7-1.		

7.3 Bridge Geometry

7.3.1 Geometry

The data items in this section provide geometric data for bridges and are considered part of the Primary Data Set. These data items have a one-to-one relationship with a bridge.

The data for these items typically remain static once a bridge has been inventoried.

The following data items are included in this section:

Item ID	Data Item	Item ID	Data Item
B.G.01	NBIS Bridge Length	B.G.09	Approach Roadway Width
B.G.02	Total Bridge Length	B.G.10	Bridge Median
B.G.03	Maximum Span Length	B.G.11	Skew
B.G.04	Minimum Span Length	B.G.12	Curved Bridge
B.G.05	Bridge Width Out-to-Out	B.G.13	Maximum Bridge Height
B.G.06	Bridge Width Curb-to-Curb	B.G.14	Sidehill Bridge
B.G.07	Left Curb or Sidewalk Width	B.G.15	Irregular Deck Area
B.G.08	Right Curb or Sidewalk Width	B.G.16	Calculated Deck Area

The reported dimensional values for the items in this section can be obtained from either plans or field measurement, excluding B.G.01 – NBIS Bridge Length, which is field measured when required by the item specification.

NBIS Bridge Length					
Item ID	B.G.01				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 7		Decimal places: 1	

Specification

Report the bridge length to the nearest tenth of a foot measured along the roadway centerline.

Measure along the roadway centerline between undercopings of abutments or spring lines of arches.

For filled or closed spandrel arches, measure along the roadway centerline from inside faces of exterior spring lines.

For other bridges under fill, measure along the roadway centerline from inside faces of exterior walls; this includes multiple pipes, where the clear distance between openings is less than half if the smaller contiguous opening.

Vaulted abutments and enclosed spans or sections are included in the bridge length.

Commentary

The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The length for curved structures would be measured along the curved centerline.

When Item B.G.02 – Total Bridge Length is less than 30.0 feet, the value must be field verified. For structures 30.0 feet or greater, the value may be estimated from plans, drawings, or field observations.

Refer to the bridge definitions in the introduction of this section for additional information.

The figure below depicts the difference between overall bridge length and the NBIS bridge length reported to FHWA.

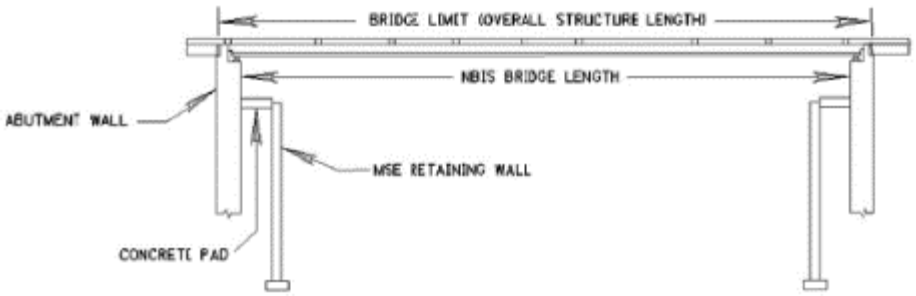


Figure 7-23: Typical bridge elevation depicting overall bridge length and NBIS bridge length.

NBIS Bridge Length - Continued

Item ID	B.G.01	SNBI

Examples

Report A.

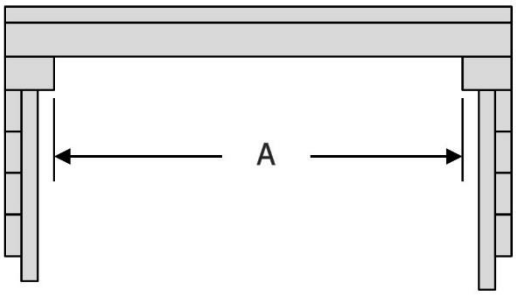


Figure 7-24: Profile view of a single span bridge with pile bent abutments.

Report A.

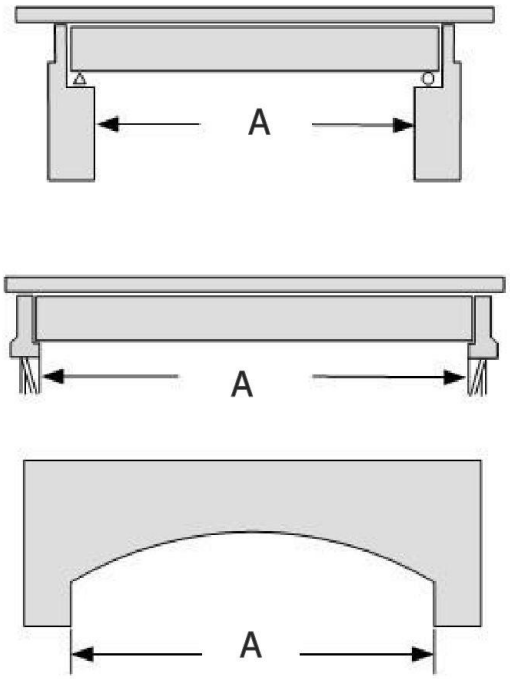


Figure 7-25: Profile views of various single span bridges.

Report A.

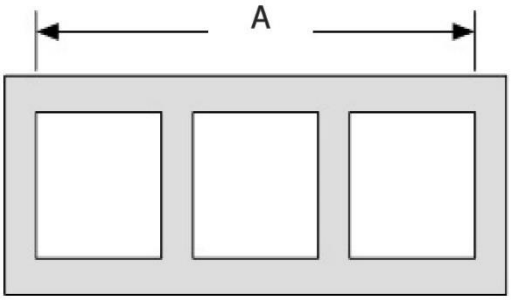


Figure 7-26: Profile view of a four-sided, multi-cell culvert under fill.

Report A.

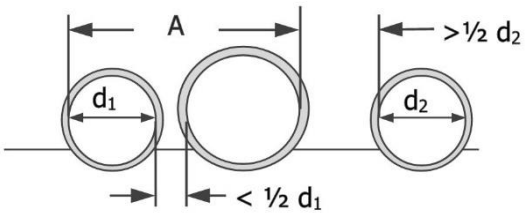


Figure 7-27: Profile view of a multi-pipe culvert under fill.

NBIS Bridge Length - Continued		
Item ID	B.G.01	SNBI

Examples - Continued

Skewed multi-pipe bridge under highway has an opening of 20.85 ft measured along the center of the roadway.

- **Report 20.9**.

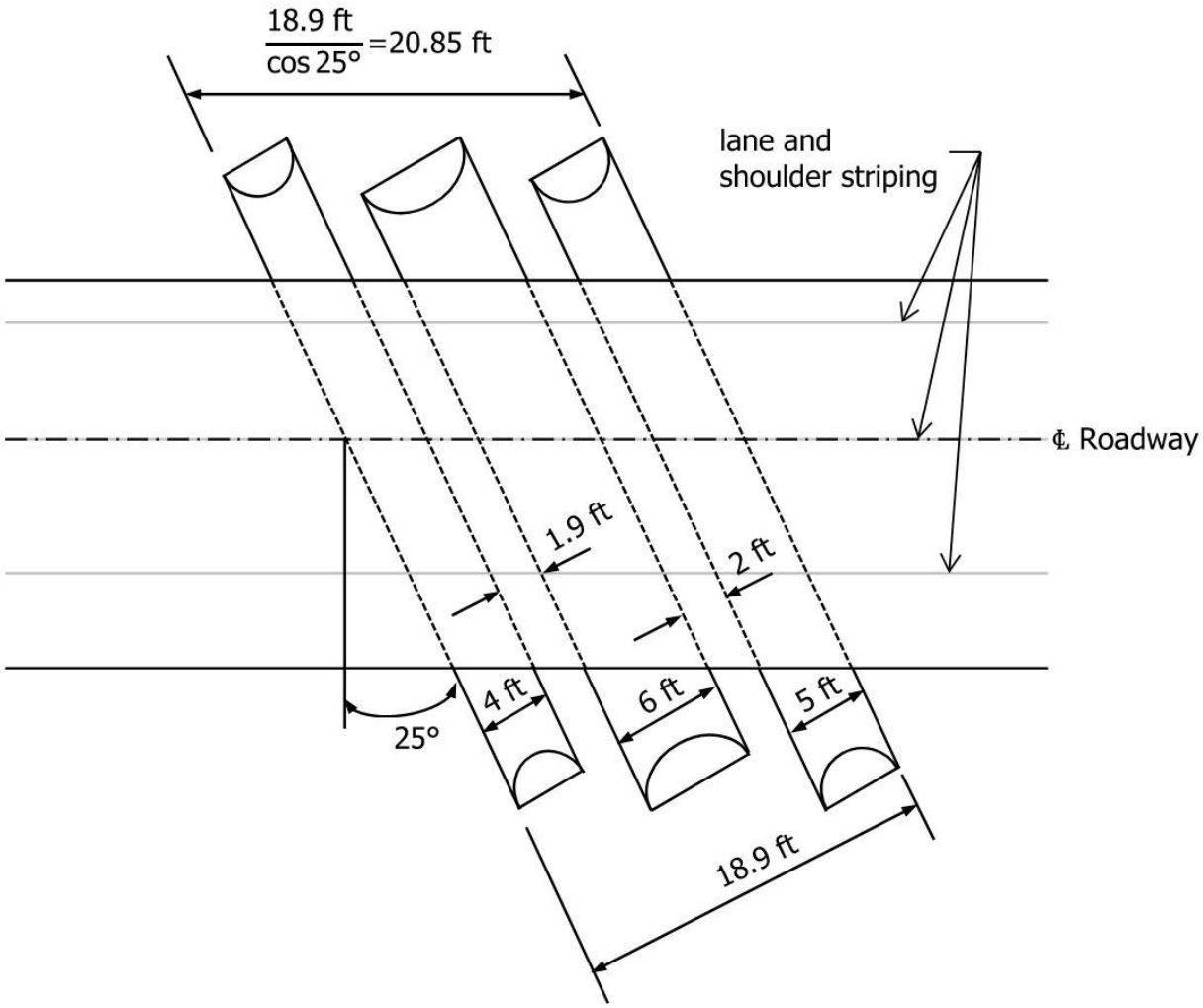


Figure 7-28: Plan view of a skewed, multi-pipe culvert under fill.

Total Bridge Length					
Item ID	B.G.02				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 7		Decimal places: 1	

Specification

Report the total length of the bridge to the nearest tenth of a foot measured along the roadway centerline.

Measure along the roadway centerline from back-to-back of backwalls or from paving notch to paving notch at abutments.

For filled or closed spandrel arches, measure along the roadway centerline from inside faces of exterior spring lines when well-defined backwalls or paving notches do not exist.

For other bridges under fill, measure along the roadway centerline from inside faces of exterior walls.

For bridges with vaulted abutments and enclosed spans or sections, measure from back-to-back of backwalls or from paving notch to paving notch inclusive of the vaulted abutments and enclosed spans.

Commentary

The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The total bridge length for curved bridges is measured along the curved centerline.

When taking the measurements from the plans, the Bridge Limits may be used.

When the paving notch at the abutment, back of backwall, or end joints are paved over and not visible, estimate the total bridge length based on available plans, indications in the barriers, or edge of deck as to the location of the end of the bridge.

Total Bridge Length - Continued

Item ID	B.G.02	SNBI

Examples

Report A.

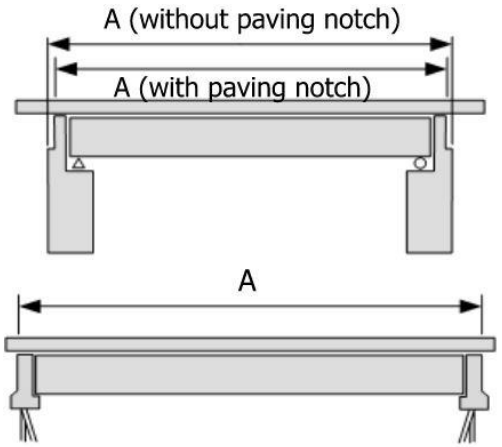


Figure 7-29: Profile views of various single span bridges.

Report A.

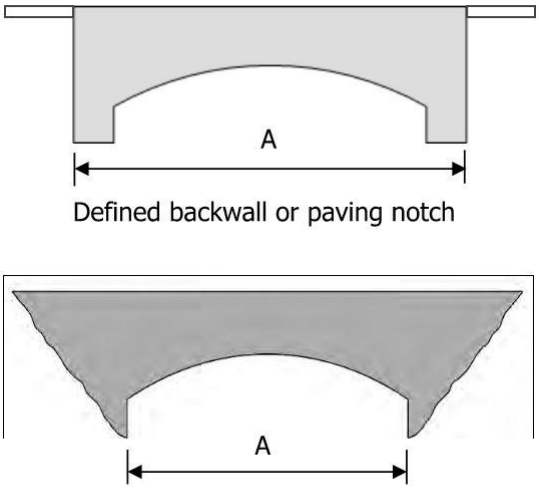


Figure 7-30: Profile views of various spandrel arches.

Report A.

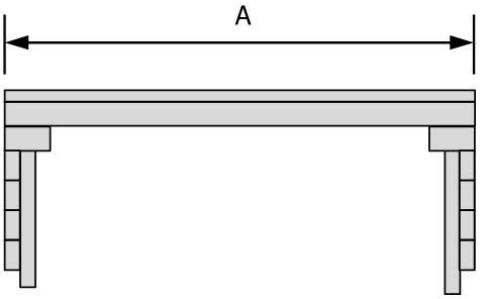


Figure 7-31: Profile view of a single span bridge with pile bent abutments.

Total Bridge Length - Continued

Item ID	B.G.02	SNBI

Examples - Continued

Report A.

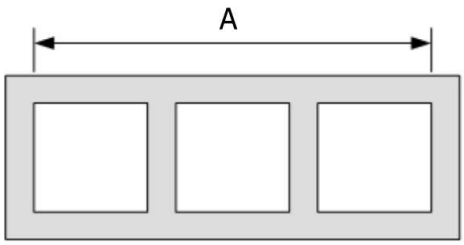


Figure 33: Profile view of a four-sided, multi-cell culvert under fill.

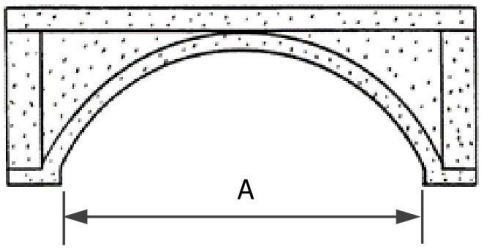


Figure 7-32: Profile view of a culvert under fill.

Report A.

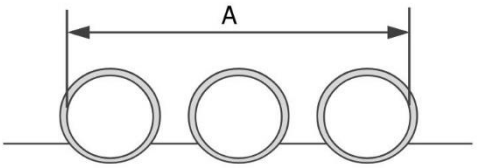


Figure 7-34: Profile view of a multi-pipe culvert under fill.

Four span bridge with variable skews. Total bridge length is measured along the roadway centerline from back-to-back of backwalls at abutments.

- **Report 477.6**.

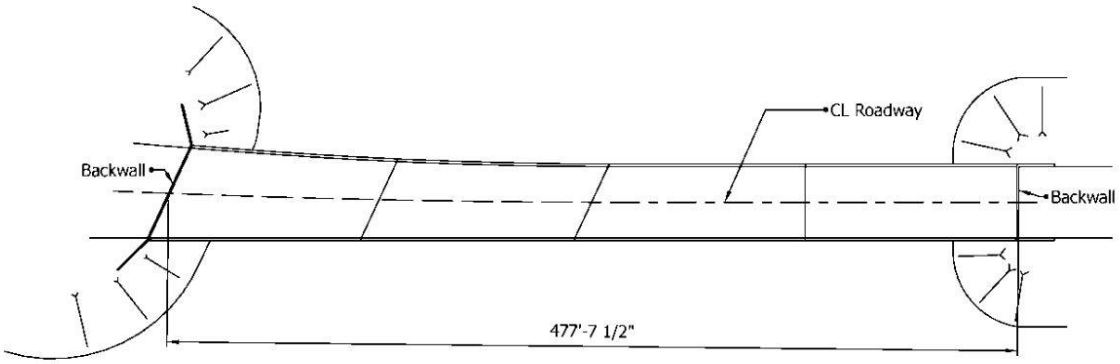


Figure 7-35: Plan view of a four-span bridge with variable skews.

Total Bridge Length - Continued

Item ID	B.G.02	SNBI

Examples - Continued

Three span curved bridge. Total bridge length is measured along the roadway centerline from back-to-back of backwalls at abutments.

- **Report 504.0**.

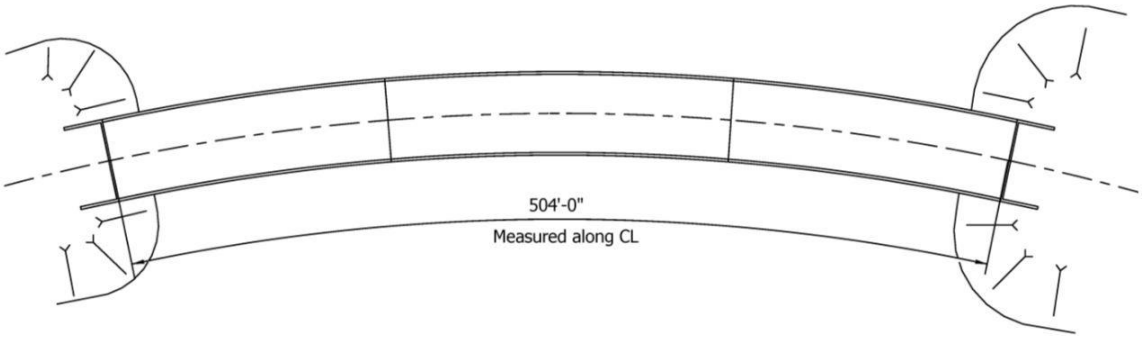


Figure 7-36: Plan view of a three-span curved bridge.

Skewed pipe bridge under a highway has an opening of 20.85 ft measured along the roadway centerline.

- **Report 20.9**.

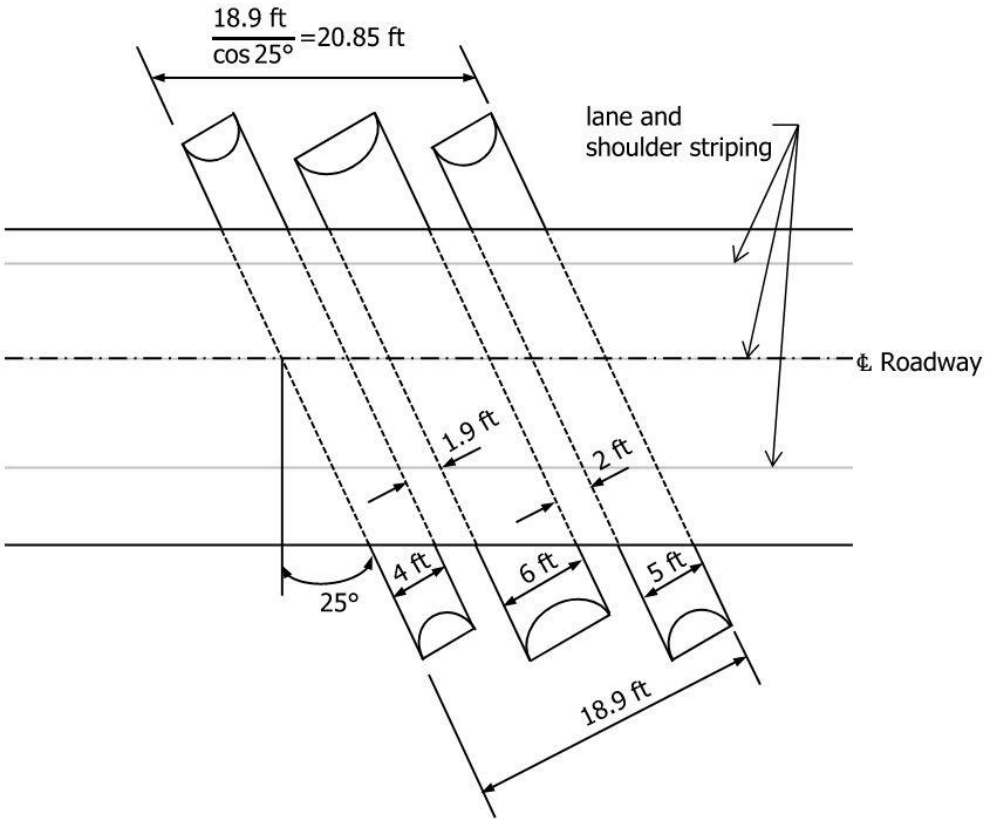


Figure 7-37: Plan view of a skewed, multi-pipe culvert under fill.

Maximum Span Length					
Item ID	B.G.03				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	5	Decimal places:	1

Specification

Report the length of the maximum span to the nearest tenth of a foot, measured from centerline of bearing to centerline of bearing, along the roadway centerline.

Commentary

For rigid frames, arches, pipes, integral abutments, or similar type bridges where there is not a clear centerline of bearings, use the clear open distance between piers, bents, walls, or abutments.

The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The length for curved bridges would be measured along the curved centerline.

For bridges with single spans or bridges of equal span lengths, this item has the same value as B.G.04 – Minimum Span Length.

Examples

Report A.

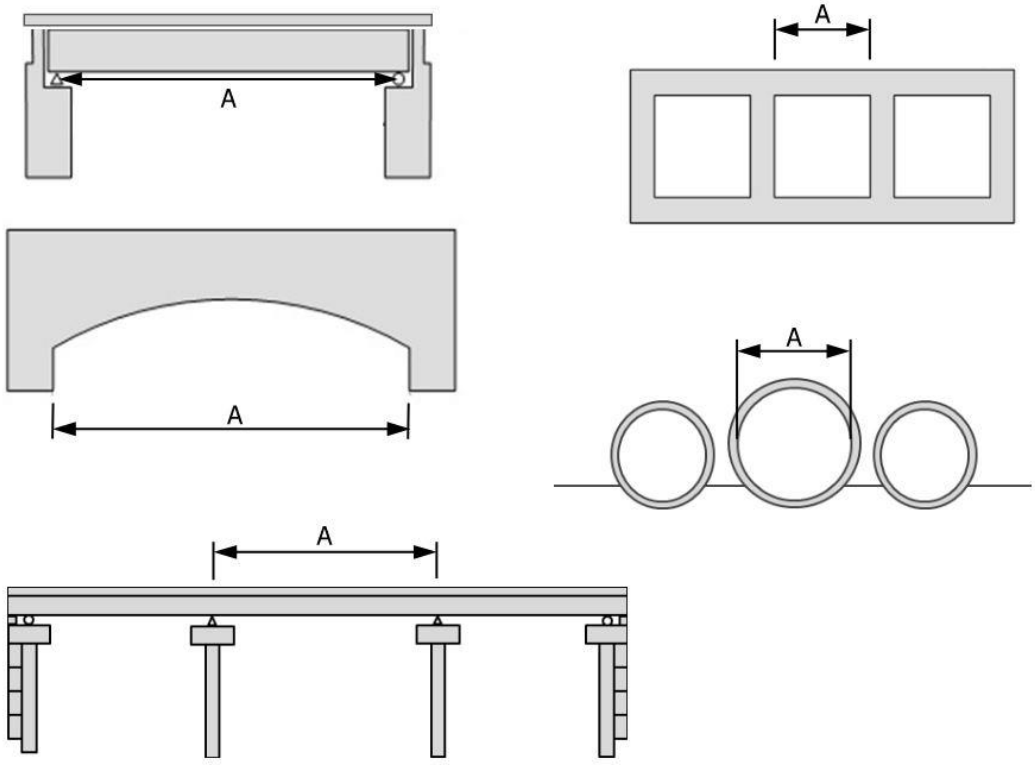


Figure 7-38: Profile views of various bridge types.

Maximum Span Length - Continued

Item ID	B.G.03	SNBI

Examples - Continued

Four span bridge with variable skews. Span lengths are measured from centerline of bearing to centerline of bearing along the roadway centerline.

- **Report 120.1**.

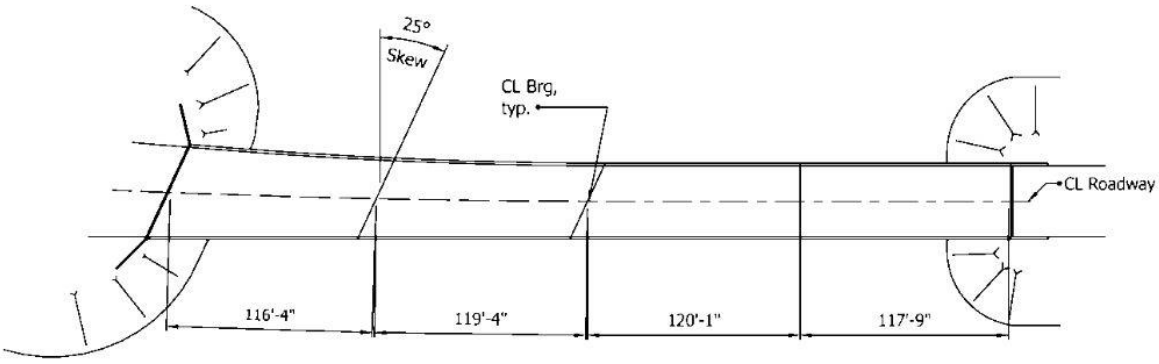


Figure 7-39: Plan view of a four-span bridge with variable skews.

Three span curved bridge. Span lengths are measured from centerline of bearing to centerline of bearing along the curved roadway centerline.

- **Report 190.0**.

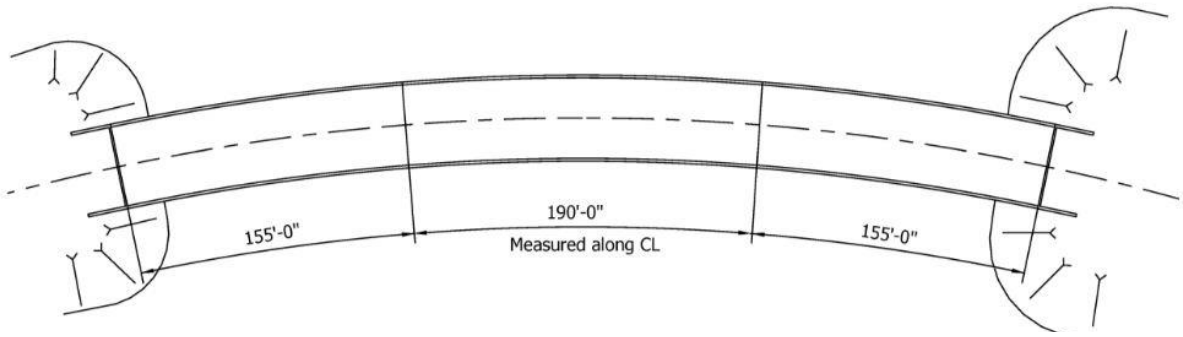


Figure 7-40: Plan view of a three-span curved bridge.

Minimum Span Length					
Item ID	B.G.04				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 5		Decimal places: 1	

Specification

Report the length of the minimum span to the nearest tenth of a foot, measured from centerline of bearing to centerline of bearing, along the roadway centerline.

Commentary

For rigid frames, arches, pipes, integral abutments, or similar type bridges where there is not a clear centerline of bearings, use the clear open distance between piers, bents, walls, or abutments.

The roadway centerline is the physical center of the portion of the roadway for the movement of vehicles, regardless of striping, and exclusive of shoulders. The length for curved bridges is measured along the curved centerline.

For bridges with single spans or bridges of equal span lengths, this item has the same value as B.G.03 – Maximum Span Length.

Examples

Report A.

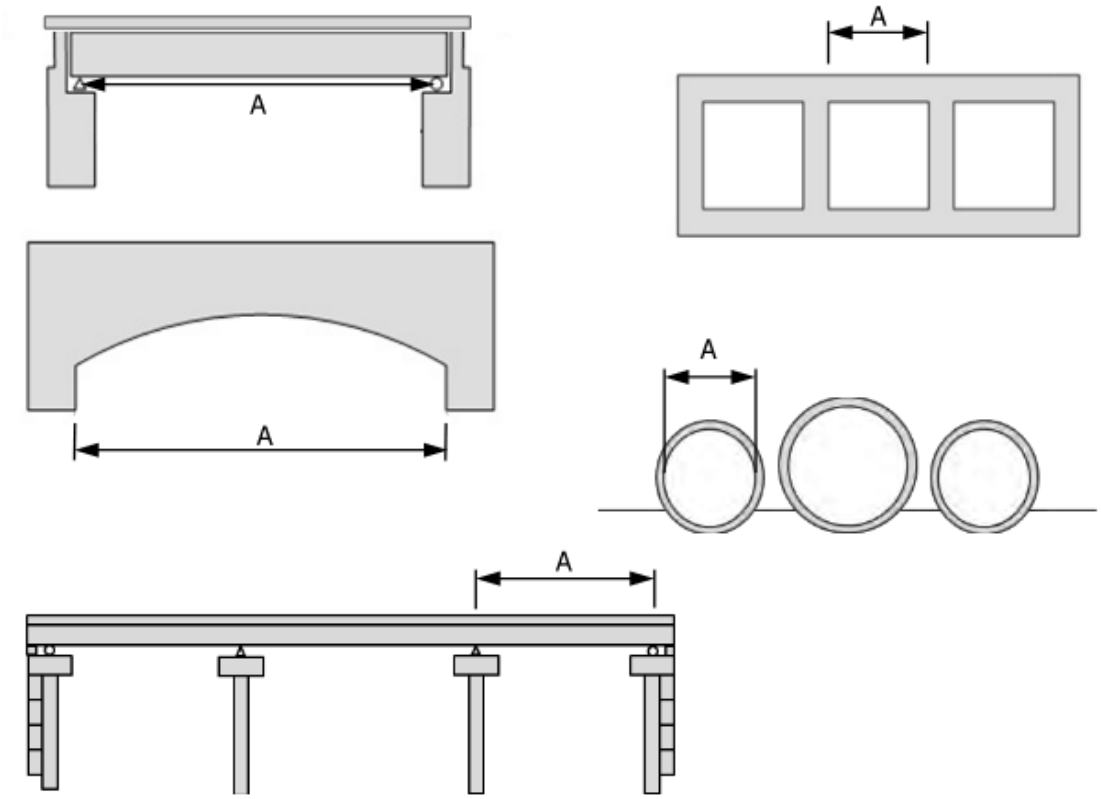


Figure 7-41: Profile views of various bridge types.

Minimum Span Length - Continued

Item ID	B.G.04	SNBI

Examples - Continued

Four span bridge with variable skews. Span lengths are measured from centerline of bearing to centerline of bearing along the roadway centerline.

- **Report 116.3**.

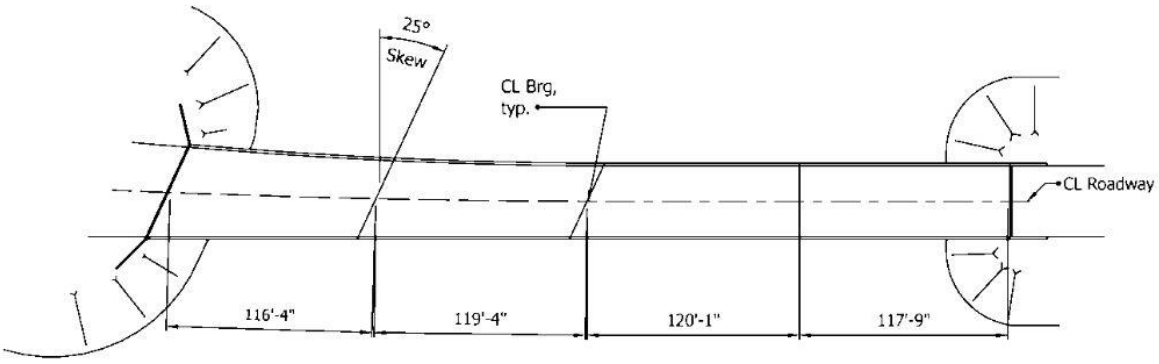


Figure 7-42: Plan view of a four-span bridge with variable skews.

Three span curved bridge. Span lengths are measured from centerline of bearing to centerline of bearing along the curved roadway centerline.

- **Report 155.0**.

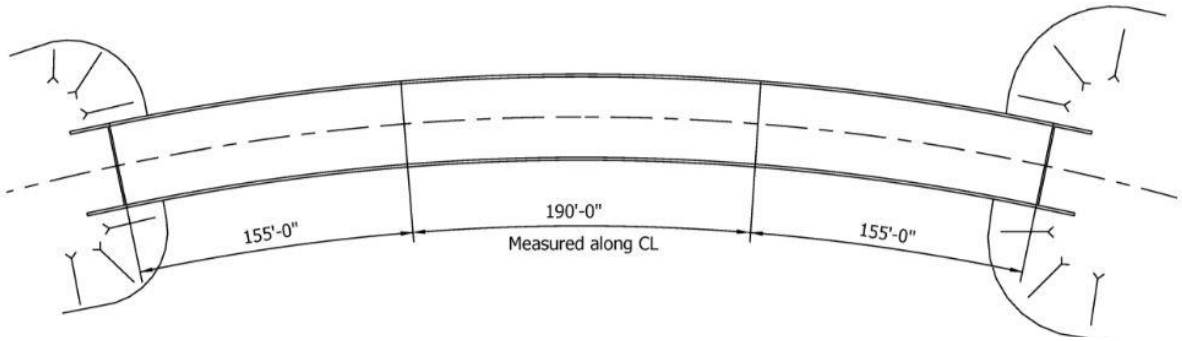


Figure 7-43: Plan view of a three-span curved bridge.

Bridge Width Out-to-Out					
Item ID	B.G.05				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 1	

Specification

Report the minimum out-to-out width measured perpendicular to the centerline of the roadway to the nearest tenth of a foot.

For multiple (double) deck bridges that are inventoried as one bridge, measure all levels, and report the sum of the measurements to account for the total width carried on the bridge.

For bridges under fill, measure the width from out-to-out of the headwalls or barrel ends.

For sidehill bridges, measure the out-to-out structure width.

For bridges that carry multiple types of service, for example highway, pedestrian, and railroad, measure the out-to-out width that encompasses all service types.

Commentary

For bridges under fill in which the features that define the out-to-out width are not parallel, report the minimum out-to-out width of the headwalls or barrel ends.

For bridges under fill, the reported value can be limited to the width of the roadway section over the bridge for unusual situations where the bridge continues far beyond the roadway cross-section, and a lesser width would likely be constructed for a replacement project.

For flared bridges, measure the out-to-out width at the narrowed portion exclusive of flared areas for ramps, etc.

Examples

Report A.

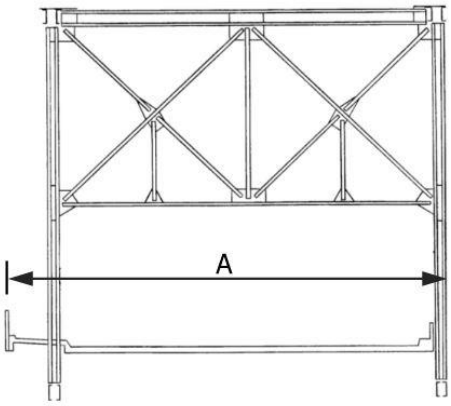


Figure 7-44: Cross-section view of a through truss bridge.

Bridge Width Out-to-Out - Continued		
Item ID	B.G.05	SNBI
Examples - Continued		

Report A.

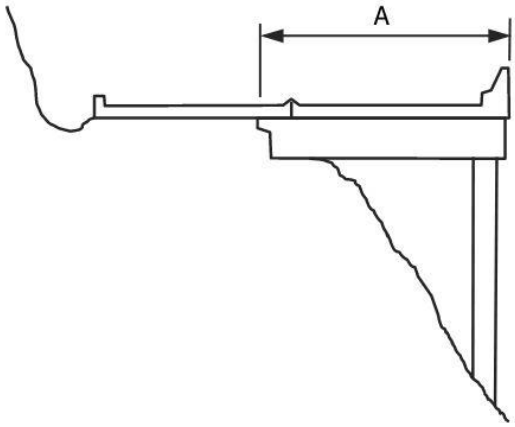


Figure 7-45: Cross-section view of a sidehill bridge.

Report A.

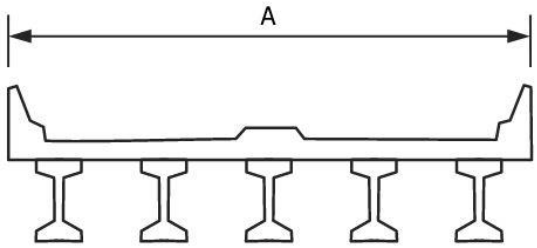


Figure 7-46: Cross-section view of a multi-girder bridge.

Report A.

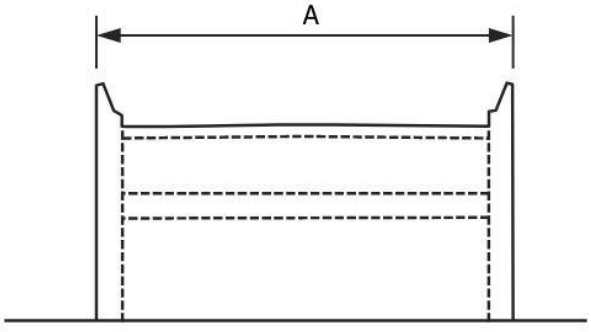


Figure 7-47: Cross-section view of a filled arch bridge or culvert under fill with headwalls.

Bridge Width Out-to-Out - Continued

Item ID	B.G.05	SNBI

Examples - Continued

Report A.

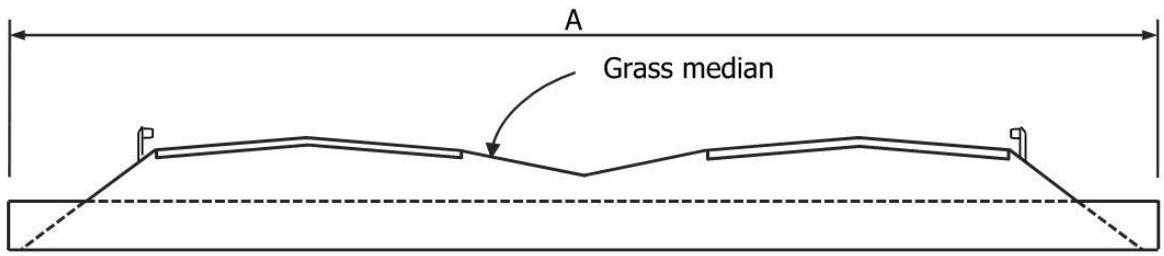


Figure 7-48: Cross-section view of a pipe culvert under fill.

Report A.

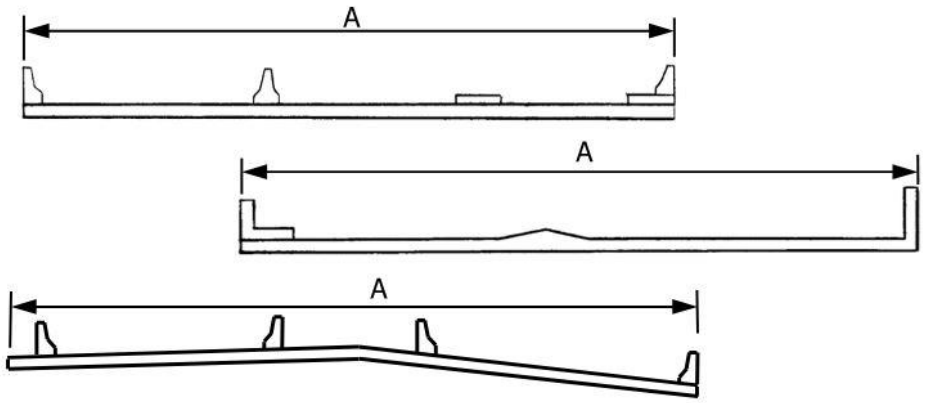


Figure 7-49: Cross-section views of various bridge decks with medians.

Report A.

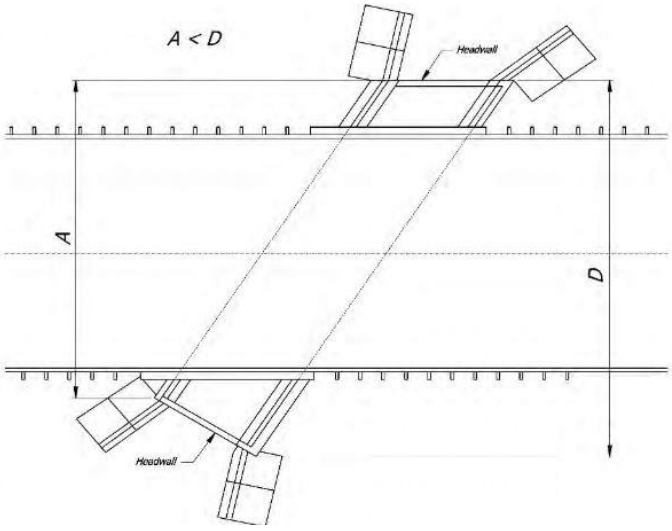


Figure 7-50: Plan view of a bridge with non-parallel fascias.

Bridge Width Out-to-Out - Continued

Item ID	B.G.05	SNBI

Examples - Continued

Report A.

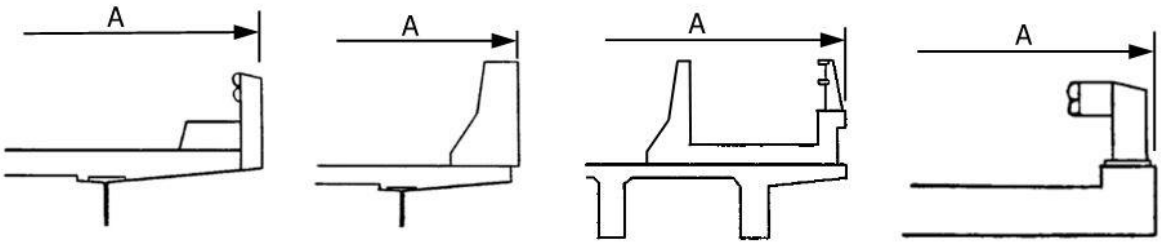


Figure 7-51: Partial cross-section views of various bridge decks with railings.

Report A.

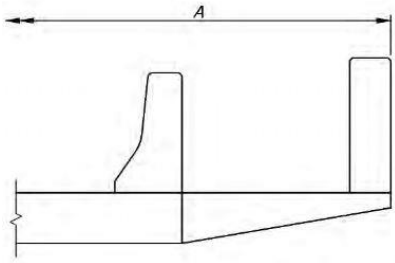


Figure 7-52: Cross-section view of a sidewalk retrofit.

Report A.

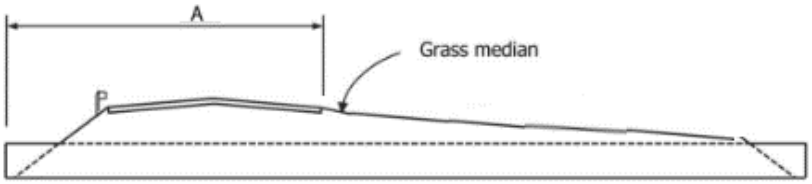


Figure 7-53: Cross-section view of a single roadway over culvert under fill.

Report A.

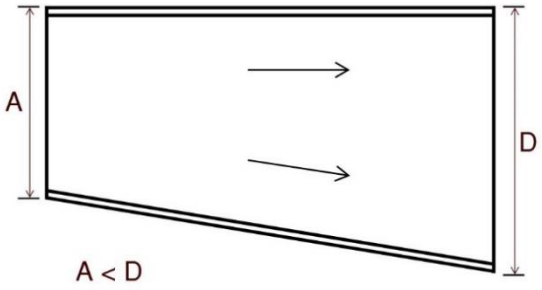


Figure 7-54: Plan view of a flared bridge with varying roadway width.

Bridge Width Curb-to-Curb					
Item ID	B.G.06				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 1	

Specification

Report the sum of the most restrictive minimum usable distances for all roadways carried by the bridge. Measure the distance on the bridge perpendicular to the centerline of the roadway between curbs or rails to the nearest tenth of a foot. Exclude from the usable distance measurement medians, sidewalks, structural inadequate shoulders, and other non-mountable areas.

For multiple (double) deck bridges that are inventoried as one bridge and bridges with closed medians, measure all portions carrying highway traffic, and report the sum of the most restrictive minimum useable distances carried by the bridge.

For sidehill bridges measure the actual full curb-to-curb roadway width.

For bridges 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.

For bridges that carry multiple types of service, for example highway, pedestrian, and railroad, report the usable distance that serves the highway service as denoted by curb or barrier separation, or other delineation that separates the service types.

The measurement for this item shall be compatible with the measurement used for Item B.G.09 – Approach Roadway Width.

Commentary

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

The measurement should be exclusive of flared areas for ramps, and it should be the minimal or nominal width.

Usable roadway width includes the width of traffic lanes and width of shoulders.

Shoulders must be contiguous with the traveled way and must be structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not considered to be a shoulder for this item. Shoulders should be asphalt or concrete pavement, or similar to the roadway surface for gravel roads. The presence of rutting, heaving, water retention, or other distress shall be used as indicators that the shoulder is not stabilized.

For bridges under fill, the usable roadway width crossing the bridge is commonly the same value reported for Item B.G.09 – Approach Roadway Width.

A barrier or curb greater than 6 inches high shall be considered non-mountable for these specifications.

Bridge Width Curb-to-Curb - Continued

Item ID	B.G.06	SNBI

Examples

Report A.

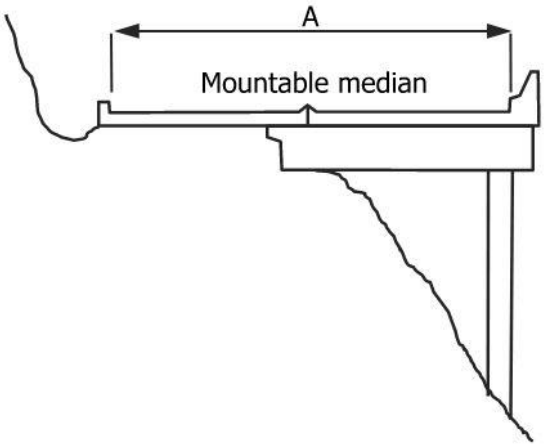


Figure 7-55: Cross-section view of a sidehill bridge.

Report A.

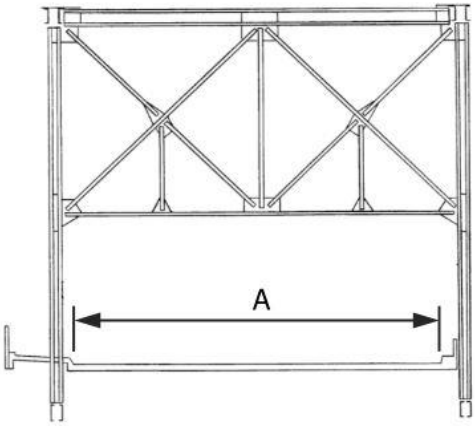


Figure 7-56: Cross-section view of a through truss bridge.

Report A.

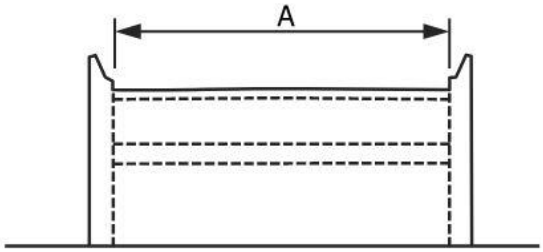


Figure 7-57: Cross-section view of a filled arch bridge or culvert under fill with headwalls.

Report A.

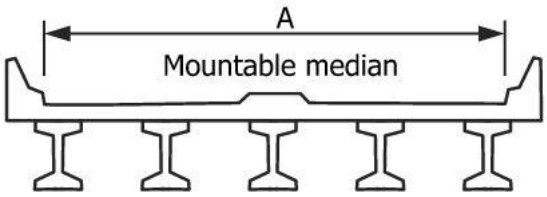


Figure 7-58: Cross-section view of a multi-girder bridge.

Report the sum of A+B.

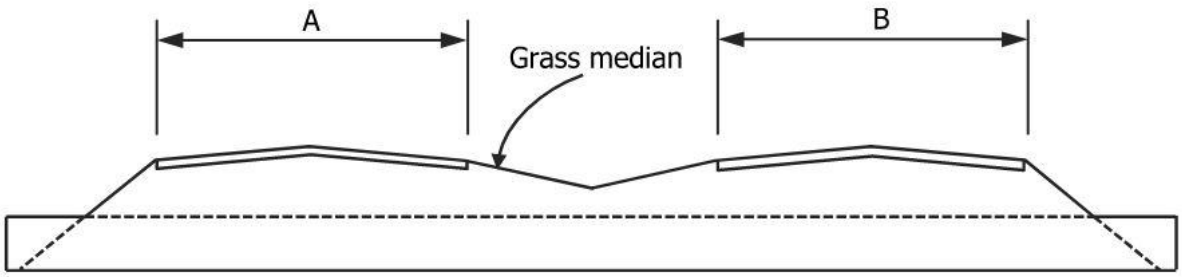


Figure 7-59: Cross-section view of a pipe culvert under fill.

Bridge Width Curb-to-Curb - Continued

Item ID	B.G.06	SNBI

Examples - Continued

Report A.

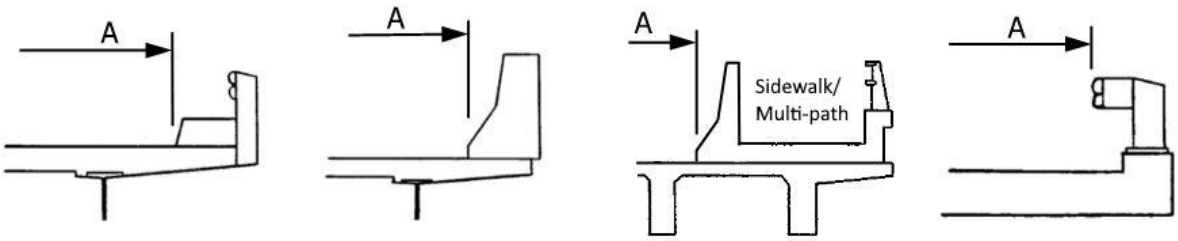


Figure 7-60: Partial cross-section views of various bridge decks with railings.

Report A.

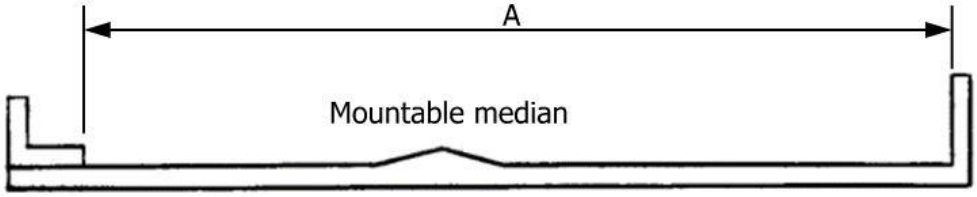


Figure 7-61: Cross-section view of a bridge deck with mountable median.

Report the sum of A+B+C.

Note that Lane C is a travel-way for vehicular traffic; this shall not be reported if it is a multi-use path.

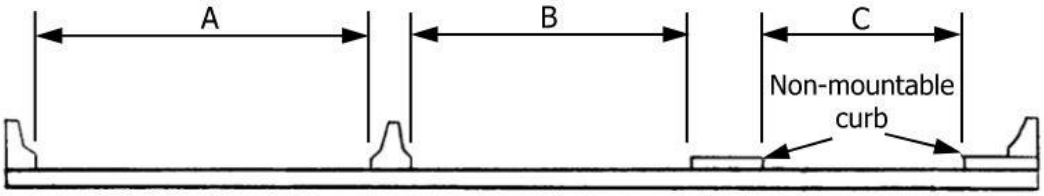


Figure 7-62: Cross-section view of a bridge deck with non-mountable curb and median barrier.

Report the sum of A+B.

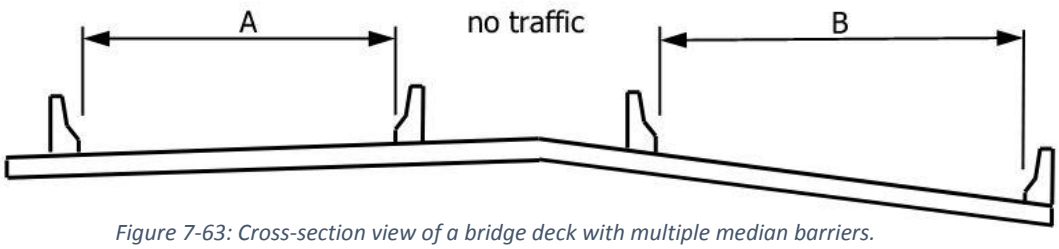


Figure 7-63: Cross-section view of a bridge deck with multiple median barriers.

Left Curb or Sidewalk Width

Item ID	B.G.07			SNBI
Frequency	Initial			
Format	Numeric	Max digits: 3	Decimal places: 1	

Specification

Report the minimum width of the left curb or sidewalk to the nearest tenth of a foot from the face of bridge rail to the face of curb. Measure the width perpendicular to the centerline of the roadway.

Report 0.0 when the face of the curb does not extend beyond the face of the bridge rail.

Report 0.0 when there is no left curb or sidewalk.

Commentary

Left and right are determined based on the direction of the inventoried route carried by the bridge, commonly west to east or south to north.

When a defined longitudinal joint exists between the curb and the sidewalk, such as a granite curb and concrete sidewalk, measure the width from the face of bridge rail to the face of the granite curb.

Examples

Report C.

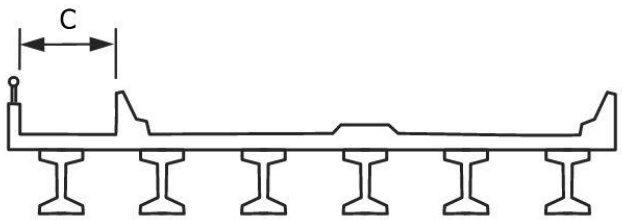


Figure 7-64: Cross-section view of a multi-girder bridge.

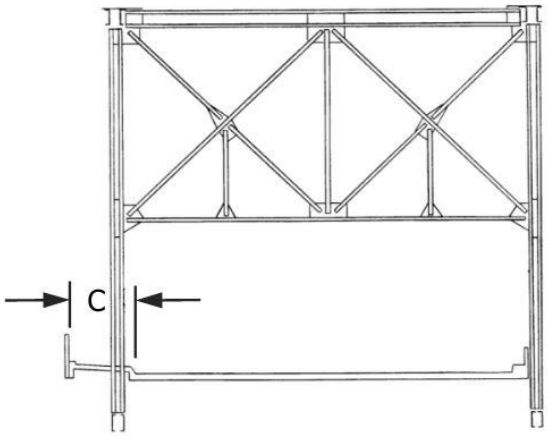


Figure 7-65: Cross-section view of a through truss bridge.

Report C.

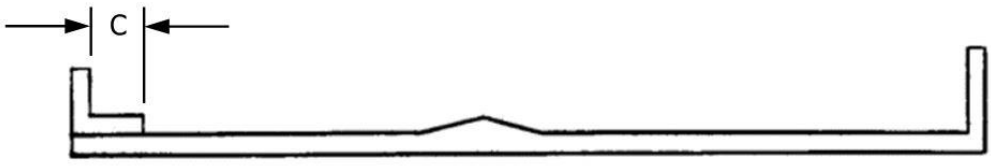


Figure 7-66: Cross-section view of a slab bridge.

Left Curb or Sidewalk Width - Continued

Item ID	B.G.07	SNBI

Examples - Continued

Report C.

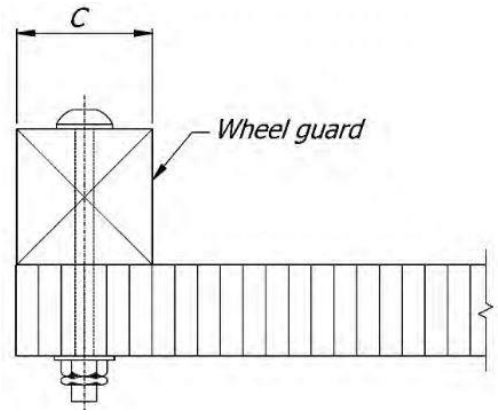


Figure 7-67: Cross-section view of a timber wheel guard.

Report C.

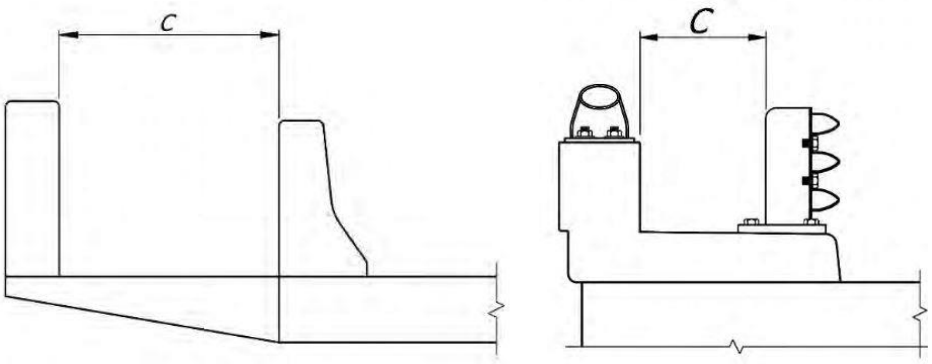


Figure 7-68: Cross-section views of sidewalk retrofits.

Report 0.0.

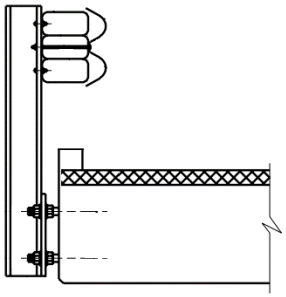


Figure 7-69: Cross-section views of a bridge railing with curb not extending beyond the face of rail, and bridge railing with no curb.

Right Curb or Sidewalk Width

Item ID	B.G.08	SNBI
Frequency	Initial	
Format	Numeric Max digits: 3 Decimal places: 1	

Specification

Report the minimum width of the right curb or sidewalk to the nearest tenth of a foot from the face of bridge rail to the face of curb. Measure the width perpendicular to the centerline of the roadway.

Report 0.0 when the face of the curb does not extend beyond the face of the bridge rail.

Report 0.0 when there is no right curb or sidewalk.

Commentary

Right and left are determined based on the direction of the inventoried route carried by the bridge, commonly west to east or south to north.

When a defined longitudinal joint exists between the curb and the sidewalk, such as a granite curb and concrete sidewalk, measure the width from the face of bridge rail to the face of the granite curb.

Examples

Report C.

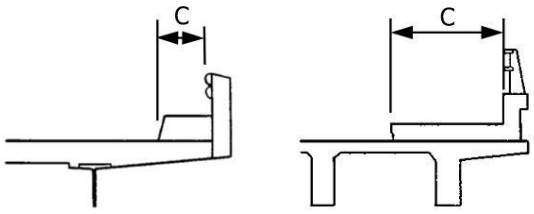


Figure 7-70: Partial cross-section views of various bridge decks with railings.

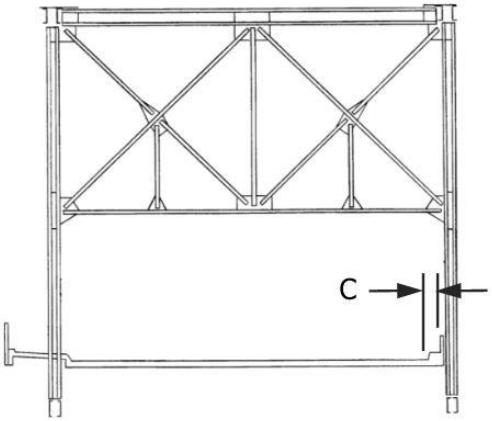


Figure 7-71: Cross-section view of a through truss bridge.

Report C.

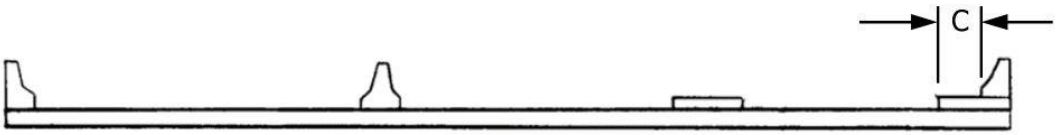


Figure 7-72: Cross-section view of a slab bridge with various medians.

Right Curb or Sidewalk Width - Continued		
Item ID	B.G.08	SNBI
Examples - Continued		

Report C.

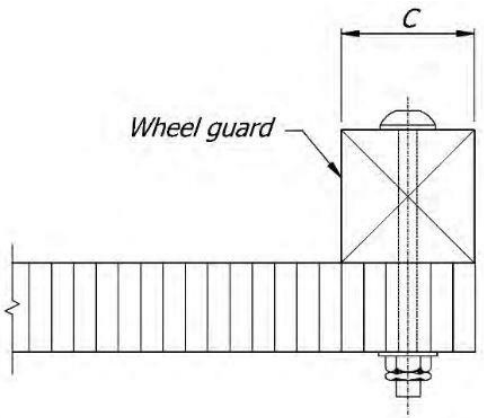


Figure 7-73: Cross-section view of a timber wheel guard.

Report C.

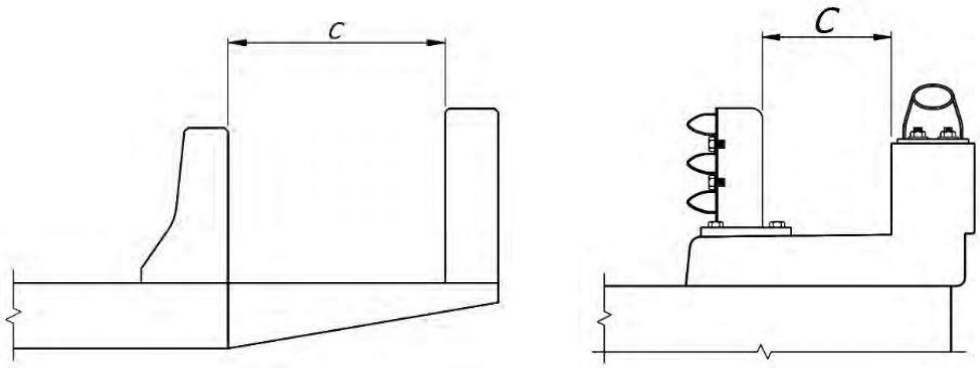


Figure 7-74: Cross-section views of sidewalk retrofits.

Report 0.0.

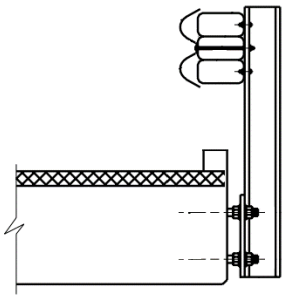


Figure 7-75: Cross-section views of a bridge railing with curb not extending beyond the face of rail, and bridge railing with no curb.

Approach Roadway Width					
Item ID	B.G.09				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 1	

Specification

Report the minimum usable approach roadway width measured to the nearest tenth of a foot.

Measure the distance perpendicular to the centerline of the roadway between curbs or rails that is representative of the approach roadway within 100 feet of a bridge. Exclude from the usable distance measurement: medians, sidewalks, and other protected areas with non-mountable curbs or barriers.

Report the lesser of the two approach roadway widths for bridges that carry two-way traffic.

Report the width at the leading approach in the direction of traffic for bridges that carry one-way traffic.

Commentary

Usable roadway width includes the width of traffic lanes and the width of shoulders.

Shoulders must be contiguous with the traveled way and must be structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not considered to be a shoulder for this item. Shoulders should be asphalt or concrete pavement, or similar to the roadway surface for gravel roads. The presence of rutting, heaving, water retention, or other distress shall be used as indicators that the shoulder is not stabilized.

A curb greater than 6 inches high is considered non-mountable for these qualifications.

Examples

Both roadways are carried on one bridge.

- **Report the sum of A+B**.

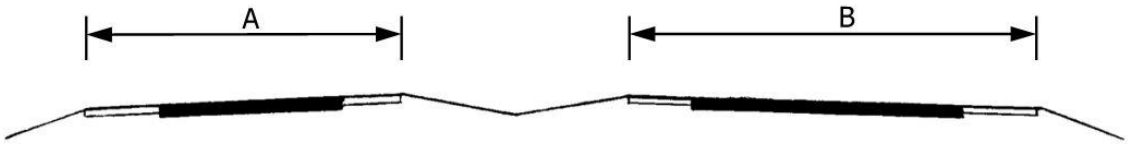


Figure 7-76: Cross-section view of two approach roadways that are carried across one bridge.

Approach Roadway Width - Continued

Item ID	B.G.09	SNBI

Examples - Continued

Mainline and Ramp are both carried on the bridge.

- **Report the sum of A+B**.

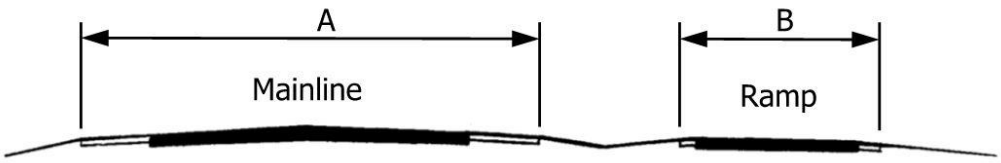


Figure 7-77: Approach roadway cross-section view for a mainline and a ramp that are carried across one bridge.

Mainline and Ramp are carried on separate bridges.

- **Report A** for the Mainline bridge.
- **Report B** for the Ramp bridge.

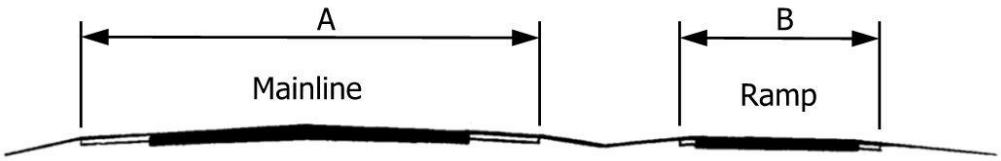


Figure 7-78: Approach roadway cross-section view for a mainline and a ramp that are carried across separate bridges.

Bridge with tapered width.

- **Report A**.

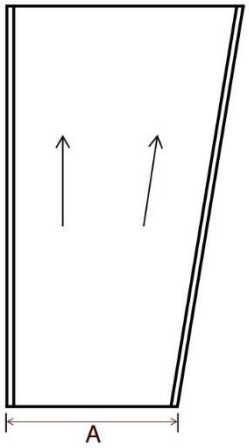


Figure 7-79: Plan view for a bridge with a tapered roadway width.

Bridge Median

Item ID	B.G.10	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the type of bridge median using one of the following codes.

Code	Description
0	No median
1	Open median
2	Closed median (mountable)
3	Closed median (non-mountable)

Commentary

A barrier or curb greater than 6 inches high is considered non-mountable.

For bridges with a longitudinal joint, use code 1 when traffic cannot safely traverse the joint width. If the joint width is safely traversable, use one of the remaining codes. Joint condition does not affect the coding of this item.

Use code 0 for bridges that do not have a median, including bridges that carry adjacent traffic lanes separated only by centerline, edge line, or channelization striping, with or without a traversable longitudinal joint.

Use code 2 for bridges with medians that are either flush or mountable, with or without a traversable longitudinal joint, including areas that are striped to designate a median.

Median barriers must be permanent to be classified as code 3.

Examples

Report 1.

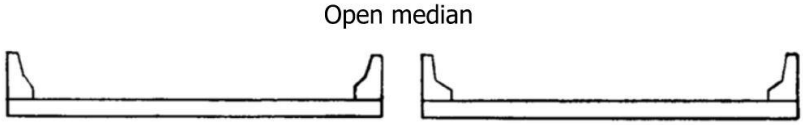


Figure 7-80: Cross-section view of a bridge deck with open median.

Report 2.

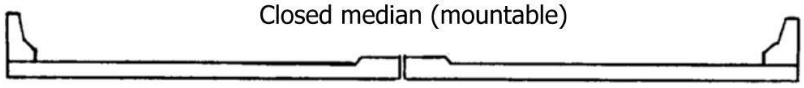


Figure 7-81: Cross-section view of a bridge deck with closed median (mountable).

Report 3.

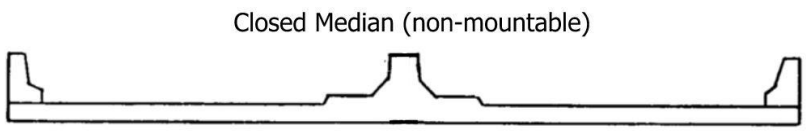


Figure 7-82: Cross-section view of a bridge deck with closed median (non-mountable).

Skew					
Item ID	B.G.11				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 2		Decimal places: 0	

Specification

Report the skew angle to the nearest degree. Measure the skew angle between the centerline of a substructure unit and a line perpendicular to the roadway centerline.

Report the maximum skew when skews vary amongst substructure units.

Report 0 if there is no skew.

Commentary

The skew angle can be taken directly from the plans, if available, or measured in the field.

Examples

Report the skew as the result of $COS^{-1}(B/C)$.

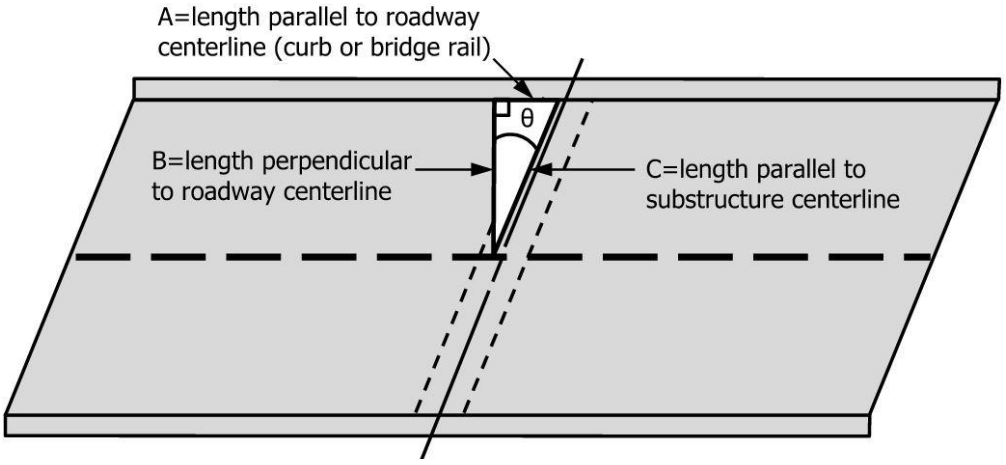


Figure 7-83: Plan view of a bridge deck indicating skew determination.

Report the maximum skew value (Φ).

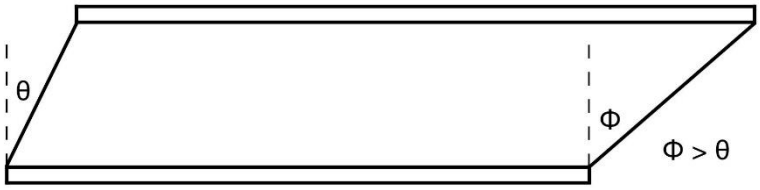


Figure 7-84: Plan view of a bridge deck with varying skews.

Curved Bridge		
Item ID	B.G.12	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

Report whether the bridge is horizontally curved using one of the following codes.

Code	Description
CU	Curved girder(s)
CP	Piecewise straight girders
CK	Kinked girder(s)
N	Not curved

Commentary

A bridge is considered horizontally curved when at least one partial or full length girder line forms a curve using either a curved girder(s), piecewise straight girders forming a segmented/chorded curve, or a kinked girder(s).

For this specification, a piecewise straight girder line is comprised of girders with a longitudinal axis that changes orientation at one or more supports. The girder line may be simply supported or continuous at supports. A kinked girder is a girder with a longitudinal axis that changes orientation at a location(s) along the girder length excluding at the supports.

Diaphragm and cross frame members in horizontally curved bridges are primary members.

Code CK will only apply to bridge girders comprised of steel.

Use code N for bridges that have curved deck geometry, or may be striped as curved, but the girders do not form a curve.

Examples

Report CK.

Figure 7-85: Curved bridge with kinked girders.

Curved Bridge - Continued		
Item ID	B.G.12	SNBI
Examples - Continued		

Report CP.

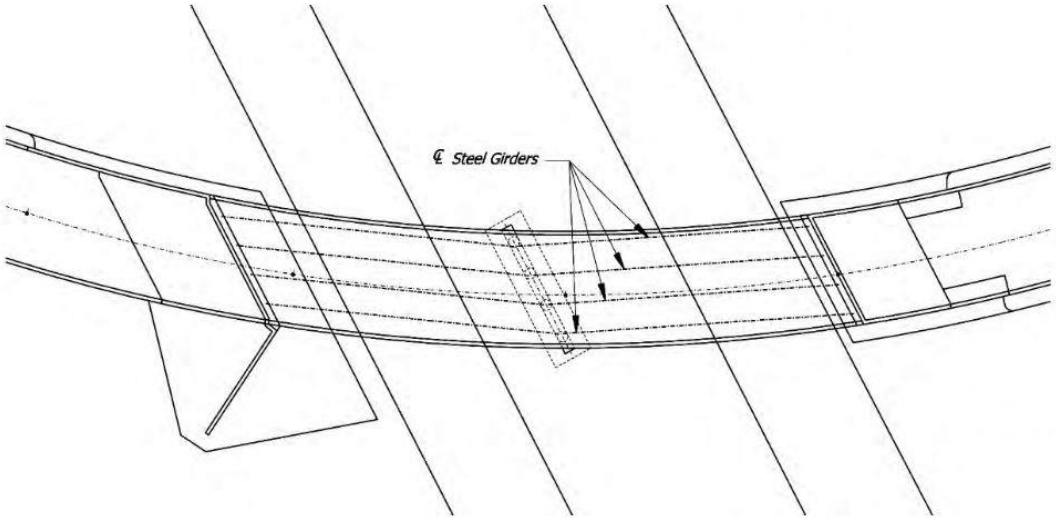


Figure 7-86: Plan view of a curved bridge with piecewise straight girders.

Report CK.

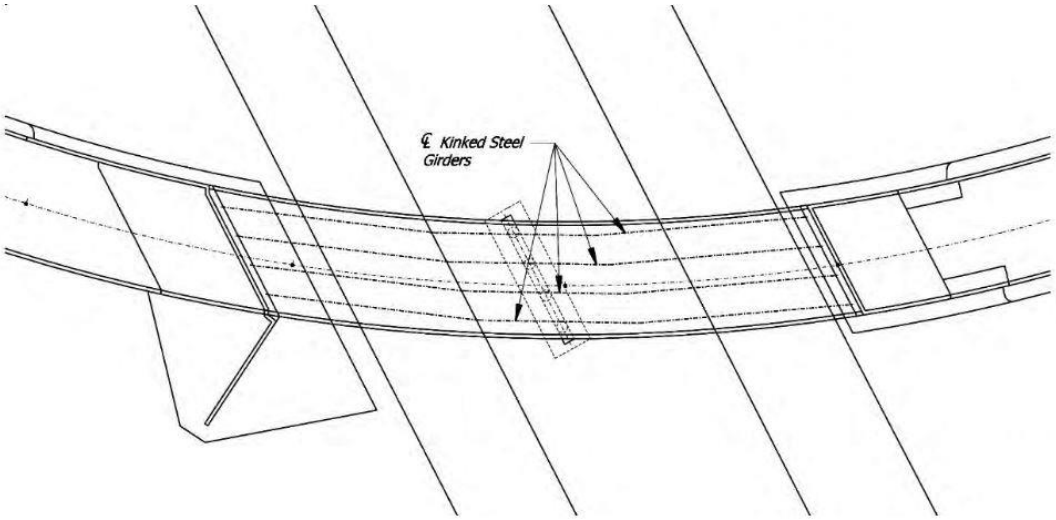


Figure 7-87: Plan view of a curved bridge with kinked girders.

Maximum Bridge Height					
Item ID	B.G.13				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 0	

Specification

Record the maximum height from top of deck to ground line or water surface elevation, whichever yields the largest value, rounded to the nearest foot.

Commentary

For double-deck bridges inventoried as one bridge, measure from top of deck on the lower deck to the ground line or water surface elevation. For double-deck bridges inventoried as two bridges, measure from the top of deck of each inventoried bridge.

For bridges under fill, excluding closed spandrel arches, measure from top of slab, or top of pipe, to water surface elevation. When there is no waterway feature, measure to inside bottom of pipe, inside of floor slab, or ground line when the bottom is unexposed or the bridge is bottomless. For closed spandrel arches measure from top of roadway surface.

Ground line represents dry terrain or pavement.

Use the water surface elevation at the time the value for this item is established.

This item may be estimated by field observation or from plans when it is not practical or is infeasible to measure, or height is more than 30 ft.

This item does not need to be updated due to fluctuations in water surface elevation.

Examples

Bridge carries SR170 over Felix Creek and County Trail.

- **Report 27**.

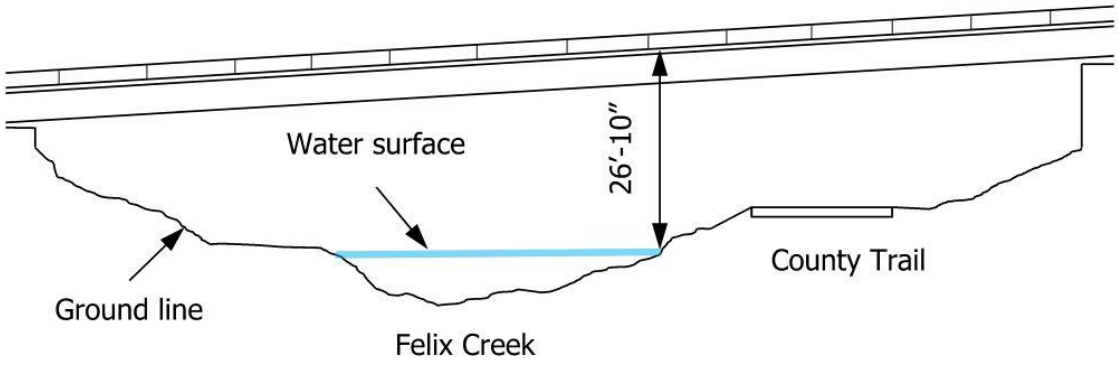


Figure 7-88: Profile view of a bridge over a creek and trail.

Sidehill Bridge

Item ID	B.G.14	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether any portion of the bridge is a sidehill structure.

Code	Description
N	Not a sidehill bridge
Y	Is a sidehill bridge

Commentary

A sidehill bridge is a structure built onto the side of terrain or earth material with the roadway centerline running nearly parallel to the face of the terrain or material. The roadway is carried partially on structure and partially on terrain that has been modified by cutting or filling to form the required roadway subgrade elevation.

For sidehill bridges, Item B.G.06 – Bridge Width Curb-to-Curb is typically longer than Item B.G.05 – Bridge Width Out-to-Out.

For sidehill bridges with irregular geometry, reporting the actual deck area in Item B.G.15 – Irregular Deck Area provides a more accurate value than using the default calculation for that item.

Use code N when no portion of the bridge is a sidehill structure.

Examples

A bridge is built onto the side of a hill with the roadway partially on ground and partially on structure.

- **Report Y**.

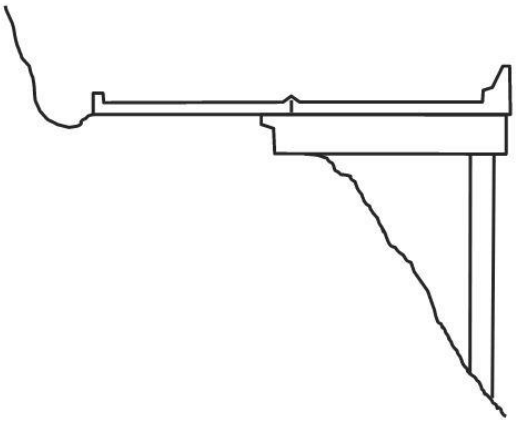


Figure 7-89: Cross-section view of a sidehill bridge.

Irregular Deck Area					
Item ID	B.G.15				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	10	Decimal places:	1

Specification

Report the total deck area rounded to the nearest tenth of a square foot.

Only report this item when the actual area is obtained from plans or measurement of bridges with irregular geometry.

The limits of measurement shall be in accordance with Item B.G.05 – Bridge Width Out-to-Out and Item B.G.02 – Total Bridge Length.

For bridges that carry multiple types of service, for example highway and railroad, report the deck area that encompasses all service types.

Commentary

Reporting the deck area calculated from plans may more accurately reflect the deck area for bridges with unusual geometry (e.g., flared, sidehill, or bifurcated structures), or through structures with cantilevered sidewalks.

This item can improve the accuracy of national performance measure computations, estimating cost, etc.

Calculated Deck Area					
Item ID	B.G.16				SNBI
Frequency	Calculated				
Format	Numeric	Max digits:	10	Decimal places:	1

Specification

The default calculation for bridges is the value reported in Item B.G.05 – Bridge Width Out-to-Out multiplied by Item B.G.02 – Total Bridge Length rounded to the nearest tenth of a square foot.

Commentary

Item B.G.16 – Calculated Deck Area is calculated by FHWA using data from other items in the SNBI. This item is not reported to FHWA. The item specification that explains how the item is calculated is presented for reference only.

7.4 Features

This section has data items that have been grouped by the following: Chapter 7.4.1 Feature Identification, Chapter 7.4.2 Routes, Chapter 7.4.3 Highways, Chapter 7.4.4 Railroads, and Chapter 7.4.5 Navigable Waterways. The data items in these groups identify and describe the features that are above, below, and carried on bridges. See Appendix L for complete features coding of example bridges.

7.4.1 Feature Identification

The data items in the Feature Identification group identify and locate features that are above, below, and carried on the bridge. These items are considered part of the Features Data Set and have a many-to-one relationship with a bridge. Therefore, each feature has a unique Feature Data Set, and there are typically multiple Feature Data Sets associated with a bridge.

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

Item ID	Data Item
B.F.01.1	Feature Type Selection
B.F.01	Feature Type
B.F.02	Feature Location
B.F.03	Feature Name

When a highway (e.g. H01, H02, etc.) is reported under Item B.F.01 – Feature Type the data items in the Routes and Highway groups are reported.

When a railroad (e.g. R01, R02, etc.) is reported under Item B.F.01 – Feature Type the data items in the Railroad group are reported.

When a waterway feature (e.g. W01, etc.) is reported under Item B.F.01 – Feature Type the data items in the Navigable Waterway group are reported.

Feature Type Selection

Item ID	B.F.01.1	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

Report the feature that is above, below, or carried on the bridge using one of the following codes.

Code	Description
H	Highway
R	Railroad
P	Pathway
W	Waterway
F	Relief for waterway
B	Urban feature
D	Dry terrain or side slope
X	Other

For a double deck bridge that is inventoried with one unique bridge number, report a feature for each deck level.

Report a railroad feature for each separate railroad service type, as identified in Item B.RR.01 – Railroad Service Type, that is carried on or passes below the bridge. When a track carries multiple railroad service types, report as one feature. When multiple tracks carry the same railroad service type(s), report only one feature.

When there are several railroad features (multiple tracks) with the same service but differing owners, report each owner as an individual railroad feature.

Report one highway feature for a highway that is designated with two or more route numbers.

Report multiple highway features when the highway is divided at the bridge.

Commentary

All bridges have at least one feature carried on the bridge and one feature below the bridge. Some bridges have several features that are above, below, or carried on the bridge.

Each feature type is numbered sequentially in Item B.F.01 – Feature Type, starting with one (H01, R01, etc.). Highway features should be numbered beginning with the features carried on the bridge, followed by those below and above (H01, H02, H03, etc.). The features under or above the bridge shall be recorded starting at the rear abutment and proceeding upstation (cardinal direction).

Feature Type Selection - Continued		
Item ID	B.F.01.1	SNBI

Commentary - Continued

When multiple route numbers correspond with a feature, only one highway feature shall be designated. When the highway is divided at the bridge, report multiple highway features. For bridges with divided highways, the route looking upstation (cardinal) direction shall be recorded as H01 and the downstation (non-cardinal) direction shall be recorded as H02. The presence of a flush or mountable median does not in itself indicate that the highway is divided.

For multi-level interchanges, report highway features for each bridge directly above and below the bridge being inventoried.

This item does not include ancillary structures and utilities.

Only report one Urban feature or Other feature if present.

Use code R for each railroad service type listed in Item B.RR.01 – Railroad Service Type.

For abandoned rail lines where all track and railroad property has been removed and the railroad no longer has right-of-way, do not code R for railroad feature. Active rail lines can be found in TIMS under the Assets Layer and Rail Lines.
https://tims.dot.state.oh.us/tims/map/sid/5Y6Z5Y

Use code P for separated pathways dedicated for pedestrian, bicycle, equestrian, or other non-highway modes of human transportation not covered in other codes.

Use code W for each unique waterway. Do not use for roadside ditches or pipes that typically only carry roadway runoff from rain events.

Use code F for bridges where one or more spans provide waterway openings for flow only during flood stages to provide additional hydraulic capacity, such as relief channels.

Use code B for urban features such as buildings, surface storage lots, parking lots, parks (playground), recreation facilities, etc.

Use code D for features such as a natural depression or sidehill slope when there is no discernable waterway channel and none of the other feature codes apply.

Use code X when no other code applies for features that exist below the bridge.

Feature Type		
Item ID	B.F.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

The Feature Type selected in Item B.F.01.1 – Feature Type Selection will be automatically populated starting with 01 and continuing with sequential numbering for each feature type selected. The first instance of each code shall be 01.

Commentary

Each feature type is numbered sequentially, starting with one (H01, R01, etc.). Highway features should be numbered beginning with the features carried on the bridge, followed by those below and above (H01, H02, H03, etc.). The features under or above the bridge shall be recorded starting at the rear abutment and proceeding upstation (cardinal direction).

For additional information as to when a feature needs to be added see Item B.F.01.1 – Feature Type Selection.

For border bridges, the Neighboring State reports this item for all highway features carried on or passing above the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Feature Location		
Item ID	B.F.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the location for the feature reported in Item B.F.01 – Feature Type that is above, below, or carried on the bridge using one of the following codes.

Code	Description
C	Carried on bridge
A	Above bridge
B	Below bridge
T	Top level
L	Lower level

Commentary

This item has a corresponding code for each feature reported for Item B.F.01 – Feature Type.

Use code T for the top level of a double deck bridge that is inventoried using one unique bridge number.

Use code L for the lower level of a double deck bridge that is inventoried using one unique bridge number.

For border bridges, the Neighboring State reports this item for all highway features carried on or passing above the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Feature Name		
Item ID	B.F.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 300	

Specification

Report the commonly known name(s) for the feature reported in Item B.F.01 – Feature Type. If the feature has no commonly known name, provide a general description.

For more than one name, report all names with the most common name first.

Report the interstate, US, or state route number first followed by other names.

For divided highways include the direction of the route (i.e. NB, SB, EB, WB).

Report multiple names separated by pipe (|) delimiters.

Commentary

This item has correlating data for each feature reported for Item B.F.01 – Feature Type.

The owner may include directional or other descriptive information in this field. Official names and local names may be included.

For border bridges, the Neighboring State reports this item for all highway features carried on or passing above the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Examples

I-80, commonly named the Ohio Turnpike.

- **Report I-80|Ohio Turnpike.**

US23 in Columbus is also named N High St.

- **Report US-23|N High St.**

Bridge carries SR31 also called S Main St and a pedestrian pathway on each side over the Scioto River.

- **Report SR-31|S Main St.** for the highway feature (H01).
- **Report Sidewalks** for the pedestrian pathway on each side (P01).
- **Report Scioto River** for the waterway (W01).

7.4.2 Routes

The data items in the Routes group identify the routes that are carried on each highway feature reported in Item B.F.01 – Feature Type and make up the Routes Data Set. There may be multiple route data sets associated with a highway feature with each route reported in Item B.RT.01 – Route Designation and having a unique route data set with a many-to-one relationship with a highway feature.

For each highway feature that is carried on the bridge, report all route items.

For each highway feature that passes below the bridge and is not carried by another NBIS bridge, report all route items. If the highway feature passes below a bridge and is carried on a non-NBIS bridge (less than 20'), report all route items.

Do not report route items for highway features that pass above or below the bridge and are carried by another NBIS bridge. When needed, FHWA or ODOT obtains the data for these highway feature(s) using the data reported for the crossing bridge, per Item B.H.18 – Crossing Bridge Number.

The following data items are included in this section:

Item ID	Data Item
B.RT.H	Route Highway Mapping
B.RT.01	Route Designation
B.RT.02	Route Number
B.RT.03	Route Direction
B.RT.04	Route Type
B.RT.05	Service Type

Route Highway Mapping		
Item ID	B.RT.H	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

When adding route repeating fields in AssetWise, for B.RT.H – Route Highway Mapping, select the highway feature in Item B.F.01 – Feature Type that the route is being defined for.

If a highway carries multiple routes, report only those routes that have a route number. If a highway carries only routes without route numbers, report one route designation.

Multiple route designations is only needed when highway feature in Item B.F.01 – Feature Type has multiple interstate, US numbered, and/or state routes present on the highway.

If a highway feature carries multiple routes, a separate route repeating group will be added, and the same highway feature will be selected for B.RT.H – Route Highway Mapping. Each route group added will be numbered sequential starting at 01 for each highway feature in Item B.RT.01 – Route Designation.

Commentary

This item captures how routes that share the reported highway feature are designated.

Each highway feature has at least one route designation.

Typically, the route with the highest-class route type is listed first with an interstate is considered the highest-class route.

If the highway feature is a ramp, report all applicable routes for the highways that are being connected.

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Route Designation		
Item ID	B.RT.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 3	

Specification

The route designation will be automatically populated starting with 01 and continuing with sequential numbering based each highway feature selected in Item B.RT.H – Route Highway Mapping. The first instance for each highway feature will be 01.

Commentary

Each highway feature has at least one route designation.

Typically, the route with the highest-class route type is listed first with an interstate is considered the highest-class route.

If the highway feature is a ramp, report all applicable routes for the highways that are being connected.

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Examples

A bridge carries I-80 and is divided at the bridge.

- **Report R01** for the westbound highway carried on the bridge for H01.
- **Report R01** for the eastbound highway carried on the bridge for H02.

Bridge over SR-82 also known as E Aurora Rd.

- **Report R01** for SR-82 for the highway feature under the bridge.
- Do not report a route record for E Aurora Rd.

Ramp bridge departs I-71 northbound and enters I-275 westbound.

- **Report R01** for I-71.
- **Report R02** for I-275.

Route Number		
Item ID	B.RT.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 15	

Specification

Report the route number for the route reported in Item B.RT.01 – Route Designation.

Report 0 for routes without route numbers.

Letters used to designated divided highways, alternate routes, or direction travel shall not be coded with the route number in B.RT.02 – Route Number.

Commentary

Do not report leading zeros for route numbers.

For divided highways, do not report the route direction. Identify that information in Item B.RT.03 – Route Direction.

Route numbers can be found using the ODOT Transportation Information Mapping System (TIMS):

https://tims.dot.state.oh.us/tims/map/sid/vP95bP

Within TIMS, utilize the Road Inventory data under Roadway Information. Within the Roadway Inventory, ROUTE_NBR corresponds to Item B.RT.02 – Route Number.

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Examples

A bridge carries I-80 and is divided at the bridge.

- **Report 80**.

Bridge over SR-82 also known as E Aurora Rd.

- **Report 82** for SR-82 for the highway feature under the bridge.
- Do not report a route record for E Aurora Rd.

Ramp bridge departs I-71 northbound and enters I-275 westbound.

- **Report 71** for the route designated as I-71.
- **Report 275** for the route designated as I-275.

Bridge carries Township Road 100.

- **Report 100** from TIMS information.

Route Direction

Item ID	B.RT.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

Report the designated route direction for the route reported in Item B.RT.01 – Route Designation using one of the following codes.

Code	Description
NB	Northbound
EB	Eastbound
SB	Southbound
WB	Westbound
NS	Northbound and Southbound
EW	Eastbound and Westbound

Commentary

Use code NS when the route is not divided at the bridge and carries traffic in both north and south directions.

Use code EW when the route is not divided at the bridge and carries traffic in both east and west directions.

Use the designated route direction for the departure or entrance route when a bridge only carries a ramp (i.e. Item B.RT.05 – Service Type is 7).

Use the most applicable code when a route does not have a designated route direction.

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Examples

A bridge carries I-80 and is divided at the bridge.

- **Report WB** for I-80 westbound route (R01).
- **Report EB** for I-80 eastbound route (R02).

Bridge over SR82 also known as E Aurora Rd.

- **Report EW** for eastbound and westbound direction on SR82.
- Do not report a route record for E Aurora Rd.

Ramp bridge departs I-71 northbound and enters I-275 westbound.

- **Report NB** for the route designated as I-71 northbound (R01).
- **Report WB** for the route designated as I-275 westbound (R02).

Bridge carries Township Road 100.

- **Report EW** for eastbound and westbound direction on Township Road 100.

Route Type

Item ID	B.RT.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the route type for the route reported in Item B.RT.01 – Route Designation using one of the following codes.

Code	Description	Roadway Information Manual Route Type or Designation
1	Interstate route	IR
2	U.S. numbered route	US
3	State route	SR
4	County route (includes township roads)	CR, TR
5	City Street	MR
6	Federal lands road	
7	State lands road	
X	Other	

Commentary

Route type can be found using the ODOT Transportation Information Mapping System (TIMS):

https://tims.dot.state.oh.us/tims/map/sid/XP4GKR

Within TIMS, utilize the Road Inventory data under Roadway Information. Within the Roadway Inventory, ROUTE_TYPE corresponds to Item B.RT.04 – Route Type.

Use code 4 for parish routes or other county route equivalents.

Use code 5 for city or other municipal streets.

Use code 6 when a public highway passes through Federal lands such as national parks, national forests, or DOD facilities and does not meet the description of codes 1 through 5.

Use code 7 when a public highway passes through State lands such as State parks or State forests and does not meet the description of codes 1 through 5.

Use code X when a public highway is not designated as one of the defined route type codes.

See ODOT's Roadway Information Manual for additional information.
https://www.transportation.ohio.gov/working/publications/roadway-manual

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Service Type

Item ID	B.RT.05	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the designated service type for the route reported in Item B.RT.01 – Route Designation, using one of the following codes.

Code	Description
1	Mainline
2	Alternate
3	Bypass
4	Spur
6	Business
7	Ramp, connector, etc.
8	Service or frontage road
X	Other

Commentary

The service type designation is determined by the State, and typically included as part of the signage for the route. The service type will typically be coded as 1, mainline, unless the route is designed otherwise by signage or within the route name.

Use code 7 for all types, arrangements, and sizes of turning roadways that connect two or more highways at an interchange.

Use code 8 for frontage roads. These are typically parallel to the traveled way, may be provided on one or both sides of the mainline, and may or may not be continuous. A frontage road may include a U-turn lane.

For Federal agency roads, report the most logical description of the service type compared to other routes within the facility.

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

Examples

Ramp bridge departs I-71 northbound to I-275 westbound.

- **Report 7** for the route designated as I-71 northbound (R01).
- **Report 7** for the route designated as I-275 westbound (R02).

A Bridge carries US-250 Business, SR-259 over US-250 and SR-800.

- **Report 6** for the route designated as US-250 BUS (R01 for carried on the bridge).
- **Report 1** for the route designated as SR-259 (R01 for carried on the bridge).
- **Report 1** for the route designated as US-250 (R01 for route under the bridge).
- **Report 1** for the route designated as SR-800 (R02 for route under the bridge).

7.4.3 Highways

The data items in the Highways group provide information about the highways that are carried on, and that pass above or below the bridge and are considered part of the Features Data Set with a many-to-one relationship with a bridge. Each highway feature reported in Item B.F.01 – Feature Type has a unique highway feature data set, and there are typically multiple highway feature data sets associated with a bridge.

For each highway feature that is carried on the bridge, report all applicable items. For each highway feature that passes below the bridge and is not carried by another NBIS bridge, report all applicable items.

Items B.H.12 – Highway Maximum Usable Vertical Clearance and B.H.16 – Highway Maximum Usable Surface Width apply to highway features below a bridge only when the highway feature carries an NHS route (i.e. when Item B.H.03 – NHS Designation is Y).

For each highway feature that passes above or below the bridge and is carried by another NBIS bridge, report only Item B.H.18 – Crossing Bridge Number. When needed, FHWA or ODOT obtains the data for these highway feature(s) using the data reported for the crossing bridge.

The following data items are included in this section:

Item ID	Data Item
B.H.01	Functional Classification
B.H.01.01	Priority System Code
B.H.02	Urban Code
B.H.03	NHS Designation
B.H.04	National Highway Freight Network
B.H.05	STRAHNET Designation
B.H.06	LRS Route ID
B.H.07	LRS Milepoint
B.H.07.01	Interstate Mile Marker
B.H.08	Lanes on Highway
B.H.09	Annual Average Daily Traffic
B.H.10	Annual Average Daily Truck Traffic
B.H.11	Year of Annual Average Daily Traffic
B.H.12	Highway Maximum Usable Vertical Clearance
B.H.13	Highway Minimum Vertical Clearance
B.H.14	Highway Minimum Horizontal Clearance, Left
B.H.15	Highway Minimum Horizontal Clearance, Right
B.H.16	Highway Maximum Usable Surface Width
B.H.17	Bypass Detour Length
B.H.18	Crossing Bridge Number

Functional Classification

Item ID	B.H.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the functional classification for the highway feature reported in Item B.F.01 – Feature Type using one of the following codes.

Code	Description
1	Interstate
2	Principal Arterial – Other Freeways and Expressways
3	Principal Arterial - Other
4	Minor Arterial
5	Major Collector
6	Minor Collector
7	Local

Commentary

Functional classifications result from the grouping of highways by the character of service they provide.

Ensure the functional classification designated in this item is consistent with the Highway Performance Monitoring System (HPMS). See https://www.fhwa.dot.gov/policyinformation/hpms.cfm for additional information.

When one highway feature carries multiple route types, report the code for the highest-class route following the hierarchy in the code descriptions, Interstate being the highest class.

Use code 7 for State or Federal parkways and other park roads unless there is a through highway designated at a higher classification.

FHWA Highway Functional Classification Concepts, Criteria, and Procedures website: https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/.

ODOT Roadway Functional Classifications: https://www.transportation.ohio.gov/working/funding/resources/ohio-roadway-functional-class.

TIMS can be utilized to obtain this information by selecting the data layer for Functional Class under the Roadway Information tab.

https://tims.dot.state.oh.us/tims/map/sid/BxepdY

Priority System Code		
Item ID	B.H.01.01	Previously ODOT Item 5.01
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the designated priority system code for the route reported in Item B.RT.01 – Route Designation, using one of the following codes.

Code	Description
P	Priority
U	Urban
G	General
N	Not Applicable

This classification is crucial for the Ohio Department of Transportation for decision making purposes. The classification is for key activities, including prioritizing funding, planning, and assessing road conditions.

Commentary

Use code P (Priority) for all Functional Class routes 1 or 2.

Use code P for Functional Class routes 3, 4, 5, 6, and 7 if the route is on the NHS system (B.H.03 – NHS Designation is coded "Y" – NHS) and rural or inside a municipality with a population < 5000.

Use code U (Urban) for Functional Class routes 3, 4, 5, 6, and 7 when inside a municipality with a population of 5000 or greater, if not coded P.

Use code G (General) for Functional Class routes 3, 4, 5, 6, and 7 if rural or inside municipalities with a population of < 5000 and not coded P.

TIMS can be utilized to obtain this information by selecting the data layer for Priority System under the Roadway Information tab.

https://tims.dot.state.oh.us/tims/map/sid/MPnXdx

Urban Code		
Item ID	B.H.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 5	

Specification

Report the urbanized area code consistent with the State's HPMS urban boundaries for the highway feature reported in Item B.F.01 – Feature Type at the bridge.

Commentary

TIMS can be utilized to obtain this information by selecting the data layer for Adjusted Urbanized Areas under the Boundary tab. Within the Adjusted Urbanized Areas layer, click on the map at the location of the bridge and record the value listed for Urban_Area_Code.

https://tims.dot.state.oh.us/tims/map/sid/LRLG5x

For bridges outside urbanized areas, use code 99999 for rural areas with population less than 5,000 and use code 99998 for small urban areas with population 5,000 to 49,999 in accordance with the HPMS Field Manual.

Urban codes can be found at:
https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html.

FHWA approves adjusted urban boundaries submitted by State DOT planning offices. State's HPMS urban boundaries are based on the FHWA-approved adjusted urban boundaries.

Information in this field should be updated as new data and boundaries are approved with the Census every 4 years.

NHS Designation		
Item ID	B.H.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the NHS designation for the highway feature reported in Item B.F.01 – Feature Type, using one of the following codes.

Code	Description
N	Non-NHS
Y	NHS

Commentary

The National Highway System (NHS) includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The NHS was developed by the U.S. Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs). The NHS includes the following subsystems of highways: Interstate, other principal arterials, STRAHNET, major STRAHNET connectors, and intermodal connectors.

NHS routes and connectors are identified in the HPMS.

State maps can be found at:

https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

TIMS can be utilized to obtain this information by selecting the data layer for NHS under the Roadway Information tab.

https://tims.dot.state.oh.us/tims/map/sid/7PdZbx

National Highway Freight Network		
Item ID	B.H.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the National Highway Freight Network (NHFN) designation for the highway feature reported in Item B.F.01 – Feature Type, using one of the following codes.

Code	Description
1	Primary Highway Freight System
2	Interstate portions not on the Primary Highway Freight System
3	Critical Rural Freight Corridor
4	Critical Urban Freight Corridor
N	Not on the NHFN

Commentary

This item is used to identify the National Highway Freight Network and to report to Congress on the conditions and performance of the network. This item is also used with other items to classify bridges according to serviceability, safety, and essentiality for public use and considers the potential impacts to emergency evacuation routes and to regional and national freight and passenger mobility if the serviceability of the bridge is restricted or diminished.

There are currently no Critical Rural or Urban Freight Corridors in Ohio.

TIMS can be utilized to obtain this information by selecting the data layer for National Freight Network under the Roadway Information tab.

https://tims.dot.state.oh.us/tims/map/sid/oP362R

More information can be found at:
https://ops.fhwa.dot.gov/Freight/infrastructure/nfn/index.htm.

STRAHNET Designation		
Item ID	B.H.05	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the Strategic Highway Network (STRAHNET) designation for the highway feature reported in Item B.F.01 – Feature Type, using one of the following codes.

Code	Description
1	STRAHNET Route
2	STRAHNET Connector Route
N	Not a STRAHNET route

Commentary

The STRAHNET is a system of Interstate and primary highways and connectors that provide access to major US military installations and strategic ports and provides continuity and emergency capabilities for defense purposes. The STRAHNET is determined by the Surface Deployment and Distribution Command (SDDC) in coordination with FHWA.

TIMS can be utilized to obtain this information by selecting the data layer for STRAHNET under the Roadway Information tab.

https://tims.dot.state.oh.us/tims/map/sid/5Y6Z5Y

STRAHNET routes and STRAHNET Connector routes specific to Ohio can be found on NHS Ohio State map and the maps associated with the urbanized areas of the state at: https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/ohio/.

LRS Route ID		
Item ID	B.H.06	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 120	

Specification

Report the LRS Route ID defined by the State that is reported to the HPMS for the highway feature reported in Item B.F.01 – Feature Type.

The LRS Route ID must match the HPMS data exactly.

Report N if an LRS Route ID has not been assigned.

Commentary

The LRS Route ID is not necessarily the same as the route number posted along the highway, but is a number used to uniquely identify a route within a county or a State for GIS analysis and mapping purposes.

Within TIMS and the Roadway Information Manual, the NLF ID equals the LRS ID for this item.

In TIMS the NLF ID is found by right clicking on any route and clicking on “Location Information”.

https://tims.dot.state.oh.us/tims/map/sid/0PM0AR

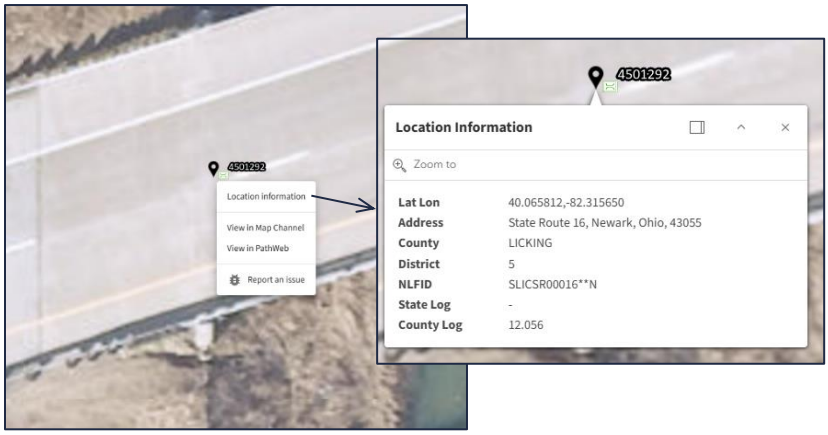


Figure 7-90: LRS Route ID within TIMS shown as NLFID.

Refer to the FHWA HPMS Field Manual for additional information at:

https://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/.

For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

LRS Milepoint					
Item ID	B.H.07				SNBI
Frequency	Calculated				
Format	Numeric	Max digits:	8	Decimal places	3

Specification

Report the LRS mile point for the highway feature reported in Item B.F.01 – Feature Type to the nearest thousandth of a mile. The mile point must be consistent with the LRS route and mile point system for the HPMS.

For highway features that carry an LRS route, report the mile point at the beginning of the bridge.

When the LRS route passes below the bridge, report the mile point on the LRS route where the bridge is first encountered in direction of increasing mileage.

Commentary

The LRS mile point is used to establish the location of the bridge along the LRS route.

If the highway does not carry an LRS route, report the most appropriate mile point.

The beginning of the bridge is defined as the end of the Rear Approach slab, the back of the Rear Abutment backwall, or the back of the first wall or edge of a culvert along the centerline of the roadway.

To obtain the LRS Milepoint within TIMS right click on the map at the location where you would like to get the LRS Milepoint and select “Location Information.” The County Log point shall be used for LRS Milepoint.

https://tims.dot.state.oh.us/tims/map/sid/0PM0AR

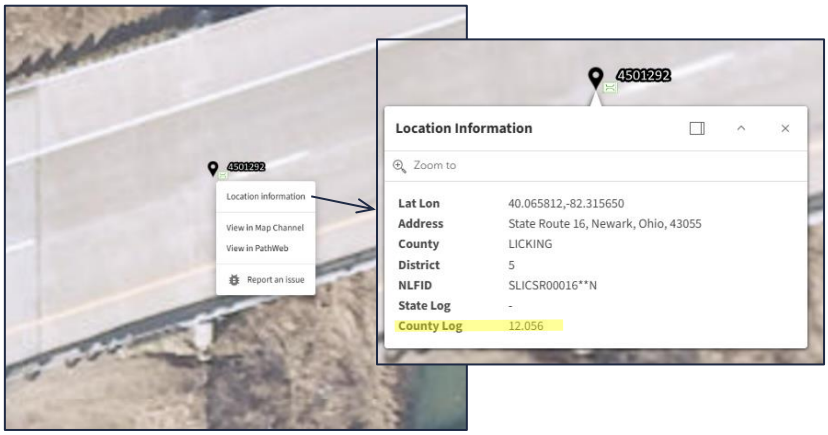


Figure 7-91: LRS Route information within TIMS with the county log point shown.

For additional information refer to the FHWA HPMS Field Manual at:

http://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/.

LRS Milepoint - Continued		
Item ID	B.H.07	SNBI
Commentary - Continued		
For border bridges, the Neighboring State reports this item for all highway features carried on the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.		

Interstate Mile Marker				
Item ID	B.H.07.01			Previously ODOT Item 209.01
Frequency	Initial			
Format	Numeric	Max digits: 6	Decimal places 3	

Specification

Interstate Mile Marker is a Roadway Inventory field that is updated automatically based on the bridge's spatial data in relation to the road inventory data for the route carried on the bridge.

Commentary

This item is automatically imported into AssetWise and shown for informational purposes only. It is only shown for the route carried on the bridge.

Lanes on Highway

Item ID	B.H.08				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	2	Decimal places:	0

Specification

Report the number of highway traffic lanes for the highway feature reported in Item B.F.01 – Feature Type.

Report 1 when a highway is signed or striped for one-lane but carries two-way traffic.

Report 1 for a highway feature carried on the bridge when Item B.G.06 – Bridge Width Curb-to-Curb is less than 16 feet and the bridge is not striped for full width traffic lanes.

Commentary

For highway features carried on the bridge, include all lanes that are striped or otherwise operated as full width highway traffic lanes, auxiliary lanes (e.g. merge lanes, ramp lanes, turn lanes), and special use lanes that run the entire length of the bridge.

For highway features below the bridge that are not carried on another bridge, include all lanes that are striped or otherwise operated as full width highway traffic lanes, auxiliary lanes (e.g. merge lanes, ramp lanes, turn lanes), and special use lanes that pass below the entire width of the bridge.

Do not include pedestrian sidewalks, bike paths, or railroad tracks as lanes, unless the railroad tracks are concurrent with the highway lanes.

For double deck bridges and parallel bridges, report the number of lanes consistent with the highway feature reported in Item B.F.01 – Feature Type.

For sidehill bridges, report the total number of lanes for the highway feature regardless if carried on the bridge or terrain/earth material.

Examples

Highway feature carried on the bridge has one lane.

- **Report 1**.

Highway feature carries two-way traffic on unstriped lanes and has a curb-to-curb width of 18 ft.

- **Report 2**.

Double deck bridge inventoried as one unique bridge number. Highway feature on top level carries five lanes. Highway feature on lower level carries five lanes.

- **Report 5** for the highway feature on the top level.
- **Report 5** for the highway feature on the lower level.

Annual Average Daily Traffic					
Item ID	B.H.09				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	8	Decimal places:	0

Specification

Report the annual average daily traffic (AADT) from the most recent count for the highway feature reported in Item B.F.01 – Feature Type.

The AADT must be compatible with the other items reported for the highway feature.

Report the design AADT for a newly inventoried highway feature when actual AADT information is not yet available.

Report the last open AADT for a highway feature that is temporarily closed until repair or replacement can be completed.

Commentary

Future AADT shall not be reported.

The AADT should be updated at intervals in accordance with the standards for the HPMS or every 6 years.

When AADT values are presented for the total highway segment (both directions), but multiple highway features are used to define each direction (i.e. divided highway), the AADT value should be divided based on the percentage of AADT in each direction.

Within TIMS the AADT can be found under the Roadway Information tab and within the Traffic Count Segments Layer.

https://tims.dot.state.oh.us/tims/map/sid/AxZAXY

Within the Traffic Count Segments Layer, AADT_TOTAL is reported as the AADT. For routes recorded using multiple features, within TIMS, click on the TRAFFIC_REPORTS link to ODOT's Traffic Count Database System (TCDS) for additional information regarding the AADT for each direction of travel.

All traffic, including trucks, is counted in the AADT. The number of trucks counted in the AADT is reported in Item B.H.10 – Annual Average Daily Truck Traffic.

AADT values can also be found online through ODOT's TCDS-25 site at:
https://odot.public.ms2soft.com/tcds/tsearch.asp?loc=Odot&mod=TCDS

When HPMS or other planning data are not available, use a best estimate based on site familiarity or functional classification.

Annual Average Daily Truck Traffic					
Item ID	B.H.10				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	8	Decimal places:	0

Specification

Report the Average Annual Daily Truck Traffic (AADTT) from the most recent count for the highway feature reported in Item B.F.01 – Feature Type.

The AADTT must be compatible with the other items reported for the highway feature.

Report the design AADTT for a newly inventoried highway feature when actual AADTT information is not yet available.

Report the last open AADTT for a highway feature that is temporarily closed until repair or replacement can be completed.

Commentary

Future AADTT shall not be reported.

The AADTT should be updated at intervals in accordance with the standards for the HPMS or every 6 years.

When AADTT values are presented for the total highway segment (both directions), but multiple highway features are used to define each direction (i.e. divided highway), the AADTT value should be divided based on the percentage of AADTT in each direction.

Within TIMS the AADTT can be found under the Roadway Information tab and within the Traffic Count Segments Layer.

https://tims.dot.state.oh.us/tims/map/sid/AxZAXY

Within the Traffic Count Segments Layer, AADT_TRUCK is reported as the AADTT. For routes recorded using multiple features, within TIMS, click on the TRAFFIC_REPORTS link to ODOT's Traffic Count Database System (TCDS) for additional information regarding the AADTT for each direction of travel. Within the Traffic Reports link, there is a column for BC (business/commercial vehicles of FHWA Class 4 and above) that can be used to report AADTT.

When HPMS or other planning data are not available, use a best estimate based on site familiarity or functional classification.

Do not include vans, pickup trucks, and other light delivery trucks in the AADTT.

Year of Annual Average Daily Traffic					
Item ID	B.H.11				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	4	Decimal places:	0

Specification

Report the year associated with the data reported in Item B.H.09 – Annual Average Daily Traffic for the highway feature reported in Item B.F.01 – Feature Type.

Commentary

Future AADT shall not be reported.

The traffic data should be updated at intervals in accordance with the standards for the HPMS and or every 6 years.

Within TIMS the year of AADT can be found under the Roadway Information tab and within the Traffic Count Segments Layer.

https://tims.dot.state.oh.us/tims/map/sid/AxZAXY

Within the Traffic Count Segments Layer, AADT_YEAR is reported as the year for the data shown within TIMS. For additional years of data, click on the TRAFFIC_REPORTS link to ODOT's Traffic Count Database System (TCDS) which provides data for additional years.

Highway Maximum Usable Vertical Clearance					
Item ID	B.H.12				SNBI
Frequency	Each Inspection				
Format	Numeric	Max digits:	3	Decimal places:	1

Specification

Report the minimum vertical clearance for the highway feature reported in Item B.F.01 – Feature Type, measured over the 10-foot-wide envelope of the traveled part of the highway, which provides for the maximum usable clearance envelope, rounded down to the nearest tenth of a foot.

Measure the vertical clearance plumb from the deck or highway surface to the lowest bridge member restriction, appurtenance (signs, utilities, etc.) attached to the bridge, or other structure.

Report 99.9 when the clearance is 100 feet or greater or no restriction exists above the highway.

Commentary

This item identifies the maximum height of a notional 10-foot-wide vehicle that can pass on the highway feature(s) reported in Item B.F.01 – Feature Type. This information is sometimes used for preliminary military routing.

The data may not represent the absolute minimum clearance over the highway feature. Refer to Item B.H.13 – Highway Minimum Vertical Clearance for the absolute minimum clearance.

The traveled part of the highway feature does not include shoulders.

This value may be different than the posted vertical clearance due to agency vertical clearance posting policies and procedures. These data are not sufficient for permit routing as the location of the 10-foot-wide envelope that provides for the maximum usable clearance is not reported.

For a double decked bridge inventoried as one bridge, report this information for each highway feature on each level of the bridge.

Update field measurements when alterations are made to the bridge or highway that affect the previously measured clearance.

Reporting this item is optional for highway features below the bridge that do not carry NHS routes as identified in Item B.H.03 – NHS Designation.

Clearances greater than 30 feet may be estimated.

Highway Maximum Usable Vertical Clearance - Continued

Item ID	B.H.12	SNBI

Examples

The bridge has a 13'-9" maximum usable vertical clearance.

- **Report 13.7**.

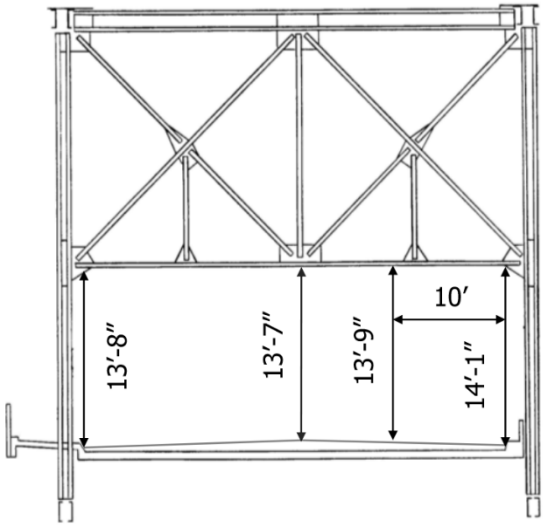


Figure 7-92: Cross-section view of through truss bridge showing vertical clearances. Note. Adapted from FHWA-HIF-22-017

The bridge carries a highway with no vertical clearance restrictions.

- **Report 99.9**.

Arthur Road passes below the bridge and has an 18'-5" maximum usable vertical clearance. SR70 also passes below the bridge and has a 19'-11" maximum usable vertical clearance.

- **Report 18.4** for the Arthur Road highway feature.
- **Report 19.9** for the SR70 highway feature.

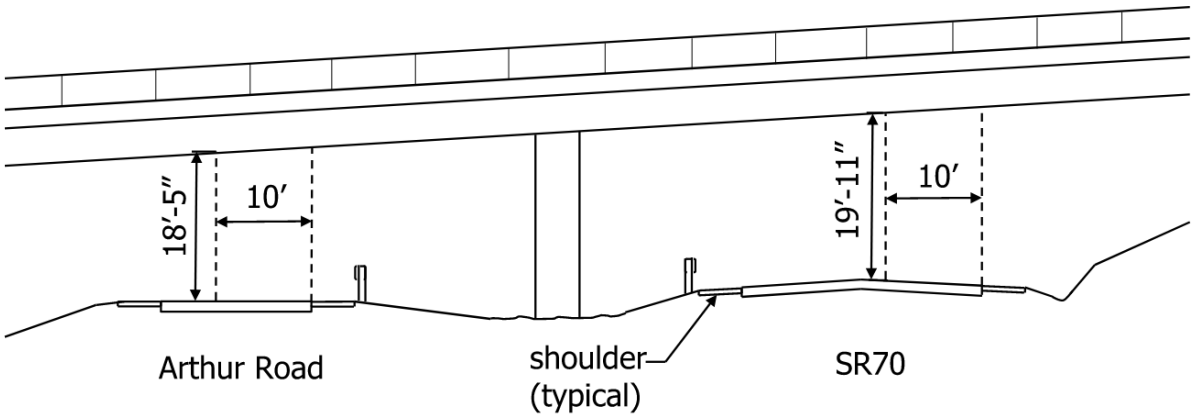


Figure 7-93: Elevation view with two separate highway features passing below the bridge. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Vertical Clearance					
Item ID	B.H.13				SNBI
Frequency	Each Inspection				
Format	Numeric	Max digits:	3	Decimal places:	1

Specification

Report the minimum vertical clearance measured over the highway feature reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

Measure the vertical clearance plumb from the deck or highway surface (including paved or stabilized shoulders) to the lowest bridge member restriction, appurtenance (signs, utilities, etc.) attached to the bridge, or other structure.

Report 99.9 when the clearance is 100 feet or greater or no restriction exists above the highway.

Commentary

Several measurements may need to be made to determine the minimum vertical clearance. However, only the minimum measurement is reported.

Shoulders must be contiguous with the traveled way and must be structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not to be considered a shoulder for this item. Stabilized shoulders are of similar construction and materials of the roadway with to abrupt change in profile from the roadway to shoulder. When it is not readily known if stabilized construction details were used, the presence of rutting, heaving, water retention, or other distress may be used as indicators that the shoulder is not stabilized.

This data may be different than the posted vertical clearance due to agency vertical clearance posting policies and procedures.

Update field measurements when alterations are made to the bridge or highway that affect the previously measured clearance (such as new wearing surface or pavement).

Clearances greater than 30 feet may be estimated.

Examples

The bridge has a 13'-7" maximum usable vertical clearance.

- **Report 13.5**.

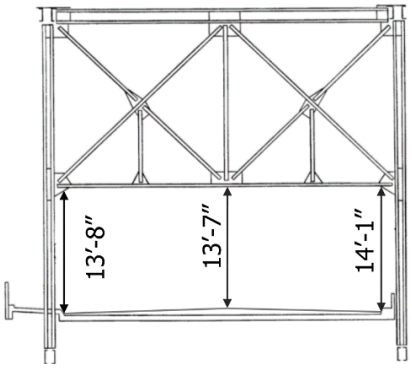


Figure 7-94: Cross-section view of a through truss bridge minimum showing vertical clearances. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Vertical Clearance		
Item ID	B.H.13	SNBI
Examples - Continued		

The bridge carries a highway with no vertical clearance restrictions.

- **Report 99.9**.

Two highway features below the bridge. Arthur Road passes below the bridge and has an 18'-3" minimum vertical clearance. SR70 also passes below the bridge and has a 19'-9" minimum vertical clearance.

- **Report 18.2** for the Arthur Road highway feature.
- **Report 19.7** for the SR70 highway feature.

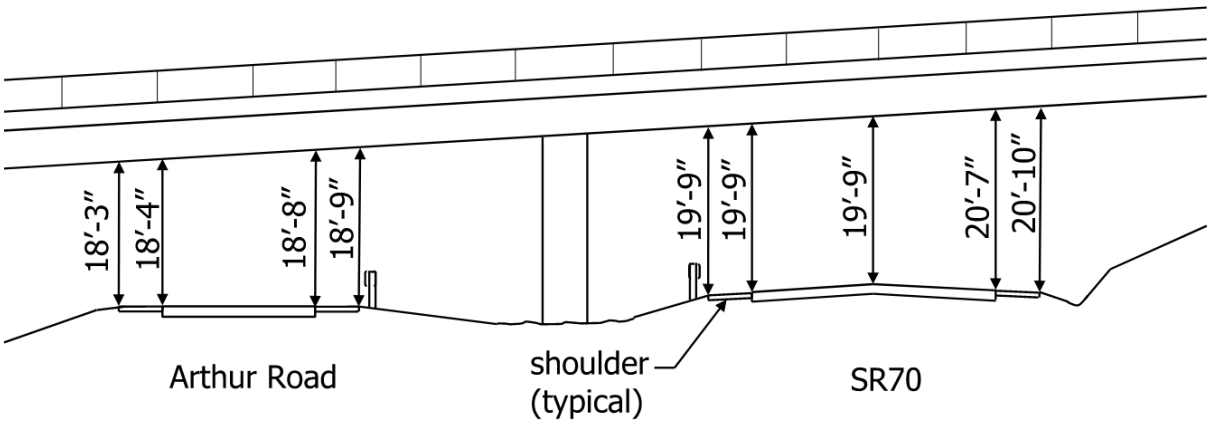


Figure 7-95: Elevation view with two separate highway features passing below the bridge. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Horizontal Clearance, Left					
Item ID	B.H.14				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 3		Decimal places: 1	

Specification

Report the minimum horizontal clearance on the left, for the highway feature reported below the bridge in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

Measure from the left edge line of the highway (excluding shoulders, turn lanes, acceleration, or deceleration lanes) ***in the direction of travel*** to the nearest substructure unit, rigid barrier, oncoming traffic lane, or toe of slope that is steeper than 1 to 3 (vertical to horizontal).

Report 99.9 when the clearance is 100 feet or greater.

Report 0 when the highway is a two-way highway that is not divided at the bridge.

Do not report this item for highway feature(s) carried on the bridge.

Commentary

This item provides data for the highway feature(s) reported in Item B.F.01 – Feature Type that pass below the bridge.

Highways undivided at the bridge are reported as 0 due to the adjacent oncoming traffic lane which provides no horizontal clearance to the left.

Reinforced concrete and masonry traffic safety features are considered rigid barriers; metal and timber railings are not considered rigid barriers.

Clearances greater than 30 feet may be estimated.

Examples

Highway feature below the bridge carries 1-way traffic, looking in the direction of travel.

- **Report 20.0**.

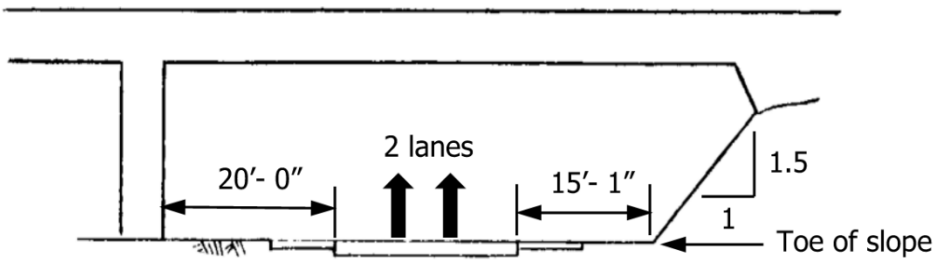


Figure 7-96: Bridge elevation view of horizontal clearances for a 2-lane highway with 1-way traffic below the bridge. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Horizontal Clearance, Left - Continued

Item ID	B.H.14	SNBI

Examples - Continued

Highway feature below the bridge carries 2-way traffic.

- **Report 0**.

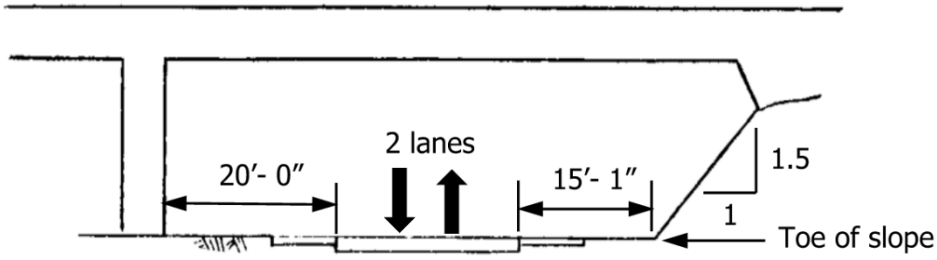


Figure 7-97: Bridge elevation view of horizontal clearances for a 2-lane highway with 2-way traffic below the bridge. Note. Adapted from FHWA-HIF-22-017

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic southbound, and one carries 1-way traffic northbound.

- **Report 18.0** for the southbound highway feature (looking in direction of traffic).
- **Report 19.0** for the northbound highway feature (looking in direction of traffic).

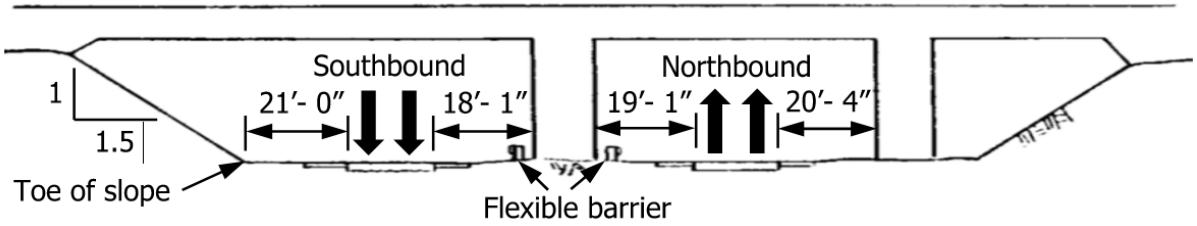


Figure 7-98: Bridge elevation view of horizontal clearances for separate southbound and northbound highway features below the bridge, with flexible barriers. Note. Adapted from FHWA-HIF-22-017

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic eastbound, and one carries 1-way traffic westbound.

- **Report 35.5** for the eastbound highway feature (looking in direction of traffic).
- **Report 35.5** for the westbound highway feature (looking in direction of traffic).

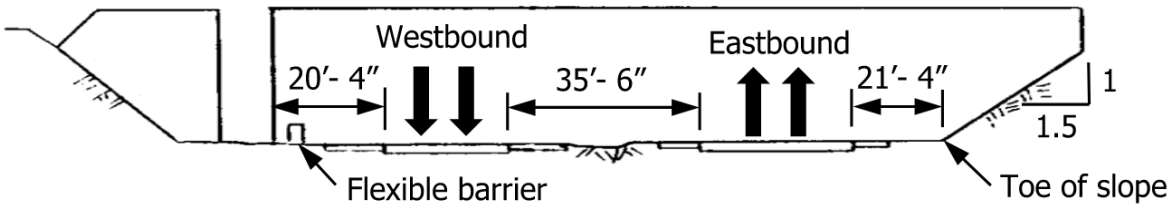


Figure 7-99: Bridge elevation view of horizontal clearances for separate westbound and eastbound highway features below the bridge, with flexible barrier. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Horizontal Clearance, Left - Continued

Item ID	B.H.14

Examples - Continued

Highway feature below the bridge carries 1-way ramp traffic, looking in the direction of travel.

- **Report 14.5**.

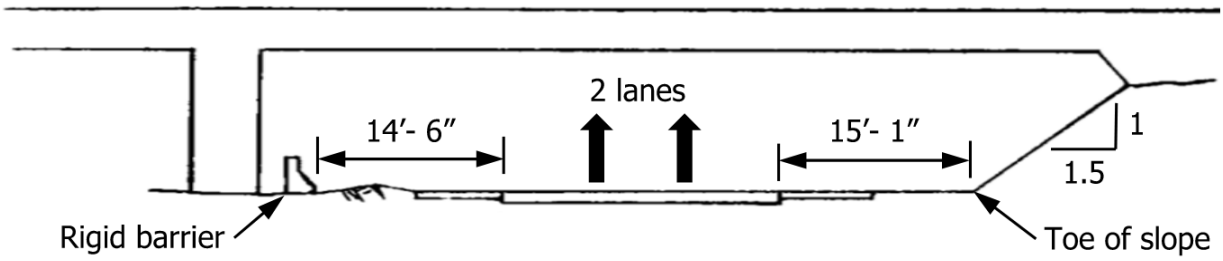


Figure 7-100: Bridge elevation view of horizontal clearances for a 2-lane, 1-way highway feature below the bridge, with a rigid barrier. Note. Adapted from FHWA-HIF-22-017

Highway feature below the bridge carries 1-way mainline traffic and 1-way ramp traffic, looking in the direction of travel.

- **Report 20.0**.

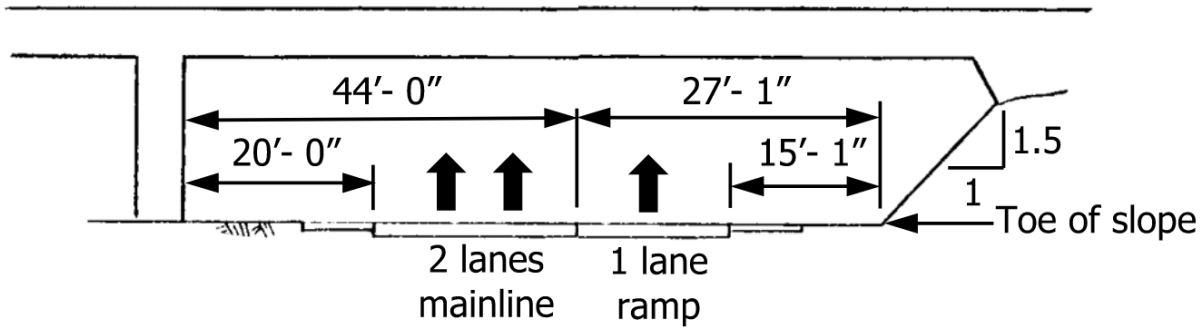


Figure 7-101: Bridge elevation view of horizontal clearances for a highway feature below the bridge carrying mainline and ramp. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Horizontal Clearance, Right					
Item ID	B.H.15				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 3		Decimal places: 1	

Specification

Report the minimum horizontal clearance on the right, for the highway feature below the bridge reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

Measure from the right edge line of the highway (excluding shoulders, turn lanes, acceleration, or deceleration lanes) ***in the direction of travel*** to the nearest substructure unit, rigid barrier, oncoming traffic lane or toe of slope that is steeper than 1 to 3 (vertical to horizontal).

Report 99.9 when the clearances are 100 feet or greater.

Do not report this item for highway feature(s) carried on the bridge.

Commentary

This item provides data for the highway feature(s) reported in Item B.F.01 – Feature Type that pass below the bridge.

Reinforced concrete and masonry traffic safety features are considered rigid barriers; metal and timber railings are not considered rigid barriers.

Clearances greater than 30 feet may be estimated.

Examples

Highway feature below the bridge carries 1-way traffic, looking in the direction of travel.

- **Report 15.0**.

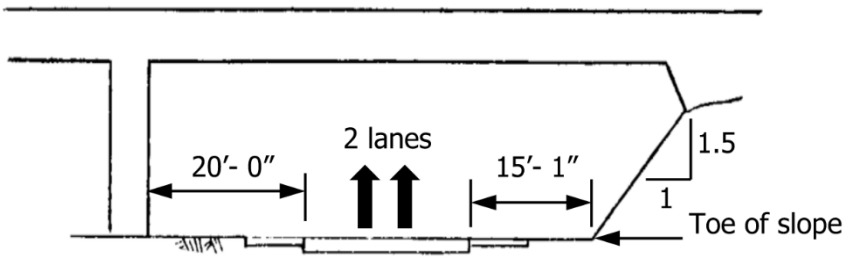


Figure 7-102: Bridge elevation view of horizontal clearances for a 2-lane highway feature with 1-way traffic below the bridge. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Horizontal Clearance, Right - Continued

Item ID	B.H.15	SNBI

Examples - Continued

Highway feature below the bridge carries two-way traffic.

- **Report 15.0** (minimum distance on right side when looking in either direction of travel).

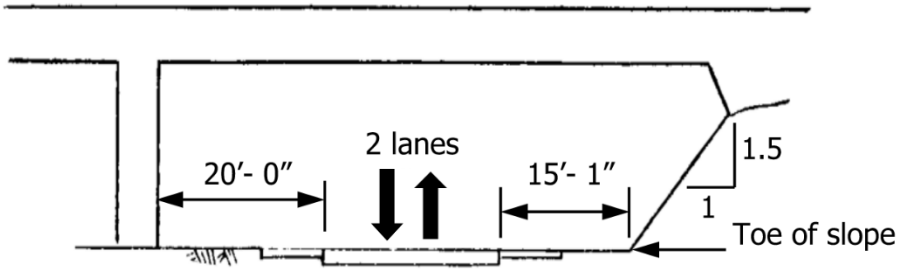


Figure 7-103: Bridge elevation view of horizontal clearances for a 2-lane highway feature with 2-way traffic below the bridge. Note. Adapted from FHWA-HIF-22-017

Highway feature below the bridge carries 2-way traffic.

- **Report 14.5** (minimum distance on right side when looking in either direction of travel).

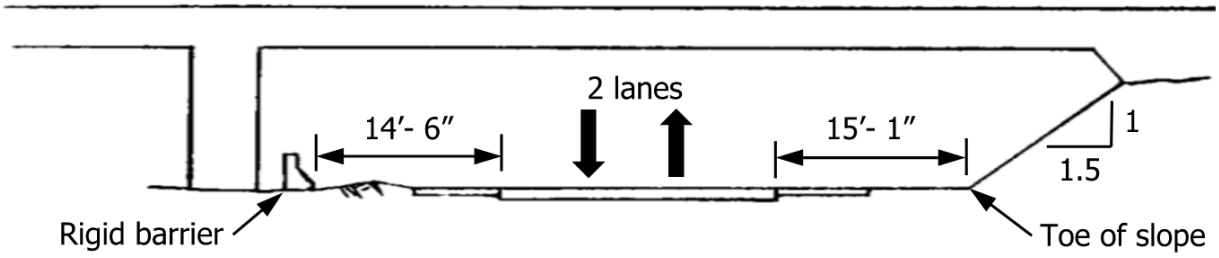


Figure 7-104: Bridge elevation view of a 2-lane, 2-way highway feature below the bridge, with a rigid barrier. Note. Adapted from FHWA-HIF-22-017

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic southbound, and one carries 1-way traffic northbound.

- **Report 21.0** for the southbound highway feature (looking in the direction of travel).
- **Report 20.3** for the northbound highway feature (looking in the direction of travel).

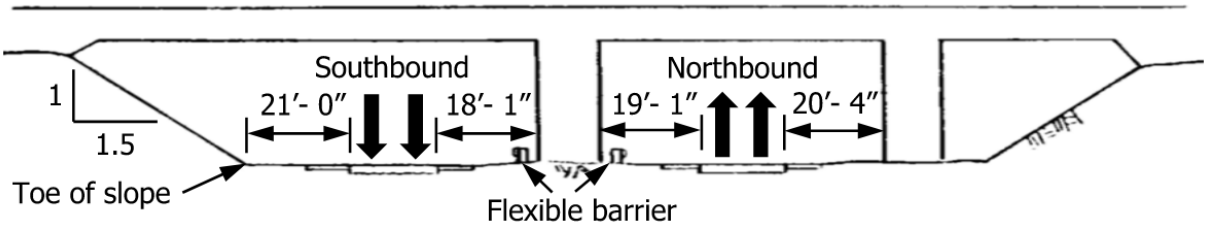


Figure 7-105: Bridge elevation view of horizontal clearances for separate southbound and northbound highway features below the bridge, with flexible barriers. Note. Adapted from FHWA-HIF-22-017

Highway Minimum Horizontal Clearance, Right - Continued

Item ID	B.H.15

Examples - Continued

Two highway features below the bridge for a highway that is divided at the bridge. One highway feature carries 1-way traffic eastbound, and one carries 1-way traffic westbound.

- **Report 21.3** for the eastbound highway feature (looking in the direction of travel).
- **Report 20.3** for the westbound highway feature (looking in the direction of travel).

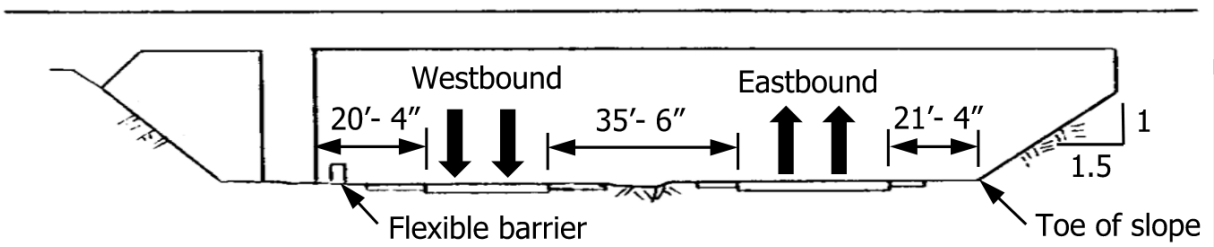


Figure 7-106: Bridge elevation view of horizontal clearances for separate westbound and eastbound highway features below the bridge, with a flexible barrier. Note. Adapted from FHWA-HIF-22-017

Highway feature below the bridge carries 1-way ramp traffic, looking in the direction of travel.

- **Report 15.0**.

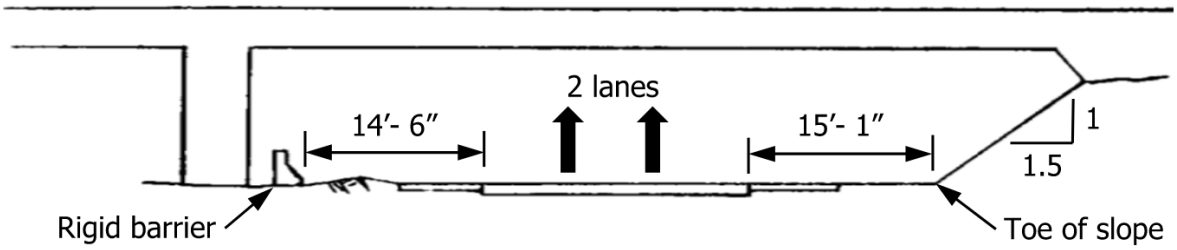


Figure 7-107: Bridge elevation view of horizontal clearances for a 2-lane, 1-way highway feature below the bridge, with a rigid barrier. Note. Adapted from FHWA-HIF-22-017

Highway feature below the bridge carries 1-way mainline traffic and 1-way ramp traffic, looking in the direction of travel.

- **Report 15.0**.

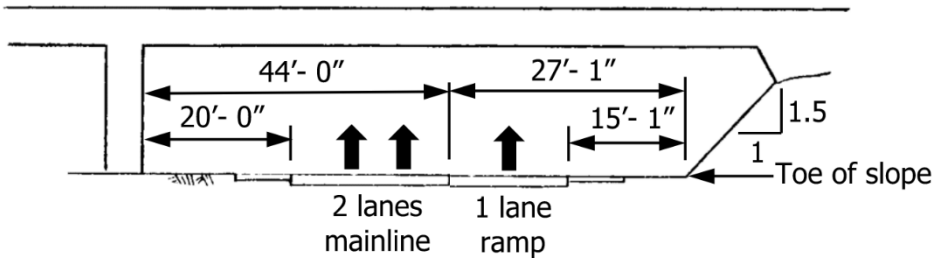


Figure 7-108: Bridge elevation view of horizontal clearances for highway feature carrying mainline and ramp traffic below the bridge. Note. Adapted from FHWA-HIF-22-017

Highway Maximum Usable Surface Width					
Item ID	B.H.16				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 3		Decimal places: 1	

Specification

Report the maximum usable surface width for the highway feature reported in Item B.F.01 – Feature Type that passes below or is carried on the bridge, rounded down to the nearest tenth of a foot.

Measure the width perpendicular to the centerline of the highway (including paved or stabilized shoulders).

Report 99.9 when the surface width is 100 feet or greater.

Commentary

Shoulders are included when they are contiguous with the traveled way and structurally adequate for all weather and traffic conditions consistent with the facility carried. Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not considered a shoulder for this item. Stabilized shoulders are of similar construction and materials of the roadway with to abrupt change in profile from the roadway to shoulder. When it is not readily known if stabilized construction details were used, the presence of rutting, heaving, water retention, or other distress may be used as indicators that the shoulder is not stabilized.

Flush (striped) and mountable medians are not considered restrictions.

A curb or median greater than 6 inches high may be considered non-mountable for these specifications.

Use the least restrictive configuration when movable rigid barriers are used to accommodate reversible lanes for non-construction-related applications.

Reporting this item is optional for highway features below the bridge that do not carry NHS routes as identified in Item B.H.03 – NHS Designation.

Examples

Two highway features below the bridge. One highway feature carries eastbound traffic, and one carries westbound traffic.

- **Report 34.6** for the eastbound highway feature.
- **Report 42.4** for the westbound highway feature.

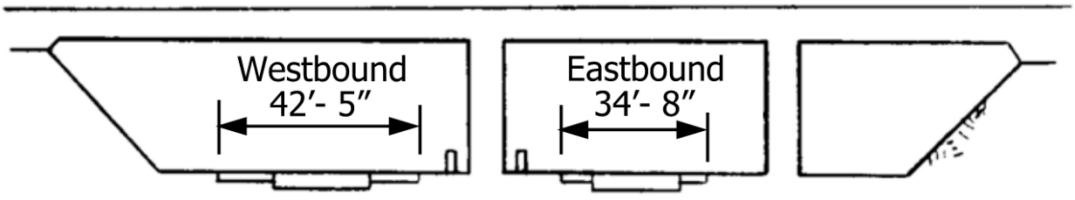


Figure 7-109: Bridge elevation view of two separate highway features below the bridge. Note. Adapted from FHWA-HIF-22-017

Highway Maximum Usable Surface Width - Continued

Item ID	B.H.16	SNBI

Examples - Continued

One highway feature carried on the bridge. Highway feature carries 2-way traffic that is not divided at the bridge.

- **Report A**.

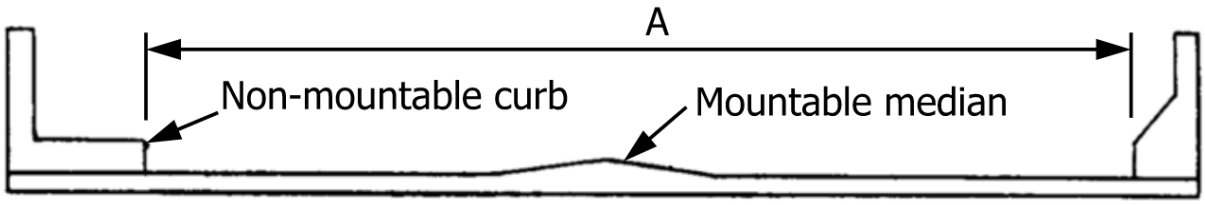


Figure 7-110: Cross-section view of a highway feature carried on the bridge with a mountable median. Note. Adapted from FHWA-HIF-22-017

Two highway features carried on the bridge. Highway 1 (H01) and Highway 2 (H02) are divided at the bridge by the non-mountable median.

- **Report A** for H01.
- **Report B** for H02.

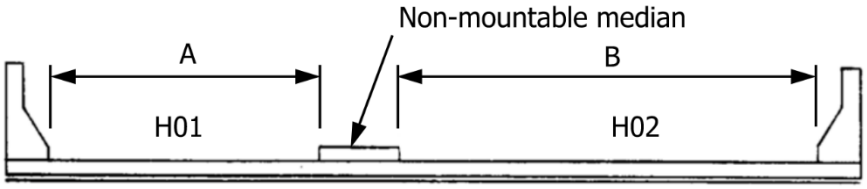


Figure 7-111: Cross-section view of two highway features carried on the bridge with a non-mountable median. Note. Adapted from FHWA-HIF-22-017

Two highway features carried on the pipe culvert under fill. Highway 1 (H01) and Highway 2 (H02) are divided at the bridge.

- **Report A** for H01.
- **Report B** for H02.

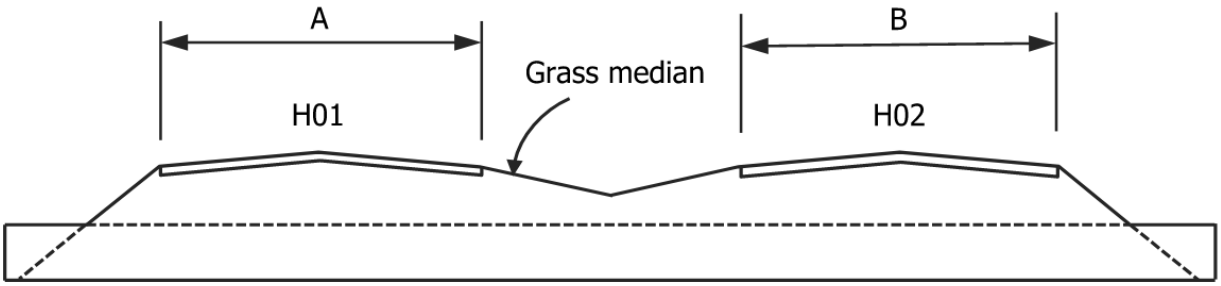


Figure 7-112: Cross-section view of two highway features carried on the pipe culvert under fill with a grass median. Note. Adapted from FHWA-HIF-22-017

Bypass Detour Length					
Item ID	B.H.17				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 3		Decimal places: 0	

Specification

Report the length to the nearest mile of the total ***additional*** travel for a vehicle to bypass the bridge for the highway feature reported in Item B.F.01 – Feature Type, which passes below or is carried on the bridge.

Report 999 where a detour does not exist.

Report 0 for available ground level bypass.

Report 1 when the highway feature is carried by a bridge, is not at an interchange, and a parallel bridge can be used as a temporary bypass with a reasonable amount of crossover grading.

Commentary

Determine bypass detour length by evaluating the potential to move traffic, including military vehicles and trucks, around bridges.

- Avoid detour routes that have load, height, or capacity limitations unacceptable for the additional traffic detoured onto them.
- Consider using the parallel bridge of dual bridges or temporary culverts if emergency detours can be constructed with a reasonable amount of grading within the existing right-of-way.
- Consider using ramps and/or frontage roads in interchanges.
- Review plans for strategic bridge detour routes.

Detour routes for State highway or Interstate routes shall only utilize other State highway or Interstate routes.

Examples

Diamond interchange. Bridge can be bypassed.

- **Report 0**.

Cloverleaf interchange. Bridge cannot be bypassed; 18-mile detour.

- **Report 18**.

Bypass Detour Length - Continued

Item ID	B.H.17	SNBI

Examples - Continued

Highway feature carried on the bridge with a 4-mile detour.

- **Report 4.**

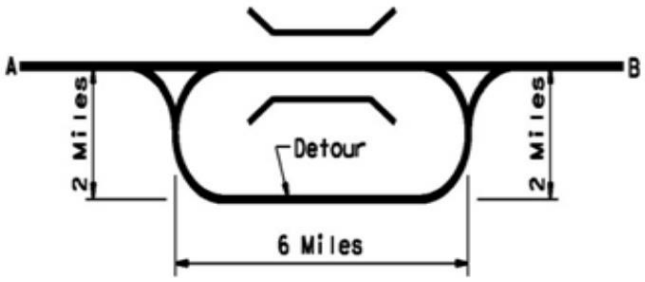


Figure 7-113: Detour map for a highway feature carried on the bridge. Note. Adapted from FHWA-HIF-22-017

Highway feature passes below the bridge with a 0-mile detour.

- **Report 0.**

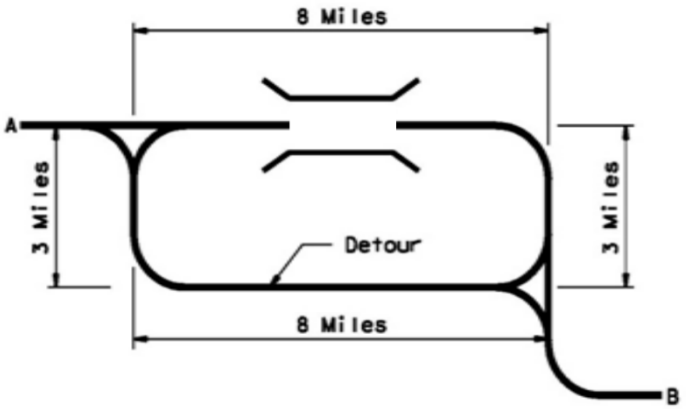


Figure 7-114: Detour map for a highway feature that passes below the bridge. Note. Adapted from FHWA-HIF-22-017

Crossing Bridge Number		
Item ID	B.H.18	SNBI
Frequency	Initial	
Format	Alphanumeric Max digits: 15 Decimal places: 0	

Specification

Report the exact bridge number(s) as assigned in Item B.ID.01 – Bridge Number for the bridge carrying a highway feature that is located directly above or below the inventoried highway bridge.

Do not report this item when the highway bridge does not pass above or below another bridge or passes above or below a bridge that is not reportable to the NBI.

Commentary

The intent of this item is to capture the bridge number for bridges of a multi-level interchange, where bridges pass directly above or below other bridges.

Do not report crossing bridge number for non-NBI bridges (span length less than 20') that are below a bridge. For non-NBI bridges all feature fields shall be filled out.

When B.H.18 – Crossing Bridge Number is reported for NBI bridges (span length greater than 20'), all data items of the Highway subsection can be left blank. When needed, FHWA obtains the data for these highway feature(s) using the data reported for the crossing bridge.

For border bridges, the Neighboring State reports this item for all highway features that pass above the bridge, as part of their abbreviated bridge record. For more information, see Chapter 7.1.1 of this document.

7.4.4 Railroads

The data items in the Railroads group are reported when the feature type reported in Item B.F.01 – Feature Type is a railroad (e.g. code R01, R02, etc.). The items in this subsection provide information about railroads that are carried on or pass below the bridge and are part of the Features Data Set with a many-to-one relationship with a bridge. Each railroad feature reported in Item B.F.01 – Feature Type has a unique railroad feature data set, and there may be multiple railroad feature data sets associated with a bridge.

Item B.RR.01 – Railroad Service Type is reported for all railroads, and the remaining items are reported only for railroads below the bridge (i.e. when Item B.F.02 – Feature Location is B).

The dimensional values for the items in this subsection can be obtained from either plans or field measurements. When access to the railroad right-of-way is restricted, dimensional values can be estimated utilizing laser measuring devices to obtain approximate measurements outside the railroad limits or resources such as TIMS or Google Earth to obtain approximate clearances and elevations of the bridge and the ground below.

The following data items are included in this section:

Item ID	Data Item
B.RR.01	Railroad Service Type
B.RR.02	Railroad Minimum Vertical Clearance
B.RR.03	Railroad Minimum Horizontal Offset

Railroad Service Type

Item ID	B.RR.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 2	

Specification

Report the designated railroad service type for the railroad feature reported in Item B.F.01 – Feature Type using one of the following codes.

Code	Description
F	Freight
FE	Freight – electrified
P	Passenger
PE	Passenger – electrified
M	Multiple services – not electrified
ME	Multiple services – electrified
I	Inactive

Commentary

Electrified is intended for electricity-powered rail lines and third rails, but not for battery or fuel cell powered lines.

Use code M when multiple rail services (such as freight and passenger rail) use the same tracks and both services are not electrified.

Use code ME when multiple rail services (such as freight and passenger rail) use the same tracks, and at least one is electrified.

Use code I when track or other railroad property is present but the track is not in use or abandoned.

Examples

The bridge carries two highway features separated by two electrified passenger rail tracks (i.e. one railroad feature). Two railroad tracks pass below the bridge that both carry freight (i.e. one railroad feature).

- **Report PE** for the railroad feature carried on the bridge.
- **Report F** for the railroad feature below the bridge.

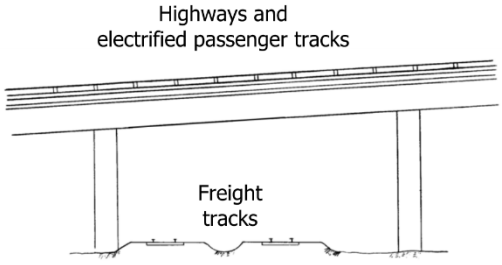


Figure 7-115: Bridge elevation view with two electrified passenger rail tracks carried on the bridge and two freight rail tracks below the bridge. Note. Adapted from FHWA-HIF-22-017

Railroad Service Type - Continued		
Item ID	B.RR.01	SNBI

Examples - Continued

Two railroad tracks below the bridge. One carries passenger rail service, and one carries freight (i.e. two railroad features).

- **Report P** for the passenger rail feature.
- **Report F** for the freight rail feature.

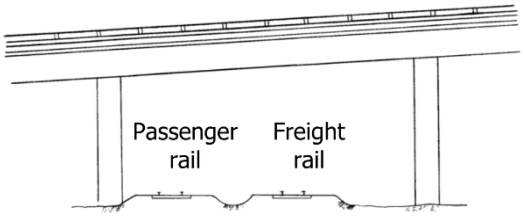


Figure 7-116: Bridge elevation view with one passenger rail and one freight rail track below the bridge. Note. Adapted from FHWA-HIF-22-017

Two railroad tracks below the bridge that both carry freight and passenger service (i.e. one railroad feature).

- **Report M**.

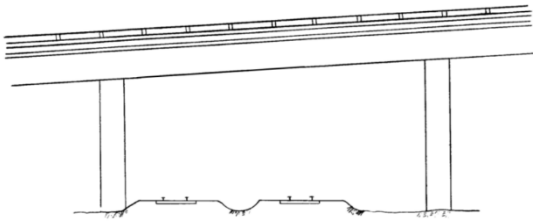


Figure 7-117: Bridge elevation view with two freight/passenger rail tracks below the bridge. Note. Adapted from FHWA-HIF-22-017

Two railroad tracks below the bridge. One carries electrified passenger service, and one carries non-electrified passenger service (i.e. two railroad features).

- **Report PE** for the electrified passenger rail feature.
- **Report P** for the non-electrified passenger rail feature.

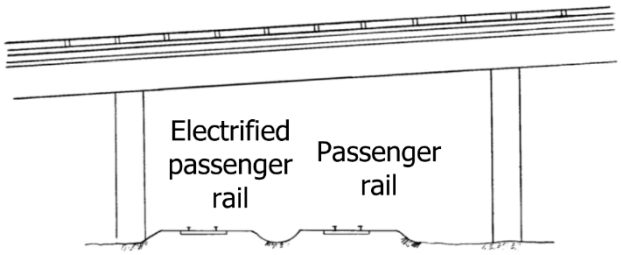


Figure 7-118: Bridge elevation view with an electrified passenger rail track and a non-electrified passenger rail track below the bridge. Note. Adapted from FHWA-HIF-22-017

Railroad Minimum Vertical Clearance		
Item ID	B.RR.02	SNBI
Frequency	Each Inspection	
Format	Numeric Max digits: 3 Decimal places: 1	

Specification

Report the minimum vertical clearance for the railroad feature reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

Measure plumb from the top of rails to the lowest bridge restriction or appurtenance (signs, utilities, etc.) attached to the bridge. Appurtenances attached to the bridge that serve only a railroad purpose, such as catenary systems, are excluded from the measurement and do not reduce the vertical clearance measurement.

Report 99.9 when the clearance is 100 feet or greater.

Report this item only when Item B.F.02 – Feature Location is B

Commentary

Several measurements may need to be made to determine the minimum vertical clearance for each railroad feature when one or more railroad tracks pass below the bridge. However, only the minimum measurement is reported.

Update measurements when alterations are made to the bridge or railroad tracks that affect the previously measured clearance.

Clearances greater than 30 feet may be estimated.

Examples

Two railroad tracks below the bridge that both carry freight and passenger service (i.e. one railroad feature).

- **Report 31.2**.

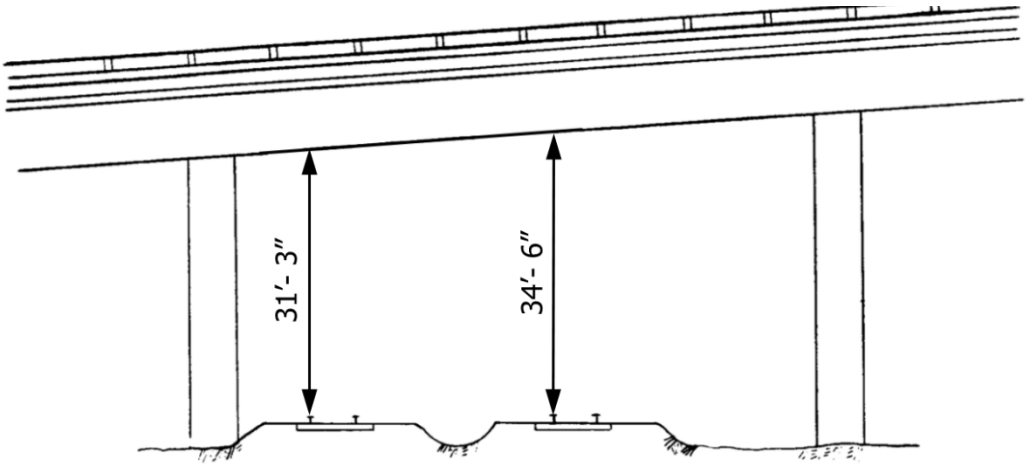


Figure 7-119: Bridge elevation view with two freight/passenger rail tracks below the bridge. Note. Adapted from FHWA-HIF-22-017

Railroad Minimum Vertical Clearance		
Item ID	B.RR.02	SNBI

Examples - Continued

Two railroad tracks below the bridge. One carries passenger rail service, and one carries freight (i.e. two railroad features).

- **Report 20.2** for the passenger rail feature.
- **Report 21.2** for the freight rail feature.

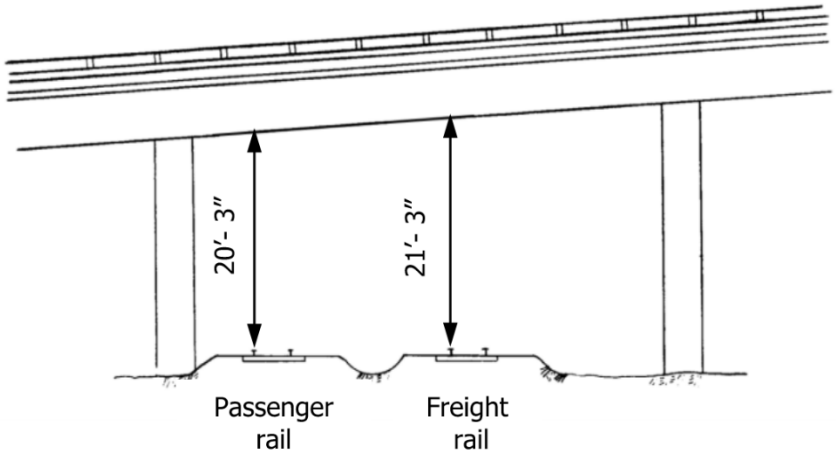


Figure 7-120: Bridge elevation view with one passenger rail and one freight rail track below the bridge. Note. Adapted from FHWA-HIF-22-017

Railroad Minimum Horizontal Offset					
Item ID	B.RR.03				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	3	Decimal places:	1

Specification

Report the minimum horizontal offset for the railroad feature reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

Measure perpendicular from the centerline of the tracks to the nearest substructure unit or toe of slope that is steeper than 1 to 3 (vertical to horizontal).

For multiple tracks with the same railroad service type, report the minimum distance after measuring the offsets in both directions from all tracks.

Report 99.9 when the minimum horizontal offset is 100 feet or greater.

Report this item only when Item B.F.02 – Feature Location is B.

Commentary

The intent of this item is to collect the minimum distance from the centerline of the railroad track to a bridge related obstruction (such a pier or embankment).

Offsets greater than 30 feet may be estimated.

Examples

One railroad track below the bridge.

- **Report 20.3**.

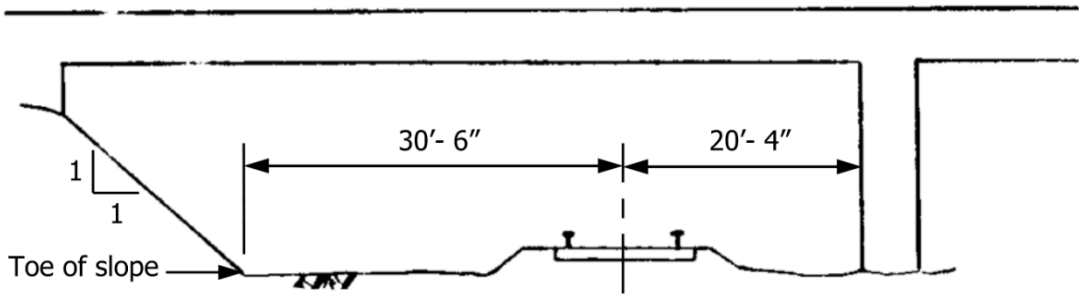


Figure 7-121: Bridge elevation view indicating horizontal offset for one railroad track below the bridge. Note. Adapted from FHWA-HIF-22-017

Railroad Minimum Horizontal Offset - Continued

Item ID	B.RR.03	SNBI

Examples - Continued

Two railroad tracks that both carry freight (i.e. one railroad feature).

- **Report 18.5**.

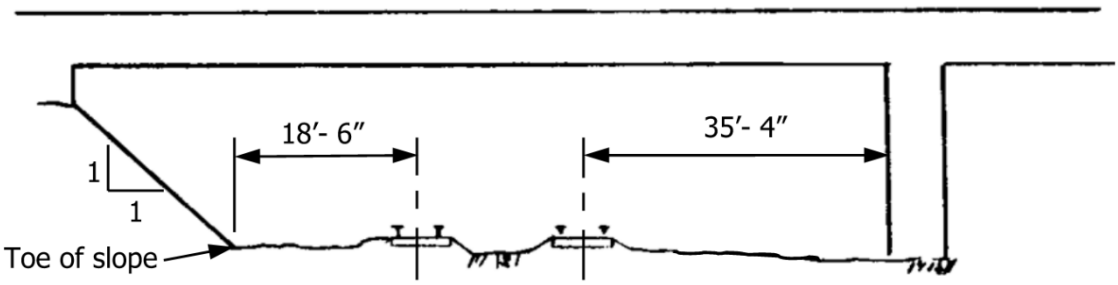


Figure 7-122: Bridge elevation view indicating horizontal offset for two railroad tracks below the bridge. Note. Adapted from FHWA-HIF-22-017

7.4.5 Navigable Waterways

The data items in the Navigable Waterways group are reported when the feature type reported in Item B.F.01 – Feature Type is a waterway (e.g. code W01, W02, etc.). The items in this group provide information on navigable waterways that pass below the bridge and are part of the Features Data Set with a many-to-one relationship with a bridge. Each waterway feature reported in Item B.F.01 – Feature Type has a unique waterway feature data set, and there may be multiple waterway feature data sets associated with a bridge.

Item B.N.01 – Navigable Waterway is reported for all waterways, and the remaining items are reported only for navigable waterways (i.e. when Item B.N.01 – Navigable Waterway is Y).

The dimensional values for the items in this subsection can be obtained from either plans or field measurement.

The following data items are included in this section:

Item ID	Data Item
B.N.01	Navigable Waterway
B.N.02	Navigation Minimum Vertical Clearance
B.N.03	Moveable Bridge Maximum Navigation Vertical Clearance
B.N.04	Navigation Channel Width
B.N.05	Navigation Channel Minimum Horizontal Clearance
B.N.06	Substructure Navigation Protection

Navigable Waterway		
Item ID	B.N.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether the waterway feature reported in Item B.F.01 – Feature Type is considered navigable waters of the United States using one of the following codes.

Code	Description
N	Not navigable waters
Y	Navigable waters
U	Navigable waters designation is undetermined

Commentary

This item identifies bridges over navigable waters where the United States Coast Guard may exercise jurisdiction, as defined in 33 CFR, Part 2. This information helps identify bridges at risk from vessel collision and bridges where a Coast Guard permit may be required for modifications to the structure.

Navigability of the waterway may be determined by the USCG, Congress, the federal courts, or the U.S. Army Corps of Engineers.

Information helpful in coding this item may be found in design and construction documentation or prior correspondence with the Coast Guard.

Information defining the navigable waterways in Ohio can be found utilizing the following references:

- https://devgis.charttools.noaa.gov/pod/ (defines the boundaries of the waterways along Lake Erie)
- https://geodata.bts.gov/datasets/06037f2b23ff401aa1d379c2632a58f6/explore?location=39.658936%2C-80.862598%2C16.98 (defines the U.S. Department of Transportation Navigable Waterway Network Lines)
- https://www.atlanticarea.uscg.mil/Our-Organization/District-9/Ninth-District-Staff/Legal-Office/Navigable-Waterways-Determinations/ (USCG table of navigable waterways)

Navigation Minimum Vertical Clearance					
Item ID	B.N.02				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	4	Decimal places:	1

Specification

Report the minimum vertical clearance over the waterway feature reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

The reported clearance is from the highest datum plane referenced in the approved permit plans to the lowest superstructure restriction or other appurtenances attached to the bridge over the designated navigation channel.

For all movable bridges, the vertical clearance reported for this item is for the bridge in the closed position (i.e., open to vehicular traffic).

Report the most restrictive clearance when there are multiple designated navigation channels.

Report this item only when Item B.N.01 – Navigable Waterway is Y.

Commentary

Reference datum, designated navigation channels, and vertical clearances can be found on permit plans approved by the United States Coast Guard.

When permit plans are not available, values can be established from field measurements obtained for known navigation channels and the most restrictive clearance recorded. Reference field measurements to the following datum:

Crossing Type	Datum
Tidal Waters	Mean High Water
Non-tidal waters	Extreme High Water
River	Q50 Surface Elevation

Examples

Permit plans for a bridge over tidal waters with the navigation channel designated by cross-hatched area. Permit plans set the datum at mean higher-high water (M.H.H.W.) instead of mean high water.

- **Report 50.0**.

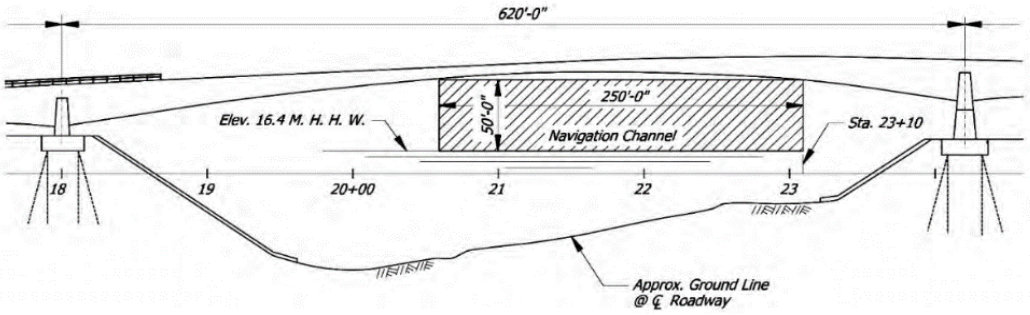


Figure 7-123: Bridge elevation view indicating navigation channel and vertical clearance. (Source: Alaska DOT). Note. Adapted from FHWA-HIF-22-017

Navigation Minimum Vertical Clearance - Continued

Item ID	B.N.02	SNBI

Examples - Continued

Permit plans for a bridge over tidal waters with multiple designated navigation channels. Permit plans set the datum at mean higher-high water (M.H.H.W.) instead of mean high water.

- **Report 23.1**.

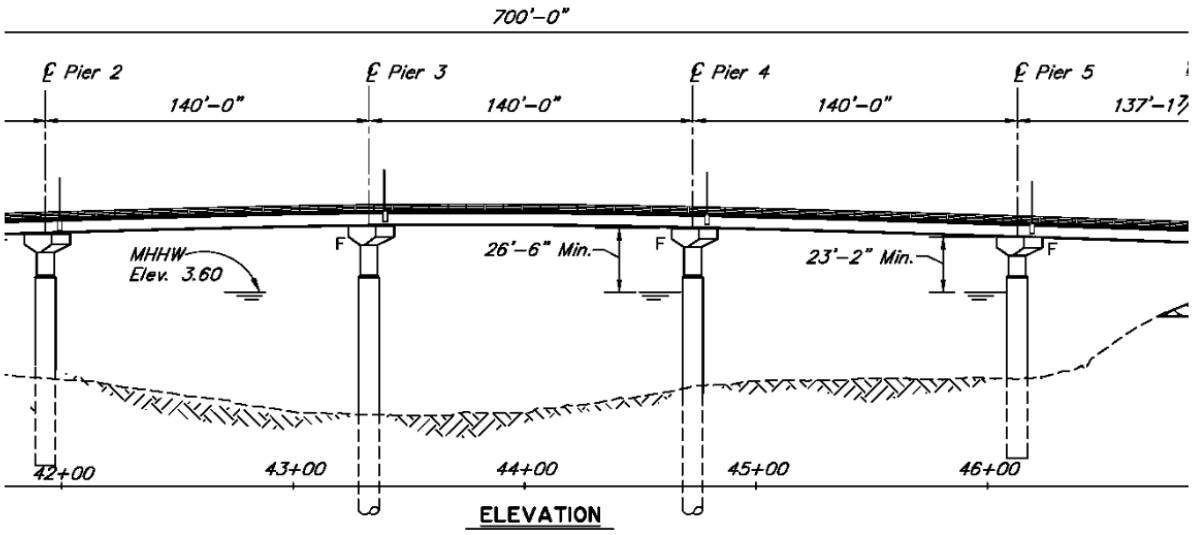


Figure 7-124: Bridge elevation view indicating multiple navigation channels and vertical clearances. (Source: Alaska DOT). Note. Adapted from FHWA-HIF-22-017

Vertical lift bridge. Information taken from "As-Built" plans as no permit plans are available. Mean High Water elevation is 3.2 ft. Minimum vertical under clearance is 12 ft – 3.2 ft = 8.8 ft.

- **Report 8.8**.

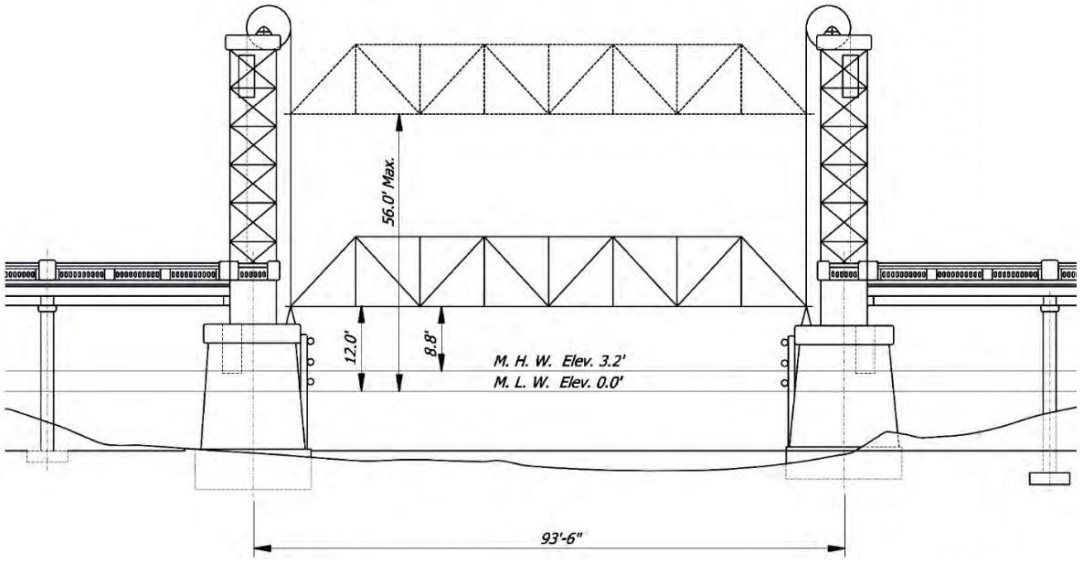


Figure 7-125: Bridge elevation view for a vertical lift bridge indicating vertical clearances. (Source: Florida DOT). Note. Adapted from FHWA-HIF-22-017

Movable Bridge Maximum Navigation Vertical Clearance					
Item ID	B.N.03				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	4	Decimal places:	1

Specification

Report the maximum vertical clearance over the waterway feature reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

The reported clearance is from the highest datum plane referenced in the approved permit plans to the lowest superstructure restriction or other appurtenances attached to the bridge over the designated navigation channel, when the movable bridge is in the open position.

Report 999.9 when the bridge provides unlimited vertical clearance over the navigation channel in the open position.

Report this item only when Item B.N.01 – Navigable Waterway is Y and Item B.SP.06 – Span Type begins with M, indicating that the span type is movable.

Commentary

The value reported for this item is particularly useful for vertical lift bridges and for bascule bridges where the leaf (or leaves) does not provide unlimited vertical clearance over the designated navigation channel in the open position.

When permit plans are not available, values can be obtained from field measurements. Reference field measurements to the following datum:

Crossing Type	Datum
Tidal Waters	Mean High Water
Non-tidal waters	Extreme High Water
River	Q50 Surface Elevation

Movable Bridge Maximum Navigation Vertical Clearance - Continued

Item ID	B.N.03	SNBI

Examples

Vertical lift bridge. Information taken from "As-Built" plans as no permit plans are available. Mean High Water elevation is 3.2 ft. Maximum vertical under clearance is 56 ft – 3.2 ft = 52.8 ft.

- **Report 52.8**.

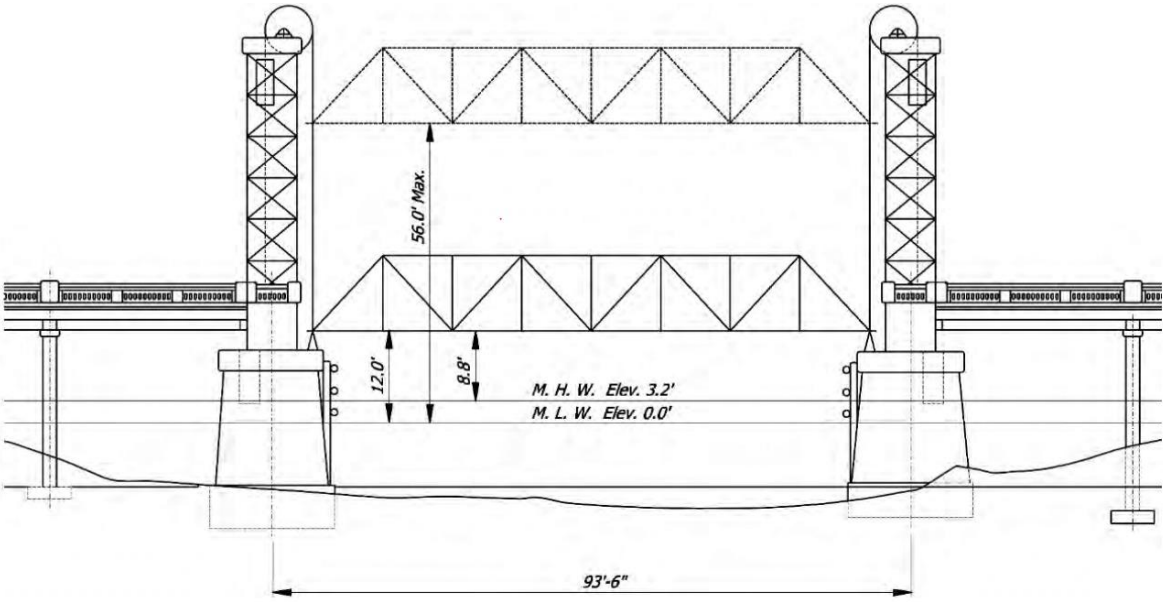


Figure 7-126: Bridge elevation view for a vertical lift bridge indicating vertical clearances. (Source: Florida DOT). Note. Adapted from FHWA-HIF-22-017

Navigation Channel Width

Item ID	B.N.04				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	5	Decimal places:	1

Specification

Report the navigation channel width for the waterway feature reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

The width is as shown on the approved permit plans, or field measured when the navigation channel changes or is unmarked.

For field measurements, measure the horizontal distance perpendicular to the centerline of the navigation channel. For marked channels measure between the markers designating the limits of the channel at the bridge. For unmarked channels, measure the minimum clear distance between fenders or piers.

If multiple channels exist, report the most restrictive.

Report this item only when Item B.N.01 – Navigable Waterway is Y.

Commentary

The width provided here should be consistent with the navigation channel used in the navigation vertical clearance items. The designated navigation channel width may be less than the distance between substructure units.

Examples

Permit plans for a bridge over tidal waters with the navigation channel designated by cross-hatched area.

- **Report 250.0**.

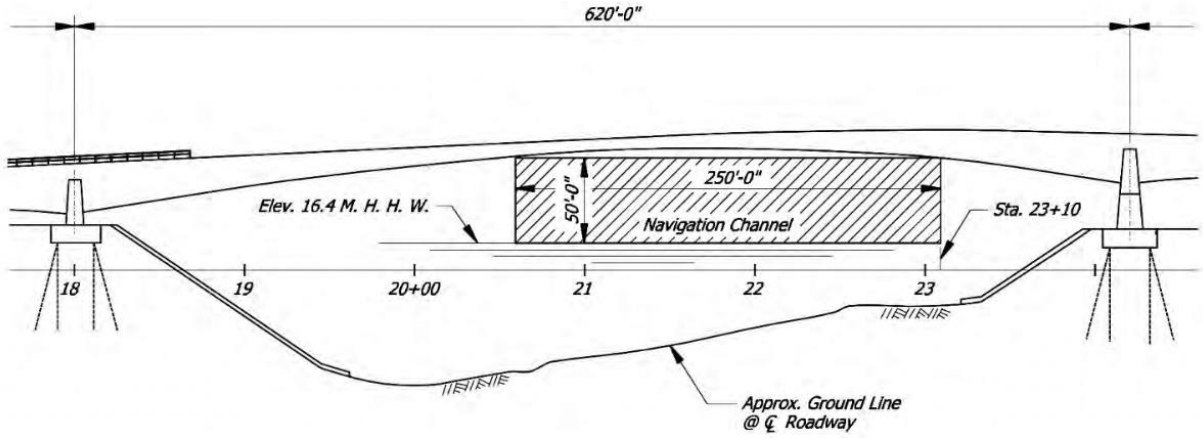


Figure 7-127: Bridge elevation view indicating navigation channel width dimensions. (Source: Alaska DOT). Note. Adapted from FHWA-HIF-22-017

Navigation Channel Width - Continued

Item ID	B.N.04	SNBI

Examples - Continued

Bridge with multiple designated navigation channels bounded by piers.

- **Report 126.5**.

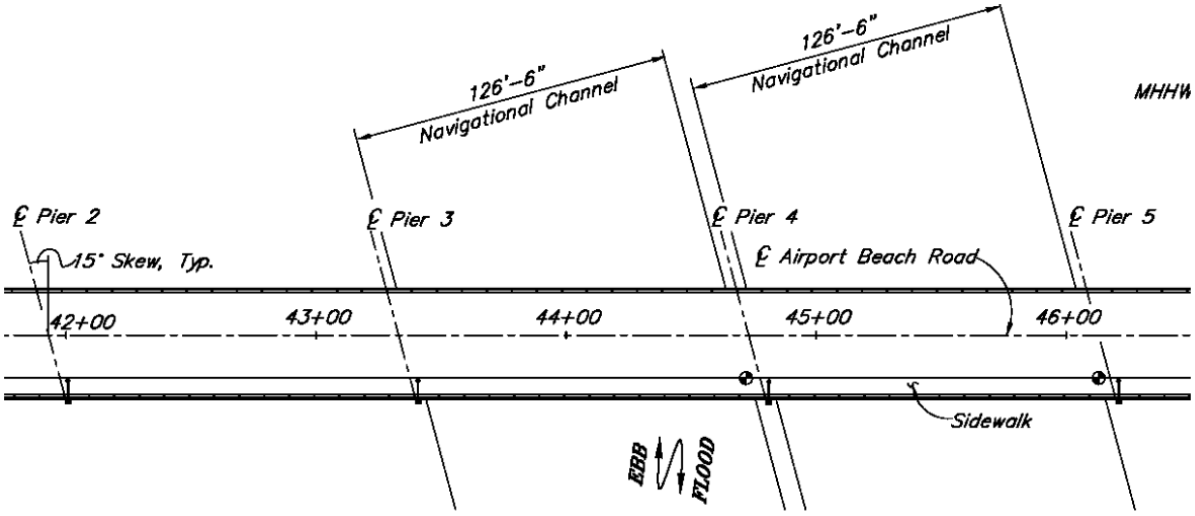


Figure 7-128: Bridge plan view indicating navigation channel width dimensions. (Source: Alaska DOT). Note. Adapted from FHWA-HIF-22-017

Navigation Channel Minimum Horizontal Clearance					
Item ID	B.N.05				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	5	Decimal places:	1

Specification

Report the minimum horizontal clearance for the waterway feature reported in Item B.F.01 – Feature Type, rounded down to the nearest tenth of a foot.

The clearance is the minimum distance from either edge of the navigation channel shown on the approved permit plans, to the face of the nearest bridge substructure unit located within the waterway.

The clearance may be field measured when the placement of navigation markers at the bridge is inconsistent with the permit plans, or if the presence of navigation markers indicates a navigation channel and no permit plans are available.

For field measurements, measure the horizontal distance perpendicular to the centerline of the navigation channel from the markers designating the limits of the channel at the bridge, to the face of the nearest bridge substructure unit located within the waterway.

Report 0 when substructure units in the waterway are the boundaries for the navigation channel.

Report 9999.9 when no substructure unit is within the waterway.

Report this item only when Item B.N.01 – Navigable Waterway is Y.

Commentary

The intent of this item is to collect the most restrictive distance from the edge of the navigational channel to a bridge substructure to assess risk for vessel collision.

The clearance provided here should be consistent with the navigation channel used in Item B.N.04 – Navigation Channel Width.

Navigation Channel Minimum Horizontal Clearance - Continued

Item ID	B.N.05	SNBI

Examples

Permit plans for a bridge over tidal waters with the navigation channel designated by cross-hatched area. No substructure units within the waterway.

- **Report 9999.9**.

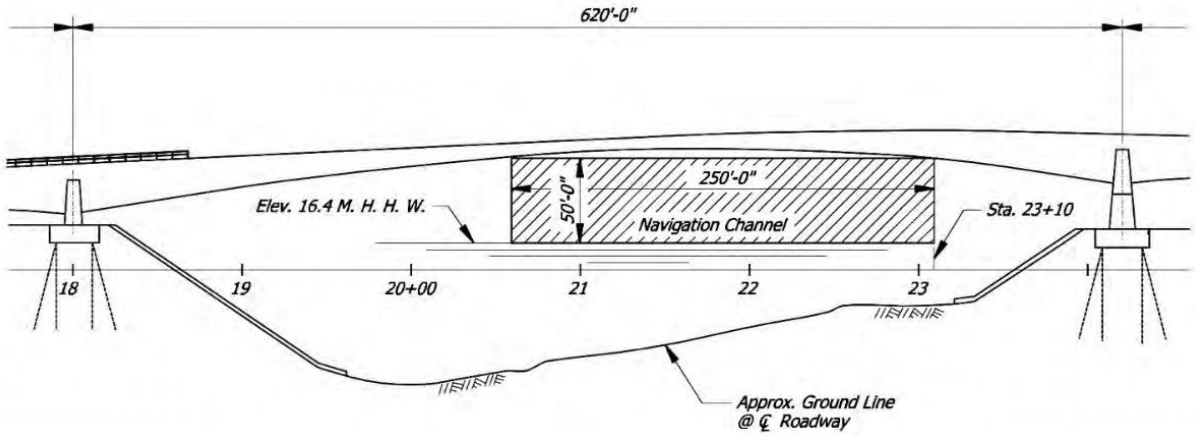


Figure 7-129: Bridge elevation view with no substructure units in the waterway. (Source: Alaska DOT). Note. Adapted from FHWA-HIF-22-017

Bridge with multiple designated navigation channels bounded by piers.

- **Report 0**.

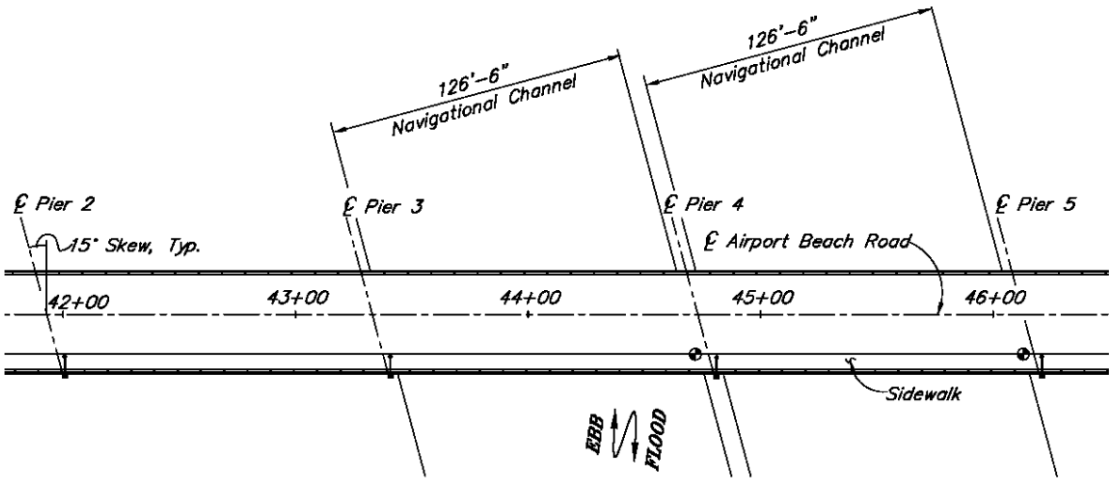


Figure 7-130: Bridge plan view indicating multiple navigation channel width dimensions to substructure units in the waterway. (Source: Alaska DOT). Note. Adapted from FHWA-HIF-22-017

Navigation Channel Minimum Horizontal Clearance - Continued		
Item ID	B.N.05	SNBI
Examples – Continued		

Bridge with navigation channel designated by cross-hatched area. Substructure units within the waterway.

- **Report 135.6**.

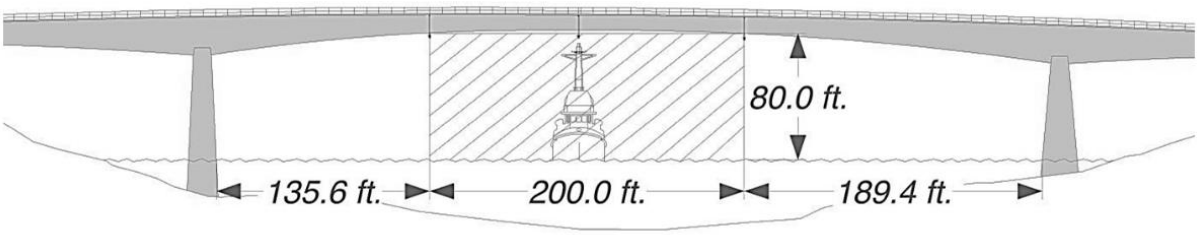


Figure 7-131: Bridge elevation view indicating navigation channel clearances to substructure units in the waterway. Note. Adapted from FHWA-HIF-22-017

Substructure Navigation Protection

Item ID	B.N.06	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the presence and adequacy of substructure navigation protection for the waterway feature reported in Item B.F.01 – Feature Type, using one of the following codes.

Code	Description
0	Navigation protection not required; bridge has been designed or assessed to have adequate capacity to resist anticipated impact loads without collapse.
1	Navigation protection not required; assessment of navigation opening and vessel traffic has determined that there is a low probability that an errant vessel could impact the bridge.
2	Protective system is in place and functioning.
3	Protective system in place, but damage or deterioration impacts ability to protect.
4	Protective system in place, but reevaluation of design suggested.
5	No protective system in place, but reevaluation of the need for a protective system is recommended.

Report this item only when Item B.N.01 – Navigable Waterway is Y.

Commentary

Substructure navigation protection systems can be fender systems, dolphins, or other systems that either prevent the substructure from being impacted or adequately reduce the impact load that is transferred into the substructure.

Use codes 0 and 1 to indicate that an assessment of vessel traffic characteristics and/or bridge capacity has determined that navigation protection is not required. AASHTO's Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges provides a method for assessing an existing bridge's vulnerability to vessel collision. Codes 0 and 1 should not be assigned based on field observation.

Use codes 4 and 5 to indicate that observed conditions necessitate a review of vessel traffic characteristics, bridge capacity, and protective system capability to determine whether the bridge is adequately protected from vessel collision.

7.5 Loads, Load Rating, and Posting

This section has data items that have been grouped by the following sections: Chapter 7.5.1 Loads and Load Rating, Chapter 7.5.2 Load Posting Status, and Chapter 7.5.3 Load Evaluation and Posting.

7.5.1 Loads and Load Rating

The data items in the Loads and Load Rating section provide information on the load carrying capacity of bridges, as well as the method used to determine the capacity and load posting. These items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. Some of the data items remain static once a bridge has been inventoried, but others may change after reevaluation of the load rating.

The following data items are included in this section:

Item ID	Data Item
B.LR.01	Design Load
B.LR.02	Design Method
B.LR.03	Load Rating Date
B.LR.03.01(A)	Load Rater First Name
B.LR.03.01(B)	Load Rater Last Name
B.LR.03.01(C)	Load Rater PE Number
B.LR.04	Load Rating Method
B.LR.04.01	Load Rating Software
B.LR.04.02	Rating Source
B.LR.05	Inventory Load Rating Factor
B.LR.06	Operating Load Rating Factor
B.LR.07	Controlling Legal Load Rating Factor
B.LR.08	Routine Permit Loads

Design Load

Item ID	B.LR.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 8	

Specification

Report the live load for which the bridge was designed using one of the following codes.

Code	Description
H10	H-10
H15	H-15
H20	H-20
HS15	HS-15
HS20	HS-20
HS20M	HS-20 and Military
HS20Plus	Greater than HS-20
HL93	HL-93
HL93Plus	Greater than HL-93
RR	Railroad
U	Unknown
X	Other

Commentary

For widened or rehabilitated bridges, code the most restrictive design load governing any portion of the bridge.

Use code HS20M when the bridge is designed to accommodate both the HS-20 and the alternate military load.

Use codes HS20Plus and HL93Plus when the HS-20 or HL-93 design load configuration is increased proportionally above that specified in the AASHTO design specifications.

For bridges with a design load of HS-25 or greater use code HS20Plus.

For design loadings specified as CF XXX-XX or S-XX-XX on the design plans or design specifications at the time of construction use the following table to convert to the equivalent H loading.

Approximate AASHTO Equivalent (B.LR.01 Code)	Ohio S-Loading	Ohio CF-Loading
H10	None	CF-30 to CF-129
H15	None	CF-130 to CF 399
H20	S-12	CF-400 to CF-999
HS15	S-15	CF-1000 to CF-1999
HS20	S-20	CF-2000
HS20Plus	None	CF-2000 (AASHO Alt.)

Design Load - Continued

Item ID	B.LR.01	SNBI

Commentary - Continued

Use code U when the design plans are not available and the likely design load cannot be inferred from the design characteristics of the bridge or ODOT policy at the time the bridge was built. A code other than U can be reported when design plans are not available, but the design load can be inferred from design characteristics of the bridge, standard drawings, or ODOT policy at the time the bridge was built.

Use code X when the design load is known but is not based on AASHTO or railroad design load configurations.

Use code X when the bridge is designed specifically for a pedestrian bridge regardless of the design load configurations.

Examples

A bridge designed for an HS-20 load is later widened. The widening is designed for the HL-93 load.

- **Report HS-20**.

Per design, a bridge is designed using LRFD, in which the truck load portion of the HL-93 load is increased by 25%.

- **Report HL93Plus**.

Per design, a bridge is designed for the HL-93 design load, with further consideration of a defined permit vehicle. The permit vehicle controls the design of the superstructure.

- **Report X**.

Bridge constructed in 1919, design plans unavailable, but the design loading per the ODOT BDM in 1918 was a design load of T-10 to T-20.

- **Report X.**

Design Method

Item ID	B.LR.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 4	

Specification

Report the method by which the bridge was designed using one of the following codes.

Code	Description
ASD	Allowable Stress Design
LFD	Load Factor Design
LRFD	Load and Resistance Factor Design
U	Unknown
X	Other

Commentary

The codes describe the design methods used in accordance with AASHTO design specifications.

For widened or rehabilitated bridges, code the design method associated with the code in Item B.LR.01 – Design Load.

Code the design method based on B.LR.01 – Design Truck

Design Truck	Design Method
H10	ASD
H15	ASD
H20	ASD
HS15	ASD
HS20	LFD
HS20M	LFD
HS20Plus	LFD
HL93	LRFD
HL93Plus	LRFD
RR	ASD

Use code U when the design plans are not available and the likely design method cannot be inferred from design characteristics of the bridge or agency policy at the time the bridge was built. A code other than U can be reported when design plans are not available, but the design method can be inferred from design characteristics of the bridge or agency policy at the time the bridge was built.

Examples

A bridge designed for an HS-20 load using Load Factor Design is later widened. The widened portion is designed for the HL-93 load using Load and Resistance Factor Design. Item B.LR.01 – Design Load has a code of HS20 reported.

- **Report LFD**.

A bridge design for an HS-20 loading using Load Factor Design is later widened and rehabilitated. The existing bridge was analyzed and strengthened to the HL-93 using Load and Resistance Factor Design. Item B.LR.01 – Design Load has been updated to be coded as HL93.

- **Report LRFD.**

Load Rating Date		
Item ID	B.LR.03	SNBI
Frequency	Initial	
Format	YYYYMMDD	

Specification

Report the date of the most recent load rating.

Do not report this item if no rating analysis or evaluation has been performed.

Commentary

This item reflects the date of the most recent calculation or re-evaluation of the load rating.

The load rating may be performed independently and at a different date than the inspection.

Defects discovered during inspections that may impact the strength or serviceability of the bridge typically require reevaluation of the load rating. When the reevaluation of the load rating is completed, report the date of the reevaluation for this item.

Examples

Load rating calculations found in the bridge record are dated September 5, 1999.

- **Report 19990905**.

A bridge rated for an HS-20 load using Load Factor rating is later widened. The entire bridge is re-rated using Load and Resistance Factor rating on July 23, 2012.

- **Report 20120723**.

Load Rater First Name		
Item ID	B.LR.03.01	Previously ODOT Item 705
Frequency	Initial	
Format	Alphabetic Max characters: 14	

Specification

Code the first name of the Ohio Professional Engineer who is approving/stamping the load rating.

Commentary

This item reflects the first name of the load rater for the most recent calculation or reevaluation of the load rating.

The first name shall match that of their Professional Engineering License.

Load Rater Last Name		
Item ID	B.LR.03.02	Previously ODOT Item 706
Frequency	Initial	
Format	Alphabetic Max characters: 20	
Specification		
Code the last name of the Ohio Professional Engineer who is approving/stamping the load rating.		
Commentary		
This item reflects the last name of the load rater for the most recent calculation or reevaluation of the load rating.		

Load Rater PE Number		
Item ID	B.LR.03.03	Previously ODOT Item 707
Frequency	Initial	
Format	Numeric	Max digits: 5

Specification

Code the Ohio Professional Engineer registration number of the load rater for the bridge.

Code item with leading zeros, as necessary.

Commentary

This item reflects the Ohio Professional Engineer registration number of the load rater for the most recent calculation or reevaluation of the load rating.

Examples

Professional Engineer with registration number of 01234 reviewed and stamped the report.

- **Report 01234.**

Load Rating Method

Item ID	B.LR.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 4	

Specification

Report the method used to calculate the load rating using one of the following codes.

Code	Description
LFR	Load Factor Rating
ASR	Allowable Stress Rating
LRFR	Load and Resistance Factor Rating
LT	Load Testing
AR	Assigned Rating
EJ	Field evaluation and documented engineering judgement
N	No rating analysis or evaluation has been performed

Commentary

When different portions of a bridge are load rated using different methods, report the rating method associated with the controlling rating factor.

Refer to the most current version of the Ohio Bridge Design Manual for further loading rating requirements at: https://www.transportation.ohio.gov/working/engineering/structural/bdm

For information on applicable load rating methods, refer to the October 30, 2006, FHWA memorandum at: https://www.fhwa.dot.gov/bridge/nbis/103006.cfm

For information on using code AR, refer to the September 29, 2011, FHWA memorandum at: https://www.fhwa.dot.gov/bridge/110929.cfm

For information on using code EJ, refer to the February 2, 2011, FHWA memorandum at: https://www.fhwa.dot.gov/bridge/110202.cfm

Examples

A bridge rated for an HS-20 load using Load Factor rating is later widened. The entire bridge is re-rated using Load and Resistance Factor rating.

- **Report LRFR**.

A steel truss bridge with steel beam approach spans is originally rated using Allowable Stress Rating. The approach spans are re-rated using Load Factor Rating due to deterioration. The rating of the approach spans controls.

- **Report LFR**.

A bridge designed and checked using Load Factor Design and an HS-20 live load. The bridge meets the criteria stated in the September 29, 2011, FHWA memo and has an assigned load rating.

- **Report AR**.

A concrete bridge constructed in 1910 has no design plans. Load rating was determined by a qualified engineer after field condition and live load history evaluation.

- **Report EJ**.

Load Rating Software		
Item ID	B.LR.04.01	Previously ODOT Item 708
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the method used to calculate the load rating using one of the following codes.

Code	Description
1	BARS
2	BRASS
3	AASHTO BrR (VIRTIS)
4	Testing
5	Finite Element (FE) Program
6	In-House Program/Spreadsheet
7	Combination
8	Other Program
9	Manual Calculations
0	Assigned Rating (no calculations performed)

Commentary

Code 7 when different software is used on different portions of the bridge.

A listing of preferred and other load rating programs can be found in the Ohio BDM at: https://www.transportation.ohio.gov/working/engineering/structural/bdm

Rating Source		
Item ID	B.LR.04.02	Previously ODOT Item 709
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the source of information used to load rate the bridge.

Code	Description
0	No plans or information available for load rating analysis
1	Plan information available for load rating analysis
2	Field measured information for load rating analysis
3	Field testing information
N	Not Applicable

Commentary

Code 0 if only a site plan or construction layout sketch, etc., is available as there is not sufficient information on the plans to perform a load rating.

Code 2 if an inspection was performed to obtain the geometry and section properties of the bridge for load rating and no plans are available.

Code 3 when load testing is performed to rate the bridge.

Inventory Load Rating Factor					
Item ID	B.LR.05				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 2	

Specification

Report the inventory load rating factor, truncated to the hundredth, for the standard AASHTO HS-20 or HL-93 loadings, whichever is applicable based on the method reported in Item B.LR.04 – Load Rating Method.

Do not report this item when no rating analysis or evaluation has been performed.

Commentary

When temporary or supported conditions exist, as indicated in Item B.PS.01 – Load Posting Status, report the rating factor for the bridge including the temporary or supported conditions.

For LRFR, this is the rating factor for the design load rating at the inventory level of reliability using the HL-93 loading considering all applicable strength and serviceability limit states.

For LFR, this rating factor at the inventory level corresponds to the design level of stresses but reflects the existing bridge and material conditions.

Refer to the AASHTO Manual for Bridge Evaluation for details of HS-20 and HL-93 loadings and limit states.

Examples

A bridge has a calculated HS-20 inventory load rating factor of 1.486.

- **Report 1.48**.

Operating Load Rating Factor					
Item ID	B.LR.06				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 2	

Specification

Report the operating load rating factor, truncated to the hundredth, for the standard AASHTO HS-20 or HL-93 loadings, whichever is applicable based on the method reported in Item B.LR.04 – Load Rating Method.

Do not report this item when no rating analysis or evaluation has been performed.

Commentary

When temporary or supported conditions exist, as indicated in Item B.PS.01 – Load Posting Status, report the rating factor for the bridge including the temporary or supported conditions.

For LRFR, this is the rating factor for the design load rating at the operating level of reliability using the HL-93 loading considering all applicable strength and serviceability limit states.

Refer to the AASHTO Manual for Bridge Evaluation for details of HS-20 and HL-93 loadings and limit states.

Examples

A bridge has a calculated HL-93 operating load rating factor of 1.679.

- **Report 1.67**.

Controlling Legal Load Rating Factor

Item ID	B.LR.07	SNBI
Frequency	Initial	
Format	Numeric Max digits: 4 Decimal places: 2	

Specification

This is a calculated field based on the inputs of the Chapter 7.5.3 Load Evaluation and Posting.

The lowest (controlling) rating factor for the AASHTO, FHWA emergency vehicle, or Ohio legal loads truncated to the hundredth is reported.

Do not report a rating factor that was calculated using reduced force effects from posting or restrictions that affect traffic operations (e.g. that limit speed, number of lanes, number of trucks, or do not allow commercial vehicles). Report the rating factor that represents unrestricted operation.

Do not report this item when no rating analysis or evaluation has been performed.

Commentary

When temporary or supported conditions exist, as indicated in Item B.PS.01 – Load Posting Status, report the rating factor for the bridge including the temporary or supported conditions.

The controlling legal load rating factor is the lowest or the controlling rating factor for all the legal loads, and it is calculated by AssetWise based on the rating factors entered for the legal loads.

For LRFR method, this would be the rating factor of the "Legal Load Rating."

For Allowable Stress and Load Factor rating methods this would be the operating rating factor.

Examples

A bridge has the following calculated legal load rating factors for the AASHTO. FHWA emergency vehicle, and Ohio legal loads:

Legal Load Configuration	Operating Rating Factor	Legal Load Configuration	Operating Rating Factor
2F1	3.32	SU7	1.80
3F1	2.36	Type 3	2.62
5C1	2.47	Type 3-3	3.21
SU4	2.17	Type 3S2	2.67
SU5	2.02	EV2	2.20
SU6	1.86		

- **Report 1.80.**

Routine Permit Loads		
Item ID	B.LR.08	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether the bridge carries routine permit loads or whether routine permit loads are restricted from the bridge using one of the following codes.

Code	Description
A	Bridge carries routine permit loads. Load capacity is adequate for all routine permit loads approved for the route segment; no routine permit loads are restricted.
B	Bridge carries routine permit loads. Load capacity is adequate for some routine permit loads approved for the route segment, but some routine permit loads are restricted.
C	Bridge does not carry routine permit loads. Load capacity is inadequate for all routine permit loads approved for the route segment. Routine permit loads are restricted from the bridge.
N	Bridge does not carry routine permit loads. Routine permit loads are not approved for the route segment.

Commentary

This item is used to identify bridges where routine permit loads must be considered in load rating and posting evaluations and to identify bridges where routine permit loads are restricted due to bridge load capacity limitations.

For State owned bridges use code N as ODOT does not issues routine permits and therefore the bridge does not carry routine permit loads.

For all other bridges in Ohio, bridge owners/agencies may have varying policies for issuing routine permits, from not issuing routine permits (ODOT) to issuing various routine permits when these loads exceed State legal loads.

Use code A when all routine permit loads allowed to travel the route segment are also allowed to travel on the bridge.

Use code B when not all routine permit loads allowed to travel the route segment are allowed to travel on the bridge.

Use code C when all routine permit loads allowed to travel the route segment are restricted from the bridge.

Use code N when the bridge owner does not issue route permits or routine permit loads are not approved for the route segment that is carried by the bridge.

7.5.2 Load Posting (Operational) Status

The data items in the Load Posting Status section provide information on the status of the bridge with regards to weight or other load restrictions. These items are considered part of the Posting Status Data Set and have a many-to-one relationship with a bridge when applicable. The data for these items may change after reevaluation of the load rating.

Any time any part of the load posting status changes, a new data set shall be added to document the new posting status.

The following data items are included in this section:

Item ID	Data Item
B.PS.01.01	Load Posting Status – Structure
B.PS.01.02	Load Posting Status – Restriction
B.PS.01	Load Posting Status
B.PS.02	Posting Status Change Date

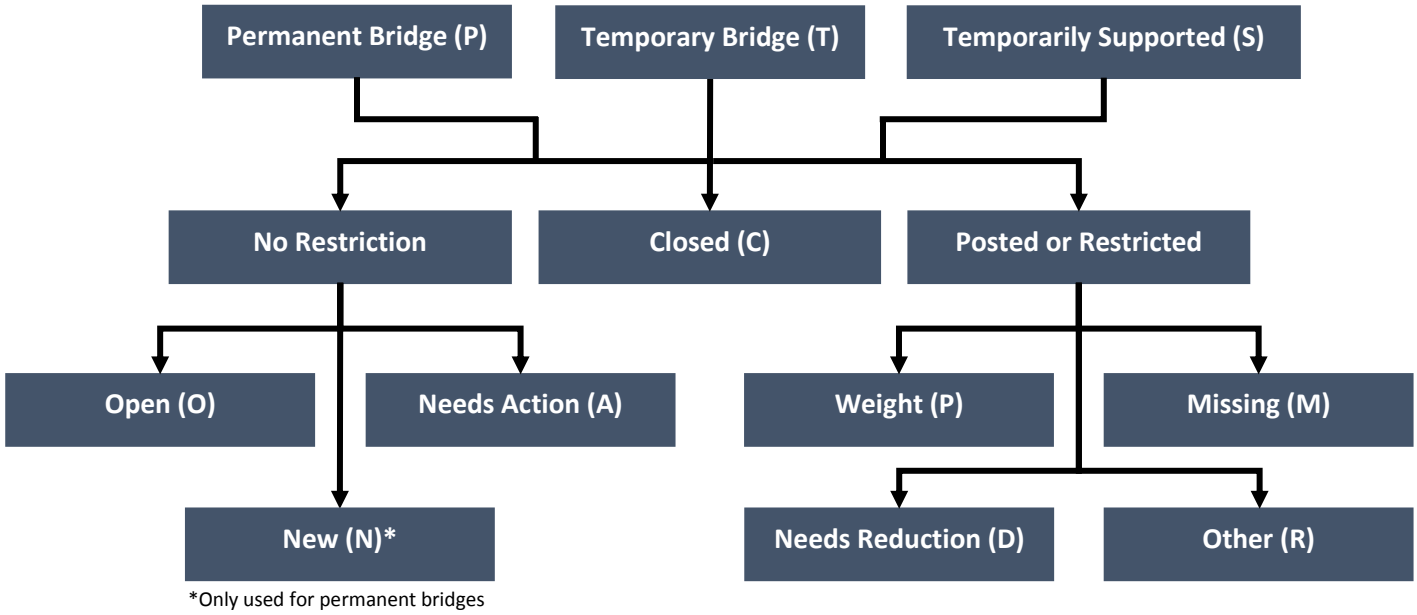


Figure 7-132: Flowchart for load posting status codes.

Load Posting Status - Structure

Item ID	B.PS.01.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the status of the bridge using one of the following codes.

Code	Description
P	Permanent
T	Temporary
S	Supported

Commentary

Terms:

- Permanent (P) – Permanent bridge in place with no temporary supports.
- Temporary (T) – Temporary bridge in place to carry traffic while the permanent bridge is closed and awaiting repair, rehabilitation, or replacement.
- Supported (S) – Bridge with temporary shoring, supports, repairs, or supplemental members in place to keep the bridge open pending the completion of active or imminent repair, or replacement projects.

When temporary or supported conditions exist, ensure that data items related to physical characteristics of the bridge (e.g., geometry, clearances, condition, and load rating), represent those characteristics of the temporary or supported bridge.

Examples

A permanent bridge is in place and open to traffic with no temporary support.

- **Report P.**

A temporary bridge is in place during construction of a new bridge.

- **Report T.**

An overpass bridge was hit by an oversized load. Temporary shoring towers were placed to support the damaged girder.

- **Report S.**

Load Posting Status - Restriction		
Item ID	B.PS.01.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the restriction at the bridge using one of the following codes.

Code	Description
N	No Restriction
P	Posted or restricted
C	Closed

Commentary

Terms:

- No Restriction (N) – Bridge has no restrictions.
- Weight (P) – Bridge is posted or restricted.
- Closed (C) – Bridge is closed to all traffic.

Code C when the bridge is permanently or temporarily closed. Closure can be due to critical finding, construction, 3-ton load posting, etc.

Code P when a portion of the bridge is close for construction (e.g. part width construction).

Code P when signs are in place restricting commercial vehicles.

Examples

An overpass bridge was hit by an oversized load. Temporary shoring towers were placed to support the damaged girder, and a single lane was closed across the bridge.

- **Report P.**

No trucks sign is place on the roadway prior to the bridge.

- **Report P.**

The bridge has an ongoing deck replacement project that utilizes phased construction to maintain traffic.

- **Report P.**

The bridge is closed due to the superstructure being severely compromised.

- **Report C.**

Load Posting Status

Item ID	B.PS.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the restriction at the bridge using one of the following codes.

Code	Description	Restriction
N	New	
O	Open	No restriction
A	Needs action	
P	Weight	
R	Other	Posted or
D	Needs reduction	restricted
M	Missing	
C	Closed	Closed

Commentary

Terms:

- New (N) – Bridge is newly constructed and not yet open to traffic but is expected to be open within 12 months.
- Open (O) – Bridge is open with no restrictions.
- Needs action (A) – Bridge that is open with load posting recommended, but no posting signs in place, or a posting sign that is not legally enforceable.
- Weight (P) – Bridge is posted with a weight limit sign or signs.
- Other (R) – A posting sign or other traffic control device(s) at the bridge that reduces loading by reducing speed (to reduce impact), limiting the number of lanes or vehicles, or restricting commercial vehicles in general.
- Needs reduction (D) – Bridge is posted, with posting reduction recommended but not implemented.
- Missing (M) – Bridge has a legally enforceable load posting and was posted, but one or more required signs are missing or illegible.
- Closed (C) – Bridge is closed to all traffic.

When coding this item consider if the signing is visible at the bridge site, correctly represented in the inventory, and effective. To be effective it shall meet the requirements in Chapter 2.2 Load Rating and Load Posting. If the signing does not meet any of the requirements code as “Needs action” (A), “Missing” (M).

Examples

An overpass bridge was hit by an oversized load. Temporary shoring towers were placed to support the damaged girder, and a single lane was closed across the bridge.

- **Report R.**

Load Posting Status - Continued		
Item ID	B.PS.01	SNBI
Examples - Continued		

No trucks sign is placed on the roadway prior to the bridge.

- **Report R.**

The bridge has an ongoing deck replacement project that utilizes phased construction to maintain traffic.

- **Report R.**

The bridge is closed due to the superstructure being severely compromised.

- **Report C.**

A routine inspection discovered vegetation has covered the load posting signs causing them to be illegible.

- **Report M.**

A bridge is currently posted, and the load rating was updated due to additional deterioration noted during the inspection. The updated loading rating calculated a lower load posting with the new signs yet to be installed.

- **Report D.**

Posting Status Change Date		
Item ID	B.PS.02	SNBI
Frequency	Initial	
Format	YYYYMMDD	

Specification

Report the date the bridge entered the status reported in Item B.PS.01 – Load Posting Status.

Commentary

For bridges entering posted status, it is preferable that the reported date represents the date on which the signs were properly installed at the bridge. The date the load posting became legally enforceable can also be used for this item when the installation date is unknown. When neither the installation nor legal enforcement date are known, the date the posting was first documented to be in place can be used for this item.

7.5.3 Load Evaluation and Posting

The data items in the Load Evaluation and Posting section provide information on the load carrying capacity of the bridge with respect to the legal load configurations established by AASHTO, FHWA, or ODOT. These items are considered part of the Posting Evaluation Data Set and have a many-to-one relationship with a bridge when applicable.

Data items in this subsection are reported, as applicable, for each legal load configuration evaluated when the bridge has undergone a load rating evaluation, and each legal load configuration included in a posting when present at the bridge. The data for these items may change after reevaluation of the load rating.

The following data items are included in this section:

Item ID	Date Item
B.EP.01	Legal Load Configuration
B.EP.02	Legal Load Rating Factor
B.EP.03	Posting Type
B.EP.04	Posting Value

Legal Load Configuration

Item ID	B.EP.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 4	

Specification

Report the configuration of the vehicle load using one of the following codes.

Code	Description	Classification
S-2F1	2F1 Truck	Ohio Legal Vehicles
S-3F1	3F1 Truck	
S-5C1	5C1 Truck	
SU4	AASHTO SU4 Truck	Specialized Hauling Vehicles (SHVs)
SU5	AASHTO SU5 Truck	
SU6	AASHTO SU6 Truck	
SU7	AASHTO SU7 Truck	
3	AASHTO Type 3	AASHTO Trucks
3-3	AASHTO Type 3-3	
3S2	AASHTO Type 3S2	
EV2	FHWA Type EV2 Emergency Vehicle	Emergency Vehicles
EV3	FHWA Type EV3 Emergency Vehicle	
S60T	Permit Load 60T	Permit Loads
S65T	Permit Load 65T	

Commentary

Refer to the AASHTO Manual for Bridge Evaluation and the State of Ohio Department of Transportation Bridge Design Manual for details of legal loading configurations.

For information on the load rating and load posting of emergency vehicles, refer to the November 3, 2016 FHWA memorandum at: https://www.fhwa.dot.gov/bridge/loadrating/161103.cfm

Legal Load Rating Factor					
Item ID	B.EP.02				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 2	

Specification

Report the rating factor for the legal load configuration truncated to the hundredth.

Commentary

Report the rating factor for the legal load configuration without consideration of reduced force effects from postings or restrictions that affect traffic operation, e.g. that limit speed, number of lanes, number of trucks, or do not allow commercial vehicles.

When temporary or supported conditions exist, as indicated in Item B.PS.01 – Load Posting Status, report the rating factor for the bridge including the temporary or supported conditions.

For LRFR method this would be the rating factor of "Legal Load rating."

For Allowable Stress and Load Factor rating methods this would be the operating rating factor of the legal load.

Refer to the AASHTO Manual for Bridge Evaluation and the ODOT Bridge Design Manual for details of legal loading configurations.

Do not report this item when there is no calculated legal load rating factor for the vehicle load configuration.

Examples

A bridge has a calculated legal load rating factor of 0.926 for the AASHTO Type 3S2 load.

- **Report 0.92** for 3S2.

Posting Type

Item ID	B.EP.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 17	

Specification

Report the type of posting at the bridge restricting the vehicle reported in Item B.EP.01 – Legal Load Configuration using one or more of the following codes.

Each legal load configuration defined in B.EP.01 – Legal Load Configuration will have a corresponding posting type defined.

Code	Description
G	Gross Load
A	Single Axle Load
D	Tandem Axle Load
T	Truck Load
C	No Commercial Vehicles
S	Speed Reduction
L	Number of Lanes Restricted
V	Number of Vehicles Restricted
X	Other

Do not report this item if no posting sign is used for the legal load configuration.

Commentary

This item is reported when a bridge is posted for the legal load configuration. Roadway postings are excluded.

Refer to Chapter 2.2, the Ohio BDM, and OMUTCD for additional information on when posting is required and requirements for load posting signs.

EV3 is a permit vehicle in Ohio and a load posing sign is not required at the bridge, but if a sign is in place for an emergency vehicle posting (EV2 or EV3) report the posting type.

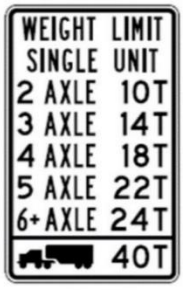
Examples

Report G for all legal load configurations excluding the EV3 emergency vehicle.

R12-1

Figure 7-133: Weight limit sign - gross load (10T).

Report T for all legal load configurations excluding the EV3 emergency vehicle.



R12-H5

Figure 7-134: Truck weight limit sign by number of axles.

Posting Value		
Item ID	B.EP.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 15	

Specification

Report the weight limit value(s) shown on the load posting sign for the vehicle reported in Item B.EP.02 – Legal Load Rating Factor rounded down to the nearest U.S. ton.

Do not report this item if no posting sign is used for the legal load configuration.

Do not report this item if Item B.EP.03 – Posting Type only has codes C, S, L, V, or X reported.

Commentary

This item is reported when a bridge is posted. Roadway postings are excluded.

For configuration and number of axles refer to the Ohio BDM Section 908.3.

ODOT typically combines posting values for several vehicles and only post controlling values of the combined vehicles on the signs. Additional information can be found in the Ohio BDM and within the BR 100 form.

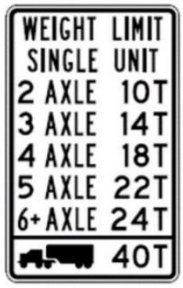
Examples

Report 10 for all legal load configurations excluding EV3 emergency vehicle.

R12-1

Figure 7-135: Weight limit sign - gross load (10T).

- **Report 10** for 2F1.
- **Report 14** for 3F1.
- **Report 40** for 5C1.
- **Report 18** for SU4.
- **Report 22** for SU5.
- **Report 24** for SU6.
- **Report 24** for SU7.
- **Report 14** for Type 3
- **Report 24** for Type 3-3
- **Report 40** for Type 3S2
- **Report 10** for EV2



R12-H5

Figure 7-136:Truck weight limit sign by number of

7.6 Inspection Requirements and Inspection Events

This section has data items that have been grouped by the following two sections: Chapter 7.6.1 Inspection Requirements and Chapter 7.6.2 Inspection Events.

7.6.1 Inspection Requirements

The data items in the Inspection Requirements section provide information about non-routine inspection types required, and special inspection features of the bridge. These items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. The data for items in this subsection typically remain static once a bridge has been inventoried.

The following data items are included in this section:

B.IR.01	NSTM Inspection Required
B.IR.02	Fatigue Details
B.IR.03	Underwater Inspection Required
B.IR.04	Complex Features
B.IR.05.01	Protected Species
B.IR.06.01	QAR Sticker Year and Number
B.IR.06.02	QAR Sticker Location
B.IR.07.01	Snooper Inspection
B.IR.07.02	Drone Inspection
B.IR.07.03	Inspection Access System

NSTM Inspection Required		
Item ID	B.IR.01	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether the bridge requires an NSTM inspection using one of the following codes.

Code	Description
N	NSTM inspection not required
Y	NSTM inspection required
I	NSTM inspection not required – Internal Redundancy
S	NSTM inspection not required – System Redundancy

Do not report this item for bridges that do not have steel members, as indicated in Items B.SP.04 – Span Material and B.SB.03 – Substructure Material.

Commentary

The intent of this item is to identify bridges that require NSTM inspection for any part of the bridge, to ensure they are inspected in accordance with NBIS.

It is the control authority's option to record a required NSTM inspection for any bridges meeting a State definition more rigorous than the FHWA definition of NSTM inspection.

Use code N when an NSTM inspection is not required and codes I and S do not apply.

Use code I when the bridge owner has demonstrated to FHWA, based on the guidance in the Ohio BDM, that a member without load path redundancy is internally redundant, and it is determined that the bridge does not require an NSTM inspection.

Use code S when the bridge owner has demonstrated to FHWA, based on the guidance in the Ohio BDM, that a bridge without load path redundancy is system redundant, and it is determined that the bridge does not require an NSTM inspection.

Fatigue Details		
Item ID	B.IR.02	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether the bridge has AASHTO fatigue category E or E' details using one of the following codes.

Code	Description
N	No E/E' details
Y	E/E' details are present

Do not report this item for bridges that do not have steel members.

Commentary

This item provides data to identify bridges that have details most prone to fatigue.

Refer to the Appendix F, BIRM, or AASHTO LRFD Bridge Design Specifications for fatigue categories and descriptions.

Underwater Inspection Required		
Item ID	B.IR.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether an underwater inspection is required under normal flow conditions using one of the following codes.

Code	Description
N	Underwater inspection not required
Y	Underwater inspection required

Do not report this item for bridges that do not pass over water as indicated in Item B.F.01 – Feature Type.

Commentary

The intent of this item is to identify bridges that require an underwater inspection per the NBIS.

Use code Y when during a typical routine inspection, a portion of a bridge substructure and the surrounding channel cannot be inspected to the mudline at low water by wading or probing, generally requiring diving or other appropriate technique.

Use code N when during a typical routine inspection, all portions of a bridge substructure and surrounding channel can be inspected to the mudline at low water by wading or probing.

If this item was previously reported as Y because an underwater inspection is generally required, it should continue to be reported as Y even for instances of unusually low flow where all portions of the substructure can be inspected by wading and probing, and an underwater inspection is not required. This applies only if the low flow condition is truly unusual and is not likely to reoccur during the next inspection interval.

The reported code for this item may change in the rare circumstance where long-term environmental conditions change for inspection access to underwater portions of the substructure.

Complex Feature		
Item ID	B.IR.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether the bridge has a complex feature by using one of the following codes.

Code	Description
N	Bridge does not have a complex feature
Y	Bridge has complex feature

Commentary

Complex features are bridge component(s) or member(s) with advanced or unique structural members or operational characteristics, construction methods, and/or requiring specific inspection procedures. This includes mechanical and electrical elements of movable spans and cable-related members of suspension and cable-stayed superstructures (23 CFR 650.305).

Bridges with complex features include:

- Cable-Supported Bridges
  - Suspension Bridges
  - Cable-Stayed Bridges
- Movable Bridges
  - Swing Bridges
  - Bascule Bridges
  - Vertical Lift Bridges

The intent of this item is to identify bridges with complex features as defined by the NBIS.

Protected Species

Item ID	B.IR.05.01	Previously ODOT Item 262
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report whether the bridge has evidence of a protected species by using one of the following codes.

Code	Description
1	Evidence of bat presence on bridge
2	Evidence of bird presence on bridge
3	Evidence of bat and bird presence on bridge
4	Not yet determined

Commentary

All bat species and most native bird species in Ohio are protected by federal and state laws.

Favorable characteristics for bat presence include cracks in concrete, expansion joints free of debris, locations near large rivers or floodplains, and any cave-like environment. Bats roost at a minimum of four feet from the ground and are most commonly found on concrete beam or box beam bridges.

Hibernation occurs between September and May, at which time the bats will likely not be present under the bridge.

The presence of bat droppings (guano) and high pitch squeaking or chirping are signs that a bat presence is likely.

Evidence of birds on a bridge include inhabited and non-inhabited nests. Pigeons are not considered protected species and are not included in this item.

Additional information regarding protected species in Ohio can be found on Ohio Department of Natural Resources website.

https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/wildlife/state-listed-species

Examples

Droppings were noted underneath the expansion joint.

- **Report 1.**

Figure 7-137: Typical bat droppings.

Protected Species - Continued		
Item ID	B.IR.05.01	ODOT
Examples - Continued		

Bats were noted in a gap between masonry stones.

- **Report 1.**

Figure 7-138: Bats roosting in gap between masonry stones

QAR Sticker Year and Number		
Item ID	B.IR.06.01	ODOT
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 4	

Specification

Report the year and number of the sticker on the bridge.

Commentary

Only report this item when a QAR sticker is present on the bridge and the year matches the current inspection year.

The following is representative of the information provided on the sticker.

Figure 7-139: NBIS QAR sticker on a concrete pier.

Examples

A NBIS QAR sticker is located on the east face of Column 2 in Pier 1. It was placed in District 7 in 2020 with sticker number 4 identified. Routine inspection was completed on September 7, 2020.

- **Report 2020 | 04**.

QAR Sticker Location		
Item ID	B.IR.06.02	ODOT
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 300	

Specification

Report the location of the sticker on the bridge. Use appropriate abbreviations when necessary.

Commentary

Only report this item when a QAR sticker is present on the bridge and the year matches the current inspection year.

The following is representative of the information provided on the sticker.

Figure 7-140: NBIS QAR sticker on a concrete pier.

Examples

A NBIS QAR sticker is located on the east face of Column 2 in Pier 1. It was placed in District 7 in 2020 with sticker number 4 identified.

- **Pier 1 at the east face of Column 2**

Snooper Inspection		
Item ID	B.IR.07.01	Previously ODOT Item 92D.01
Frequency	Each Inspection	
Format	Alphanumeric	

Specification

Report if a snooper inspection is required (Y or N), the interval, and the snooper inspection date.

Report N if a snooper inspection is not required and the interval shall remain blank.

Commentary

The bridge owner should enter if a snooper inspection is required and the interval at which it is required.

Each inspection cycle that a snooper is utilized to complete the inspection type, the date shall be updated and entered.

If Snooper Inspection Required is coded N, but a snooper is used to complete an inspection, the date should be updated within AssetWise, but the Snooper Inspection Required field can remain N if no future snooper inspections are planned at a regular interval.

Drone Inspection		
Item ID	B.IR.07.01	Previously ODOT Item 92E.01
Frequency	Each Inspection	
Format	Alphanumeric	

Specification

Report if a drone inspection is required (Y or N), the interval, and the drone inspection date.

Report N if a drone inspection is not required and the interval shall remain blank.

Commentary

The bridge owner should enter if a drone inspection is required and the interval at which it is required.

Drone Inspection code Y indicates that a drone is required as the primary means of completing a routine inspection.

If a drone is utilized to inspect a portion of the bridge, the Drone Inspection required item shall be coded N and a drone inspection date updated accordingly.

Each inspection cycle that a drone is utilized to complete the inspection type, the date shall be updated and entered.

Inspection Access System		
Item ID	B.IR.17.03	Previously ODOT Item 459
Frequency	Each Inspection	
Format	Alphanumeric Max digits: 1	

Specification

Report if the bridge includes inspection access systems.

Code	Description
Y	The bridge includes this feature
N	The bridge does not include this feature

Commentary

Inspection access systems include fixed ladders, catwalks, horizontal lifelines, and any other permanent systems in place to provide access for the inspection.

7.6.2 Inspection Events

The data items in the Inspection Events section provide information about each inspection performed for the bridge. These items are considered part of the Inspections Data Set and have a many-to-one relationship with a bridge.

Data items in this section are reported for each inspection performed on the bridge. **If more than one type of inspection is performed on a given inspection date, a separate inspection data set is reported for each inspection type performed.** This uniquely identifies reported information for multiple inspection types that may occur during a calendar year or between submittals of data to FHWA.

This section also has a data item for reporting inspection equipment used during an inspection. This data item is considered part of the Inspection Equipment Data set and has a many-to-one relationship with an Inspection Event. The data for these items change with each inspection.

The following data items are included in this section:

B.IE.01	Inspection Type
B.IE.02	Inspection Begin Date
B.IE.03	Inspection Completion Date
B.IE.04	Nationally Certified Bridge Inspector
B.IE.05	Inspection Interval
B.IE.06	Inspection Due Date
B.IE.07	Risk-Based Inspection Interval Method
B.IE.08	Inspection Quality Control Date
B.IE.09	Inspection Quality Assurance Date
B.IE.10	Inspection Data Update Date
B.IE.11	Inspection Note
B.IE.12	Inspection Equipment
B.IE.13.01	Ohio Cursory Interval
B.IE.13.02	Ohio Cursory Description
B.IE.13.03	Ohio Cursory Inspection Date
B.IE.14.01	Probe Date

Inspection Type		
Item ID	B.IE.01	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the inspection type or scour monitoring performed using one of the following codes.

Code	Description
1	Initial (SNBI)
2	Routine (SNBI)
3	Underwater (SNBI)
4	NSTM (SNBI)
5	Damage (SNBI)
6	In-Depth (SNBI)
7	Special (SNBI)
8	Service (SNBI)
9	Scour Monitoring (SNBI)

Commentary

Use code 2 when all portions of a bridge substructure and the surrounding channel have been inspected to the mudline at low water visually, or by wading or probing during routine inspections.

Use code 3 when all portions of a bridge substructure reported Y for Item B.IR.03 – Underwater Inspection Required is inspected by wading and probing in an instance of unusually low flow. If this is performed during a routine inspection, record both a routine and underwater inspection.

Use code 9 when scour monitoring is performed for a triggering storm event. This can include periodic remote electronic readings of streambed changes when required in the POA. If multiple site visits occur for a triggering storm event, record this item once for that storm event.

Code 8 will not be used in Ohio as Ohio requires bridge inspections at a maximum, at least once every 24 months.

For inspection definitions, requirements, intervals, qualifications, etc. see Chapter 4 – Inspection Types.

Examples

The initial inspection of a widened bridge.

- **Report 1**.

A routine inspection, scheduled every twelve months, of an entire bridge that is in poor condition.

- **Report 2**.

An unscheduled inspection to assess the damage resulting from a vehicular impact.

- **Report 5**.

Inspection Type - Continued		
Item ID	B.IE.01	SNBI
Examples - Continued		

An inspection to perform a hands-on inspection of pins using non-destructive testing methods.

- **Report 6**.

An inspection to use non-destructive testing methods to assess the condition of the cables (complex feature) of a cable-stayed bridge.

- **Report 6**.

An inspection of only the girders (controlling members) of a load restricted bridge.

- **Report 7**.

A routine inspection scheduled every 24 months of the entire bridge and hands-on inspection of all NSTMs.

- **Report 2 and 4.**

A routine inspection of a suspension bridge scheduled every 12 months of the entire bridge, hands-on inspection of all NSTMs, and non-destructive testing of the pins.

- **Report 2, 4, and 6.**

Inspection Begin Date		
Item ID	B.IE.02	SNBI
Frequency	Each Inspection	
Format	YYYYMMDD	

Specification

Report the date for the inspection type performed. For multiple day inspections, record the first day that field inspection begins.

Commentary

The intent of this item is to report the inspection dates for the inspection types in Item B.IE.01 – Inspection Type since the previous data submittal to FHWA.

If multiple site visits occur for scour monitoring inspections, for a triggering storm event, report the first site visit date for that storm event.

Examples

A routine and NSTM inspection started on August 1, 2020.

- **Report 20200801** for the routine inspection.
- **Report 20200801** for the NSTM inspection.

An underwater inspection started on August 31, 2020.

- **Report 20200831**.

The bridge was struck by an over-height vehicle on November 22, 2020 requiring a damage inspection on the same day.

- **Report 20201122**.

The damage in the example above was repaired, and a one-time special inspection of the repair was performed on December 23, 2020.

- **Report 20201223**.

Inspection Completion Date		
Item ID	B.IE.03	SNBI
Frequency	Each Inspection	
Format	YYYYMMDD	

Specification

Report the completion date for the inspection type performed.

For single day inspections, report the same date that field inspection begins.

Commentary

The intent of this item is to report the field inspection completion dates for all inspections.

If multiple site visits occur for scour monitoring inspections, for a triggering storm event, report the last site visit date for that storm event.

Examples

A routine and NSTM inspection started on August 1, 2020. The routine inspection was completed on August 2, 2020, and the NSTM inspection was completed on August 4, 2020.

- **Report 20200802** for the routine inspection.
- **Report 20200804** for the NSTM inspection.

An Underwater inspection started on August 31, 2020 and completed on September 1, 2020.

- **Report 20200901**.

Nationally Certified Bridge Inspector		
Item ID	B.IE.04	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 15	

Specification

Report the unique code identifying the Nationally Certified Bridge Inspector (team leader) responsible for the inspection type performed.

The unique identifier code is assigned by ODOT.

Commentary

The intent of this item is to indicate the Nationally Certified Bridge Inspector (team leader) present at the inspection, for each inspection type required by the NBIS.

B.IE.04 shall match the AssetWise user identified as the inspection report owner in AssetWise.

Inspection Interval					
Item ID	B.IE.05				SNBI
Frequency	Each Inspection				
Format	Numeric	Max digits:	2	Decimal places:	0

Specification

Report the planned interval in number of months between the current and next scheduled inspection for the type associated with Items B.IE.01 – Inspection Type and B.IE.03 – Completion Date.

This item is calculated within Assetwise and will be populated for routine, underwater, and NSTM inspection types. Other inspection types will be left blank.

Commentary

The intent of this item is to report the planned interval at which the bridge is to be inspected per the NBIS and agency policies and procedures.

This interval should be evaluated after each inspection and adjusted, as necessary.

For the required inspection intervals per inspection type see Chapter 4 – Inspection Types.

Inspection Due Date		
Item ID	B.IE.06	SNBI
Frequency	Calculated	
Format	YYYYMMDD	

Specification

This item is calculated within AssetWise.

The default calculation is the value reported in Item B.IE.03 – Inspection Complete Date plus the value reported in Item B.IE.05 – Inspection Interval.

Commentary

The intent of this item is to provide the inspection due date for the inspection types defined in the B.IE.01 – Inspection Type where applicable.

This item is only calculated for inspection types which have an inspection interval.

Inspections without an inspection interval this item is left blank.

Risk-Based Inspection Interval Method		
Item ID	B.IE.07	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the risk-based inspection interval method using one of the following codes.

Code	Description
N	Not Applicable
1	Method 1
2	Method 2 (Not used in Ohio)

Commentary

The intent of this item is to report the risk-based inspection interval method, described in the NBIS, for determining the inspection interval.

Ohio follows Method 1 for all inspection types that have an interval. Code 1 when B.IE.01 – Inspection Type is 2 (Routine), 3 (Underwater), or 4 (NSTM).

Use code N when Item B.IE.01 – Inspection Type is 1, 5, 6, 7, 8, or 9.

Method 1, as described in the NBIS, is when inspection intervals are determined by a simplified assessment of risk to classify each bridge into one of three risk levels with an inspection interval not to exceed 12, 24, or 48 months.

Inspection Quality Control Date		
Item ID	B.IE.08	SNBI
Frequency	Each Inspection	
Format	YYYYMMDD	

Specification

Report the date that an independent Professional Engineer review has been completed as part of the report approval process.

Do not report when the Team Leader and Professional Engineer reviewer is the same person.

Typically, this date will match the Report Approval Date in AssetWise B.IE.10 – Inspection Data Update Date if the independent Professional Engineer is reviewing and then approving the report.

Commentary

The intent of this item is to identify inspections that have had independent QC reviews to maintain inspection quality at or above a specified level.

Examples

A routine and NSTM inspection started on August 1, 2020. The routine inspection was completed on August 2, 2020. The NSTM inspection was completed on August 4, 2020. A QC review was performed on the routine and NSTM inspections on September 15, 2020.

- **Report 20200915** for the routine inspection.
- **Report 20200915** for the NSTM inspection.

The bridge above was then struck by an over-height vehicle on November 22, 2020 requiring a damage inspection. The damage was repaired, and a one-time special inspection of the repair was performed on December 23, 2020. No QC review was performed on the damage and special inspections.

- **Do not report this item** for the damage inspection.
- **Do not report this item** for the special inspection.

Inspection Quality Assurance Date		
Item ID	B.IE.09	SNBI
Frequency	Each Inspection	
Format	YYYYMMDD	

Specification

Report the date that the QA review was completed by ODOT Office of Structural Engineering, County Engineers Association of Ohio, or FHWA.

Do not report when a QA review is not performed.

Commentary

The intent of this item is to identify inspections that have had independent QA reviews to measure or verify the overall quality of the inspection program.

This data will typically not be filled out or updated as part of the standard report approval process.

If a QA date is previously recorded in AssetWise, the date shall remain until a new QA is performed.

Examples

A routine and NSTM inspection started on August 1, 2020. The routine inspection was completed on August 2, 2020. The NSTM inspection was completed on August 4, 2020. A QC review was performed on the routine and NSTM inspections on September 15, 2020. The routine inspection was randomly selected for an OSE QA review, which was performed on January 4, 2021.

- **Report 20210104** for the routine inspection.

Inspection Data Update Date		
Item ID	B.IE.10	SNBI
Frequency	Each Inspection	
Format	YYYYMMDD	

Specification

Report the date that the NBI inspection data is approved in AssetWise.

Commentary

The intent of this item is to verify that a complete NBI inspection data set is accepted and is entered or updated in the inventory within the timeframes required by the NBIS.

This date shall correspond with the approval of the report in AssetWise and be within 3 months after the month when the field portion of the inspection is completed.

Examples

A routine and NSTM inspection started on August 1, 2020. The routine inspection was completed on August 2, 2020. The NSTM inspection was completed on August 4, 2020. A QC review was performed on the routine and NSTM inspections on September 15, 2020. The reports were approved by a Professional Engineer on September 15, 2020.

- **Report 20200915** for the routine inspection.
- **Report 20200915** for the NSTM inspection.

Inspection Note		
Item ID	B.IE.11	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 300	

Specification

Report a brief description of the members or features inspected when limited portions of the bridge are inspected. Use consistent terms to describe similar inspections.

Commentary

This item is intended to capture a brief description of the members inspected when limited portions of the bridge are inspected such as for underwater, NSTM, in-depth, special, and damage inspections, or for scour monitoring.

This item is also used to describe the purpose for special inspections performed following extreme events such as floods, hurricanes, and earthquakes.

Examples

An NSTM inspection was performed, including hands-on inspection of all girders and floorbeams in Spans 2 and 3.

- **Report "Hands-on inspection of all girders and floorbeams in Spans 2 and 3."**

An underwater inspection was performed on August 31, 2020 with divers for Piers 4-7 during a period of low water.

- **Report "Dove Piers 4-7 at low water, with deficiencies in the splash zone noted and photographed."**

The bridge was struck by an over-height vehicle on November 22, 2020 requiring a Damage inspection.

- **Report "East portal and bracing given a hands-on inspection; mag-particle testing used in several locations where a crack was suspected."**

The damage was repaired, and a one-time Special inspection of the repair was performed on December 25, 2020.

- **Report "East portal and bracing given a hands-on inspection."**

A scour critical bridge experienced flood water elevations up to the web of the exterior girder. Per the scour POA, scour monitoring was immediately completed by a team leader.

- **Report "Bridge was visually monitored for damage and alignment issues during flooding."**

Inspection Equipment

Item ID	B.IE.12	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 120	

Specification

Report all access and inspection equipment used to perform the inspection using one or more of the following codes.

Select multiple codes as applicable.

Do not report this item if none of the access and inspection equipment below was used.

Access		Inspection	
Code	Description	Code	Description
A01	Ladder	I01	Ultrasonic
A02	Bucket lift vehicle	I02	Ground-penetrating radar
A03	Under bridge inspection vehicle	I03	Infrared thermography
A04	Rigging	I04	Radiographic testing
A05	Waders	I05	Impact echo
A06	Boat	I06	Electromagnetic methods
A07	Snorkel	I07	Rebound & penetration methods
A08	SCUBA	I08	Acoustic emissions testing
A09	Surface supplied air	I09	Dye penetrant
A10	Remotely Operated Vehicle (ROV)	I10	Magnetic particle
A11	Video pole	I11	Eddy current
A12	Borescope	I12	Boring or drilling
A13	Unmanned Aerial Systems (UAS)	I13	Underwater imaging
A14	Service Traveler	I14	Depth finder/fathometer
A15	Rope	I15	Stress wave timer
AX	Other	I16	Chain drag
		IX	Other

Commentary

This item is used to provide information about access and inspection equipment used in addition to standard equipment for each inspection. Refer to the BIRM for a listing of standard equipment.

Remotely operated vehicles include any remotely controlled device used to provide video access to members of a bridge via ground, water surface, or underwater.

Use code AN when none of the listed access equipment codes apply for the inspection performed.

Use code A13 when unmanned aerial systems (UAS), also referred to as drones, are used to supplement inspections.

Use code IN when none of the listed inspection equipment codes apply for the inspection performed.

Inspection Equipment - Continued		
Item ID	B.IE.12	SNBI

Commentary – Continued

Use code I13 when underwater imaging technologies such as side scan solar are used to supplement underwater inspections.

NDE and testing inspection equipment listed represent only more common or general types. Use the most closely related code, or use code IX for types not listed.

Examples

An NSTM inspection was performed, including hands-on inspection of all girders and floorbeams in Spans 2 and 3. An under bridge inspection vehicle was used to gain access and magnetic particle testing was done to check fatigue details for cracking.

- **Report A03|I10** for the NSTM inspection.

An underwater inspection was performed with divers using a boat and surface supplied air. Before the dive, side-scan sonar was performed to capture underwater images.

- **Report A06|A09|I13** for the underwater inspection.

The bridge was struck by an over-height vehicle requiring a damage inspection. A hands-on inspection was performed using a bucket truck for access. Dye penetrant testing was used in several locations where cracks were suspected. The tip of identified cracks was determined using Eddy Current testing.

- **Report A02|I09|I11** for the damage inspection.

A scour critical bridge experienced flood water elevations up to the web of the exterior girder. Per the scour POA, scour monitoring was immediately completed by a team leader. A remotely operated water vehicle was used that was equipped with underwater imaging technology.

- **Report A10|I13** for scour monitoring inspection.

Ohio Cursory Interval					
Item ID	B.IE.13.01				SNBI
Frequency	Each Inspection				
Format	Numeric	Max characters:	2	Decimal places:	0

Specification

Report the planned interval in number of months between the current and next scheduled inspection for the Ohio Cursory Inspection Type.

Commentary

The intent of this item is to report the planned interval at which the bridge is to be inspected per ODOT's requirements for non-vehicular bridges.

The interval should be evaluated after each inspection and adjusted, as necessary.

For the required inspection intervals per inspection type see Chapter 4 – Inspection Types.

Ohio Cursory Description					
Item ID	B.IE.13.02				SNBI
Frequency	Initial				
Format	Numeric	Max characters:	1	Decimal places:	0

Specification

Report whether an Ohio Cursory Inspection is required for the bridge.

Code	Description
1	NA – Inspection represents full routine scope
2	Cursory Safety Inspection with known primary
3	Cursory safety inspection with no known primary

Commentary

Code 1 for bridges requiring routine, in-depth, NSTM, etc. and where the inspection events are recorded under Items B.IE.01 through B.IE.12.

Code 2 for non-vehicular bridges over public highways or closed bridges where the owner and primary inspection responsibility are known.

Code 3 for non-vehicular bridges over public highways or closed bridges where the owner and primary inspection responsibility are not known.

Ohio Cursory Inspection Date		
Item ID	B.IE.13.03	SNBI
Frequency	Each Inspection	
Format	YYYMMDD	
Specification		
Report the completion date for the Ohio Cursory Inspection type performed.		
Commentary		
If multiple days are required to complete the inspection, report the completion date of the inspection.		

Probe Date		
Item ID	B.IE.14.01	SNBI
Frequency	Each Inspection	
Format	YYYMMDD	
Specification		
Record the date all substructure units were able to be adequately accessed for condition and scour via visual, or probing inspection techniques. No not report if B.C.11 equals N.		
Commentary		
Do not report if Item B.IR.03 – Underwater Inspection Required is coded Y – Underwater inspection required. Do not report if a waterway feature is not defined under Item B.F.01 – Feature Identification.		

7.7 Bridge Condition

This section has data items that have been grouped by the following five subsections: Component Condition Ratings, Element Identification, Element Conditions, Appraisal, and Work Events.

Element identification and element conditions are required for all vehicular carrying bridges owned or maintained by the state or bridges that carry NHS routes (B.H.03 – NHS Designation is coded "Y" for route carried on the bridge). For all other bridges element identification and element conditions are optional and per the direction of the bridge controlling authority. All other fields regarding condition ratings, appraisal, and work events need to be coded for all bridge as they apply.

7.7.1 Component Condition Ratings

The data items in the Component Condition Ratings subsection provide information about the condition of the bridge and waterway(s).

Condition Ratings shall be assigned to each bridge component based on the structure type, material, defect, quantities, severity, and location.

When determining the overall condition rating of an item, take into account the defect severity and location (e.g. high stress region) which may govern over the quantity of a defect. For example, a major defect in a high stress region or critical area may necessitate a lower overall condition rating even though it is only present in a single or limited locations.

Table 7-2 visually shows the relationship between defect severity and quantity and how it relates to the condition rating. This table provides general guidance with the tables in the following sections providing additional information and guidance regarding component and material type.

Condition		Defect Severity				Strength or Performance Affected?
		Inherent	Minor	Moderate	Major	
9	Excellent	Isolated				No
8	Very Good	Some				No
7	Good		Some			No
6	Satisfactory		Widespread	Isolated		No
5	Fair			Some	Isolated AND	No
4	Poor			Widespread	Isolated AND	Yes – advanced deterioration to structure. Repairs are necessary.
3	Serious				≥ Isolated	Yes – local failures possible. Urgent repairs are necessary.
2	Critical				≥ Isolated	Yes – severe loss of strength. Emergency repairs are required.
1	Imminent Failure					Yes – bridge is closed pending major repairs or rehabilitation.
0	Failed					Yes – bridge is closed and beyond repair

Table 7-2: Relationship between condition rating, defect severity and defect quantity.

7.7.1.1 Definitions for Component Condition Ratings

Structural Review – should be completed when major defects are present at the bridge. A structural review may include the following:

- Discussion with bridge owner and professional engineer regarding the findings and significance;
- Verify the existing load rating or analysis includes the major defect and no significant changes from the previous inspection;
- Load rating of a portion of the bridge;
- Complete load rating of the bridge including as inspected conditions.

Strength and/or performance affected – The safe load carrying capacity of the bridge has been affected. Does not directly indicate the bridge is required to be posted, but it may be posted. An inspection rating is required to include major defects such as section loss of beam ends which may or may not control the rating.

Unless noted otherwise throughout the condition rating tables the following terms shall be assume as:

- **Isolated** defect occurs in one or a few concentrated locations.
- **Some** defects occurs more than isolated and less than widespread.
- **Widespread** defect is present in many locations.

The definition of isolated, some, and widespread, should be considered relative to the size and configuration of each bridge.

7.7.1.2 Crack Width Definitions

Crack width size and definitions are shown in *Table 7-3*

Size	SNBI Terms	Reinforced Concrete	Prestressed/ Post-tensioned Concrete
Insignificant	Inherent	<0.012"	<0.004"
Medium	Minor	0.012" to 0.05"	0.004" to 0.009"
Wide	Moderate	>0.05"	>0.009"
Medium Pattern (map)	Minor	Cracks spaced 1' to 3' apart	
Heavy Pattern (map)	Moderate	Cracks spaced less than 1' apart	

Table 7-3: Reinforced and prestressed/ post-tensioned concrete size and pattern definitions.

7.7.1.3 Spatial Area Estimates Diagrams

This section includes diagrams that can be used to estimate the amount of a defect. The area estimates are presented in terms of percentage of the total area with each diagram representing 4000 square feet (sq ft) configured in a 40 ft by 100 ft scale diagram. Figure 7-141 through Figure 7-145 can be used to assist in estimating an area of defect(s) by comparing the appearance of the diagram with conditions observed in the field.

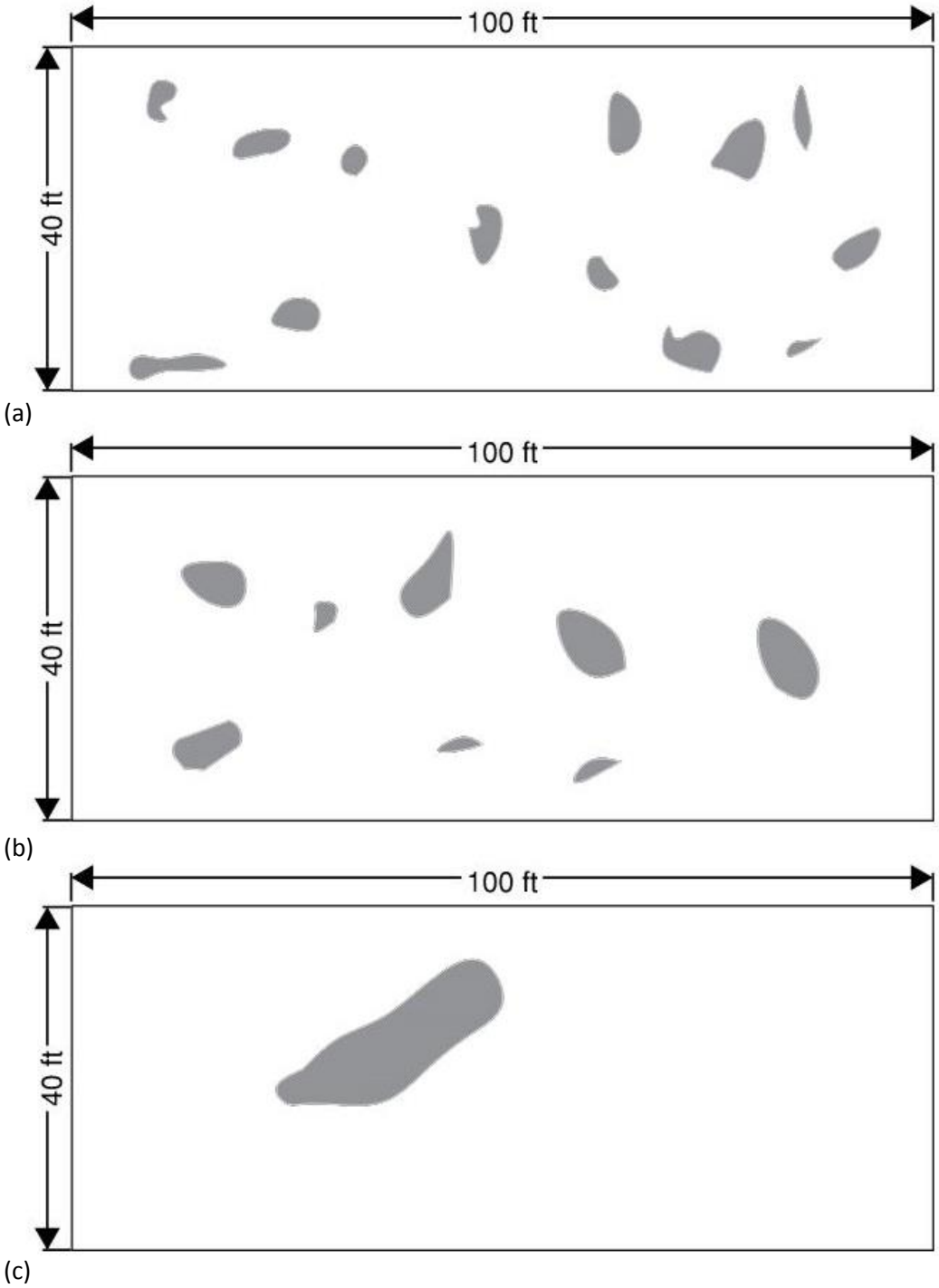


Figure 7-141 (a), (b), and (c): Area quantity estimate showing 5% of area with a defect.

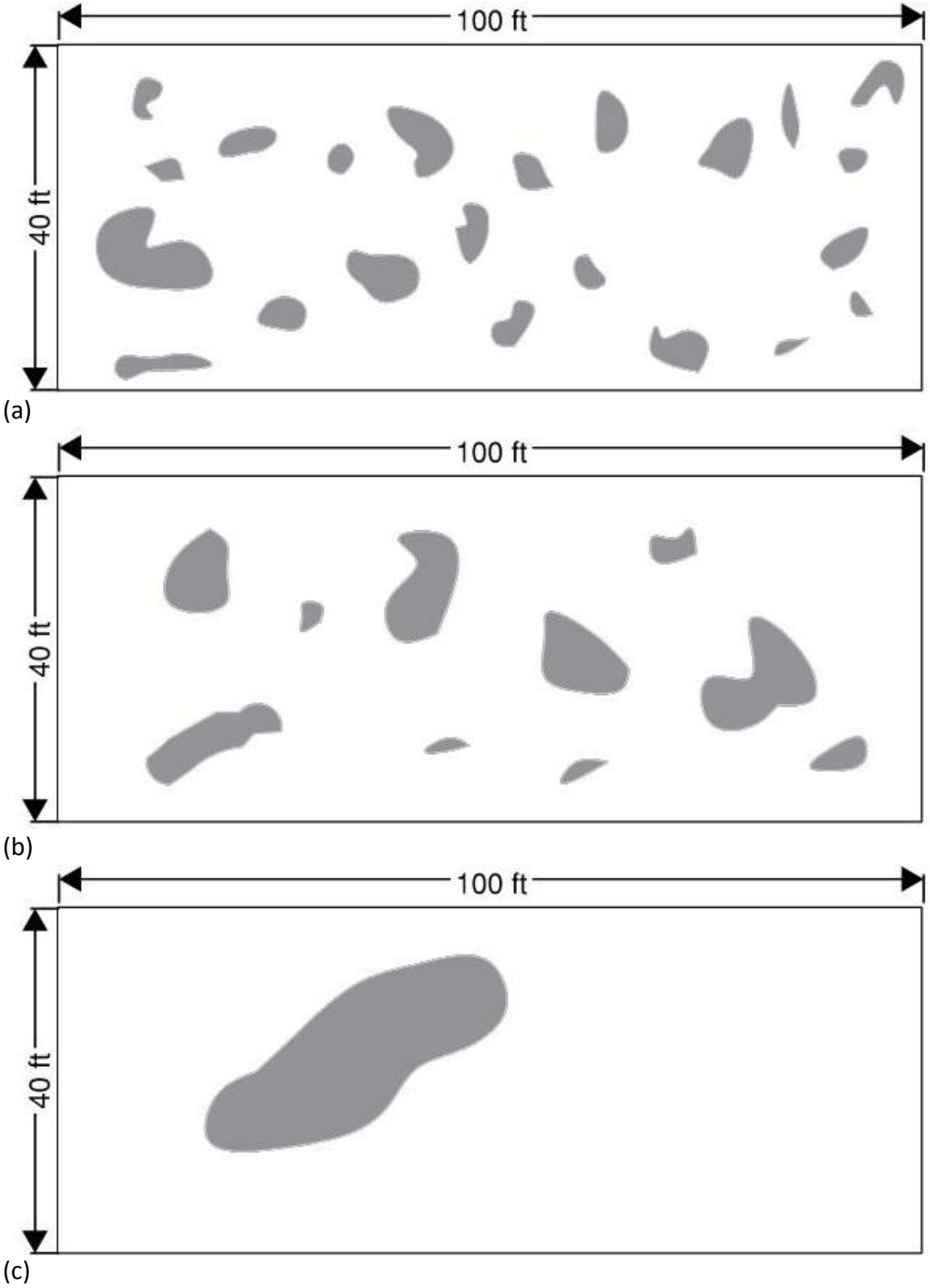


Figure 7-142 (a), (b), and (c): Area quantity estimate showing 10% of area with a defect.

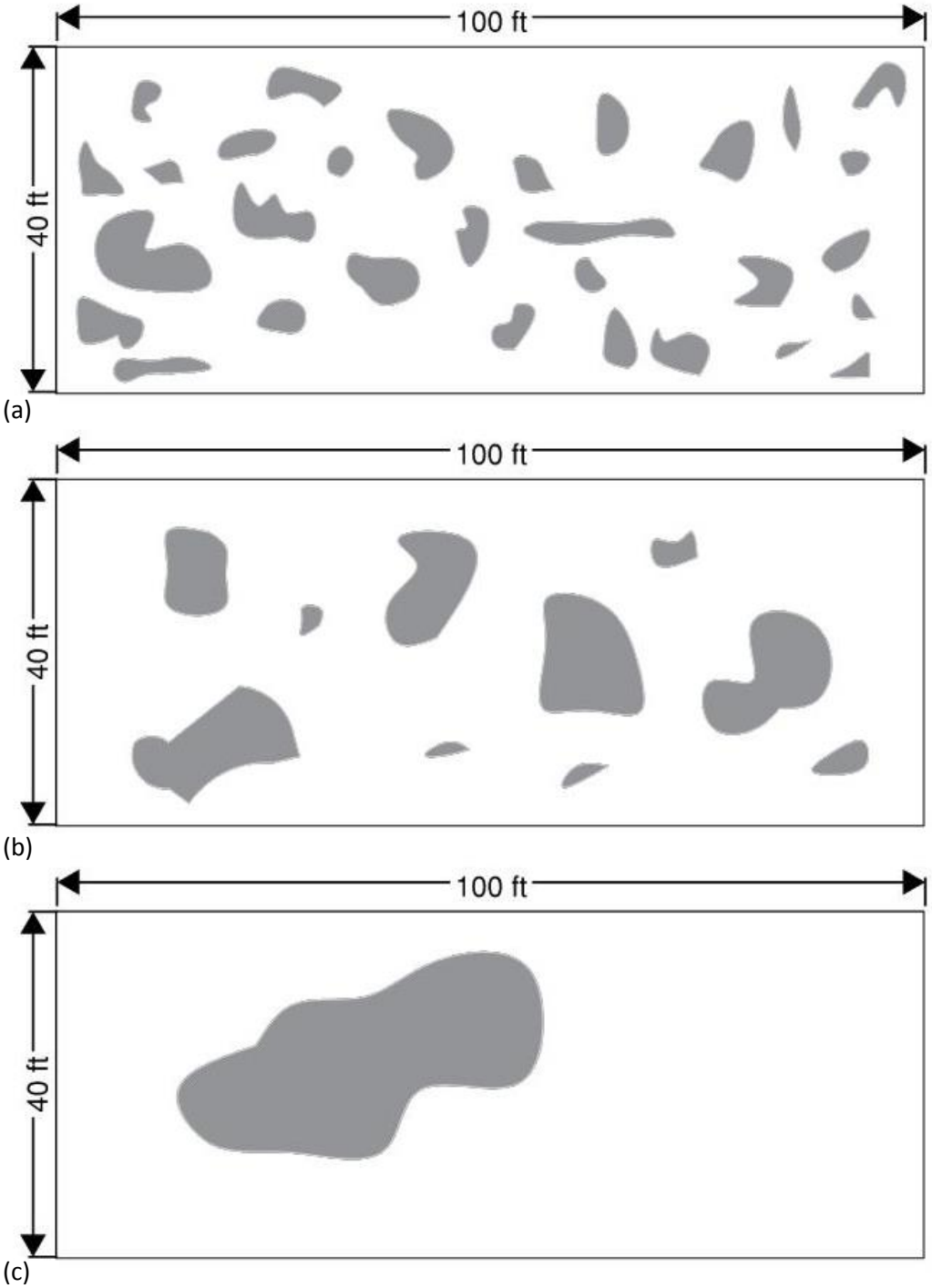


Figure 7-143 (a), (b), and (c): Area quantity estimate showing 15% of area with a defect.

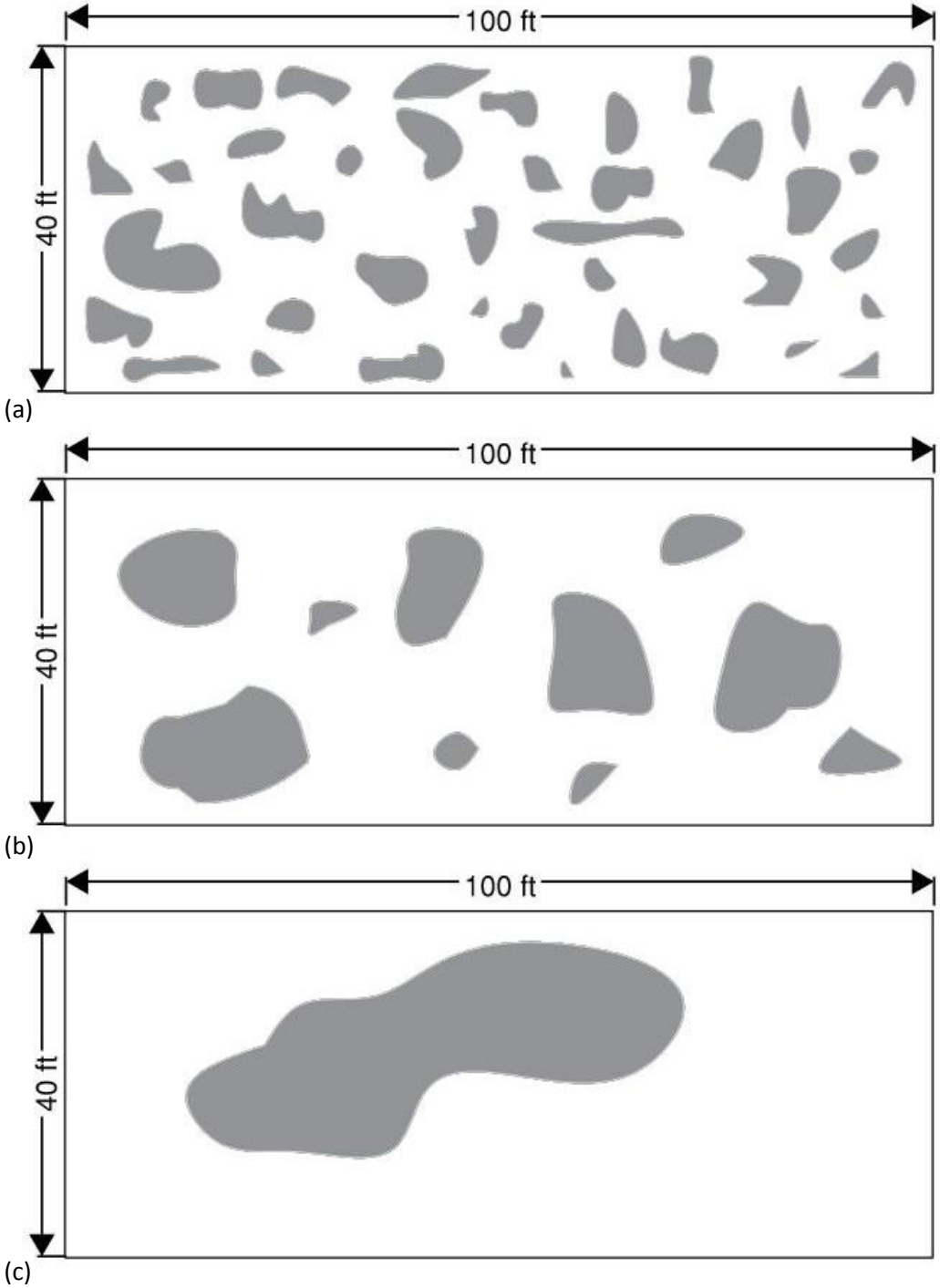


Figure 7-144 (a), (b), and (c): Area quantity estimate showing 20% of area with a defect.

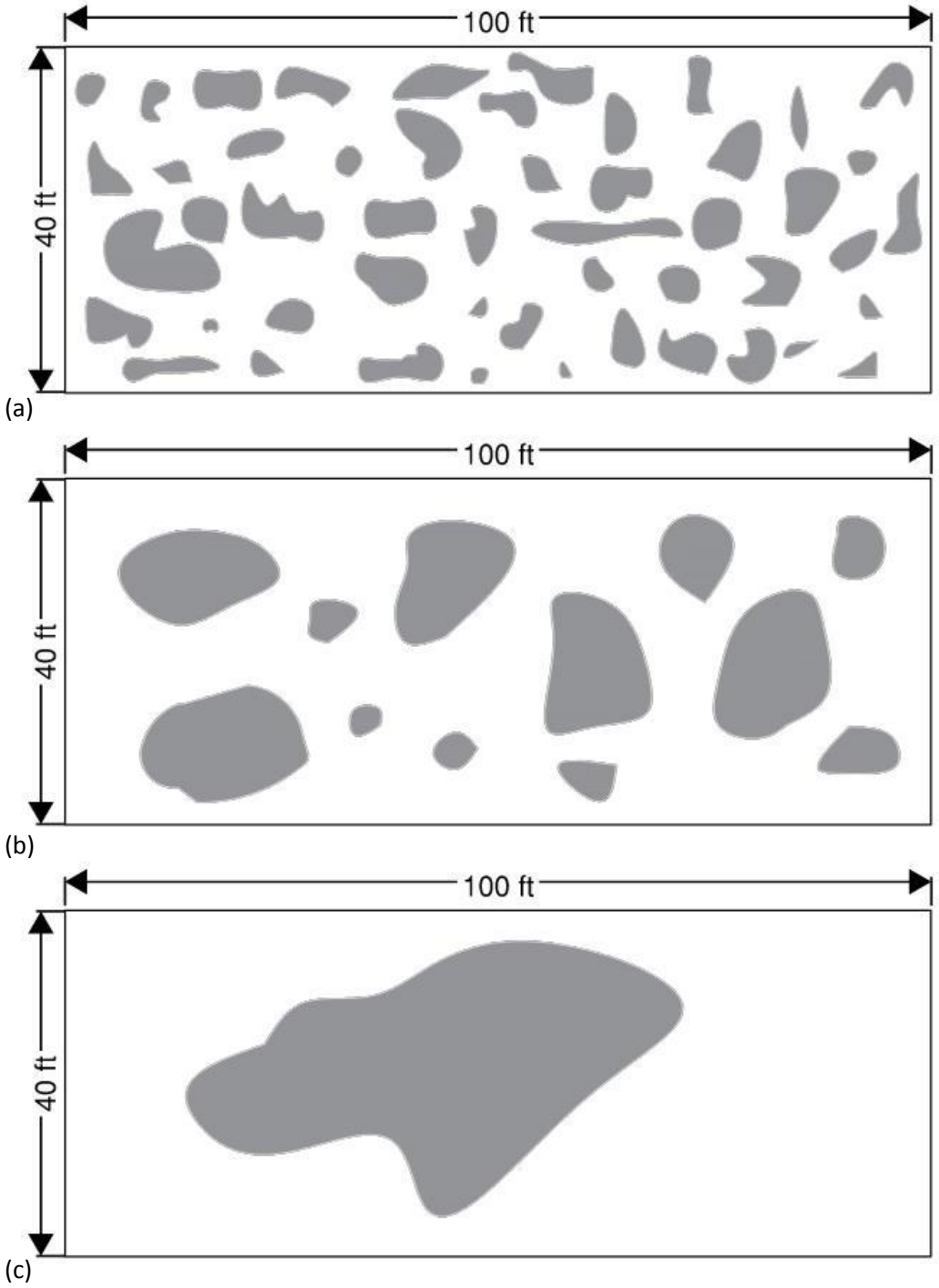


Figure 7-145 (a), (b), and (c): Area quantity estimate showing 25% of area with a defect.

7.7.1.4 Component Condition Ratings

The data for these items may change after each inspection. The following data items are included in this group:

Item ID	Data Item
B.C.01	Deck Condition Rating
B.C.01.01	Wearing Surface Condition Rating
B.C.02	Superstructure Condition Rating
B.C.02.01	Protective Coating System Condition Rating
B.C.03	Substructure Condition Rating
B.C.04	Culvert Condition Rating
B.C.05	Bridge Railing Condition Rating
B.C.06	Bridge Railing Transition Condition Rating
B.C.07	Bridge Bearing Condition Rating
B.C.08	Bridge Joints Condition Rating
B.C.09	Channel Condition Rating
B.C.10	Channel Protection Condition Rating
B.C.11	Scour Condition Rating
B.C.12	Bridge Condition Classification
B.C.13	Lowest Condition Rating Code
B.C.13.01	Ohio General Appraisal
B.C.14	NSTM Inspection Condition
B.C.15	Underwater Inspection Condition

Deck Condition Rating

Item ID	B.C.01	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max digits: 1	

Specification

Report the deck condition rating using one of the codes in the following tables.

Report N when Items B.SP.09 – Deck Material and Type is 0.

Condition Rating Reinforced Concrete

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such as construction or fabrication defects or inherent cracks (temperature and shrinkage).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as delaminations, small spalls, sound patches, reinforcement with shallow cover (no section loss), unsealed medium width cracks, or leaching.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as spalls, unsound patches, exposed reinforcement without section loss, wide cracks, loose coarse aggregate, efflorescence build-up, or rust staining.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory), or isolated exposed reinforcement with section loss; **strength and performance of the deck are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the deck is affected.**
	3	Serious	**Major defects; strength and/or performance of the deck is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; deck is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to deck condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to deck condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges.

When defects such as delamination or spall occur on the top side and saturation or cracking occur on the bottom side, consideration should be given to lowering the rating due to the possibility of a full depth spall (punch through or hot spot).

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Condition Rating Reinforced Concrete - Continued

Edge of deck spalls isolated to the underside and bottom corner (<2' wide) will generally not be considered as affecting the performance of the deck. When the edge of deck spalls becomes full height or encroaching into the shoulder or travel way and become a safety hazard, the performance of the deck is affected.

Defect	Minor	Moderate	Major
Delamination / Spall/ Patched Area	Delamination, small spall (<1" deep or <6" diameter), or patched area that is sound without cracking.	Large spall (>1" deep or >6" diameter) or patched area that is unsound or showing distress.	Full depth spalls, hot spots, or widespread edge of deck spalls/delaminations which is encroaching into the travel way.
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Debonded (360° exposure) from concrete in multiple locations; multiple locations present with measurable section loss.
Cracking	Unsealed medium width (0.012" to 0.05" wide) cracks or unsealed medium pattern (map) cracking.	Wide width (>0.05") cracks or heavy pattern (map) cracking.	
Saturation	Areas of staining but currently dry.	Areas of staining or areas currently damp.	Damp areas where the concrete easily disintegrates when hit with hammer.
Efflorescence / Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.	
Abrasion/ Wear	Exposed coarse aggregate, but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix.	
Distortion/ alignment	Has been mitigated or does not require mitigation.	Requires mitigation but has not been addressed.	Requires mitigation which has not been addressed.
Deterioration of Metal SIP Forms	Corrosion and or section loss (no holes).	Corrosion holes through SIP forms; leaching of deck.	

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Condition Rating Reinforced Concrete - Continued

The condition of stay-in-place (SIP) deck forms should not be considered in the condition rating, except insofar as they indicate the condition of the deck itself.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Spall/Delamination/ Patch	Up to 1%	1-10%	>10%
Cracking	5-10%	10-20%	>20%
Saturation/ Efflorescence	1-5%	5-25%	>25%

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Example Reinforced Concrete

A three-span continuous reinforced concrete slab structure exhibits the following conditions:

Figure 7-146: Typical wearing surface (Item B.C.01.01 – 7 (Good))

Span 1 Findings:

Field Note	Severity	Extent	Rating
Moderate saturation (5%)	Mod.	Isolated	6
Moderate efflorescence (2%)	Mod.	Isolated	6
Isolated areas of rust staining	Mod.	Isolated	6
Spall 15'L x 24"W x up to 2"D (<1%)	Mod.	Isolated	6

Figure 7-147: Underside of deck in Span

Span 2 Findings:

Field Note	Severity	Extent	Rating
Wide cracking (7%)	Mod.	Isolated	6
Surface white efflorescence (5%)	Minor	Isolated	7
Areas of delamination (2%)	Minor	Some	7

Figure 7-148: Underside of deck in

Span 3 Findings:

Field Note	Severity	Extent	Rating
Delaminated and spalled area - 30' wide by 2' long by up to 2" deep (<1%)	Mod.	Isolated	6

Figure 7-149: Underside of deck in Span

Defects totaling some moderate (spalls, rust staining, saturation, and efflorescence) and some minor (surface white efflorescence and delaminations)

Report 6 (Satisfactory) for Item B.C.01 – Deck Condition Rating.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Example Reinforced Concrete - Continued

A three-span continuous steel girder/beam structure with reinforced concrete deck exhibits the following conditions:

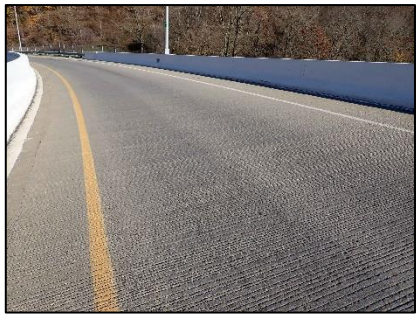


Figure 7-150: Typical wearing surface (Item B.C.01.01 – 6, Satisfactory Condition)

Span 1 Findings:

Field Note	Severity	Extent	Rating
Moderate saturation (6%)	Mod.	Some	5
Moderate efflorescence (7%)	Mod.	Some	5
Haunch spalls up to 7” long (2%)	Mod.	Some	5
Areas of delamination (11%)	Minor	Widespread	6

Figure 7-151: Underside of deck in Span

Span 2 Findings:

Field Note	Severity	Extent	Rating
Spalls with exposed reinforcement (4%)	Mod.	Some	5
Wide cracking (12%)	Mod.	Some	5
Areas of delamination (11%)	Minor	Widespread	6

Figure 7-152: Underside of deck in Span 2

Span 3 Findings:

Field Note	Severity	Extent	Rating
Spalls with exposed reinforcement (7%)	Mod.	Some	5
Wide cracking (14%)	Mod.	Some	5
Areas of delamination (12%)	Minor	Widespread	6

Figure 7-153: Underside of deck in Span 3

Defects totaling some moderate (spalls with exposed reinforcement with section loss, wide cracks, efflorescence, and saturation).

Report 5 (Fair) for Item B.C.01 – Deck Condition Rating.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Example Reinforced Concrete - Continued

A three-span reinforced concrete slab with a monolithic wearing surface exhibits the following conditions:

Figure 7-154: Typical wearing surface (Item B.C.01.01 – 7, Good Condition)

Span 1 Findings:

Field Note	Severity	Extent	Rating
Spall 10' long x 8' wide by 5" deep with debonded reinforcement (<1%)	Major	Isolated	4
Areas of large spalls with exposed reinforcement with section loss (11%)	Mod.	Widespread	4
Wide longitudinal cracks (12%)	Mod.	Some	5

Figure 7-155: Underside of deck in Span

Span 2 Findings:

Field Note	Severity	Extent	Rating
Large spall with exposed and debonded reinforcement (<1%)	Major	Isolated	4
Spalls with exposed reinforcement and measurable section loss (<1%)	Major	Isolated	4
Wide longitudinal cracks (12%)	Mod.	Some	5

Figure 7-156: Underside of deck in Span 2

Span 3 Findings:

Field Note	Severity	Extent	Rating
Spalls with exposed and debonded reinforcement with measurable section loss (<1%)	Major	Isolated	4
Moderate saturation (7%)	Mod.	Some	5
Areas of delamination (12%)	Minor	Widespread	6
Wide longitudinal cracks (12%)	Mod.	Some	5

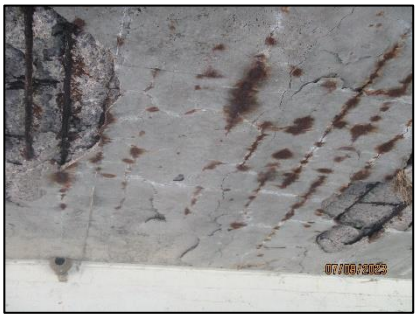


Figure 7-157: Underside of deck in Span

Defects totaling widespread moderate (wide cracking, saturation, and large spalls) and isolated major (spalls with debonded reinforcement and multiple locations of measurable section loss)

Report 4 (Poor) for Item B.C.01 – Deck Condition Rating.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Condition Rating Steel

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects (poor quality welds).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as freckled rust, corrosion has initiated, loose fasteners, pack rust without distortion, cracks that have self-arrested or been effectively arrested.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as section loss, missing bolts or rivets or fasteners or broken welds, pack rust with distortion, or crack that has not been arrested.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory); **strength and performance of the deck are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the deck is affected.**
	3	Serious	**Major defects; strength and/or performance of the deck is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; deck is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to deck condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to deck condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges.

When inspecting steel grid deck defects may include cracks or broken fasteners between the gird bars, abrasion to the riding surface (creating a slick surface), section loss to the primary and secondary bars, and connections to the superstructure.

When inspecting steel decks with asphalt overlay, defect may include section loss to the decking pans, water leakage, and distortion or deformation to the decking pans. Cracking and or settlement of the asphalt wearing surface can indicate signs of distress or deformation of the decking pans below.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Condition Rating Steel - Continued

Defect	Minor	Moderate	Major
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is evident.	May include significant section loss or holed through areas in steel decking pans or high stress regions and warrants structural review.
Crack	Crack that has self-arrested or been effectively arrested.	Crack that has not been arrested or newly identified crack.	Cracks in several adjacent grid bars.
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners. Broken welds.	Missing fasteners require structural review. Load path altered.
Distortion	Distortion of the deck pans or deck grid bars that has been mitigated or does not require mitigation.	Distortion of the deck pans or deck grid bars that requires mitigation but has not been addressed.	Distortion of deck pans along seams and between members. Steel grid deck bars distortion within wheel path to several primary bars.
Pack Rust	Pack rust present without distortion.	Pack rust present with distortion.	Pack rust causing, distortion of member, broken fasteners, or compromised the connection.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Crack	Up to 1%	1-10%	>10%
Corrosion/ Pack Rust/ Section Loss	1-5%	5-15%	>15%

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Example Steel

A simple span steel thru truss structure exhibits the following conditions:

Figure 7-158: Typical wearing surface (Item B.C.01.01 – 6, Satisfactory Condition)

Findings:

Field Note	Severity	Extent	Rating
Areas of freckled rust above floorbeams (5%)	Minor	Some	7
Areas of corrosion with section loss (1%)	Mod.	Isolated	6

Figure 7-159: Typical underside of deck pans above floorbeam locations

Findings:

Field Note	Severity	Extent	Rating
Areas of freckled rust above floorbeams (5%)	Minor	Some	7
Areas of corrosion with section loss (1%)	Mod.	Isolated	6

Figure 7-160: Underside of deck above Floorbeam 5

Findings:

Field Note	Severity	Extent	Rating
Areas of freckled rust above floorbeams (10%)	Minor	Some	7
Areas of corrosion with section loss (3%)	Mod.	Isolated	6

Figure 7-161: Underside of deck above the Forward Abutment

Defects totaling widespread minor (freckled rust and initiation of corrosion) and isolated moderate (corrosion with section loss)

Report 6 (Satisfactory) for Item B.C.01 – Deck Condition Rating.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Example Steel - Continued

A simple span steel thru truss structure exhibits the following conditions:

Figure 7-162: Typical wearing surface (Item B.C.01.01 – 5, Fair Condition)

Findings:

Field Note	Severity	Extent	Rating
Areas of laminar corrosion with section loss near drain holes (5%)	Mod.	Some	5

Figure 7-163: Typical underside of deck near drain hole locations

Findings:

Field Note	Severity	Extent	Rating
Areas of laminar corrosion with section loss above floorbeams (4%)	Mod.	Some	5

Figure 7-164: Typical underside of deck near drain hole locations

Findings:

Field Note	Severity	Extent	Rating
Areas of laminar corrosion with section loss between floorbeams (5%)	Mod.	Some	5

Figure 7-165: Typical widespread corrosion throughout the underside of the deck

Defects totaling some moderate (corrosion with section loss)

Report 5 (Fair) for Item B.C.01 – Deck Condition Rating.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Example Steel - Continued

A simple span steel multi-beam structure exhibits the following conditions:

Field Note	Severity	Extent	Rating
Corrosion with section loss along inside of fascia beams (17%)	Mod.	Widespread	4

Figure 7-166: Typical underside of deck between beams

Findings:

Field Note	Severity	Extent	Rating
Corrosion with 100% section loss (<1%)	Major	Isolated	4

Figure 7-167: Significant section loss to the underside of steel deck pan

Findings:

Field Note	Severity	Extent	Rating
Laminar corrosion with section loss near and along the interior beams (16%)	Mod.	Widespread	4

Figure 7-168: Typical areas of section loss near beam interface

Findings:

Field Note	Severity	Extent	Rating
Corrosion with section loss along exterior beyond fascia beam (17%)	Mod.	Widespread	4

Figure 7-169: Typical edge corrosion

Defects totaling widespread moderate (corrosion with section loss) and isolated major (significant section loss)

Report 4 (Poor) for Item B.C.01 – Deck Condition Rating.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Condition Rating Timber

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such as material imperfections.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as up to 10% section loss, arrested cracks, loose fasteners, checks in shakes in non-high-stress regions, splits, or abrasion.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as 10% or greater section loss, cracks, missing bolts, checks or shakes, splits and delaminations, or abrasion.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory); **strength and performance of the deck are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the deck is affected.**
	3	Serious	**Major defects; strength and/or performance of the deck is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; deck is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to deck condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to deck condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges.

Timber decks should have visual inspection supplemented with physical methods such as sounding, pick test, etc. Timber members typically decay starting on the inside first. Sounding can identify areas of internal decay and deterioration.

Deck Condition Rating - Continued

Item ID	B.C.01	SNBI

Condition Rating Timber - Continued

Defect	Minor	Moderate	Major
Decay/ Section Loss	Affects up to 10% of the member section.	Affects more than 10% of the member section but does not warrant structural review.	May include significant decay/ section loss or holed through areas in high stress regions and warrants structural review.
Connection	Loose fasteners. Connection is in place and functions as intended.	Missing bolts or fasteners.	Missing fasteners require structural review. Load path altered.
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion that warrants structural review.
Check/ Shake	Penetrates up to 50% of the thickness of the member not in a high-stress region.	Penetrates 50% of the thickness or greater and length equal to or greater than the member depth not in a high-stress region, or up to 5% of the member thickness in a high-stress region.	Penetrates 25% or greater of the member thickness in a high-stress region.
Splits/ Delamination	Length less than the member depth, or arrested with effect actions taken to mitigate.	Length equal to or greater than the member depth, but does not warrant structural review.	Length equal to or greater than the member depth and warrants structural review.
Abrasion/ Wear	Affects up to 10% of the member section (thickness).	Affects 10% or greater of the member section (thickness) but does not warrant structural review.	Affects 10% or greater of the member section (thickness) and warrants structural review.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Decay/ Section Loss	1-5%	5-10%	>10%
Abrasion/ Wear	1%	1-15%	>15%
Check/ Shake/ Split/ Delamination	1-5%	5-10%	>10%

Deck Condition Rating - Continued		
Item ID	B.C.01	SNBI
Commentary		

This item represents the condition of the deck as determined from the inspection of all deck surfaces (top, underside, and edges).

Item B.C.01 – Deck Condition Rating and Item B.C.02 – Superstructure Condition Rating are the same for solid and voided slab bridges.

For structures when the top flange is acting as the deck, (e.g. rigid frames, decked girders or tee beams, box beams, etc.) the deck and superstructure condition rating shall be equal.

Do not consider the condition of monolithic or non-monolithic wearing surfaces (i.e., overlays), stay-in-place deck forms, joint assemblies, expansion devices, bridge rails, or scuppers when determining the condition rating code for B.C.01 – Deck Condition Rating, except insofar as they indicate the condition of the deck itself.

Consider the condition of a joint header only when the deck serves as a joint header.

Inspect general alignment along the curb line, top of railing, and along joints for both vertical and horizontal alignment.

Visual assessments may be supplemented with non-destructive or destructive testing results. Deck surveys should be considered, including but not limited to electrical potential, chloride content, concrete cores, ground penetrating radar, or chain dragging.

Use destructive or non-destructive testing results or visual condition indicators of materials covering the surfaces being assessed when top, underside or both surfaces are not visible for assessment. Past inspection reports and repair records may also provide supplemental information to aid in the determination of the condition rating.

Downgrade the B.C.05 – Bridge Railings Condition Rating when the deck edge deterioration has exposed or comprised the connection between the deck and railing (railing anchorage).

Wearing Surface Condition Rating

Item ID	B.C.01.01	ODOT
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the wearing surface condition rating using one of the codes in the following tables.

Report N when M, A, or W is not reported for Item B.SP.01 – Span Configuration Designation and when Item B.SP.09 – Deck Material and Type is 0.

Condition Rating Wearing Surface

Condition			Guidelines
GOOD	9	Excellent	Wearing surface is new. **Isolated inherent defects.** Wearing surface is on a new deck or new wearing surface.
	8	Very Good	**Some inherent defects** such as insignificant cracks and wear.
	7	Good	**Isolated minor defects** such as unsealed medium width cracks, exposed aggregate within wheel lines. Rideability smooth and no issues.
FAIR	6	Satisfactory	**Some minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as large spalls, unsound patches, wide cracks, abrasion with loose or missing aggregate, leakage on the underside of deck. Rideability some minor issues.
	5	Fair	**Some moderate** as note in Condition Rating 6 (Satisfactory) **or isolated major defects** such as full depth spalls to the wearing surface, asphalt patches, saturation to the underside of deck. Rideability isolated moderate or widespread minor issues.
POOR	4	Poor	**Widespread moderate or isolated major defects.** Wearing surface condition no longer protecting the structural deck with signs of saturation/ leaking on the underside of deck (hot-spots). Rideability widespread moderate or some major issues, causing unsafe driving conditions.
	3	Serious	**Widespread moderate and some major defects.** Limited effectiveness in protecting the structural deck. Saturation/ leaking and reflective cracking on underside of deck within the travel lanes (hot-spots). Wearing surface degradation is problematic to the condition of the deck. Rideability, vehicles must slow down to safely cross the bridge due to wearing surface defects.
	2	Critical	**Widespread major defects.** Consideration given to closing lane(s) or increasing the number of inspections to monitor.
	1	Imminent Failure	**Bridge is closed to traffic due to the wearing surface condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to wearing surface condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for Bridges where the Code for B.SP.10 is 0.

Wearing Surface Condition Rating - Continued

Item ID	B.C.01.01	ODOT

Condition Rating Concrete

Defect	Minor	Moderate	Major
Delamination / Spall / Patched Area	Delamination, small spall (<1" deep or <6" diameter), or patched area that is sound without cracking.	Large spall (>1" deep or >6" diameter) underlying deck not exposed, or patched area that is unsound or showing distress.	Spall has exposed the structural deck. Asphalt pathed areas.
Cracking	Unsealed medium width (0.012" to 0.05") cracks or unsealed medium pattern cracking.	Wide width (>0.05") cracks or heavy pattern cracking.	Reflective cracking between the wearing surface and underside of deck (typically with leakage or saturation).
Abrasion/ Wear	Exposed coarse aggregate with aggregate remaining secure in wearing surface.	Exposed coarse aggregate with loose or missing aggregate due to wear/ abrasion.	Abrasion/ wear has exposed the structural deck.
Effectiveness	Signs of leakage on the underside of deck, dry, with areas of staining.	Active leakage on the underside of the deck.	Saturation of the underside of deck with reflective cracking or delamination/spall in wearing surface.
Rideability	No reduction in speed (smooth).	Rideability affected.	Unsafe, vehicles must avoid defects.
Damage	Scrapes or gouges <1" deep.	Staining or scaling from fire damage. Scrapes or gouges > 1" deep.	Unsafe, vehicles must avoid defects.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Delaminations/ Spalls	1%	1-10%	>10%
Cracking	5-10%	10-20%	>20%
Asphalt Patches	1%	1-5%	>5%

Wearing Surface Condition Rating - Continued

Item ID	B.C.01.01	ODOT

Condition Rating Asphalt

Defect	Minor	Moderate	Major
Delamination / Spall (Pothole) / Patched Area	Delamination, small spall (<1" deep or <6" diameter), or patched area that is sound without cracking.	Large spall (>1" deep or >6" diameter) underlying deck not exposed, or patched area that is unsound or showing distress.	Underlying deck is exposed, unsealed patched areas, or patches showing distress. Wearing surface no longer present or effective.
Cracking	Sealed cracks.	Unsealed cracks.	Reflective cracking between the wearing surface and underside of deck (typical with leakage or saturation).
Rutting	Rutting <1 in. deep.	Rutting >1 in. deep.	The wearing surface is no longer effective.
Effectiveness	Signs of leakage on the underside of deck, dry, with areas of staining.	Active leakage on the underside of the deck.	Saturation of the underside of deck with reflective cracking or delamination/spall in wearing surface.
Rideability	No reduction in speed (smooth).	Rideability affected.	Unsafe, vehicles must avoid defects.
Damage	Scrapes or gouges <1" deep.	Staining or scaling from fire damage. Scrapes or gouges >1" deep.	Unsafe, vehicles must avoid defects.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Delaminations/ Spalls	1%	1-5%	>5%
Cracking	5-10%	10-20%	>20%
Patches	1%	1-5%	>5%
Cracking/Rutting	1-5%	5-15%	>15%

Wearing Surface Condition Rating - Continued

Item ID	B.C.01.01	ODOT

Condition Rating Epoxy / Chip and Seal Overlays

Defect	Minor	Moderate	Major
Delamination/ Adhesion Failure	Adhesion to deck, surface only defect.	Delamination of epoxy layer, no adhesion to deck	Epoxy layer loose or missing.
Cracking	Sealed moderate width cracks or sealed moderate pattern cracking.	Unsealed cracks, wide cracks, or heavy pattern cracking.	Unsealed wide cracks or heavy pattern cracking causing the wearing surface to no longer be effective.
Scaling/ Wear/ Abrasion	Aggregate loss or polishing of surface with no significant loss of friction/traction.	Aggregate loss or polishing of surface with noticeable loss of friction/traction.	Causing potential hazard in adverse weather conditions.
Patches	Permanent patches that are sound.	Deteriorated patches or temporary patches.	Patches no longer effective or asphalt patches.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Delaminations/ Adhesion Failure	1%	1-10%	>10%
Cracking	5-10%	10-20%	>20%
Scaling/ Wear/ Abrasion	5%	15%	>15%
Patches/ Asphalt Patches	1%	1-5%	>5%

Condition Rating Timber

Defect	Minor	Moderate	Major
Deterioration	Less than 25% of thickness.	More than 25% of thickness.	Deterioration causing loose planks, exposing structural deck, causing rideability issues.
Connections	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners.	Planks loose, cause a safety hazard.

Refer to Chapter 7.7.1.1 for definitions of Isolated, Some, and Widespread.

Wearing Surface Condition Rating - Continued		
Item ID	B.C.01.01	ODOT
Commentary		

The primary function of the wearing surface is to provide a smooth riding surface and to protect the underlying bridge deck. It should be examined for rideability, cracks, delaminations, patches, and signs of deterioration. Crack density should be quantified using an area that Is repeatable and quantifiable such as a 12' wide lane by 12' length of the bridge deck.

Unsealed cracks due to reflective cracks that are actively promoting deck or superstructure deterioration should be rated no better than the protected element (ex. longitudinal reflective crack above a prestressed box beam (PSBB) or transverse cracks above the negative moment regions).

Update Item B.SP.10.01 – Wearing Surface Thickness in the inventory as it may affect the dead load calculations and influence the available live load capacity.

Wearing Surface Condition Rating - Continued

Item ID	B.C.01.01	SNBI

Examples

9 Wearing surface is new. Isolated inherent defects. Wearing surface is on a new deck or new wearing surface.

8

Figure 7-170: Some insignificant cracks

7

Figure 7-171: Isolated minor wear and unsealed medium with cracks (minor)

Figure 7-172: Isolated minor wear

6

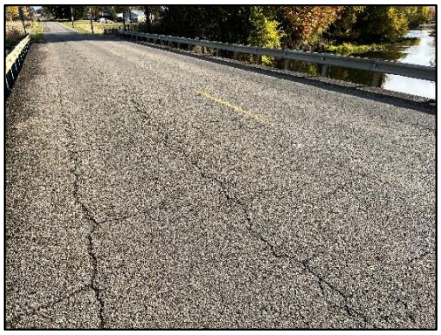


Figure 7-173: Isolated wide cracks (moderate)

Figure 7-174: Some medium width unsealed longitudinal cracks (moderate)

Wearing Surface Condition Rating - Continued

Item ID	B.C.01.01	SNBI

Examples - Continued

5

Figure 7-175: Isolated spall with an asphalt patch (major)

Figure 7-176: Medium pattern (map) cracking (minor) with some wide cracks (moderate)

4

Figure 7-177: Isolated asphalt patches (major) and some concrete patches showing cracking and delaminations (moderate)

Figure 7-178: Widespread spalls (moderate) and limited effectiveness

3

Figure 7-179: Widespread partial-depth spalls (moderate), some asphalt patches (major), and some delaminations (minor)

Figure 7-180: Some asphalt patches (major) causing moderate rideability issues

Wearing Surface Condition Rating - Continued

Item ID	B.C.01.01	SNBI

Examples - Continued

2

Figure 7-181: Widespread loss of wearing surface and no longer effective

Figure 7-182: Excessive wear and wearing surface no longer effective

1 Bridge is closed to traffic due to wearing surface condition. Repair or rehabilitation may return the bridge to service.

Superstructure Condition Rating

Item ID	B.C.02	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max digits: 1	

Specification

Report the superstructure condition rating using one of the codes in the following tables.

Report N when M, A, or W is not reported for Item B.SP.01 – Span Configuration Designation.

Condition Rating Reinforced Concrete

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects or inherent cracks (shrinkage cracking).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as delaminations, small spalls, sound patches, unsealed medium width cracks, or efflorescence.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as large spalls, unsound patches, exposed reinforcement without section loss, wide cracks, heavy efflorescence, or rust staining.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory) including reinforcement with section loss; **strength and performance of the superstructure are not affected.**
POOR	4	Poor	**Isolated major defects or widespread moderate or; strength and/or performance of the superstructure is affected.**
	3	Serious	**Major defects; strength and/or performance of the superstructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; superstructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to superstructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to superstructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, or filled spandrel arch bridges.

Reinforced concrete superstructures should be inspected for cracking near and over supports and at midspan (shear and flexural cracking), rust staining, delaminations, spalls, and exposed reinforcement. Exposed primary reinforcement should be measured for section loss and compared with as-built conditions for possible load rating.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Reinforced Concrete - Continued

Defect	Minor	Moderate	Major
Delamination / Spall/ Patched Area	Delamination, small spall (< 1" deep or <6" diameter) or patched area that is sound.	Large spall (>1" deep or >6" diameter) or patched area that is unsound or showing distress.	Spall extends beyond reinforcement cover particularly in compression regions.
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Present with measurable section loss and warrants structural review (ex. multiple primary bars with section loss).
Cracking	Unsealed medium width (0.012" to 0.05") cracks or unsealed medium pattern (map) cracking.	Wide width (>0.05") cracks or heavy pattern (map) cracking.	Wide flexural cracks at midspan or wide shear cracking over supports.
Efflorescence / Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.	
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion that warrants structural review.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry. Damage requires a structural review.

Refer to Chapter 7.7.1.1 for definitions of Isolated, Some, and Widespread.

For slab superstructures refer to Condition Rating Reinforcing Concrete Deck for additional defects regarding wear/abrasion and leaching/saturation of the slab.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Prestressed/ Post-tensioned Concrete/Prestressed Concrete Box Beams

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects or inherent cracks (shrinkage cracks).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as delaminations, small spalls, sound patches, unsealed medium width cracks, or efflorescence.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as spalls, unsound patches, wide cracks, reinforcement without section loss, heavy efflorescence, or rust staining.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory) including exposed reinforcement with section loss or prestressing steel without section loss; **strength and performance of the superstructure are not affected.**
POOR	4	Poor	**Isolated major defects or widespread moderate or; strength and/or performance of the superstructure is affected.** Prestressed box beam (PSBB) bridge with an isolated interior beam or two adjacent beams with major defects.
	3	Serious	**Major defects; strength and/or performance of the superstructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. PSBB with 3 adjacent beams with major defects.
	2	Critical	**Major defects; superstructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. PSBB with majority of beams with major defects or localized critical area such as signs of deformation (sag).
	1	Imminent Failure	**Bridge is closed to traffic due to superstructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to superstructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges

Prestressed/ Post-tensioned concrete superstructures should be inspected for cracking near and over supports and at midspan (shear and flexural cracking), rust staining, delaminations, spalls, and exposed reinforcement. Exposed primary reinforcement (shear stirrups) and prestressing strands should be measured for section loss and compared with as-built conditions for possible load rating.

Reinforcement includes both mild reinforcing steel and prestressing/post-tensioning strands or anchorage components.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Prestressed/ Post-tensioned Concrete

Defect	Minor	Moderate	Major
Delamination / Spall/ Patched Area	Shallow delamination not to level of prestressing steel, small spall (<1" deep or <6" diameter).	Delaminations reaching prestressing strands, large spall (>1" deep or >6" diameter), or exposing post tensioning anchorages.	Spall extends beyond reinforcement cover particularly in compression regions or beyond prestressing steel in tension regions.
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Present with measurable section loss, stirrup bars broken, structural review warranted.
Exposed Prestressing	Present in non-high-stress region or at beam end without section loss.	Present in non-high-stress region or beam end with section loss or high-stress region without section loss (near midspan).	Present with section loss to multiple strands in high-stress regions (midspan).
Cracking	Unsealed medium width (0.004" to 0.009") cracks or unsealed medium pattern (map) cracking.	Wide width (>0.004") cracks or heavy pattern (map) cracking.	Wide flexural cracks at midspan or wide shear cracking over supports.
Efflorescence / Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.	
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion that warrants structural review.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry. Damage requires a structural review.

Refer to Chapter 7.7.1.1 for definitions of Isolated, Some, and Widespread.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Prestressed Concrete Box Beams (PSBB)

Defect	Minor	Moderate	Major
Delamination / Spall	Shallow delamination not to level of prestressing steel, small spall (<1" deep or <6" diameter).	Delaminations reaching prestressing strands, large spall (>1" deep or >6" diameter), or exposing post tensioning anchorages.	Spall extends beyond reinforcement cover particularly in compression regions or beyond prestressing steel in tension regions.
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review. *Fascia Web wall:* Exposed stirrups over pier or abutment.	Present with measurable section loss, stirrup bars broken, structural review warranted.
Exposed Prestressing	End quarters of span with 1-2 prestressing strands exposed. Beam ends with 1-2 strands exposed.	Any beam with the center half of the span (midspan) with <20% strands exposed, end quarter of span with <25% strands exposed, or beam end with <50% of strands exposed.	Any beam with the center half of the span (midspan) with >20% strands exposed, end quarter of span with >25% strands exposed, or beam end with >50% of strands exposed. Any 2 adjacent beams with >20% of strands exposed. Section loss present on any strands or broken strands present.
Keyways/ Leakage	Cracking in wearing surface along keyway. Light leakage.	Cracking in wearing surface with heavy leakage.	Cracking in wearing surface, active leakage, or independent beam movement evident under live load.
Cracking	Unsealed medium width (0.004" to 0.009") cracks or unsealed medium pattern (map) cracking.	Wide width (>0.004") cracks or heavy pattern (map) cracking.	Shear crack near supports, wide flexural cracks at midspan.
Efflorescence / Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.	
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Sag of any box beam or distortion that warrants structural review.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Prestressed Concrete Box Beams (PSBB) - Continued

Defect	Minor	Moderate	Major
Live Load Movement	Minor misalignment from construction, box beams all behaving as one unit under truck traffic.	Minor independent movement evident under truck traffic.	3 or 4 beams act independently from others. 2 beams moving independently directly under any lane/wheel path.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry.

This table applies to prestressed concrete box beams (PSBB) with both composite and non-composite decks.

Exposed prestressing refers to strands exposed to corrosion, not just visibly corroded. This includes areas where the concrete is deteriorated or unsound to the level of the prestressing steel, or prestressing steel adjacent to longitudinal cracks with rust staining or delaminations.

Inspection practices:

- Leaking and evidence of leakage should be well documented. If there is leaking, document the last time it rained in the inspection notes. When keyways are leaking, the wearing surface or expansion joints ratings should be rated based on the level, quantity and source of the leak.
- Where plans exist, document the total number of strands per box beam and the number of compromised strands in inspection comments. Compromised strands shall include the visible strand and one adjacent strand in all directions (above and to each side).
- Remove delaminations to inspection condition of prestressing steel and reinforcement.
- Measure differential box movement under truck traffic.
- Document cracks in wearing surface that could lead to leaking (i.e. longitudinal cracks along the box beams).
- Widespread longitudinal cracking in the wearing surface is typically evidence to differential movement of the box beams.

If an exterior beam is closed to traffic due to the condition, then B.C.02 – Superstructure Condition Rating should be no higher than **3 – Serious Condition**.

Refer to Chapter 7.7.1.1 for definitions of Isolated, Some, and Widespread.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Example PSBB

A one-span prestressed concrete box beam bridge exhibits the following conditions:

- Comprised of eight precast adjacent box beams.

Figure 7-183: Elevation view

Findings:

Field Note	Severity	Extent	Rating
Areas of rust staining and signs of leakage (2%)	Mod.	Isolated	6

Figure 7-184: Underside of deck near midspan

Findings:

Field Note	Severity	Extent	Rating
Delamination 12" long by 5" wide reaching the prestressing strands	Mod.	Isolated	6

Figure 7-185: Delamination in underside of box beam near abutment

Findings:

Field Note	Severity	Extent	Rating
Spall 4" diameter by up to 2" deep	Mod.	Isolated	6
Delamination 12" long by 12" wide	Mod.	Isolated	6
Areas of rust staining	Mod.	Isolated	6

Figure 7-186: Underside of box beams near abutment

Defects totaling isolated moderate (rust staining, delamination reaching prestressing strands, spall greater than 1" deep)

Report 6 (Satisfactory) for Item B.C.02 – Superstructure Condition Rating.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Example PSBB - Continued

A three-span prestressed concrete box beam bridge exhibits the following conditions:

- Each span is comprised of fourteen precast box beams.

Figure 7-187: Elevation view

Span 1 Findings:

Field Note	Severity	Extent	Rating
Areas of leakage (<1%)	Mod.	Isolated	6
Areas of efflorescence (2%)	Minor	Some	7
Areas of delaminations along edges	Mod.	Some	5

Figure 7-188: Partial underside of Span 1

Span 2 Findings:

Field Note	Severity	Extent	Rating
Areas of leakage (5%)	Mod.	Some	5
Areas of efflorescence (2%)	Minor	Some	7
Areas of rust staining	Mod.	Some	5

Figure 7-189: Underside of Span 2

Span 3 Findings:

Field Note	Severity	Extent	Rating
Areas of leakage (5%)	Mod.	Some	5
Areas of efflorescence (2%)	Minor	Some	7
Areas of rust staining	Mod.	Some	5
Areas of delaminations along edges	Mod.	Isolated	6

Figure 7-190: Underside of Span 3

Defects totaling isolated moderate (delaminations, rust staining, and leakage) and some moderate (delaminations, rust staining, and leakage)

Report 5 (Fair) for Item B.C.02 – Superstructure Condition Rating.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Example PSBB - Continued

A one-span prestressed concrete box beam bridge exhibits the following conditions:

- Comprised of ten precast box beams

Figure 7-191: Typical underside of superstructure

Findings:

Field Note	Severity	Extent	Rating
Spall 8'L by 3"W by up to 6"D	Mod.	Isolated	5
One exposed strand in Beam 3 adjacent Beam 2 at midspan	Mod.	Isolated	6

Figure 7-192: Underside of Beam 3 adjacent to Beam 2 near midspan

Findings:

Field Note	Severity	Extent	Rating
Spall 16'L by 18"W by up to 8"D	Major	Isolated	4
Four exposed and broken strands in Beam 3 adjacent Beam 2 at midspan	Major	Isolated	4

Figure 7-193: Underside of Beam 3 adjacent to Beam 2

Findings:

Field Note	Severity	Extent	Rating
Spall 5'L by 3'W by up to 6"D	Major	Isolated	4
Four exposed strands in Beam 3 adjacent Beam 4 near midspan	Mod.	Isolated	6

Figure 7-194: Underside of Beam 3 adjacent to Beam 4

Defects that control this rating are isolated major (spalls that extend beyond the prestressing cover in tension regions and broken strands present)

Report 4 (Poor) for Item B.C.02 – Superstructure Condition Rating.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Steel

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects (nicks or gouges).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as freckled rust, corrosion has initiated, loose fasteners, pack rust without distortion, or isolated cracks that have self-arrested or been effectively arrested.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) and some cracks that have been arrested **or isolated moderate defects** such as section loss, missing bolts or rivets or fasteners, broken welds, pack rust with distortion, or crack in non-tension region that has not been arrested with no signs of propagation.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory); **strength and performance of the superstructure are not affected**, or some cracks not arrested with minimal propagation**.**
POOR	4	Poor	**Isolated major defects or widespread moderate; strength and/or performance of the superstructure is affected.**
	3	Serious	**Major defects; strength and/or performance of the superstructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; superstructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to superstructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to superstructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts or filled spandrel arch bridges.

Cracks in high stress regions or NSTM are considered major defects and further structural review may be warranted.

Steel superstructures should be inspected for cracks, corrosion/ section loss, deformation, and loose connectors.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Steel - Continued

Defect	Minor	Moderate	Major
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is evident.	Significant loss or holed through areas in high stress regions, or section loss which warrants structural review.
Crack	Crack that has self-arrested or been effectively arrested.	Crack that has not been arrested.	Any crack in NSTM, un-arrested crack in a tension region, crack greater than 2" long in compression region, or crack that requires structural review.
Connection	Loose fasteners, or pack rust without distortion. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners; broken welds; or pack rust with distortion.	Missing fasteners resulting in altered load path, missing fasteners in primary member connection/splice or gusset plate, any cracks between member and gusset plate. Pack rust causing distortion and compromised the connection with broken fasteners or welds.
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Evidence of significant distortion or torsion, especially in compression members.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry. Damage requires a structural review

Refer to Chapter 7.7.1.1 for definitions of Isolated, Some, and Widespread.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Example Steel

A four-span steel continuous multi-beam bridge exhibits the following conditions:

- Comprised of 20 steel rolled wide flange beams

Figure 7-195: Elevation view

Findings:

Field Note	Severity	Extent	Rating
Areas of surface corrosion and freckled rust throughout	Minor	Widespread	6

Figure 7-196: Typical underside of framing

Findings:

Field Note	Severity	Extent	Rating
Corrosion with up to 1/16" deep section loss in the top flange and bottom portion of the webs at the ends of Beams 10 and 11 at the Rear Abutment	Mod.	Isolated	6

Figure 7-197: Beam 10 at Rear Abutment

Findings:

Field Note	Severity	Extent	Rating
Surface corrosion along the beam bottom flange edges throughout	Minor	Widespread	6

Figure 7-198: Beam 20 at the Forward Abutment

Defects controlling this rating include widespread minor (freckled rust and surface corrosion) and isolated moderate (section loss)

Report 6 (Satisfactory) for Item B.C.02 – Superstructure Condition Rating.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Example Steel - Continued

A two-span continuous steel multi-beam bridge exhibits the following conditions:

- Comprised of eight rolled wide flange beams

Figure 7-199: Elevation view

Findings:

Field Note	Severity	Extent	Rating
Areas of surface corrosion and freckled rust throughout	Minor	Widespread	6

Figure 7-200: Typical freckled rust throughout the underside of the beam bottom flange

Findings:

Field Note	Severity	Extent	Rating
Laminar corrosion with up to 3/16" deep section loss in the bottom of the web of the beam ends at the Rear Abutment	Mod.	Some	5

Figure 7-201: Typical beam ends at the Rear Abutment

Findings:

Field Note	Severity	Extent	Rating
Laminar corrosion with up to 1/8" deep section loss to the top flange of the beams at the Forward Abutment	Mod.	Some	5

Figure 7-202: Typical beam ends at the Forward Abutment

Controlling defects include widespread minor (surface corrosion throughout) and some moderate (section loss to webs and bottom flanges at the Rear Abutment and section loss to top flanges at the Forward Abutment)

Report 5 (Fair) for Item B.C.02 – Superstructure Condition Rating.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Example Steel - Continued

A two-span continuous steel multi-beam bridge exhibits the following conditions:

- Comprised of eleven rolled wide flange beams.

Figure 7-203: Elevation view

Findings:

Field Note	Severity	Extent	Rating
Surface corrosion and freckled rust on the underside of the bottom flanges throughout	Minor	Widespread	6

Figure 7-204: Typical underside of framing

Findings:

Field Note	Severity	Extent	Rating
Laminar corrosion with multiple areas of 100% section loss (corrosion holes) in the web at the end of Beam 10 at the Rear Abutment	Major	Isolated	4

Figure 7-205: Beam 10 at the Rear Abutment

Findings:

Field Note	Severity	Extent	Rating
Laminar corrosion with a 12"L x 2"H area of 100% section loss (corrosion hole) in the web at the end of Beam 2 at the Rear Abutment	Major	Isolated	4

Figure 7-206: Beam 2 at the Rear Abutment

Isolated major defects including areas of section loss in the web of Beams 2 and 10 at the Rear Abutment. The section loss occurs in a high stress area of the web where shear capacity may be affected.

Report 4 (Poor) for Item B.C.02 – Superstructure Condition Rating.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Timber

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such as material imperfections.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as up to 10% section loss, arrested cracks, loose fasteners, checks in shakes in non-high-stress regions, splits, or abrasion.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as 10% or greater section loss, cracks, missing bolts, checks or shakes, splits and delaminations, or abrasion.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the superstructure are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the superstructure is affected.**
	3	Serious	**Major defects; strength and/or performance of the superstructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; superstructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to superstructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to superstructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges.

Timber superstructures should have visual inspection supplemented with physical methods such as sounding, pick test, etc. Timber decay typically on the inside of a timber member first. Sounding can identify areas of internal decay and deterioration. Sight down members to look for distortion or sagging.

Superstructure Condition Rating - Continued

Item ID	B.C.02	SNBI

Condition Rating Timber - Continued

Defect	Minor	Moderate	Major
Decay/ Section Loss	Affects up to 10% of the member section.	Affects more than 10% of the member section but does not warrant structural review.	May include significant loss or holed through areas in high stress regions and warrants structural review.
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners. Broken welds.	Missing fasteners require structural review. Load path altered.
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion that warrants structural review.
Check/Shake	Penetrates up to 50% of the thickness of the member not in a high-stress region.	Penetrates 50% of the thickness or greater and length equal to or greater than the member depth not in a high-stress region, or up to 5% of the member thickness in a high-stress region.	Penetrates 25% or greater of the member thickness in a high-stress region.
Splits/ Delamination	Less than the member depth, or arrested with effect actions taken to mitigate.	Length equal to or greater than the member depth, but does not warrant structural review.	Length equal to or greater than the member depth and warrants structural review.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry.

Superstructure Condition Rating - Continued		
Item ID	B.C.02	SNBI

Commentary

This item represents the condition of the superstructure as determined from the inspection of all superstructure members.

Consider primary load carrying members when determining the condition rating code for this item, which includes cross-frames and diaphragms for curved girder or highly skewed (>30 degrees) bridges. Consider secondary members only if they adversely impact the primary members, structural capacity, or safety of the bridge. Visual assessments may be supplemented with non-destructive or destructive testing results.

The superstructure includes:

- members above the bearings for bridges with non-integral superstructure and substructure;
- girders/beams for semi-integral or integral superstructures and the end diaphragm above the bearings (form line);
- members above the spring line for arch bridges;
- slabs of concrete rigid frame bridges;
- legs, knees and girders for concrete and steel rigid K-Frame or Delta-Frame bridges; and
- Slabs over vaulted or cellular abutments.

Do not consider the condition of bearings when determining the condition rating code for this item except to the extent that the bearings are causing distress in the superstructure.

Do not consider the condition of protective coating systems when determining the condition rating code for this item except to the extent that problems with the protective coating system are indicative of problems with the underlying superstructure material. A well-formed patina on weathering steel is considered a protective coating and is not considered a defect.

Do not consider the presence of drift, debris, and soil accumulation when determining the condition rating code for this item, except to the extent that these items are causing distress in the superstructure.

Superstructure types without substructures may be affected by scour. When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, scour is considered when reporting the code for this item. In this case, observed conditions also indicate a need to reevaluate Item B.AP.03 – Scour Vulnerability. Observed scour that is less than the tolerable limit determined in the scour appraisal does not affect this item.

For structures when the top flange is acting as the deck, (e.g. rigid frames, decked girders or tee beams, box beams, etc.) the deck and superstructure condition rating shall be equal.

The deck and superstructure condition ratings are the same for solid or void slab bridges and three- or four-sided frames.

Superstructure Condition Rating - Continued		
Item ID	B.C.02	SNBI

Commentary - Continued

High stress regions of superstructure members include the beam web over supports, top and bottom flange at midspan and over interior piers (continuous spans in negative moment regions), and gusset plates along the various failure planes (Figure 7-207).

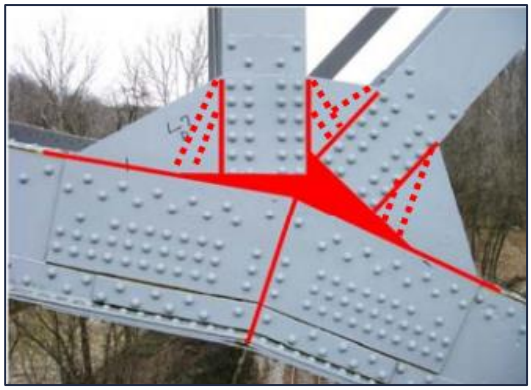


Figure 7-207: Steel gusset plate areas of primary stress and Whitmore areas (dashed lines).

Protective Coating System Condition Rating

Item ID	B.C.02.01 ODOT
Frequency	Each Inspection
Format	Alphanumeric Max characters: 1

Specification

Report the superstructure protective coating system rating using one of the codes in the following table.

Use for bridges where Item B.SP.04 – Span Material is code S01 through SX.

Condition Rating Steel Protective Coating System

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects.** Coating is in new condition. Developed patina.
	8	Very Good	**Some inherent defects** such as light chalking or workmanship issues.
	7	Good	**Some minor defects** such as freckled rust, surface dulling, or cracking/ peeling in the finish/ top coat. Weathering steel with yellow orange granular texture and light flaking. Corrosion has initiated on 1 to 5% of the bridge.
FAIR	6	Satisfactory	**Widespread minor or isolated moderate defects** such as loss of pigment, corrosion present, or cracking/ peeling in the intermediate or prime coat. Weathering steel isolated dark brown coloring with <1/4" flaking pieces. **Performance of the coating is not affected.** Corrosion has initiated on 5 to 10% of the bridge.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **isolated major defects** such as loss of effectiveness at beam ends, beneath joints, fascia beams, or underside of beams. Corrosion has initiated on 10 to 15% of the bridge.
POOR	4	Poor	**Widespread moderate or isolated major defects** such as exposure of bare metal or laminating corrosion. Weathering steel black color with flaking >1/4". **Performance of coating is affected.** Corrosion has initiated on 15 to 20% of the bridge.
	3	Serious	**Some major defects; performance of coating is seriously affected.** Corrosion has initiated on 20 to 30% of the bridge.
	2	Critical	**Widespread major defects; coating is severely compromised.** Corrosion has initiated on 30 to 40% of the bridge.
	1	Imminent Failure	Protective coating no longer protects coated elements.
0		Failed	Any issues worse than coding above.
N		Not Applicable	Use for bridges without superstructures such as culverts or when superstructure material is not steel.

Protective Coating System Condition Rating - Continued

Item ID	B.C.02.01	SNBI

Condition Rating Steel Protective Coating System - Continued

Defect	Minor	Moderate	Major
Chalking	Surface dulling.	Loss of pigment.	
Peeling/ Bubbling/ Cracking	Initiated with cracking in finish/top coat.	Intermediate or prime coat exposed with cracking.	Exposure of bare metal.
Weathering Steel Color/ Texture/ Adherence	Yellow orange granular texture, light flaking.	Dark brown coloring with flaking <1/2" pieces.	Black coloring with flaking >1/2".
Corrosion	Freckled rust initiated.	Corrosion present.	Laminate corrosion.
Effectiveness	Substantially effective.	Limited effectiveness.	Failed; no protection of the underlying metal.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

	Isolated	Some	Widespread
Defects	1-10%	10-30%	>30%

Commentary

The rating must reflect the in-place overall condition of the protective coating system protecting the primary superstructure steel members. Paint and weathering steel must be included.

Failed protective coating system on NSTMs, pin and hanger zones, and seated hinge zones can all dictate a lower protection coating system condition rating.

Protective Coating System Condition Rating - Continued

Item ID	B.C.02.01	SNBI

Examples Protective Coating System

9 Coating is in new condition. No defects present.

8

Figure 7-208: Some surface chalking (inherent)

Figure 7-209: Some workmanship issues (inherent)

7

Figure 7-210: Isolated paint scrapes in final coat (minor)

Figure 7-211: Some freckled rust (minor)

6

Figure 7-212: Isolated corrosion under median joint (moderate) widespread freckled rust (minor)

Figure 7-213: Loss of pigment and isolated corrosion (moderate)

Protective Coating System Condition Rating - Continued

Item ID	B.C.02.01	SNBI

Examples Protective Coating System - Continued

5

Figure 7-214: Some loss of pigment (moderate) and isolated exposed bare metal on the underside of the beams (major)

Figure 7-215: Some loss of pigment and cracking of prime coat (moderate) and isolated exposed bare metal (major)

4

Figure 7-216: Widespread loss of pigment (moderate) and isolated exposed bare metal (major)

Figure 7-217: Widespread loss of pigment (moderate) and exposed bare metal (major)

3

Figure 7-218: Some area of exposed bare metal (major) and performance of coating seriously affected

Figure 7-219: Some area of exposed bare metal (major) and performance of coating seriously affected

Protective Coating System Condition Rating - Continued

Item ID	B.C.02.01	SNBI

Examples Protective Coating System - Continued

2

Figure 7-220: Widespread laminate corrosion (major) underlying metal exposed

Figure 7-221: Protective coating severely compromised; underlying metal exposed (major)

1 Any issues worse than coding above.

Protective Coating System Condition Rating - Continued

Item ID	B.C.02.01	SNBI

Examples Protective Weathering Steel

9 Coating is in new condition. Patina is completely developed.

8

Figure 7-222: New bridge with no defects patina still developing.

7

Figure 7-223: Light brown granular texture with isolated light flaking on underside of beams (minor)

6

Figure 7-224: Dark brown color with some flaking on bottom flange (<1/4" pieces) (moderate)

Figure 7-225: Light to Dark brown color with some flaking on bottom flange and web (<1/4" pieces) (moderate)

Protective Coating System Condition Rating - Continued

Item ID	B.C.02.01	SNBI

Examples Protective Weathering Steel - Continued

5

Figure 7-226: Isolated dark brown and flaking at the beam ends (under the joints) (moderate)

Figure 7-227: Dark brown color with some loose granular texture and flaking up to 1/4" (moderate)

4

Figure 7-228: Dark brown with isolated black spots and flaking areas (>1/4") on the underside of the beams (major)

Figure 7-229: Dark brown with isolated black spots and flaking areas (>1/4") on the underside of the beams (major)

3

Figure 7-230: Some areas of flaking (>1/4") and isolated areas of laminate corrosion (major) at the beam ends (under the joints) with the performance of the weathering steel seriously affected

Figure 7-231: Dark brown/black color with some areas of laminate corrosion (major)

Protective Coating System Condition Rating - Continued

Item ID	B.C.02.01	SNBI

Examples Protective Weathering Steel - Continued

2

Figure 7-232: Patina no longer effective with widespread laminate corrosion (major)

Figure 7-233: Weather steel patina no longer protecting the steel with some of section loss and holed through areas

1 Any issues worse than coding above.

Substructure Condition Rating

Item ID	B.C.03	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max digits: 1	

Specification

Report the substructure condition rating using one of the codes in the following tables.

Report N when only C and/or V is reported for Item B.SP.01 – Span Configuration Designation.

Condition Rating Concrete

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects or inherent cracks (temperature and shrinkage).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as delaminations, small spalls, sound patches, or unsealed medium width cracks.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as spalls, unsound patches, exposed reinforcement, wide cracks, loose coarse aggregate, heavy efflorescence, or rust staining.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the substructure are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the substructure is affected.** Spall extending under a beam with <50% reduction in bearing area, two or more beams each with <20% reduction in bearing area or a NSTM with spall reducing bearing area up to 5%.
	3	Serious	**Major defects; strength and/or performance of the substructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. Spall extending under two or more beams with >20% reduction in bearing area. NSTM with spall reducing bearing area <20%
	2	Critical	**Major defects; substructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. Spalls extending under bearings that is worse than above.
	1	Imminent Failure	**Bridge is closed to traffic due to substructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to substructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges.

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Condition Rating Concrete - Continued

Defect	Minor	Moderate	Major
Delamination / Spall/ Patched Area	Delamination, small spall (<1" deep or <6" diameter) or patched area that is sound.	Large spall (>1" deep or >6" diameter) or patched area that is unsound or showing distress.	Spall extends beyond reinforcement cover or concrete cover spalled off throughout.
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Debonded (360° exposure) from concrete in multiple locations or measurable section loss (ex. multiple primary bars with section loss).
Exposed Prestressing	Present in non-high-stress region without section loss.	Present in non-high-stress region with section loss or high-stress region without section loss.	Present with section loss to multiple strands in high-stress regions.
Cracking	Unsealed medium width (0.012" to 0.05") cracks or unsealed medium pattern (map) cracking.	Wide width (>0.05") cracks or heavy pattern (map) cracking.	Wide cracks with offset or signs of movement.
Efflorescence / Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.	
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion that warrants structural review.
Settlement	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Exceeds tolerable limits and warrants structural review.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits, but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry.

Refer to Chapter 7.7.1.1 for definitions of Isolated, Some, and Widespread.

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Examples Concrete

9 Isolated inherent defects such as non-structural cracks, shallow honeycombing, etc.

8

Figure 7-234: New reinforced concrete abutment with some gouges and popouts (inherent)

Figure 7-235: New reinforced concrete abutment with some hairline temperature and shrinkage cracks (inherent)

7

Figure 7-236: Isolated vertical medium width cracks (minor)

Figure 7-237: Some unsealed medium width cracks (minor) at abutment cap

6

Figure 7-238: Heavy pattern cracking (moderate)

Figure 7-239: Heavy build-up of efflorescence and isolated rust staining (moderate)

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Examples Concrete – Continued

5

Figure 7-240: Some large spalls with exposed reinforcement (moderate)

Figure 7-241: Large spalls with exposed reinforcement (moderate) and medium width cracks (minor) in the pier columns

4

Figure 7-242: Isolated large spall with exposed reinforcement and measurable section loss (major)

Figure 7-243: Large spalls exposing primary reinforcement bars with several debonded bars (major)

3

Figure 7-244: Isolated wide vertical crack and rotation of the end of the abutment (major). Spall and rotation causing loss of bearing area of the slab.

Substructure Condition Rating - Continued		
Item ID	B.C.03	SNBI
Examples Concrete – Continued		

2

Figure 7-245: Large spalls, scaling, and measurable section loss to exposed reinforcing bars (major). Rotten timbers and backfill exposed behind abutment (not shown in photo).

1

Figure 7-246: Abutment wall separated with back fill material pilling through (major). Bridge closed due to substructure condition.

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Condition Rating Steel

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as freckled rust, corrosion has initiated, loose fasteners, pack rust without distortion, or isolated cracks that have self-arrested or been effectively arrested. Steel piles that are encased in concrete with section loss arrested by encasement.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate** such as section loss, missing bolts or rivets or fasteners, broken welds, pack rust with distortion, or crack in a non-tension region that has not been arrested with no signs of propagation.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the substructure are not affected,** or some cracks not arrested with minimal propagation**.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the substructure is affected.** *A single steel pile within any one substructure unit with significant section loss or corrosion holes.*
	3	Serious	**Major defects; strength and/or performance of the substructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. Multiple steel piles within any one substructure unit with significant section loss or corrosion holes.
	2	Critical	**Major defects; substructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. >50% of steel piles with significant section loss or corrosion holes at any one substructure unit.
	1	Imminent Failure	**Bridge is closed to traffic due to substructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to substructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges.

Cracks in high stress regions or in NSTMs are considered major defects and further structural review may be warranted.

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Condition Rating Steel - Continued

Defect	Minor	Moderate	Major
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is measurable, or pack rust is present.	Significant loss or holed through areas in high stress regions, or section loss which warrants structural review.
Crack	Crack that has self-arrested or been effectively arrested.	Crack that has not been arrested.	Crack in NSTM member, crack greater than 2" long in compression region, or crack that requires structural review.
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners. Broken welds.	Missing fasteners require structural review. Load path altered.
Distortion/ Alignment	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion that warrants structural review.
Settlement	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Exceeds tolerable limits and warrants structural review.
Scour	Exists within tolerable limits established for the bridge or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	Exceeds critical limits established for the bridge.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry. Damage requires a structural review

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Examples Steel

9 Isolated inherent defects such as gouges.

8

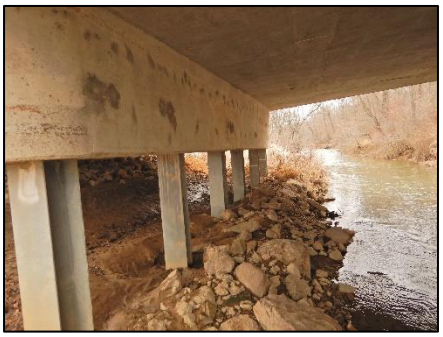


Figure 7-247: Some surface corrosion at interface of concrete (inherent)

7

Figure 7-248: Pile jackets with concrete encasement of steel piles

Figure 7-249: Corrosion has initiated (minor) at the base of the steel piles (note the steel piles are filled with concrete)

6

Figure 7-250: Widespread freckled rust with areas of corrosion initiated (no section loss present) (minor)

Figure 7-251: Widespread areas of corrosion initiated at the base (minor)

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Examples Steel - Continued

5

Figure 7-252: Steel piles with some deformation to the flanges (moderate)

Figure 7-253: Some piles with laminate corrosion and measurable section loss at ground line (moderate)

4

Figure 7-254: Single pile with corrosion hole (major)

Figure 7-255: Significant section loss to a single pile (major)

3

Figure 7-256: Multiple piles at one pier with corrosion holes in the web (major)

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Examples Steel - Continued

2

Figure 7-257: Two of three piles with corrosion holes in the web (major). Load restrictions on bridge due to condition of piles

1

Figure 7-258: All piles at a pier have localized areas of buckling due to section loss. Bridge has been closed.

Figure 7-259: All piles at a pier have localized areas of buckling due to section loss. Bridge has been closed.

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Condition Rating Masonry

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as leaching, surface white buildup, cracks or partial depth voids, splits or spalls without shifting, patches, or slight misalignment of blocks.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as heavy efflorescence, full depth voids, shifting of blocks due to spalls or splits, unsound patches, or missing blocks.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory); **strength and performance of the substructure are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the substructure is affected.**
	3	Serious	**Major defects; strength and/or performance of the substructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; substructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to substructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to substructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Condition Rating Masonry - Continued

Defect	Minor	Moderate	Major
Efflorescence	Surface white or leaching with little or no build-up.	Heavy build-up of efflorescence.	
Mortar Breakdown	Cracking or partial depth voids.	Full depth voids.	Full depth voids causing block or stone to be loose.
Splits / Spalls	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting which does not warrant structural review.	Spall or split causing ≥20% bearing loss on one substructure unit.
Patched Area	Sound patch.	Unsound patch.	
Displacement	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing.	Block or stone shifted or missing and causing loss of bearing area ≥20%.
Settlement	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Causing splits, rotation, or displacement of stones or blocks and may result in an unstable structure.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits, but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry. Damage requires a structural review.

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Condition Rating Timber

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such as material imperfections.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as up to 10% section loss, arrested cracks, loose fasteners, checks in shakes in non-high-stress regions, splits, or abrasion.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as 10% or greater section loss, cracks, missing bolts, checks or shakes, splits and delaminations, or abrasion.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the substructure are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the substructure is affected.** *A single timber pile within any one substructure unit with significant decay/section loss.*
	3	Serious	**Major defects; strength and/or performance of the substructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. Multiple timber piles within any one substructure unit with significant decay/section loss.
	2	Critical	**Major defects; substructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. >50% of timber piles with significant decay/section loss at any one substructure unit.
	1	Imminent Failure	**Bridge is closed to traffic due to substructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to substructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for culverts, roadway tunnels, or filled spandrel arch bridges.

Substructure Condition Rating - Continued

Item ID	B.C.03	SNBI

Condition Rating Timber - Continued

Defect	Minor	Moderate	Major
Decay/ Section Loss	Affects up to 10% of the member section.	Affects >10% of the member section but does not warrant structural review.	Section loss of >20% on 3 adjacent piles or >33% section loss on any 2 piles at a unit.
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners.	Missing fasteners require structural review. Load path altered.
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion warrants structural review.
Check/ Shake	Penetrates up to 50% of the thickness of the member not in a high-stress region.	Penetrates ≥50% of the thickness and length equal to or greater than the member depth not in a high-stress region, or ≤5% of the member thickness in a high-stress region.	Penetrates 5% or greater of the member thickness in a high-stress region.
Splits/ Delamination	Less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth.	Length equal to or greater than the member depth and warrants a structural review.
Abrasion/ Wear	Affects up to 10% of the member section.	Affects 10% or greater of the member section	
Settlement	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Causing loss of bearing, connections pulling apart, or causing other major defects.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.
Damage	The element has impact damage. The specific damage caused by the impact has been captured in “minor” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “moderate” under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in “major” under the appropriate material defect entry. Damage requires a structural review.

Substructure Condition Rating - Continued		
Item ID	B.C.03	SNBI

Commentary

This item addresses the condition of piers, abutments, piles, footings, and other substructure members.

For bridges that have substructures not visible for inspection, use appropriate visual condition indicators from the superstructure or surrounding foundation materials to determine the applicable code. Visual assessments may be supplemented with non-destructive or destructive testing results.

Consider the condition of integral abutment wingwalls to the first construction or expansion joint when determining the condition rating code for this item.

Do not consider the condition of protective coatings, fenders and other substructure protection systems when determining the condition rating code for this item, except to the extent that these items indicate distress of the substructure or adversely affect its condition.

Do not consider the presence of drift, debris, and soil accumulation when determining the condition rating code for this item, except to the extent that these items are causing distress in the substructure.

The substructure includes:

- backwalls (below the deck) and the members below the bearings for bridges with non-integral superstructure and substructure;
- members below the girders/beams for integral superstructures;
- thrust blocks and other members below the spring line for arch bridges;
- legs of concrete rigid frame bridges;
- abutments and footings/foundations below the leg bearings for concrete and steel rigid K-Frame or Delta-Frame bridges; and
- foundation piles exposed by erosion or scour.

When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, scour is considered in the coding of this item. In this case, observed conditions also indicate a need to reevaluate Item B.AP.03 – Scour Vulnerability. Observed scour that is above the tolerable limit determined in the scour appraisal does not affect this item.

Culvert Condition Rating

Item ID	B.C.04	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the culvert component condition rating using one of the codes in the following tables.

Report N when C or V is not reported for Item B.SP.01 – Span Configuration Designation.

Condition Rating Reinforced Concrete

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects or inherent cracks (temperature and shrinkage).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent). Isolated inherent gaps or misalignment due to fit-up.
	7	Good	**Some minor defects** such as delaminations, small spalls, sound patches, unsealed medium width cracks, leaching, exposed coarse aggregate, *or* misalignment with settlement or ponding. Scour within tolerable limits.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as spalls, unsound patches, exposed reinforcement, wide cracks, loose coarse aggregate, heavy efflorescence, rust staining, backfill infiltration, leakage through joints, or misalignment causing settlement or ponding. Isolated areas of scour below tolerable limits.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); Including dislocated end sections; **strength and performance of the culvert is not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the culvert is affected.** Isolated area where scour exceeds critical limits.
	3	Serious	**Major defects; strength and/or performance of the culvert is seriously affected and impacts the roadway over.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; culvert is severely compromised and impacts the roadway over.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the culvert open.
	1	Imminent Failure	**Culvert is closed to traffic due to overall condition.** Repair or rehabilitation may return the culvert to service.
0		Failed	**Culvert is closed due to overall condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for bridges where C or V is not reported for B.SP.01 – Span Type.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating Reinforced Concrete - Continued

Defect	Minor	Moderate	Major
Delamination / Spall/ Patched Area	Delamination, small spall (< 1" deep or <6" diameter) or patched area that is sound.	Large spall (>1" deep or >6" diameter) or patched area that is unsound or showing distress.	Spall extends beyond reinforcement cover particularly in compression regions.
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Present with measurable section loss and warrants structural review (ex. multiple primary bars with section loss).
Cracking	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	Wide longitudinal cracks along the crown, invert or sides at 3 o'clock or 9 o'clock.
Saturation/ Leakage	Areas of staining but currently dry. Light leakage through the seams/joints.	Areas of staining or areas currently damp. Heavy leakage through seams/joints.	
Efflorescence / Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.	
Abrasion/ Wear	Exposed coarse aggregate, but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix.	
Seams/Joints/ Alignment	Misalignment of joints less <1/2" no settlement. Areas of ponding <3" deep.	Misalignment of joints <2" with light infiltration. Areas of ponding <5" deep.	Misalignment of joints causing heavy infiltration of backfill. Areas of ponding >5" deep.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits, but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating Steel

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as freckled rust, corrosion has initiated, loose fasteners, cracks that have self-arrested or been effectively arrested. Isolated missing bolts or cracks at bolt holes. Isolated minor leakage through seams or misalignment with settlement or ponding. Scour within tolerable limits.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as section loss, missing bolts or rivets or fasteners, pack rust, or crack that has not been arrested. Some locations of consecutive missing bolts. Isolated backfill infiltration, leakage through joints, or misalignment causing settlement or ponding. Isolated areas with scour below tolerable limits.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory). **Strength and performance of the superstructure are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the culvert is affected.** Isolated area where scour exceeds critical limits.
	3	Serious	**Major defects; strength and/or performance of the culvert is seriously affected and impacts the roadway over.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; culvert is severely compromised and impacts the roadway over.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the culvert open.
	1	Imminent Failure	**Culvert is closed to traffic due to overall condition.** Repair or rehabilitation may return the culvert to service.
0		Failed	**Culvert is closed due to overall condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for bridges where C or V is not reported for B.SP.01 – Span Type.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating Steel - Continued

Defect	Minor	Moderate	Major
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is measurable, or pack rust is present.	Significant loss along the crown or invert or section loss which warrants structural review.
Crack	Crack that has self-arrested or been effectively arrested.	Crack that has not been arrested.	
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners. Broken welds.	Missing fasteners causing deformation, separation of seams and infiltration of backfill.
Seams/ Alignment	Seam opening <1/8". Pack rust not present. Light leakage through the seam.	Seam opening <1". Pack rust present with distortion. Backfill lost through seam causing slight deflection.	Infiltration of backfill causing significant deflection.
Shape	Flattening along the bottom, the top half remains smooth.	Top with slight flat area and bottom with slight reverse curvature.	Non-symmetric shape, kinked areas from distortion, deflection beyond tolerable limits.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits, but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating Masonry

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent). Isolated inherent gaps or misalignment due to fit-up.
	7	Good	**Some minor defects** such as delaminations or small spalls on blocks, leaching, cracks or partial depth voids, splits without shifting, or slight misalignment of blocks. Scour within tolerable limits.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as full depth voids, shifting of blocks due to spalls or splits, missing blocks, wide cracks, or backfill infiltration. Isolated areas with scour below tolerable limits.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); Including dislocated blocks at end sections; **strength and performance of the culvert is not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the culvert is affected.** Isolated area where scour exceeds critical limits.
	3	Serious	**Major defects; strength and/or performance of the culvert is seriously affected and impacts the roadway over.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; culvert is severely compromised and impacts the roadway over.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the culvert open.
	1	Imminent Failure	**Culvert is closed to traffic due to overall condition.** Repair or rehabilitation may return the culvert to service.
0		Failed	**Culvert is closed due to overall condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for bridges where C or V is not reported for B.SP.01 – Span Type.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating Masonry - Continued

Defect	Minor	Moderate	Major
Efflorescence	Surface white or leaching with little or no build-up.	Heavy build-up of efflorescence.	
Mortar Breakdown	Cracking or partial depth voids.	Full depth voids with light backfill infiltration.	Full depth voids causing block or stone to be loose or significant backfill infiltration.
Splits / Spalls	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting which does not warrant structural review.	Spall or split causing significant backfill infiltration.
Displacement	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing.	Block or stone shifted or missing.
Settlement	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Causing splits, rotation, or displacement of stones or blocks and may result in an unstable structure.
Scour	Exists within tolerable limits established for the culvert.	Exceeds tolerable limits, but is less than the critical limits established for the culvert.	Exceeds critical limits established for the culvert.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating Timber

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such as material imperfections.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as arrested cracks, loose fasteners, checks in shakes in non-high-stress regions, splits, or abrasion. Scour within tolerable limits.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such cracks, missing bolts, checks or shakes, splits and delaminations, or abrasion. Isolated areas with scour below tolerable limits.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the substructure are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the substructure is affected.** Isolated area where scour exceeds critical limits.
	3	Serious	**Major defects; strength and/or performance of the substructure is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; substructure is severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to substructure condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to substructure condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for bridges where C or V is not reported for B.SP.01 – Span Type.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating Timber - Continued

Defect	Minor	Moderate	Major
Decay/ Section Loss	Affects up to 10% of the member section either walls or top slab.	Affects >10% of the member section on either walls or top slab but does not warrant structural review.	Loss of section altering load patch or decay causing stability concerns.
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners.	Missing fasteners require structural review. Load path altered.
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	
Check/ Shake/ Splits/ Delamination	Less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth. Penetrates <25% of member thickness.	Penetrates ≥25% of member thickness, or causing loss of section as noted above.
Abrasion/ Wear	Affects <10% of the member section.	Affects ≥10% of the member section	
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating – PVC/ Other Material

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects (surface scrapes or gouges).
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as discoloration, cracks or splits less than 6" long light leakage through seams or flattening along the bottom. Scour within tolerable limits.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** blistering of the surface, cracks or splits less than 12" long, areas of measurable section loss or small perforations, or top with slight flat area or slight reverse curvature along bottom. Isolated areas with scour below tolerable limits.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory). **Strength and performance of the superstructure are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects. Strength and/or performance of the culvert is affected.** Isolated area where scour exceeds critical limits.
	3	Serious	**Major defects; strength and/or performance of the culvert is seriously affected and impacts the roadway over.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical	**Major defects; culvert is severely compromised and impacts the roadway over.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the culvert open.
	1	Imminent Failure	**Culvert is closed to traffic due to overall condition.** Repair or rehabilitation may return the culvert to service.
0		Failed	**Culvert is closed due to overall condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for bridges where C or V is not reported for B.SP.01 – Span Type.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Condition Rating PVC/Other Material- Continued

Defect	Minor	Moderate	Major
Material	Discoloration.	Blistering of the surface.	
Cracks/ Splits	Cracks or splits <6" long and <1/4" wide.	Cracks or splits <12" long and <1/2" wide.	Cracks or splits >12" long or >1/2" wide.
Seams/ Alignment	Seam opening <1/2". Light leakage through the seam.	Seam opening <1". Backfill lost through seam causing slight deflection.	Infiltration of backfill causing significant deflection.
Abrasion	Cuts, gouges, scrapes all <1/16" deep.	Measurable loss of section or small (<3" diameter) holes.	Perforations caused by abrasion.
Shape	Flattening along the bottom, the top half remains smooth.	Top with slight flat area and bottom with slight reverse curvature.	Non-symmetric shape, kinked areas from distortion, deflection beyond tolerable limits.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits, but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.

Culvert Condition Rating - Continued

Item ID	B.C.04	SNBI

Commentary

This item addresses the condition of culverts. The condition assessment includes footings, piles, and other foundation members when present.

For culverts that have components not visible for inspection, use appropriate visual condition indicators from the roadway or surrounding foundation materials to determine the applicable code. Visual assessments may be supplemented with non-destructive or destructive testing results.

Consider the condition of integral wingwalls and headwalls to the first construction or expansion joint when determining the condition rating code for this item.

Do not consider the condition of protective coatings and other culvert protection systems when determining the condition rating code for this item, except to the extent that these items indicate distress of the culvert or adversely affect its condition. When culvert liners are present, the effectiveness of the liner shall be evaluated and if the liner serves as a structural replacement or system to strengthen the existing culvert, the liner shall be rated as the primary culvert based on its material type.

Do not consider the presence of drift, debris, and soil accumulation when determining the condition rating code for this item, except to the extent that these items are causing distress in the culvert.

The culvert includes:

- buried pipe or box;
- footings below the walls of a 3-sided box; and
- foundation piles exposed by erosion or scour.

When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, scour is considered in the coding of this item. In this case, observed conditions also indicate a need to reevaluate Item B.AP.03 – Scour Vulnerability. Observed scour that is above the tolerable limit determined in the scour appraisal does not affect this item.

When inspecting culverts, the inspector should look for high water marks, changes in the drainage area, settlement of the roadway, and other indication of potential problems. The inspector should start at the outlet end of the culvert and inspect the embankment, waterway, headwall, wingwalls and culvert barre and then move through the barrel(s) and repeat the process at the inlet end.

Bridge Railings Condition Rating

Item ID	B.C.05	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the bridge railing condition rating using one of the codes in the following tables.

Report N when there are no bridge railings present.

Condition Rating Concrete

Condition			Guidelines
GOOD	9	Excellent	Railing is in new condition. **Isolated inherent defects** such as insignificant cracks and cracks of any width present at crack control joints.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as delaminations, small spalls, sound patches, exposed reinforcement with no section loss, unsealed medium width cracks, misalignment, or scrape marks from impact/ collision damage.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as spalls, unsound patches, exposed reinforcement with section loss, wide cracks or heavy map cracking, rust staining, misalignment or impact/ collision damage with spalls/ gouges.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the railing are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and or performance of the railing is affected.**
	3	Serious	**Major defects; strength and/or performance of the railing is seriously affected.** Condition typically necessitates more frequent monitoring to ensure the safety of the traveling public, may include installation of temporary railings or corrective actions.
	2	Critical	**Major defects; railing is severely compromised.** Areas of the railing are structurally compromised. Railing poses a safety hazard to traveling public and may require bridge closure until corrective action or temporary railing is installed.
	1	Imminent Failure	**Bridge is closed to traffic due to railing condition.** Repair, temporary railing, or rehabilitation may reopen the bridge.
0		Failed	**Bridge is closed due to railing condition, and is beyond corrective action.** Railing has fully or partially failed/collapsed or is missing.
N		Not Applicable	Component does not exist. Use when B.RH.01 is coded N or 0.

Bridge Railing Condition Rating - Continued

Item ID	B.C.05	SNBI

Condition Rating Reinforced Concrete - Continued

Defect	Minor	Moderate	Major
Delamination / Spall/ Patched Area	Delamination, small spall (<1" deep or <6" diameter), or patched area that is sound.	Large spall (>1" deep or >6" diameter) or patched area that is unsound or showing distress. Delaminations of top edge.	Spalls reducing the overall height of the railing >6", or spalls reducing the structural capacity of the barrier.
Scaling	Shallow popouts less than 1/2" on lower half of railing	Exposed aggregate and shallow spalls covering full height of railing.	
Exposed Rebar	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Debonded (360° exposure) from concrete in multiple locations; present with measurable section loss. Section loss to bars extending between the deck and barrier.
Cracking	Cracks of any width at control joints. Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	Wide cracks through section compromising the structural integrity.
Efflorescence / Rust Staining	Surface white or leaching with little or no build-up. No rust staining present.	Rust staining or heavy build-up of efflorescence.	
Distortion/ alignment	Has been mitigated or does not require mitigation. Catch point(s)/ misalignment up to 1/4".	Requires mitigation but has not been addressed. Catch point(s)/ misalignment of 1/4" to 1".	Catch points/ misalignment > 1" or creating a safety hazard to traveling public.
Impact/ Collision Damage	Scrape marks causing loss of protective coating or tire marks.	Large spalls or gouges.	Misalignment or railing due to impact/ collision damage.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Spall/Delamination/ Scaling	1-5%	5-15%	>15%
Cracking	5-10%	10-20%	>20%
Efflorescence/ Rust Staining	1-5%	5-10%	>10%

Bridge Railings Condition Rating - Continued

Item ID	B.C.05	SNBI

Condition Rating Steel

Condition			Guidelines
GOOD	9	Excellent	Railing is in new condition. **Isolated inherent defects** such as construction or fabrication defects.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as freckled rust, corrosion has initiated, loose fasteners pack rust without distortion, cracks that have self-arrested, been effectively arrested, or catch points or misalignment up to 1/4".
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as section loss, missing bolts or rivets or fasteners or broken welds, pack rust with localized member distortion, or catch points or misalignment up to 1".
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the railing are not affected.** Isolated major defect such as railing post anchorage exposed with less than two consecutive anchorages compromised.
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and or performance of the railing is affected.** Railing post anchorage exposed <25% on one side or <40% total on the bridge.
	3	Serious	**Major defects; strength and/or performance of the railing is seriously affected.** Condition typically necessitates more frequent monitoring to ensure the safety of the traveling public, may include installation of temporary railings or corrective actions. Railing anchorage exposed <50% on one side or <70% on the bridge.
	2	Critical	**Major defects; railing is severely compromised.** Areas of the railing are structurally compromised. Railing poses a safety hazard to traveling public and may require bridge closure until corrective action or temporary railing is installed. Any railing anchorage condition worse than above.
	1	Imminent Failure	**Bridge is closed to traffic due to railing condition.** Repair, temporary railing, or rehabilitation may reopen the bridge.
0		Failed	**Bridge is closed due to railing condition, and is beyond corrective action.** Railing has fully or partially failed/collapsed or is missing.
N		Not Applicable	Component does not exist. Use when B.RH.01 is coded N or 0.

Bridges with steel railing with anchorage rods (bolts) embedded into the deck with defects exposing these anchorages and compromising the structural integrity of the connection between the deck and railing should be rated according to the table above in addition to any other defects found on the railing members.

Bridge Railing Condition Rating - Continued

Item ID	B.C.05	SNBI

Condition Rating Steel - Continued

Defect	Minor	Moderate	Major
Exposed Anchorage	Cracking or delamination in deck at railing connection. small spall (<1" deep or <6" diameter).	Large spall (>1" deep or >6" diameter), anchorage bars not exposed.	Anchorage bars exposed.
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is evident.	May include significant section loss or holed through areas in posts or horizontal rails.
Crack	Crack that has self-arrested or been effectively arrested.	Crack that has not been arrested.	Cracks in the primary connection between the rail and superstructure component.
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners. Broken welds.	Missing fasteners and the connection of the superstructure has been compromised.
Pack Rust	Present without member distortion.	Present with localized member distortion.	Present causing distortion of member, broken fastener(s) or compromised the connection.
Distortion/ alignment	Has been mitigated or does not require mitigation. Catch point(s)/ misalignment up to 1/4" (incorrect lapped guardrail).	Requires mitigation but has not been addressed. Catch point(s)/ misalignment of 1/4" to 1".	Catch points/ misalignment > 1" or creating a safety hazard to traveling public.
Impact/ Collision Damage	Scrape marks causing loss of protective coating or tire marks.	Localized distortion.	Distortion causing cracks, broken connections, or compromising the structural integrity of the railing.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Corrosion/ Section Loss	1-5%	5-20%	>20%
Crack/ Connection	1-5%	5-10%	>10%

Bridge Railing Condition Rating - Continued

Item ID	B.C.05	SNBI

Example Steel

A one-span continuous reinforced concrete slab bridge exhibits the following conditions:

Figure 7-260: Elevation view

Findings: Right Deck Edge

Field Note	Severity	Extent	Rating
Deck: Spall full length by 32" wide by 2" deep with exposed reinforcement	Mod.	Some	5
Railing Post: Sufficient cover remains at all anchorage locations	Mod.	Isolated	6

Figure 7-261: Underside of the slab along the right edge

Findings: Left Deck Edge

Field Note	Severity	Extent	Rating
Deck: Spall full length by 12" wide by 3" high with exposed reinforcement	Mod.	Some	5
Railing Post: Sufficient cover remains at all anchorage locations	Mod.	Isolated	6

Figure 7-262: Underside of slab along the left edge

Findings: Underside of Deck

Field Note	Severity	Extent	Rating
Deck: Areas of delamination (5%)	Minor	Some	7
Deck: Medium width cracking (12%)	Minor	Some	7

Figure 7-263: Typical underside of slab

The deck and superstructure condition ratings should be controlled by the edge of deck (slab) spalls and cracking throughout. The bridge railing condition rating should consider the edge of deck (slab) spalls but should not be majorly affected due to the presence of sound concrete with sufficient cover around the railing post anchor bolts.

Report 5 (Fair) for Items B.C.01 – Deck Condition Rating and B.C.02 – Superstructure Condition Rating

Report 6 (Satisfactory) for Item B.C.05 – Bridge Railing Condition Rating.

Bridge Railing Condition Rating - Continued

Item ID	B.C.05	SNBI

Example Steel - Continued

A three-span continuous reinforced concrete slab bridge exhibits the following conditions:

Field Note	Severity	Extent	Rating
Deck: Wide longitudinal cracks (5%)	Mod.	Isolated	6
Deck: Areas of saturation (2%)	Mod.	Isolated	6
Deck: Areas of efflorescence (1%)	Mod.	Isolated	6

Figure 7-264: Typical underside of slab

Findings: Right Deck Edge

Field Note	Severity	Extent	Rating
Deck: Spall full length by up to 12" wide by up to 6" high with exposed reinforcement	Mod.	Some	5
Railing Post: Partially exposed anchor bolts (no more than two consecutive anchorages compromised)	Major	Isolated	5

Figure 7-265: Underside of slab along the right edge

Findings: Left Deck Edge

Field Note	Severity	Extent	Rating
Deck: Spall 10' long by up to 8" wide by up to 3" deep with exposed reinforcement	Mod.	Some	5
Deck: Delamination 10' long by 12" wide	Minor	Some	7

Figure 7-266: Underside of the slab along the left edge

Findings: Underside

Field Note	Severity	Extent	Rating
Deck: Areas of rust staining (1%)	Mod.	Isolated	6
Deck: Areas of wide cracking (7%)	Mod.	Isolated	6

Figure 7-267: Underside of the slab in Span 3

The deck and superstructure condition ratings should be controlled by the edge of deck (slab) spalls and cracking throughout. The bridge railing condition rating should consider the edge of deck (slab) spalls but should not be majorly affected due to the presence of sound concrete with sufficient cover around most of the railing post anchor bolts.

Report 6 (Satisfactory) for Item B.C.01 – Deck Condition Rating and B.C.02 – Superstructure Condition Rating

Report 5 (Fair) for Item B.C.05 – Bridge Railing Condition Rating.

Bridge Railing Condition Rating - Continued

Item ID	B.C.05	SNBI

Example Steel - Continued

A one-span continuous reinforced concrete slab bridge exhibits the following conditions:

Field Note	Severity	Extent	Rating
Deck: Spall full length by 18" wide by 3" high with exposed reinforcement (2%)	Mod.	Some	5

Figure 7-268: Elevation of the left deck edge

Findings: Left Deck Edge

Field Note	Severity	Extent	Rating
Deck: Spall full length by 18" wide by 3" high with exposed reinforcement (2%)	Mod.	Some	5
Railing Post: Anchorages partially exposed (<25% on left side)	Major	Some	4

Figure 7-269: Underside of slab along left edge

Findings: Right Deck Edge

Field Note	Severity	Extent	Rating
Deck: Spall full length by 16" wide by 2" deep with exposed reinforcement	Mod.	Some	5
Railing Post: Anchorages partially exposed (<25% on right side)	Major	Some	4

Figure 7-270: Underside of slab along right edge

Findings: Left Railing

Field Note	Severity	Extent	Rating
Railing: Section loss on the top of a railing post connection bracket	Mod.	Isolated	6

Figure 7-271: Top view of railing post connection bracket

The deck and superstructure condition ratings should be minimally affected by the edge of deck (slab) spall due to the location along the edge of the deck (slab). The bridge railing condition rating should consider the edge of deck (slab) spall and should be affected due to the presence of more than two consecutive exposed anchorage rods (bolts).

Report 5 (Fair) for Items B.C.01 – Deck Condition Rating and B.C.02 – Superstructure Condition Rating

Report 4 (Poor) for Item B.C.05 – Bridge Railing Condition Rating.

Bridge Railing Condition Rating - Continued

Item ID	B.C.05	SNBI

Example Steel - Continued

A one-span continuous reinforced concrete slab bridge exhibits the following conditions:

Field Note	Severity	Extent	Rating
Deck: Spall full length by up to 12" wide by full height with exposed reinforcement	Mod.	Some	5

Figure 7-272: Right railing and deck edge elevation

Findings: Right Deck Edge (Bottom)

Field Note	Severity	Extent	Rating
Deck: Spall full height by full length by up to 12" wide with exposed reinforcement (3%)	*Major	Some	*5
Railing Post: Exposed anchorage bolts (55% on one side)	Major	Widespread	3

*Does not affect overall strength of the deck in the travel way

Figure 7-273: Underside of deck along the right edge

Findings: Left Deck Edge

Field Note	Severity	Extent	Rating
Deck: Spall 8' long by up to 10" wide by 3" deep with exposed reinforcement	Mod.	Some	5
Railing Post: Anchorage bolts are not exposed but minimal cover is remaining	Mod.	Isolated	6

Figure 7-274: Underside of deck along the left edge

Findings: Right Deck Edge (Top)

Field Note	Severity	Extent	Rating
Deck: Spall full length by up to 12" wide by full depth with exposed reinforcement	*Major	Some	*5

*Does not affect overall strength of the deck in the travel way

Figure 7-275: Top of deck along the right edge

The deck condition rating should be affected by the large deck edge spalls that are beginning to encroach the shoulder of the roadway. The bridge railing condition rating is controlled by the deck edge spalls that have minimal cover or are partially or fully exposing the railing anchor bolts.

Report 5 (Fair) for Items B.C.01 – Deck Condition Rating and B.C.02 – Superstructure Condition Rating

Report 3 (Serious) for Item B.C.05 – Bridge Railing Condition Rating.

Bridge Railings Condition Rating - Continued

Item ID	B.C.05	SNBI

Condition Rating Timber

Condition			Guidelines
GOOD	9	Excellent	Railing is in new condition. **Isolated inherent defects** such as surface checks/shakes.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as checks/shakes, splits, abrasion, decay/section loss, or catch points or misalignment up to 1/2".
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as decay and section loss of more than 10% the member, missing fasteners, or check/ shakes up to 10% thickness depth.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (Satisfactory); **strength and performance of the railing are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and or performance of the railing is affected.**
	3	Serious	**Major defects; strength and/or performance of the railing is seriously affected.** Condition typically necessitates more frequent monitoring to ensure the safety of the traveling public, may include installation of temporary railings or corrective actions.
	2	Critical	**Major defects; railing is severely compromised.** Areas of the railing are structurally compromised. Railing poses a safety hazard to traveling public and may require bridge closure until corrective action or temporary railing is installed.
	1	Imminent Failure	**Bridge is closed to traffic due to railing condition.** Repair, temporary railing, or rehabilitation may reopen the bridge
0		Failed	**Bridge is closed due to railing condition, and is beyond corrective action.** Railing has fully or partially failed/collapsed or is missing.
N		Not Applicable	Component does not exist. Use when B.RH.01 is coded N or 0.

Bridge Railings Condition Rating - Continued

Item ID	B.C.05	SNBI

Condition Rating Timber - Continued

Defect	Minor	Moderate	Major
Decay/ Section Loss	Affects up to 10% of the member section.	Affects more than 10% of the member section but does not warrant structural review.	May include significant decay/ section loss at the base of post bases or to the horizontal rails. Decay/ section loss cause loss of connection.
Connection	Loose fasteners. Connection is in place and functioning as intended.	Missing bolts or fasteners.	Missing fasteners require structural review. Load path altered.
Distortion	Distortion that has been mitigated or does not require mitigation.	Distortion that requires mitigation but has not been addressed.	Distortion that warrants structural review.
Check/ Shake	Penetrates up to 5% of the thickness of the member.	Penetrates up to 10% of the thickness or length equal to or greater than the member depth.	Penetrates 10% or greater of the member thickness.
Splits/ Delamination	Less than the member depth, or arrested with effect actions taken to mitigate.	Length equal to or greater than the member depth, but does not warrant structural review.	Length equal to or greater than the member depth and warrants structural review.
Impact/ Collision Damage	Scrape marks causing scrape marks or minor slits/ delaminations.	Localized distortion due to checks, shakes, or splits. Connection loose.	Distortion of railing and ability of railing to contain vehicles compromised.

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Defect	Isolated	Some	Widespread
Decay/ Section Loss	1-5%	5-10%	>10%
Check/ Shake/ Split/ Delamination	1-5%	5-10%	>10%

Bridge Railings Condition Rating - Continued		
Item ID	B.C.05	SNBI
Commentary		

Railings provide rigid support to retrain errant vehicles on the roadway and protect the traveling public. Inspect for structural deficiencies such as cracks, spalls, delaminations, section loss, loose and or missing connections, and catch points. Verify the lateral stability of posts and railings. Inspect post and beam railing systems for collision damage and loss of anchorage (into the deck). Downgrade Item B.C.05 – Bridge Railing Condition Rating when the deck edge has exposed or compromised the anchorage.

This item addresses the condition of all types and shapes of bridge railings (parapets, median barriers, or structure mounted) located on the bridge or that cross over buried structures. The condition assessment includes the portions of the railings, posts, blocking, and curbs that are part of the bridge railing system. The crash test level of the railing should not be considered when assigning a condition rating.

Do not consider pedestrian railings when coding this item, except to the extent that the pedestrian railing is integral to the traffic barrier.

Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying railing material.

Bridge Railing Transitions Condition Rating		
Item ID	B.C.06	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report N when there is no bridge railing transitions present.

Refer to the Bridge Railing Defect Tables in Item B.C.05 – Bridge Railings Condition Rating for additional information.

Commentary

This item addresses the condition of the transition from the bridge railing to the approach guardrail. The condition assessment includes the portions of the railings, posts, blocking, and curbs that are part of the bridge railing transitions. Care should be taken to assess the timber posts for rot at the groundline.

Emphasis of the inspection and rating shall be at the railings where traffic is approaching the bridge as the trailing end might not have a railing transition.

This item addresses the condition of all types and shapes of bridge transition railings that are connected to the bridge approaches. The condition assessment includes the portions of the railings, posts, blocking, and curbs that are part of the bridge railing transition system.

The crash test level and current standards of the transition railing should not be considered when assigning a condition rating.

When improper installation of the transition railing poses a safety hazard or affects the structural capacity of the transition railing, consideration may be given to lowering the condition rating.

Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying railing transition material.

Bridge Bearings Condition Rating

Item ID	B.C.07	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the bridge bearing condition rating using one of the codes in the following table.

Report N for bridges without bearings.

Condition Rating Bearings

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such as material or fabrication imperfections.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as minor restriction, lateral or vertical misalignment but tolerable, corrosion, or loose fasteners. Any one bearing with up to 10% reduction in bearing area.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as restricted movement, approaching limits of lateral or vertical alignment, bulging, splitting, tearing, non-parallel bearing surfaces, missing connections, broken welds, or pack rust with distortion. Any one bearing with 10 - 20% reduction in bearing area.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory); **strength and performance of the superstructure are not affected.** Beam with <30% reduction in bearing area or two or more beams each with <10% reduction in bearing area.
POOR	4	Poor	**Widespread moderate or isolated major defects; strength and/or performance of the bearings is affected. B**eam with <50% reduction in bearing area, two or beams each with <20% reduction in bearing area or NSTM with up to 5% reduction in bearing area.
	3	Serious	**Major defects; strength and/or performance of the bearings is seriously affected.** Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. Two or more beams with >20% reduction in bearing area. NSTM with <20% reduction in bearing area.
	2	Critical	**Major defects; bearings are severely compromised.** Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. Any loss of bearing that is worse than above.
	1	Imminent Failure	**Bridge is closed to traffic due to bearing condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to bearing condition, and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Component does not exist.

Bearings under nonredundant members with minor or moderate defects affecting the load path or threatening the safety of the structure shall be rated accordingly based on the strength and performance of the bearing.

Bridge Bearings Condition Rating - Continued

Item ID	B.C.07	SNBI

Condition Rating Bridge Bearings - Continued

Defect	Minor	Moderate	Major
Movement	Minor restriction.	Restricted.	Restricted causing distress/ defect to superstructure or substructure.
Alignment	Lateral or vertical alignment that is inconsistent with temperature conditions but is tolerable.	Approaching limits of lateral or vertical alignment for the bearing.	Beyond established limits of lateral or vertical alignment for the bearing.
Bulging/ Splitting/ Tearing	Bulging less than 15% of the bearing thickness.	Bulging 15% or more of the bearing thickness. Splitting or tearing. Bearing's surfaces are not parallel.	Internal steel plates exposed, delaminations between the layers
Loss of Bearing Area	Up to 10%.	10-30% but does not warrant structural review.	Greater than 30%.
Corrosion	Freckled rust. Corrosion has initiated.	Section loss is evident.	Section loss, pack rust, laminar corrosion restricting movement and impacting performance
Connection	Loose fasteners, or pack rust without distortion. Connection is in place and functioning as intended.	Missing bolts, rivets or fasteners. Broken welds. Pack rust with distortion.	Missing or broken connectors on curved and highly skewed bridges. Missing or broken connectors have altered the load path.

Commentary

This item addresses the condition of all types and shapes of bridge bearings.

Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying bearing material.

In cases where the bearing device is not visible, the condition can be assessed based on alignment, grade across the joint, or other indirect indicators of the condition.

Bridge Bearings Condition - Continued

Item ID	B.C.07	SNBI

Examples

9	Isolated inherent defects.
8	*Figure 7-276: Pot bearing with no minor defects* *Figure 7-277: Elastomeric with a fabrication flaw with void in top layers (inherent)*
7	*Figure 7-278: Isolated bulge on elastomeric bearing, less than 15% of thickness (minor)* *Figure 7-279: Isolated anchor bolt nut backed off (minor) and corrosion has initiated (minor)*

Bridge Bearings Condition Rating - Continued

Item ID	B.C.07	SNBI

Examples - Continued

6

Figure 7-280: Loss of bearing area due to elastomeric pads walking out (one bearing with 15% bearing area loss, other pads negligible) (minor)

Figure 7-281: Vertical misalignment due to pack rust under the masonry plate (moderate)

Figure 7-282: Cracking and splitting in the elastomeric layers (no internal steel plates exposed (moderate)

5

Figure 7-283: Some bearings with a broken weld between the girder flange and sole plate (moderate)

Figure 7-284: Several beam ends with spalls resulting in up to 20% loss of bearing area at each location (moderate)

Bridge Bearings Condition Rating - Continued

Item ID	B.C.07	SNBI

Examples - Continued

5

Figure 7-285: Some elastomeric bearing expanded lateral to limit (moderate)

Figure 7-286: Some elastomeric pads bulging beyond limits of sole plate (moderate)

4

Figure 7-287: Isolated elastomeric bearing beyond limits of expansion with a gap along the front edge between the abutment seat and bearing (major)

Figure 7-288: All abutment bearings with laminar corrosion (moderate) and debris covering the bearing, movement is restricted due to debris (moderate)

Figure 7-289: Elastomeric pad with cracks and internal steel plates exposed (major)

Figure 7-290: Spall to bearing pedestal cause a loss of bearing are of 30% at an exterior beam (major)

Bridge Bearings Condition Rating - Continued

Item ID	B.C.07	SNBI

Examples - Continued

3

Figure 7-291: Rocker bearing fully expanded and overhanging the back of the masonry plate (major)

Figure 7-292: Steel sliding plate expanded beyond limits with 50% of sole plate overhang bottom sliding plate (major) and weld broken between bottom flange and sole plate (moderate)

Figure 7-293: Pot bearing with portion of disk protruding out (major)

2	Conditions worse than above, load restrictions may be in place due to bearing condition.
1	Bridge closed due to bearing condition.

Bridge Joints Condition Rating

Item ID	B.C.08	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the bridge deck joint condition rating using one of the codes in the following tables.

Report N when Items B.SP.09 – Deck Material and Type is 0. Only report the condition of joints within the limits of the bridge.

Condition Rating Bridge Joints

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such as material imperfections.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent).
	7	Good	**Some minor defects** such as minimal leakage, seal abrasion with no punctures, surface cracks in seal, partially-filled hard packed debris, edge delaminations or spalls in header, sound patches, freckled rust, or loose connections.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as leakage, seal adhesion, punches or rips in seal, partial depth cracks in seal, debris impaction affecting movement, spalls without exposed reinforcement in header, delaminations or unsound patches, section loss, missing or broken fasteners, or cracks not impacting functionality.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory); **performance of the joints are not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects; performance of the joints is affected.** Movement of the bridge is impacted.
	3	Serious	**Some major defects; performance of the joints is seriously affected.** Joint gland missing allowing free flow of water or movement of the bridge restricted.
	2	Critical	**Widespread major defects; joint is severely compromised.**
	1	Imminent Failure	**Joints have failed and are ineffective.**
0		Failed	**Joints have failed and present a safety hazard.** Corrective action is required to remove safety hazard.
N		Not Applicable	Bridge does not have deck joints.

Inspection of joints shall include examination of signs of leakage, proper opening, anchorage, and deterioration to the concrete, joint armor, or seal.

Bridge Joints Condition Rating - Continued

Item ID	B.C.08	SNBI

Condition Rating Bridge Joints - Continued

Defect	Minor	Moderate	Major
Leakage	Minimal leakage (slight dripping)	More than a drip and less than free flow of water. Signs of joint leaking such as corrosion on beam ends, staining on backwalls and substructure units.	Free flow of water through joint. Areas defects to the superstructure, substructure, or bearings.
Seal Adhesion	Adhered for more than 50% of the joint height (pulling away along the top or bottom edge).	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion, seal may be dislodged.
Seal Cracking	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Seal Damage	Seal abrasion without punctures.	Punctured, torn, or partially pulled out.	Punctured completely through, pulled out, or missing.
Debris Impaction	Partially filled with hard-packed material, but still allowing free movement.	Completely filled; impacts joint movement (paved over joint with crack or sign of movement) .	Completely filled; prevents joint movement (paved over joint with no signs of movement).
Adjacent Deck or Header	Edge delamination or small spall (<1" deep or <6"diameter). No exposed rebar. Patched area that is sound.	Large spall (>1" deep or >6" diameter). Exposed rebar. Unsound patch or delaminated area that makes the joint loose.	Spall, delamination, unsound patched area, or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage	Freckled rust. Metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal, or impact damage. Joint still functioning.	Section loss, cracking of the metal, damage, or connection failure that prevents the joint from functioning as intended.

Consideration to lowering the B.C.08 – Bridge Joints Condition Rating when the joint anchorage is affected (ex. deep spalls in the joint header).

Defect quantities provided in the table below are for general guidance and may vary depending on the bridge configuration, locations of defects, and severity.

Isolated	Some	Widespread
1-10%	10-25%	>25%

Bridge Joints Condition Rating - Continued		
Item ID	B.C.08	SNBI

Commentary

This item addresses the condition of all types and shapes of bridge deck joints. The condition assessment includes all aspects of the joints such as any seals, headers (metal or concrete), connections, and other metal members.

When a joint is designed as an open joint, leakage or lack of a seal is not considered a defect.

Deficiencies for sidewalk and curb plates shall not govern the expansion joint condition rating.

Bridges with a 3/4" or 1" wide poured joint or construction joint (ex. integral/ semi-integral abutment types) do not rate under B.C.08 – Bridge Joints Condition Rating.

For slabs and box beam bridges, joints other than a construction joint are typically not present and the condition of construction joints shall not be rated in this item.

Joints at the beginning or end of the approach slab and outside the limits of the bridge shall not be rated under this item.

Do not consider the condition of protective coatings and other protection systems when determining the condition rating code for this item, except to the extent that problems with the protective coating system are indicative of problems with the underlying joint material.

In cases where the joint is not visible, the condition can be assessed based on other indirect indicators of the condition.

Consideration should be giving to recording all expansion joint measurement and ambient temperature each inspection cycle and noting those value within the bridge inspection report, so the bridge movement can be tracked and compared during future inspections.

Channel Condition Rating

Item ID	B.C.09	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the channel condition using one of the following codes. The entire code description must be satisfied for the code to apply.

Condition Rating Channel

Condition			Guidelines
GOOD	9	Excellent	**No defects.**
	8	Very Good	**Inherent defects only.**
	7	Good	**Some minor defects** such as arrested or non-threatening thalweg, arrested or tolerable degradation and/or aggradation, slightly restricting debris, or erosion which does not impact the bridge or approach roadway.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as a thalweg which impacts embankment stability, sloughing of banks not impacting the bridge, aggradation exceeding tolerable limits, restricted channel (debris or aggradation), or erosion which is progressing toward the bridge or approach roadway.
	5	Fair	**Some or widespread moderate defects** with impact to the bridge imminent but the **bridge or approach roadway is not threatened.**
POOR	4	Poor	**Bridge or approach roadway is affected; and/or widespread moderate, or isolated major defects** such as thalweg movement which has undermined the approach roadway, sloughing of banks which impact the bridge, significant redirection of stream flow/ impact of waterway capacity, or impacted stability of the approach roadway embankment**.** Occasionally likelihood of overtopping.
	3	Serious	**Bridge or approach roadway is seriously threatened and/or major defects;.** Condition typically necessitates more frequent monitoring, and/or corrective actions. High likelihood of overtopping.
	2	Critical	**Major defects; bridge or approach roadway is severely threatened.** Condition typically necessitates frequent monitoring, and/or corrective actions to keep the bridge open.
	1	Imminent Failure	**Bridge is closed to traffic due to channel condition.** Repair or rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to channel condition and is beyond corrective action.** Bridge location or design can no longer accommodate the channel, and bridge replacement is needed to restore service.
N		Not Applicable	Use for Bridges where Code for B.F.01 – Feature Type does not begin with W or F.

Channel Condition Rating - Continued

Item ID	B.C.09	SNBI

Condition Rating Channel - Continued

Defect	Minor	Moderate	Major
Alignment	Flow angle of attack is 15-30° with respect to bridge substructure, or 5-15° with respect to wall piers.	Flow angle of attack is 30-45° with respect to bridge substructure, or 15-30° with respect to wall piers.	Flow angle of attack is greater than 45° with respect to bridge substructure, or greater than 30° with respect to wall piers.
Migration	Thalweg has moved from its baseline location, but movement has arrested or does not threaten the bridge or approach roadway.	Thalweg movement has not arrested and impacts embankment stability.	Thalweg movement has begun to undermine the approach roadway.
Degradation	Exists within tolerable limits or has arrested.	Sloughing of banks resulting in vertical embankments on both sides of the channel, but the bridge is not yet impacted.	Sloughing of banks resulting in vertical embankments on both sides of the channel, and the bridge is impacted.
Aggradation	Exists within tolerable limits or has arrested.	Exceeds tolerable limits; hydraulic opening is significantly blocked.	Hydraulic opening is mostly blocked.
Debris	Slightly restricts channel or is prone to build-up.	Large deposits exist and restrict the channel causing increased water velocity, redirection of stream flow, or erosion of banks.	Hydraulic opening is mostly blocked.
Bank Erosion/Instability	Erosion/instability that does not impact the bridge or approach roadway.	Significant erosion/instability that is progressing toward the bridge or approach roadway.	Stability of the approach roadway embankment is impacted.

Channel Condition Rating - Continued		
Item ID	B.C.09	SNBI
Commentary		

This item is used to provide a condition rating for the channel at the bridge. Consider the channel upstream and downstream only insofar as it threatens the bridge and approach roadway.

The condition of channel protection devices is addressed under a separate item. Refer to Item B.C.10 – Channel Protection Condition Rating.

For concrete lined channels, channel defects typically do not apply, except for Aggradation and Debris. The condition of the channel lining would be addressed by Item B.C. 10 – Channel Protection Condition Rating.

When channel condition rating drops to 5 or lower, and B.AP.03 – Scour Vulnerability was coded based on Levels 1, 2, or 3 within the SNBI Scour Appraisal Form in AssetWise, the scour assessment shall be updated.

Channel Protection Condition Rating

Item ID	B.C.10	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the condition of the channel protection device(s) using one of the following codes. Channel protection is any device that has been design as part of the original construction or any rehabilitation project. The entire code description must be satisfied for the code to apply.

Condition Rating Channel Protection

Condition			Guidelines
GOOD	9	Excellent	**Isolated inherent defects** such construction or fabrication defects.
	8	Very Good	**Some inherent defects** as noted in Condition Rating 9 (Excellent). Riprap may be buried but is still in original position.
	7	Good	**Some minor defects** such as riprap displacement with no bare spots.
FAIR	6	Satisfactory	**Widespread minor** as noted in Condition Rating 7 (Good) **or isolated moderate defects** such as riprap displacement with bare spots.
	5	Fair	**Some moderate defects** as noted in Condition Rating 6 (satisfactory); **performance of channel protection is not affected.**
POOR	4	Poor	**Widespread moderate or isolated major defects** such as isolated undermining of ditch paving. **Performance of channel protection is affected.**
	3	Serious	**Major defects; performance of the channel protection is seriously affected.** Condition typically necessitates more frequent monitoring or corrective actions.
	2	Critical	**Major defects; channel protection is severely compromised.** Condition typically necessitates more frequent monitoring or corrective actions.
	1	Imminent Failure	**Channel protection has failed**, but corrective action could restore it to working condition.
0		Failed	**Channel protection is beyond repair** and must be replaced.
N		Not Applicable	Use for Bridges where Code for B.F.01 – Feature Type does not begin with W or F or channel protection devices do not exist.

Channel Protection Condition Rating - Continued

Item ID	B.C.10	SNBI

Condition Rating Channel Protection - Continued

Defect	Minor	Moderate	Major
Erosion	Present exposing edges of channel protection.	Present and exposing underlying material, no undermining.	Undermining of channel protection, portions missing.
Scour	Exists within tolerable limits established for the bridge.	Exceeds tolerable limits but is less than the critical limits established for the bridge.	Exceeds critical limits established for the bridge.
Settlement	Exists within tolerable limits.	Exceeds tolerable limits but not impacting the underlying material or exposing the foundations.	Exceeds tolerable limits and bridge foundations exposed.
Material defects	Delamination, small spalls, unsealed medium width cracks, abrasion exposing aggregate.	Large spalls, wide cracks, stone with cracks or split.	Full depth spalls or areas of missing stones.

For this item, a minor defect does not limit the effectiveness of the channel protection, while a moderate defect may limit its effectiveness. A major defect indicates that the channel protection is missing or is no longer effective as determined by a hydraulic review.

Inspection should check for the following potential issues:

- Stability and condition of river training and bank protection devices,
- Gaps or spreading in the protective devices,
- Separation of slope pavement joints,
- Exposure of underlying erodible material,
- Steepening of the protective material and the surface upon which these materials are placed,
- Condition and function of riprap,
- Evidence of failed riprap in the stream,
- Improper movement, condition, and function of guidebanks, or spurs,
- Evidence of scouring in the streambed at or near channel protection devices,
- Streamflow encroachment behind the protective devices,
- Integrity of wire basket where gabions have been used.

It is important to identify any change condition that is observable between inspection cycles which may be indicative of larger issues.

Channel Protection Condition Rating - Continued

Item ID	B.C.10	SNBI

Commentary - Continued

This item is used to provide a condition rating for channel protection devices.

Channel protection devices are considered countermeasures that control, inhibit, delay, or minimize stream instability and scour problems, including river training and armoring countermeasures.

River training countermeasures may include: spurs, bendway weirs, guide banks, drop structures, and check dams. Additional river training countermeasures can be found in HEC-23 and elsewhere.

Armoring countermeasures may include: rock riprap, grouted riprap, concrete slope paving, articulating concrete blocks, gabion mattresses, and grout-filled mats. Additional armoring countermeasures can be found in HEC-23 and elsewhere.

Evaluate the condition and effectiveness of channel protection devices installed on banks or in the stream to mitigate channel issues that may impact the bridge. When reporting this item, consider erosion and scour, damage (unraveling, displacement, separation, and sagging), and material defects (scaling, abrasion, spalling, corrosion, cracking, splitting, and decay).

For bridges that have countermeasures not visible for inspection, use appropriate visual condition indicators to determine the applicable code. These may include measurements taken at the bridge face(s) during every inspection to help determine degree of degradation, aggradation, and/or channel migration.

When channel protection condition rating drops to 5 or lower, and B.AP.03 – Scour Vulnerability was coded based on Levels 1, 2, or 3 within the SNBI Scour Appraisal Form in AssetWise, the scour assessment shall be updated.

Scour Condition Rating

Item ID	B.C.11	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the scour condition that represents the observed or measured scour using one of the following codes. The entire code description must be satisfied for the code to apply.

Condition Ratings Spread Footings / Unknown Foundations

Use this table when B.SB.06 is E01, E02, E03, F01, F02, F03, U, or X.

Condition			Guidelines
GOOD	9	Excellent	**No scour.**
	8	Very Good	**Insignificant scour** such as existing grade below as-built grade with footing not exposed.
	7	Good	**Some minor scour** such as locations of exposed top of footing, or where top of footing can be felt when probed or minor scour hole or scour hole filled with soft material.
FAIR	6	Satisfactory	**Widespread minor or isolated moderate** such as scour with the sides (<6") exposed or damage to scour countermeasures.
	5	Fair	**Some moderate scour; strength and stability of the bridge not affected.** Some locations of exposed sides of footing with unprotected vertical sides, or exposed corners with minor undermining. Some damage to scour countermeasures. Minor settlement, movement, misalignment, or loss of bearing area.
POOR	4	Poor	**Strength and/or stability of the bridge is affected. Widespread moderate or isolated major scour** such as unprotected vertical sides of footing (<1/3 length of any one side). **Major scour** may have caused erosion, undermining, significant settlement, movement, misalignment, or loss of bearing area.
	3	Serious	**Strength and /or stability of the bridge is seriously affected. Major scour** such as exposed vertical sides with undermining of footing (<1/3 length of any one side). Severe settlement, movement, misalignment, or loss of bearing may be present. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective action.
	2	Critical	**Strength and/or stability of the bridge is severely compromised. Major scour** such as undermining of footing (>1/3 length of any side or multiple sides), loss of bearing areas or support (>20%). Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. **Local failures are possible.**
	1	Imminent Failure	**Bridge is closed to traffic due to scour condition.** Channel, channel protection, or bridge rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to scour condition and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for Bridges that do not cross over a channel with or without water.

Scour Condition Rating - Continued

Item ID	B.C.11	SNBI

Condition Rating Deep Foundation

Use this table when B.SB.06 is P01, P02, P03, P04, P05, P06, P07, P08, P09, PX, S01, S02, or S03.

Condition			Guidelines
GOOD	9	Excellent	**No scour**.
	8	Very Good	**Insignificant scour** such as existing grade below as-built grade.
	7	Good	**Some minor scour** such as top of pile cap exposed <6" deep, or localized scour hole filled with soft material when no pile cap present.
FAIR	6	Satisfactory	**Widespread minor or isolated moderate** such as scour with full height of a side of pile cap exposed, multiple piles with localized scour holes (filled with soft material) when no pile cap present, or damage to scour countermeasures.
	5	Fair	**Some moderate scour; strength and stability of the bridge not affected.** Some locations with full height pile cap exposed, one or two piles visible <1' or 10% of pile length. Some damage to scour countermeasures. Minor settlement, movement, misalignment, or loss of bearing area.
POOR	4	Poor	**Strength and/or stability of the bridge is affected. Widespread moderate or isolated major scour** such 1/3 of the front row of piles exposed <1' or 10% of pile length, non-pile cap piles exposed <1' or 10% pile length. **Major scour** may have caused erosion, undermining, significant settlement, movement, misalignment, or loss of bearing area.
	3	Serious	**Strength and /or stability of the bridge is seriously affected. Major scour** such as any one pile exposed above or below water >1' high, >1/3 of the front row of exposed with >1' or 10% of pile height. Severe settlement, movement, or misalignment may be present. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective action.
	2	Critical	**Strength and/or stability of the bridge is severely compromised. Major scour** such as piles exposed any worse than above. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. **Local failures are possible.**
	1	Imminent Failure	**Bridge is closed to traffic due to scour condition.** Channel, channel protection, or bridge rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to scour condition and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for Bridges that do not cross over a channel with or without water.

Scour Condition Rating - Continued

Item ID	B.C.11	SNBI

Condition Ratings Culverts

Condition			Guidelines
GOOD	9	Excellent	**No scour.**
	8	Very Good	**Insignificant scour**.
	7	Good	**Some minor scour** such scour developing at inlet or outlet. Probing may indicate soft material in scour hole. Top of footing exposed (no floor/invert culvert).
FAIR	6	Satisfactory	**Widespread minor or isolated moderate** such as damage to scour countermeasures, scour holes <1' deep developing at inlet or outlet. Footing sides are exposed <6" deep.
	5	Fair	**Some moderate scour; strength and stability of the bridge not affected.** Scour holes >2' deep developing at inlet or outlet. Some damage to scour countermeasures or headwall/endwall. Minor settlement, movement, or misalignment.
POOR	4	Poor	**Strength and/or stability of the bridge is affected. Widespread moderate or isolated major scour** such as significant scour holes <3' deep at inlet or outlet, stream erosion behind headwall/endwall and threatens to undermine conduit, undermining of footing. **Major scour** may have caused erosion, undermining, significant settlement, movement, or misalignment.
	3	Serious	**Strength and /or stability of the bridge is seriously affected. Major scour** such as significant scour hole >3' deep at inlet or outlet, undermining of conduit or headwall/endwall. Severe settlement, movement, or misalignment may be present. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective action.
	2	Critical	**Strength and/or stability of the bridge is severely compromised. Major scour** such as streambed degradation causing severe settlement. Local failures are possible.
	1	Imminent Failure	**Culvert is closed to traffic due to scour condition.** Channel, channel protection, or culvert rehabilitation may return the culvert to service.
0		Failed	**Culvert is closed due to scour condition and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for Culverts that do not cross over a channel with or without water.

Scour Condition Rating (cont.)

Item ID	B.C.11	SNBI

Condition Rating Foundations with Known Scour Critical Limits

Consider design scour depth and critical scour depth, commonly found in hydraulic designs, scour evaluations, and POAs, when determining the scour condition ratings.

Condition			Guidelines
GOOD	9	Excellent	**No scour.**
	8	Very Good	**Insignificant scour**. Isolated minor scour above scour critical depth.
	7	Good	**Some minor scour**. Some minor scour above scour critical depth.
FAIR	6	Satisfactory	**Widespread minor or isolated moderate.** Isolated locations approaching scour critical depth.
	5	Fair	**Some moderate scour; strength and stability of the bridge not affected.** Some locations approaching scour critical depth.
POOR	4	Poor	**Strength and/or stability of the bridge is affected. Widespread moderate or isolated major scour.** Widespread locations approaching scour critical depth.
	3	Serious	**Strength and /or stability of the bridge is seriously affected. Major scour.** Isolated locations at or below scour critical depth.
	2	Critical	**Strength and/or stability of the bridge is severely compromised. Major scour**. Some locations at or below scour critical depth.
	1	Imminent Failure	**Bridge is closed to traffic due to scour condition.** Channel rehabilitation may return the bridge to service.
0		Failed	**Bridge is closed due to scour condition and is beyond corrective action.** Replacement is required to restore service.
N		Not Applicable	Use for Bridges that do not cross over a channel with or without water.

Commentary

Refer to Item B.AP.03 – Scour Vulnerability to verify if the bridge has been determined to be stable or unstable for appraised scour conditions.

When observed conditions are not consistent with the scour design or the assumptions used in the scour appraisal, this indicates a need to reevaluate Item B.AP.03 – Scour Vulnerability.

When scour condition rating drops to 5 or lower, and B.AP.03 – Scour Vulnerability was coded based on Levels 1, 2, or 3 within the SNBI Scour Appraisal Form in AssetWise, the scour assessment shall be updated.

Bridge Condition Classification		
Item ID	B.C.12	SNBI
Frequency	Calculated	
Format	Alphanumeric Max characters: 1	

Specification

This item is calculated within AssetWise. The bridge condition classification is indicated using one of the following codes.

Code	Description	Lowest Condition Rating
G	Good	7, 8, or 9
F	Fair	5 or 6
P	Poor	4, 3, 2, 1, or 0

Commentary

For the purpose of national performance measures, the method of assessment to determine the classification of a bridge is the minimum (i.e. lowest) condition rating code from the following items:

- B.C.01 – Deck Condition Rating
- B.C.02 – Superstructure Condition Rating
- B.C.03 – Substructure Condition Rating
- B.C.04 – Culvert Condition Rating

Lowest Condition Rating Code		
Item ID	B.C.13	SNBI
Frequency	Calculated	
Format	Alphanumeric Max characters: 1	
Specification		

This item is calculated within AssetWise. The code for this item is the lowest condition rating code from the following items:

- B.C.01 – Deck Condition Rating
- B.C.02 – Superstructure Condition Rating
- B.C.03 – Substructure Condition Rating
- B.C.04 – Culvert Condition Rating

Ohio General Appraisal		
Item ID	B.C.13.01	Previously ODOT Item 67.01
Frequency	Calculated	
Format	Alphanumeric Max characters: 1	
Specification		

This item is calculated within AssetWise. The code for this item is the lowest condition rating code from the following items:

- B.C.02 – Superstructure Condition Rating
- B.C.03 – Substructure Condition Rating
- B.C.04 – Culvert Condition Rating

NSTM Inspection Condition		
Item ID	B.C.14	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the condition rating of the Non-Redundant Steel Tension Members (NSTM) using one of the steel material condition rating tables within B.C.02 – Superstructure or B.C.03 – Substructure.

Do not report this item when Item B.IR.01 – NSTM Inspection Required is N.

Commentary

This item represents the condition of NSTM(s) identified to be inspected in the NSTM inspection procedures and incorporated into the superstructure or substructure condition rating.

For a bridge with NSTM(s) in both the superstructure and substructure, report only the lower of the two condition values for the condition of the NSTM(s).

During a non-NSTM inspection the NSTM condition rating may be lowered if conditions found differ from the previous NSTM inspection.

Item B.C.02 – Superstructure Condition Rating or B.C.03 – Substructure Condition Rating shall not be higher than the NSTM Inspection Condition Rating when there is a NSTM member present.

Underwater Inspection Condition		
Item ID	B.C.15	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max characters: 1	

Specification

Report the condition rating of the underwater members of the substructure or culvert based on the underwater inspection using the condition rating tables from B.C.03 – Substructure, B.C.09 – Channel, B.C.10 – Channel Protection, or B.C.11 – Scour.

Do not report this item when Item B.IR.03 – Underwater Inspection Required is N.

Commentary

This item represents the condition of underwater members identified to be inspected in the underwater inspection procedures and incorporated into the substructure or culvert condition rating.

If this item has previously been reported because an underwater inspection is generally required, it should continue to be reported even for instances of unusually low flow where all portions of the substructure can be inspected by wading and probing, and an underwater inspection is not required. This applies only if the low flow condition is truly unusual and is not likely to recur during the next inspection interval.

The requirement to report this item may change in the rare circumstance where long-term environmental conditions change inspection access to underwater portions of the substructure or culvert.

When the underwater condition rating drops to a 5 or lower, and B.AP.03 – Scour Vulnerability was coded based on Levels 1, 2, or 3 within the SNBI Scour Appraisal Form in AssetWise, the scour assessment shall be updated.

If an underwater inspection was not performed as part of the inspection(s) during the current cycle, the existing condition rating shall be carried forward to the current inspection cycle.

7.7.2 Element Identification

This section describes the individual bridge elements evaluated in bridge inspection and management processes.

All elements described are included in the standard set of National Bridge Elements (NBE), Bridge Management Elements (BME), or ODOT Agency Developed Elements (ADE). The elements are organized by major groupings such as Decks and Slabs, Superstructure, Bearings, Substructure, etc.

Element data is only required for state-owned bridges and bridges that carry NHS routes.

Elements that are entirely below ground and not accessible for inspection, such as piles and pile caps/footings, are not intended to be reported until they become exposed and visible for inspection.

For additional information refer to the AASHTO Manual for Bridge Element Inspection (AASHTO MBEI) for additional element descriptions, quantity calculations, and examples.

When calculating the total quality, all rounding should be on the total quantity after the summation of all components associated with the element.

Element Environment 3 – Moderate should be used for all elements.

Information regarding the element number, descriptions, and quantity calculations are included within these groups

Deck and Slab Bridge Elements
- Deck/Slabs
- Top Flanges
- Approach Slabs
- Wearing Surfaces
- Joints
- Railings
- Miscellaneous

Superstructure Bridge Elements
- Girders
- Floorbeams
- Stringers
- Trusses
- Arches
- Cables
- Gusset Plates
- Pin/Pin and Hanger Assembly
- Protective Coatings
- Bearings

Substructure Bridge Elements
- Abutments
- Columns
- Pier Walls
- Pier Caps
- Piles
- Pile Cap/Footing
- Column Tower/Trestle

Culvert Bridge Element
- Culvert

7.7.2.1 Decks and Slabs

Decks and slabs describe the components that transfer loads from vehicles to the bridge.

Deck elements transmit loads to superstructure elements. Slab elements transmit loads to the substructure elements. Structures that include slab elements typically do not have superstructure elements. These elements transmit traffic loads directly to the substructure.

All deck or slab elements can be supplemented with one or more associated protection systems or wearing surface elements.

Deck/Slab Bridge Elements

Description

This element defines all bridge decks and slabs regardless of the wearing surface or protection systems used.

Element Number	Classification	Name	Units	Description	Condition State Table
12	NBE	Reinforced Concrete Deck	SF	All reinforced concrete bridge decks regardless of the wearing surface or protection system used.	Reinforced Concrete
13	NBE	Prestressed Concrete Deck	SF	All prestressed or post-tensioned concrete bridge decks regardless of the wearing surface or protection system used.	Prestressed Concrete
28	NBE	Steel Deck with Open Grid	SF	All open grid steel decks with no fill.	Steel
29	NBE	Steel Deck with Concrete Filled Grid	SF	Steel bridge decks with concrete fill either in all of the openings or within the wheel tracks.	Steel and Reinforced Concrete
30	NBE	Steel Deck Corrugated/ Orthotropic/Etc.	SF	Corrugated metal filled with Portland cement, asphaltic concrete or other riding surfaces and Orthotropic steel. Materials added for riding surface are not part of the element condition.	Steel
31	NBE	Timber Deck	SF	Timber bridge decks. Timber running planks shall be included under the wearing surface assessment.	Timber
38	NBE	Reinforced Concrete Slab	SF	All reinforced concrete bridge slabs regardless of the wearing surface or protection system used.	Reinforced Concrete
39	NBE	Prestressed Concrete Slab	SF	All prestressed or post-tensioned concrete bridge slabs regardless of the wearing surface or protection system used.	Prestressed Concrete
54	NBE	Timber Slab	SF	Timber bridge slabs. Timber running planks shall be included under the wearing surface assessment.	Timber

Deck/Slab Bridge Elements - Continued

Description - Continued

60	NBE	Other Deck	SF	All bridge decks constructed of materials not covered by other elements, regardless of the wearing surface or protection system used.	Other Material
65	NBE	Other Slab	SF	All bridge slabs constructed of materials not covered by other elements, regardless of the wearing surface or protection system used.	Other Material

Element Commentary

When the steel grid deck has concrete fill in the wheel tracks only, use Element 29 for the concrete filled portion and Element 28 for the unfilled portion of the deck.

When multiple materials or deck types comprise the deck, code the predominant structural deck material.

Slabs over vaulted or cellular abutments shall be quantified and rated with applicable slab element.

Quantity Calculation

Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present. If the sidewalk is supported by the deck, the deck quantity shall include the width of the sidewalk.

Perform all rounding on the total quantity, once all areas of the deck are summed.

Examples

A structure with a reinforced concrete deck is 54'-0" wide and 1202'-10 11/16" long.

- **Report 64,956 SF** for Element 12.

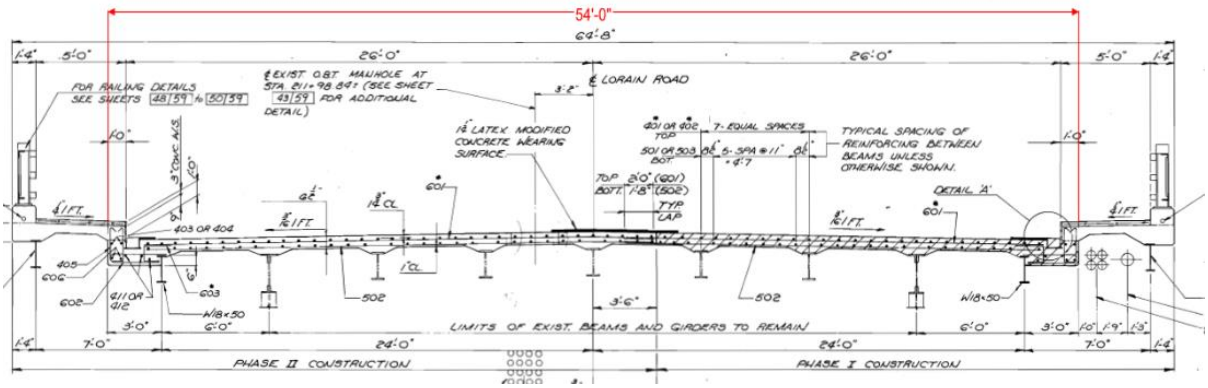


Figure 7-294: Transverse section of a reinforced concrete deck structure

Deck/Slab Bridge Elements - Continued

Examples - Continued

A structure with a reinforced concrete deck is 31'-10" wide and 268'-0" long.

- **Report 8,531 SF** for Element 12**.**

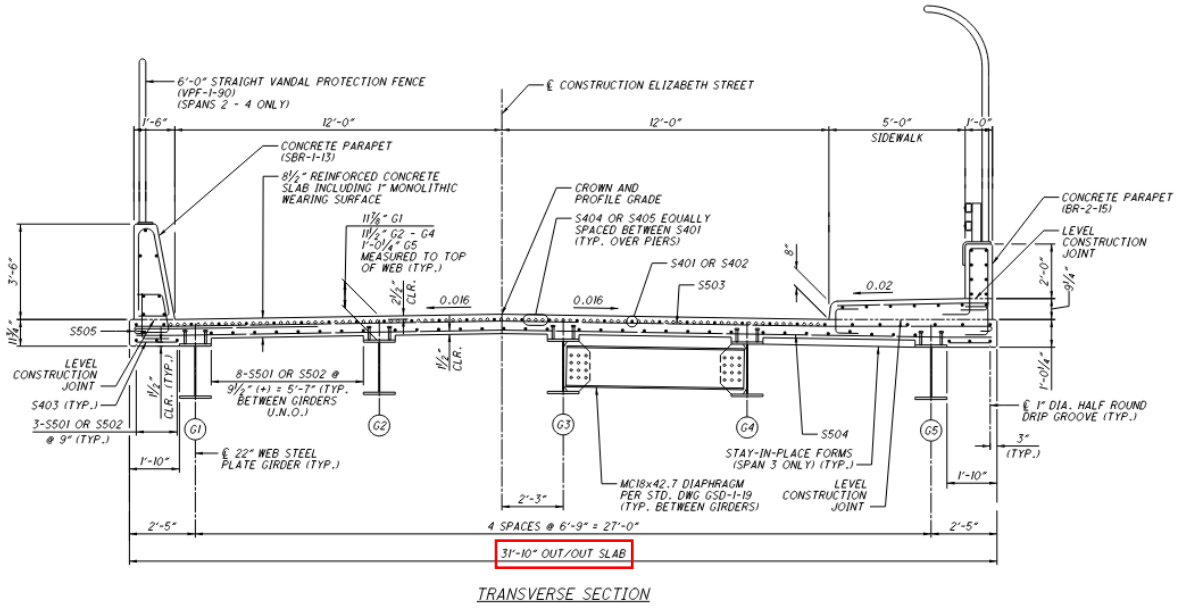


Figure 7-295: Transverse section of a reinforced concrete deck structure

Top Flange Bridge Elements

Description

This element defines all bridge girder top flanges where traffic rides directly on the structural element whether or not a wearing surface or protective system is present. These bridge types include tee-beams, box girders, and girders where traffic rides directly on the structural element.

Element Number	Classification	Name	Units	Description	Condition State Table
15	NBE	Prestressed Concrete Top Flange	SF	Prestressed or post-tensioned concrete bridge girder top flanges.	Prestressed Concrete
16	NBE	Reinforced Concrete Top Flange	SF	Reinforced concrete bridge girder top flanges.	Reinforced Concrete

Quantity Calculation

Area of the top flange from edge to edge, including any median areas and accounting for any flares or ramps present. This quantity is for the top flange riding surface only. Girder web and bottom flange to be evaluated by the appropriate girder element.

Perform all rounding on the total quantity, once all areas of the girder top flanges are summed.

Element Commentary

The material type should match the respective superstructure type (i.e. prestressed concrete box beam corresponds with Element 15 regardless of any prestressing strands in the top flange).

The flange evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, or both, and being captured using the defined condition states. Flange top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

Example

A prestress concrete box beam bridge has an asphalt wearing surface is 44'-0" wide and 30'-3 7/16" long.

- **Report 1,333 SF** for Element 15.

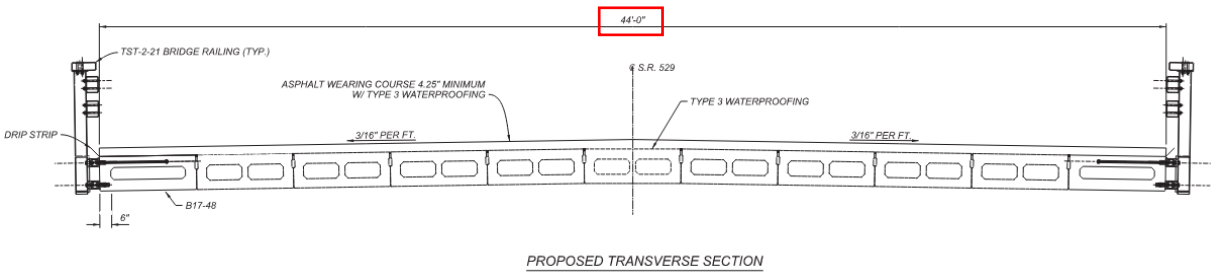


Figure 7-296: Transverse section of a prestressed concrete box beam structure

Approach Slab Bridge Elements

Description

These elements define structural sections between the abutment and the approach pavement that are constructed of mild steel reinforced concrete or prestressed (post-tensioned) reinforced concrete.

Element Number	Classification	Name	Units	Description	Condition State Table
320	NBE	Prestressed Concrete Approach Slab	SF	Those structural sections between the abutment and the approach pavement that are constructed of prestressed (post-tensioned) reinforced concrete.	Prestressed Concrete
321	BME	Reinforced Concrete Approach Slab	SF	Those structural sections between the abutment and the approach pavement that are constructed of mild steel reinforced concrete.	Reinforced Concrete
840	ADE	Approach Slab Termination or Joint	FT	Those joints filled with an assembly mechanism that has a seal between the approach slab and sleeper slab/ approach roadway. These joints are typical with integral and semi-integral abutments.	Joints

Quantity Calculation - Approach Slab

Area of the approach slab(s) from edge to edge including any median areas and accounting for any flares or ramps present.

Perform all rounding on the total quantity, once all areas of the approach slab(s) are summed.

Quantity Calculation - Approach Slab Termination Joint

Sum of all the lengths of the joint measured along the skew angle.

Element Commentary

The top portion of the backwall that sees traffic loads, should be rated with the approach slab or joint element.

Approach Slab Bridge Elements - Continued

Examples

A structure with a reinforced concrete approach slab is 54'-0" wide and 25'-0" long.

- **Report 1,350 SF** for Element 321.

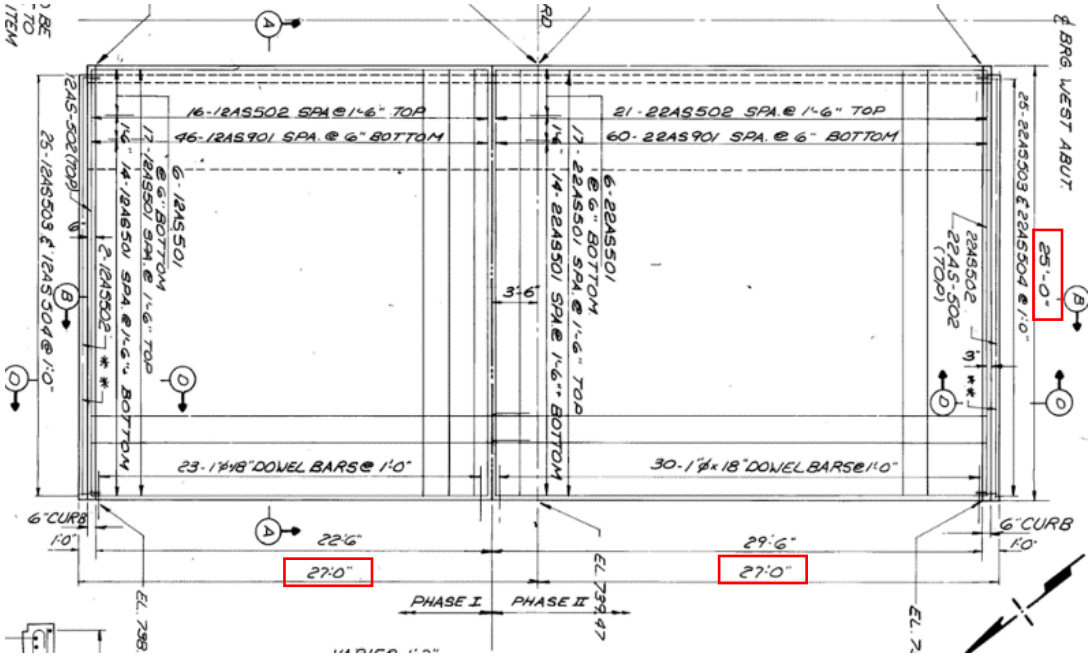


Figure 7-297: Plan view of a reinforced concrete approach slab

Wearing Surface Bridge Elements

Description

This element is for all deck/slab/top flange overlays.

Element Number	Classification	Name	Units	Description	Condition State Table
510	BME	Wearing Surfaces	SF	All decks/slabs/top flanges that have overlays made with flexible (asphaltic concrete), semi-rigid (epoxy and polyester material), and rigid (Portland cement) materials; and timber running planks.	Wearing Surface
805	ADE	Monolithic Wearing Surface	SF	Top surface of the deck, slab, or top flange elements that do not have a wearing surface (includes monolithic wearing surfaces).	Wearing Surface

Quantity Calculation

The quantity for this element should include the area of the deck/slab/top flange that is protected by this wearing surface.

Perform all rounding on the total quantity, once all areas of the wearing surface are summed.

Examples

A structure with a deck of 54'-0" out to out has a rigid material wearing surface with a width of 52'-0" between the curb lines and is 1202'-10 11/16" long.

- **Report 62,550 SF** for Element 510.

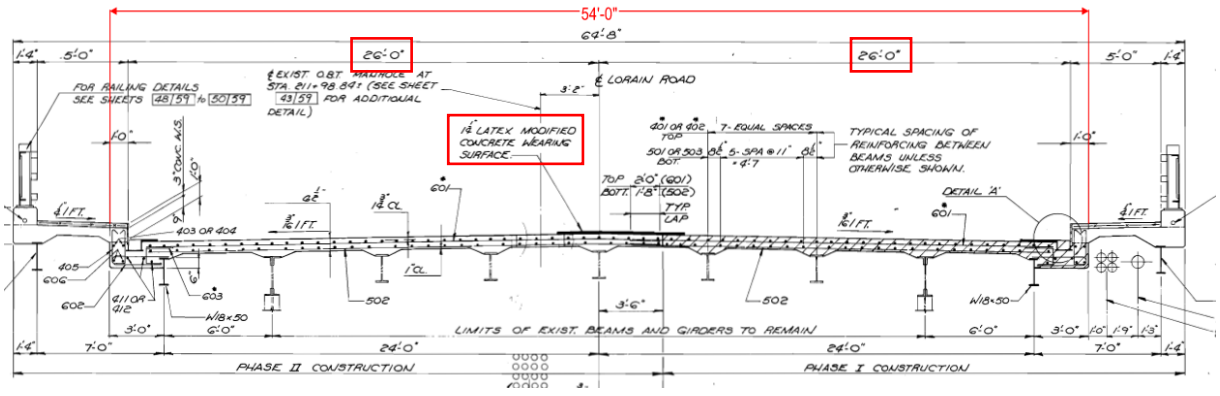


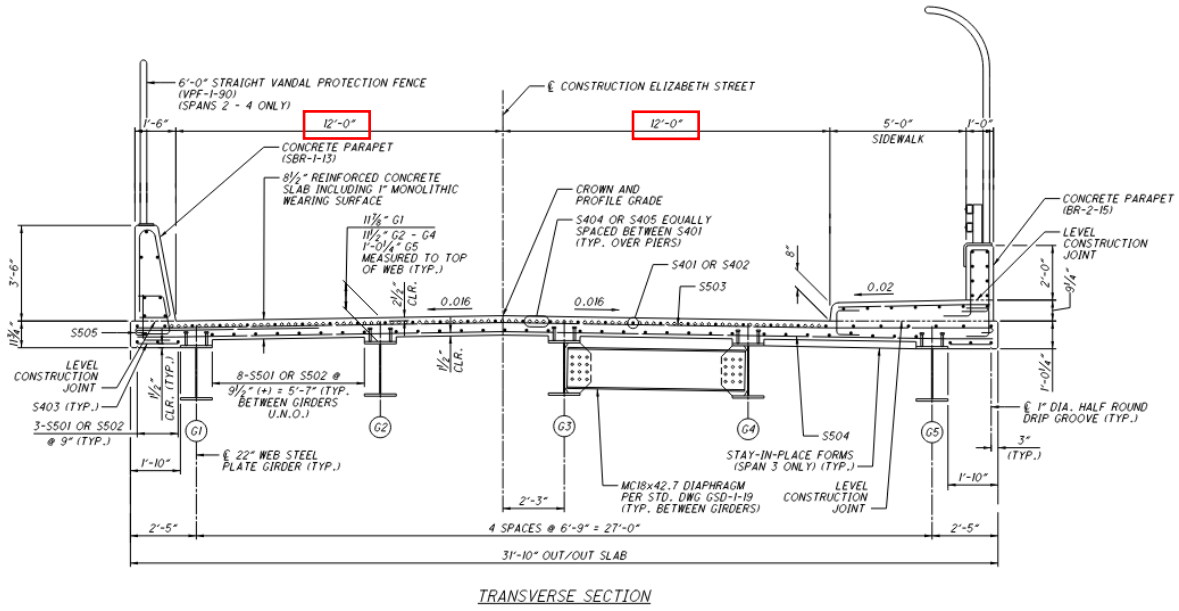
Figure 7-298: Transverse section of a structure with a rigid material wearing surface

Wearing Surface Bridge Elements - Continued

Examples - Continued

A structure with a deck of 31'-10" out to out has a 1" monolithic wearing surface with a width of 24'-0" between the curb lines and is 268'-0" long.

- **Report 6,432 SF** for Element 805.

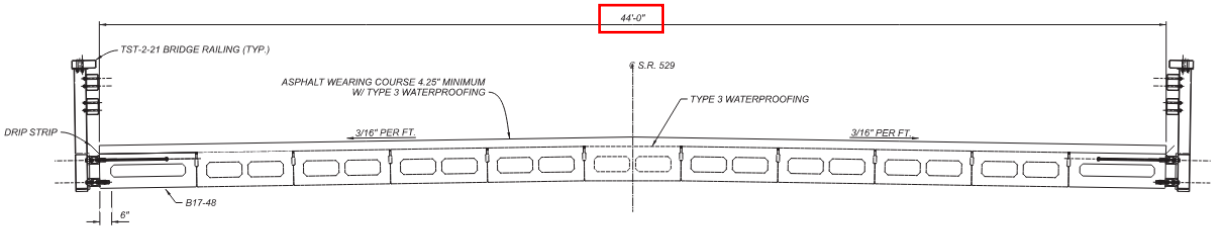


TRANSVERSE SECTION

Figure 7-299: Transverse section of a structure with a monolithic wearing surface

A prestress concrete box beam bridge has an asphalt wearing surface is 44'-0" wide and 30'-3 7/16" long.

- **Report 1,333 SF** for Element 510.



PROPOSED TRANSVERSE SECTION

Figure 7-300: Transverse section of a prestressed box beam structure with an asphalt wearing surface

Joint Bridge Elements

Description

These elements define bridge deck or slab joints.

Element Number	Classification	Name	Units	Description	Condition State Table
300	BME	Strip Seal Joint	FT	Systems comprised of a cast-in-place structural steel shape that is designed with a cavity to accept a continuously extruded elastomeric seal with corresponding ears on each side that fit into steel cavities. This is a Medium Movement Joint (MMJ).	Joints
301	BME	Pourable Joint Seal	FT	Poured-in-place expansion joint seal installed with or without a backer rod designed to accommodate compression and tension throughout movement range. This is a Small Movement Joint (SMJ).	Joints
301A	BME	Poured-In-Place Plug Joint System	FT	Poured-in-place expansion joint system designed to accommodate compression and tension throughout movement range. System can be installed with or without a centering/spanning traffic plate. This is a Small Movement Joint (SMJ).	Joints
302	BME	Compression Joint Seal	FT	Elastomeric preformed polychloroprene expansion joint seal installed with an adhesive designed to stay in compression throughout movement range. Seal can be installed with or without structural steel armor. This is a Small Movement Joint (SMJ).	Joints
302A	BME	Bonded Preformed Joint Seal	FT	Preformed elastomeric or preformed silicone expansion joints seal designed to accommodate compression and tension throughout the movement range and installed with an adhesive. Seal can be installed with or without structural steel armor. This can be a Small Movement Joint (SMJ) or a Medium Movement Joint (MMJ).	Joints

Joint Bridge Elements - Continued

Description - Continued

302B	BME	Bonded Foam Joint Seal	FT	Uncompressed closed-cell foam joint seal or pre-compressed open cell foam supported silicone joint seals with an adhesive designed to accommodate compression and tension throughout movement range. Seal can be installed with or without structural steel armor. This can be a Small Movement Joint (SMJ) or a Medium Movement Joint (MMJ).	Joints
303	BME	Assembly Joint with Seal	FT	Those joints filled with an assembly mechanism that has a seal.	Joints
303A	BME	Segmental Joint System	FT	Systems comprised of low-height monolithic segmental rubber panels spanning the joint opening and anchored rigidly to the bridge deck on both sides of the gap through the use of threaded rods or other mechanical means. Panels are steel reinforced. This can be a Medium Movement Joint (MMJ) or a Large Movement Joint (LMJ).	Joints
303B	BME	Modular Joint Assembly	FT	Systems comprised of a series of steel shapes that are rigidly connected to a series of neoprene glands which are mechanically locked to steel side extrusions. The system must be rigidly anchored or cast into the bridge deck and supported longitudinally by at least one support bar that rests inside of a support box structure that is rigidly anchored or cast into the bridge deck. This is a Large Movement Joint (LMJ).	Joints
304	BME	Open Joint	FT	Those joints that are open and not sealed, with or without structural steel armor. This is a Small Movement Joint (SMJ). This element is intended for joints designed as open joints, not for those joints that were designed to have a seal that is currently missing.	Joints

Joint Bridge Elements - Continued

Description - Continued

305	BME	Assembly Joint Without Seal	FT	Those assembly joints that are open and not sealed. This element is intended for joints designed as open joints, not for joints that were designed to have a seal that is currently missing. This element is intended to encompass all other assembly joints without seals that are not described by elements 305A or 305B.	Joints
305A	BME	Sliding Plate Joint Assembly	FT	Systems comprised of a plate sliding across the joint opening. The plate is attached to one side of the assembly which is rigidly anchored or cast into the bridge deck. The assembly may or may not require a drainage trough system. This can be a Small Movement Joint (SMJ) or a Medium Movement Joint (MMJ).	Joints
305B	BME	Finger (Tooth) Joint Assembly	FT	An open steel plate expansion joint system with interlocking steel fingers that are rigidly anchored or cast into the bridge deck, which may or may not have a drainage trough system. This can be a Medium Movement Joint (MMJ) or a Large Movement Joint (LMJ).	Joints
306	BME	Other Joint	FT	Those joints that are not defined by any other joint element.	Joints

Quantity Calculation

The quantity for this element should include the sum of all the lengths of the joint measured along the skew angle.

Perform all rounding on the total quantity, once all lengths of the joints are summed.

Joint Bridge Elements - Continued

Example

A structure includes a strip seal expansion joint at both abutments (to skew).

- **Report 62'-0"** for the total quantity of Element 300.

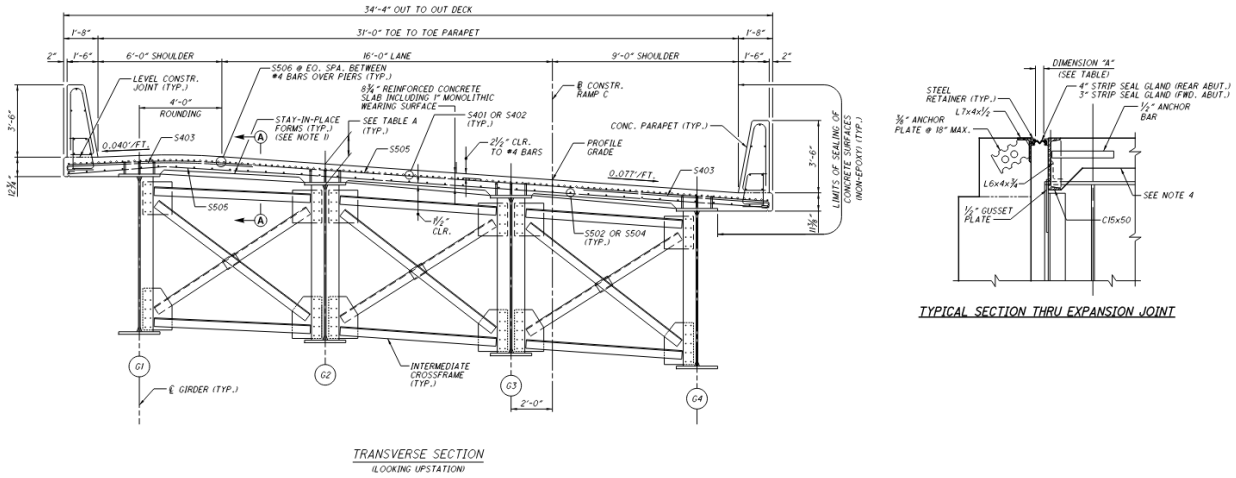


Figure 7-301: Transverse section and section through a strip seal expansion joint

Railing Bridge Elements

Description

These elements are for bridge rail, which may be fabricated from steel, other metal, concrete, masonry, timber and other materials.

When multiple materials are used, multiple railing elements may be selected unless noted below in the table such as when the posts are of a different material than the primary railing.

A concrete railing with a steel tubular railing on top, (ODOT Standard Drawing BR-2-15) Element Number 330 and 331 shall be included.

Fences mounted on bridge railings are not considered within the following elements and do not need to be assigned an element number.

Element Number	Classification	Name	Units	Description	Condition State Table
330	NBE	Metal Bridge Railing	FT	All types and shapes of metal bridge railing. Steel, aluminum, metal beam, rolled shapes, etc. will all be considered part of this element. Included in this element are posts of metal, timber, or concrete; blocking; and curb.	Steel
331	NBE	Reinforced Concrete Bridge Railing	FT	All types and shapes of reinforced concrete bridge railing.	Reinforced Concrete
332	NBE	Timber Bridge Railing	FT	All types and shapes of timber bridge railing. Included in this element are posts of timber, metal, or concrete; blocking; and curb.	Timber
333	NBE	Other Bridge Railing	FT	All types and shapes of bridge railing, except those defined as metal, concrete, timber, or masonry.	Other Material
334	NBE	Masonry Bridge Railing	FT	All types and shapes of masonry block or stone bridge railing.	Masonry

Quantity Calculation

Number of rows of bridge rail times the length of the bridge. The element quantity includes only the rail within the bridge limits.

The number of rows of rail on a bridge is commonly two, one on each side of the bridge. In some cases, there may be more than two rows when a center median or protected pedestrian/bicycle lanes are present.

When there are two median barriers (i.e. gap between the two barriers on a divided highway), each barrier shall be included in the calculation (the length of the bridge times two).

Railing Bridge Elements - Continued

Examples

A structure includes a metal bridge railing on both sides of the deck as shown below. The bridge length is 100'-0". Note the temporary construction barrier would not be included in the element level quantities.

- **Report 200 FT** for the quantity of Element 300.

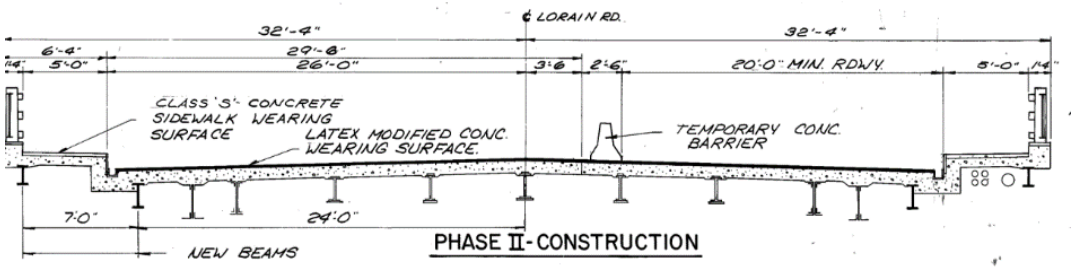


Figure 7-302: Transverse section of a structure with a metal bridge rail on both sides of the deck

A structure with a deck of 31'-10" out to out is 268'-0" long. The left railing is a 42" single sloped concrete bridge railing (ODOT Standard Drawing SBR-1-20) for the full length of the bridge. The right railing is the bridge sidewalk railing with concrete barrier (ODOT Standard Drawing BR-2-15) for the full length of the bridge.

- **Report 268 FT** for Element 330.
- **Report 536 FT** for Element 331.

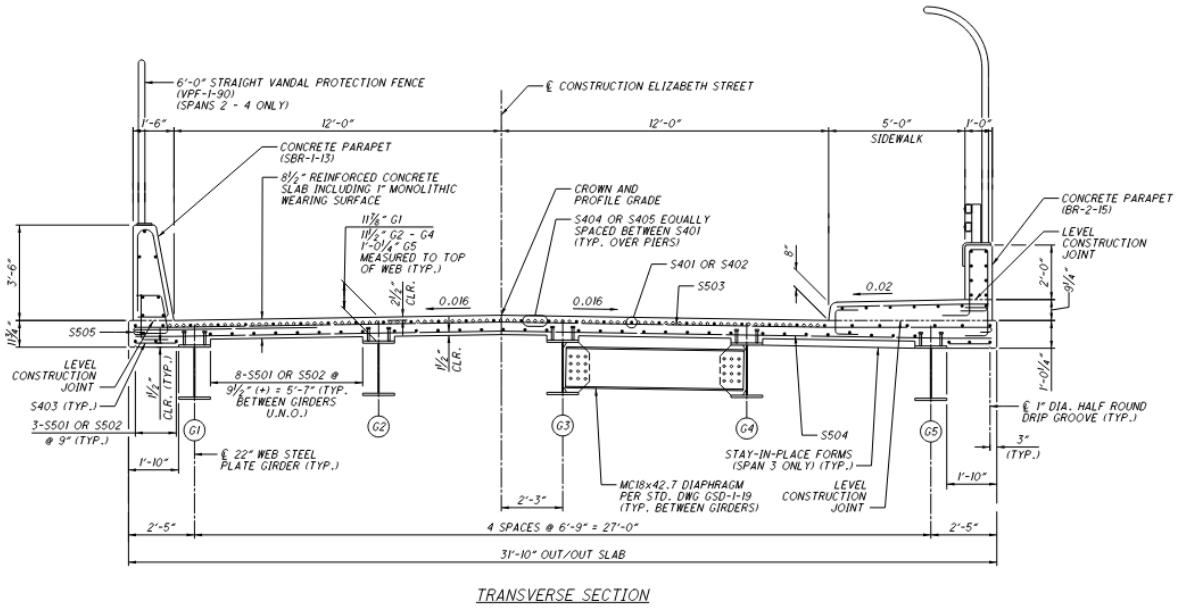


Figure 7-303: Transverse section of a structure with a single sloped concrete bridge railing on the left end and a bridge sidewalk railing with a concrete carrier on the right end

Miscellaneous Bridge Elements

Description

This element defines miscellaneous elements that cannot be categorized according to any of the previously described categories regardless of material type and protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
815	ADE	Drainage	EA	All types of devices that drainage devices that convey water off the bridge, including scuppers, over the edge, and off the ends of the bridge.	---
900	ADE	Load Posting Sign	EA	All types of load posting signs and advanced warning signs for load posted bridges.	---
901	ADE	Vertical Clearance Sign	EA	All types of vertical clearance signs that are attached to the bridge or placed before the bridge and include any advanced warning signs.	---

Quantity Calculation - Drainage

Sum of all the drainage devices (scuppers) on the bridge. If no drainage devices are present, over the side or drainage off the ends of the bridge should be summed with each side or end equivalent to one (1).

Quantity Calculation - Load Posting/ Vertical Clearance Sign

Sum of all signs attached to the bridge and any signs in place for restrictions on the bridge.

7.7.2.2 Superstructure

Superstructure elements described in this section transmit loads from decks to the substructure. These elements include girders, trusses, arches and floor systems. The floor systems include floorbeams and stringers. Additional elements in this group include cables, gusset plates and pin and hanger assemblies. These elements do not include bracing components such as diaphragms, crossframes or portal sway bracing.

Girder elements transmit the loads from the deck into the substructure. Elements listed include closed web (boxes) and open girders (I sections). The materials include steel, reinforced or prestressed concrete, or timber.

Stringer elements are part of a floor system and transmit load from the deck into the floor system, such as floorbeams. Floorbeam elements are the intermediate transverse load carrying members and transfer load from the deck and stingers to girders, trusses, or arches. Both stringers and floorbeams can be constructed from steel, concrete, or timber.

Truss and arch elements include materials of steel, concrete, timber and masonry; and are the main load carrying members for the span.

Miscellaneous superstructure elements include elements such as steel pin, pin and hanger assemblies, steel gusset plates, and main and secondary cables.

Girder Bridge Elements

Description

These elements transmit loads from the deck to the substructure. Elements listed include closed web (boxes) and open girders (I-sections) regardless of protective systems.

Element Number	Classification	Name	Units	Description	Condition State Table
102	NBE	Steel Closed Web/Box Girder	FT	All steel box girders or closed web girders. For all box girders regardless of protective system.	Steel
104	NBE	Prestressed Concrete Closed Web/Box Girder	FT	All pretensioned or post-tensioned concrete closed web girders or box girders For all box girders regardless of protective system.	Prestressed Concrete
105	NBE	Reinforced Concrete Closed Web/Box Girder	FT	All reinforced concrete box girders or closed web girders. For all box girders regardless of protective system.	Reinforced Concrete
106	NBE	Other Closed Web/Box Girder	FT	All box girders or closed web girders constructed of materials not covered by other elements. For all other material box girders, regardless of protective system.	Other Material
107	NBE	Steel Open Girder/Beam	FT	All steel open girders regardless of protective system.	Steel
109	NBE	Prestressed Concrete Open Girder/Beam	FT	Pretensioned or post-tensioned concrete open web girders regardless of protective system.	Prestressed Concrete
110	NBE	Reinforced Concrete Open Girder/Beam	FT	Mild steel reinforced concrete open web girders regardless of protective system.	Reinforced Concrete
111	NBE	Timber Open Girder/Beam	FT	All timber open girders, regardless of protection system.	Timber
112	NBE	Other Open Girder/Beam	FT	All girders constructed of materials not covered by other elements, regardless of protection system.	Other Material

For Element Number 109 and 110 where traffic rides directly on the structural element, regardless of the wearing surface, evaluation of the top flange above the fillet is also included with Element Number 15 or 16 respectively.

Girder Bridge Elements - Continued

Quantity Calculation

Sum of all lengths of each girder or girder section.

Perform all rounding on the total quantity, once all lengths of the girders/beams are summed.

Examples

A five-span structure has Girders 1 through 5 (comprised of steel) with a total length of 267'-0"as shown in the figure below.

- **Report 1,335 FT** for the total quantity of Element 107.

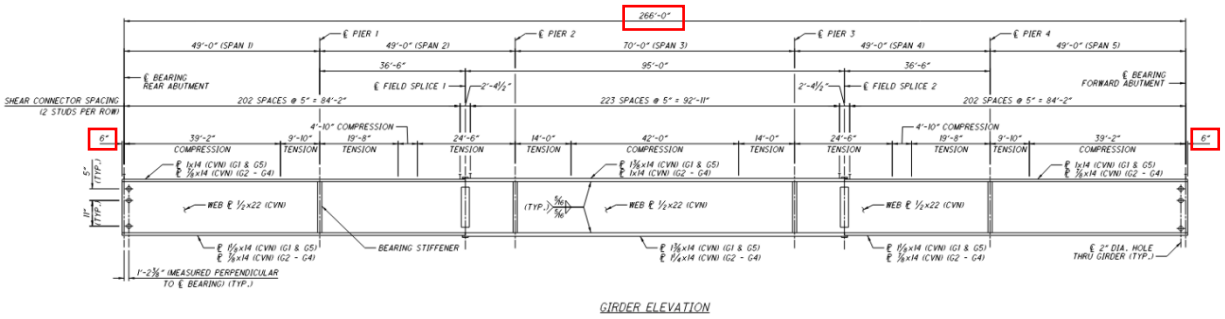


Figure 7-304: Five span structure girder elevation

A single-span structure has Girders 1 through 4 with a total length of 83'-5" as shown in the figure below.

- **Report 334 FT** for the total quantity of Element 109.

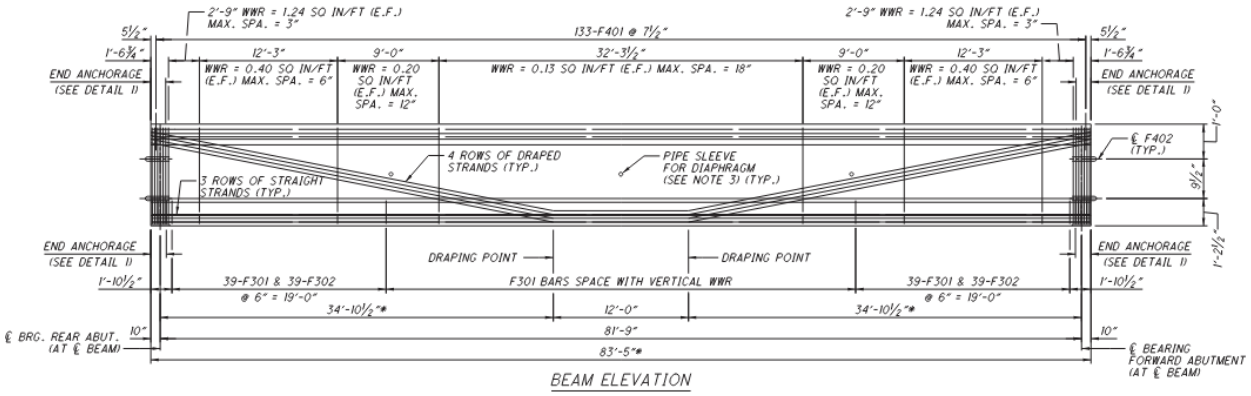


Figure 7-305: Single span structure beam elevation

Floorbeam Bridge Elements

Description

This element defines only elements that transversely support stringers or decks, regardless of protective systems.

Element Number	Classification	Name	Units	Description	Condition State Table
152	NBE	Steel Floor Beam	FT	Steel floorbeams that typically support stringers regardless of protective system.	Steel
154	NBE	Prestressed Concrete Floor Beam	FT	Prestressed concrete floorbeams that typically support stringers regardless of protective system.	Prestressed Concrete
155	NBE	Reinforced Concrete Floor Beam	FT	Mild steel reinforced concrete floorbeams that typically support stringers regardless of protective system.	Reinforced Concrete
156	NBE	Timber Floor Beam	FT	Timber floorbeams that typically support stringers, regardless of protective system.	Timber
157	NBE	Other Floor Beam	FT	Floorbeams constructed of materials not covered by other elements, that typically support stringers, regardless of protective system.	Other Material

Quantity Calculation

Sum of all lengths of each floorbeam.

Perform all rounding on the total quantity, once all lengths of the floorbeams are summed.

Examples

A structure consists of 13 steel floorbeams as shown below with a length of 47'-6 11/16".

- **Report 618 FT** for the total quantity of Element 152.

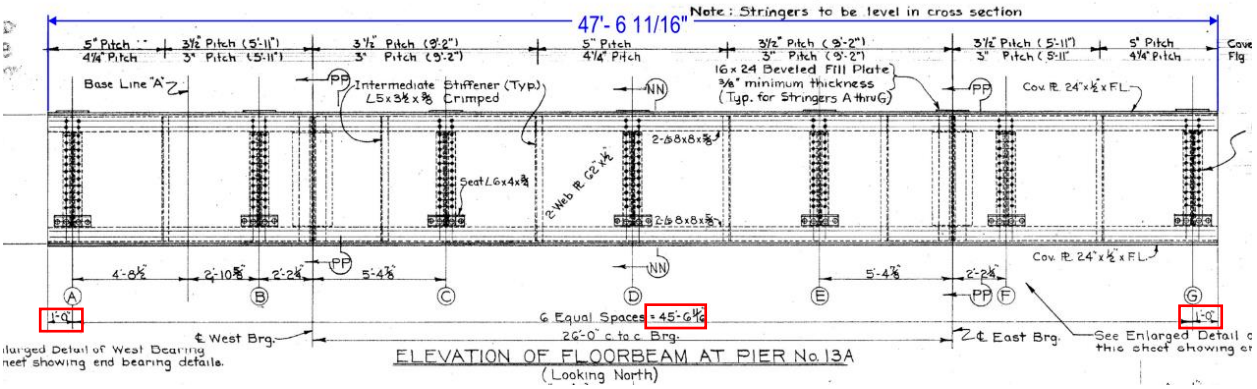


Figure 7-306: Elevation of a steel floorbeam

Stringer Bridge Elements

Description

These superstructure elements transmit loads from the deck to the floor system, such as floorbeams, regardless of protective systems. These elements define members that support the deck in a stringer floorbeam system.

Element Number	Classification	Name	Units	Description	Condition State Table
113	NBE	Steel Stringer	FT	Steel members that support the deck in a stringer floorbeam system regardless of protective system.	Steel
115	NBE	Prestressed Concrete Stringer	FT	Pretensioned or post-tensioned concrete members that support the deck in a stringer floorbeam system regardless of protective system.	Prestressed Concrete
116	NBE	Reinforced Concrete Stringer	FT	Mild steel reinforced concrete members that support the deck in a stringer floorbeam system regardless of protective system.	Reinforced Concrete
117	NBE	Timber Stringer	FT	Timber members that support the deck in a stringer floorbeam system, regardless of protective system.	Timber
118	NBE	Other Stringer	FT	All stringers constructed of materials not covered by other elements, regardless of protection system.	Other Material

Quantity Calculation

Sum of all lengths of each stringer.

Perform all rounding on the total quantity, once all lengths of the stringers are summed.

Stringer Bridge Elements - Continued

Examples

A truss bridge consists of 12 steel stringers supporting the roadway and span between 11 floorbeams with the end stringers 21'-10 3/4" long and remaining 22'-0" long.

- **Report 2,902 FT** for the total quantity of Element 113.

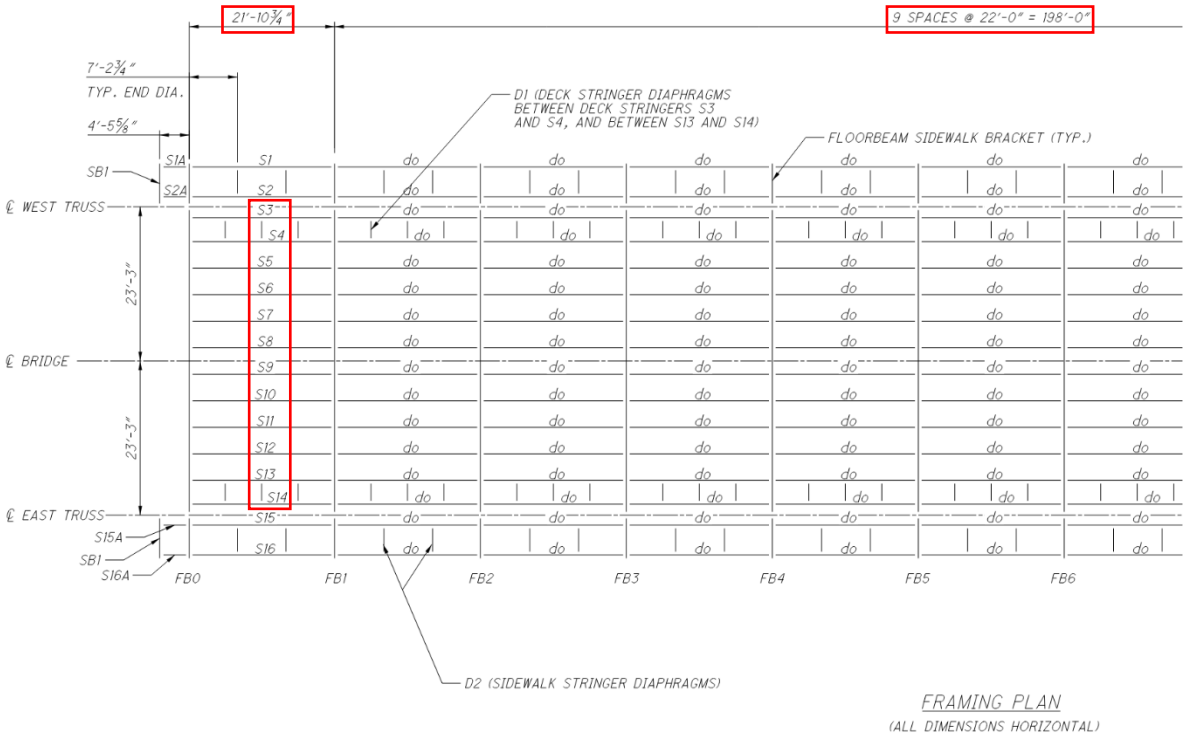


Figure 7-307: Truss bridge framing plan

Truss Bridge Elements

Description

This element defines all primary truss components that comprise each truss line, including all tension, compression, reversal, and zero force members for through, pony, and deck trusses, regardless of protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
120	NBE	Steel Truss	FT	All steel truss elements, including all tension, compression, reversal, and zero force members for through, pony, and deck trusses. For all trusses regardless of protective system.	Steel
135	NBE	Timber Truss	FT	All timber truss elements, including all tension, compression, reversal, and zero force members for through, pony, and deck trusses. For all trusses, regardless of protective system.	Timber
136	NBE	Other Truss	FT	All truss elements constructed of materials not covered by other elements, including all tension, compression, reversal, and zero force members for through, pony, and deck trusses. For all other material trusses, regardless of protective system.	Other Material

Quantity Calculation

Sum of all of the lengths of each truss panel measured longitudinally along the travel way.

Perform all rounding on the total quantity, once all lengths of the trusses are summed.

Truss Bridge Elements - Continued

Examples

A structure is carried by two truss lines as shown below with a total length of 99'-2".

- **Report 198 FT** for the total quantity of Element 12.

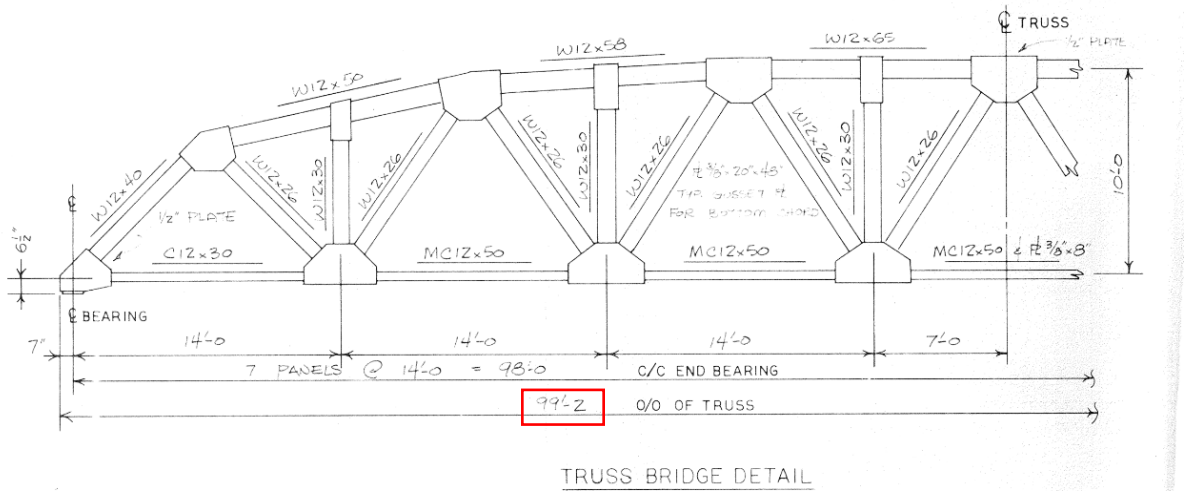


Figure 7-308: Truss bridge partial truss elevation

Arch Bridge Elements

Description

This element defines arches regardless of materials type or protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
141	NBE	Steel Arch	FT	Steel arches regardless of type or protective system.	Steel
142	NBE	Other Arch	FT	Arches constructed of materials not covered by other elements, regardless of type or protective system.	Other Material
143	NBE	Prestressed Concrete Arch	FT	Only pretensioned or post-tensioned concrete arches regardless of protective system.	Prestressed Concrete
144	NBE	Reinforced Concrete Arch	FT	Only mild steel reinforced concrete arches regardless of protective system.	Reinforced Concrete
145	NBE	Masonry Arch	FT	Masonry or stacked stone arches, regardless of protective system.	Masonry
146	NBE	Timber Arch	FT	Only timber arches, regardless of protective system.	Timber

Quantity Calculation

Sum of all the lengths of each arch panel measured longitudinally along the travel way.

Perform all rounding on the total quantity, once all lengths of the arches are summed.

Element Commentary

For filled arches without a structural deck (B.SP.09 – Deck Material and Type is coded 0 – None), Element 845 - Roadway over Structure shall be coded.

Examples

A structure consists of two lines of 8 reinforced concrete arch spans with end span lengths of 176'-10 1/2" and the remaining span with lengths of 192'-3".

- **Report 3,015 FT** for the total quantity of Element 144.

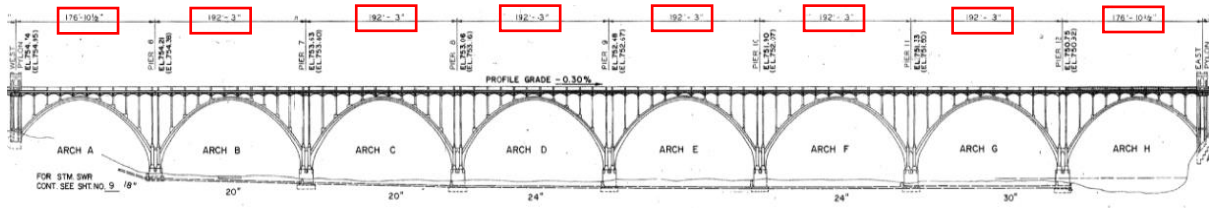


Figure 7-309: Elevation of a structure with eight concrete arch spans.

Cable Bridge Elements

Description

This element defines cables regardless of material type and regardless of protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
147*	NBE	Steel Main Cables	FT	All steel main suspension or cable stay cables not embedded in concrete. For all cable groups regardless of protective systems.	Steel
148	NBE	Secondary Steel Cables	EA	All steel suspender cables not embedded in concrete. For all individual or cable groups regardless of protective systems.	Steel
149	NBE	Other Secondary Cables	EA	All cables constructed of materials not covered by other elements and not embedded in concrete. For all individual other material cables or cable groups, regardless of protective systems.	Other Materials

Quantity Calculation – Steel Main Cables

Sum of all the lengths of each main cable measured longitudinally along the travel way.

Quantity Calculation – Secondary Cables

Sum of the individual cable or cable groups carrying the load from the superstructure to the main cable/arch elements.

Element Commentary

Element 147 is intended for use on main cables in suspension bridges or main cable stays in cable-stayed bridges.

Elements 148 and 149 are intended for use on suspender cables, other smaller cables, or groups of cables in one location acting as a system to carry loads from the superstructure to the main cable/arch.

Cable Bridge Elements - Continued

Examples

A partial elevation of a suspension bridge is shown in Figure 7-310. The total longitudinal length of the main cable measured along the travel way from the centerline of the bridge to the anchorage is 829'-8" per side.

- **Report 3,319 FT** for the total quantity of Element 147.

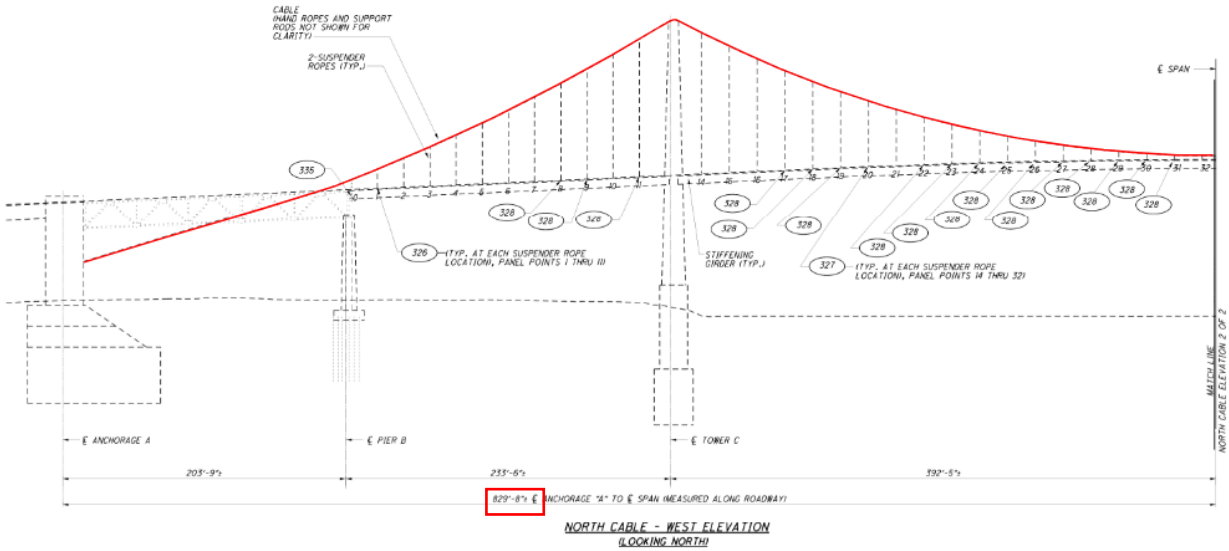


Figure 7-310: Partial elevation of suspension bridge.

The suspension bridge in Figure 7-310 has suspender cables composed of four indivual cables at each panel point as shown in Figure 7-311. There are 62 suspender groups on each side of the bridge varrying in length from 13.3186' at the ends to 100.3229'.

- **Report 124** for the total quanity for Element 148.

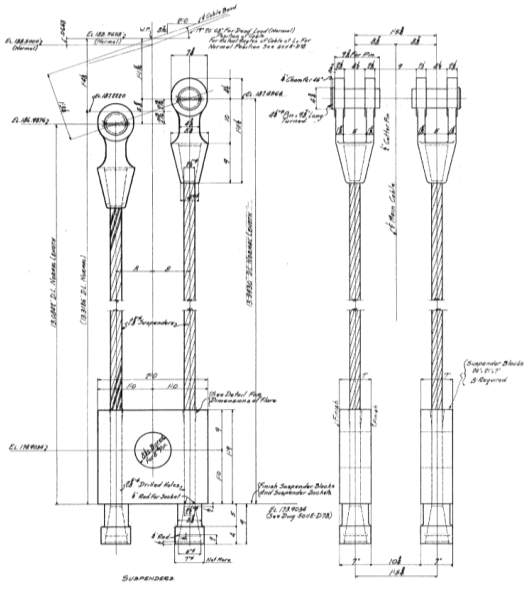


Figure 7-311: Details of one secondary cable group on a suspension bridge.

Gusset Plate Bridge Elements

Description

This element defines all gusset plates regardless of protective systems.

Element Number	Classification	Name	Units	Description	Condition State Table
162	NBE	Steel Gusset Plate	EA	Only those steel gusset plate(s) connections that are on the main truss/arch panel(s). These connections can be constructed with one or more plates that may be bolted, riveted, or welded. For all gusset plates regardless of protective systems.	Gusset Plate and Steel

Quantity Calculation

Sum of the number of primary load path gusset plate assemblies. For multiple-plate gusset connections at a single panel point, the quantity shall be one gusset plate regardless of the number of individual plates at the single connection point.

Pin and Pin and Hanger Assembly Bridge Elements

Description

This element defines all pins, pin and hanger assemblies, or both.

Element Number	Classification	Name	Units	Description	Condition State Table
161	NBE	Steel Pin and Pin and Hanger Assembly or Both	EA	Steel pins and pin and hanger assemblies regardless of protective system.	Pins/Hangers/Hinges and Steel
820	ADE	Steel Seated-Hinge Assembly	EA	Seated-hinge assembly on steel girders regardless of protective systems. Includes girder and bearings within the hinge region.	Steel and Bearings
825	ADE	Concrete Hinge Assembly	EA	Seated-hinge assembly regardless of protective systems. Includes girder and bearings within the hinge region.	Reinforced Concrete and Bearings

Quantity Calculation

Sum of the number of pins, pin and hanger assemblies, or both or the number of hinge assemblies.

Protective Coating Bridge Elements

Description

These elements define protective coatings including paint, oxide on weathering steel, cathodic protection, topcoat corrosion inhibitor and galvanization. These systems will influence the deterioration and condition of the underlying structural element.

Element Number	Classification	Name	Units	Description	Condition State Table
515	BME	Steel Protective Coating	SF	Steel elements that have a protective coating such as paint, galvanization, weathering steel patina, or other top coat steel corrosion inhibitor.	Steel Protective Coating
521	BME	Concrete Protective Coating	SF	Concrete elements that have a protective coating applied to them. These coatings include silane/siloxane water proofers, crack sealers such as High Molecular Weight Methacrylate (HMWM), or any top coat barrier that protects concrete from deterioration and reinforcing steel from corrosion.	Concrete Protective Coating

Quantity Calculation

Should include the entire protected surface area of the protected element.

Element Commentary

Element 515 shall describe all coating systems. This includes paint systems, oxide on weathering steel, and galvanization.

Element 520 is intended to capture situations where the concrete element may be expected to deteriorate at a rate that is slower than unprotected situations. Protection systems may include rebar coating, cathodic protections, or other similar protection methods. Wearing surfaces are addressed under Element 510 and not this element.

Protective Coating Bridge Elements - Continued

Examples

A superstructure consists of four welded steel plate girders with a 5/8" by 90" web and average flange dimensions of 1 1/4" by 23". The overall length of the girders is 268'-0" long. The protected perimeter of each girder equals 21.06' (252 3/4").

- **Report 22,579 SF** for Element 515.

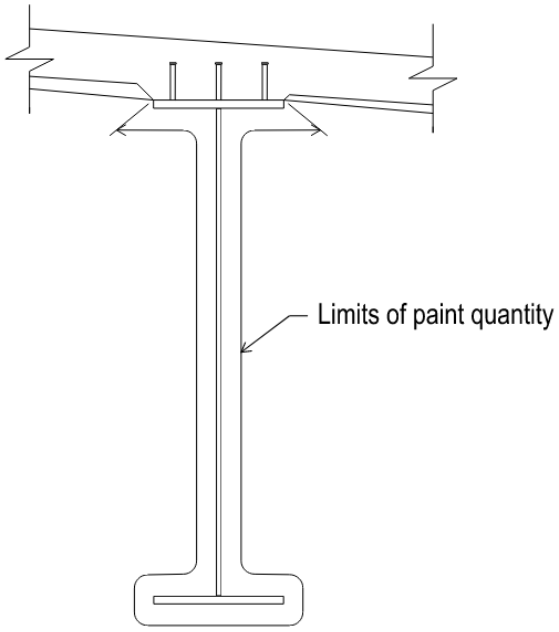


Figure 7-312: Limits of paint quantity for a steel girder.

A superstructure consist of four WF36-49 prestress concrete beams with a protective coating applied to the exterior faces of the facia beams and the underside of the interior beam as shown in Figure 7-313. Each beam is 83'-5" long. The perimeter of the exterior beam equals 8.86' (106.31") and the interior equals 4.25' (51").

- **Report 2,187 SF** for Element 521.

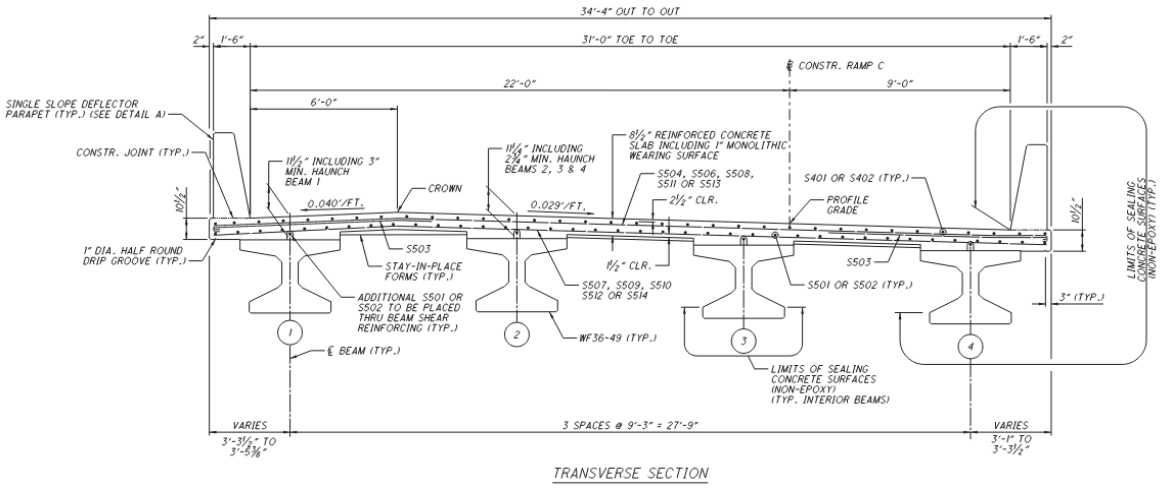


Figure 7-313: Transverse section showing limits of sealing on prestressed girders.

Bearing Bridge Elements

Description

These elements define bridge bearings.

Element Number	Classification	Name	Units	Description	Condition State Table
310	NBE	Elastomeric Bearing	EA	Bridge bearings that are constructed primarily of elastomers, with or without fabric or metal reinforcement.	Bearing
311	NBE	Moveable Bearing	EA	Bridge bearings that provide for both rotation and longitudinal movement by means of roller, rocker, or sliding mechanisms.	Bearing
312	NBE	Enclosed/Concealed Bearing	EA	Bridge bearings that are enclosed so that they are not open for detailed inspection, but may provide for rotation and longitudinal movement.	Bearing
313	NBE	Fixed Bearing	EA	Bridge bearings that provide for rotation only (no longitudinal movement).	Bearing
314	NBE	Pot Bearing	EA	Those high load bearings with confined elastomer. The bearing may be fixed against horizontal movement, guided to allow sliding in one direction, or floating to allow sliding in any direction.	Bearing
315	NBE	Disc Bearing	EA	Those high load bearings with a hard plastic disk. This bearing may be fixed against horizontal movement, guided to allow movement in one direction, or floating to allow sliding in any direction.	Bearing
316	NBE	Other Bearing	EA	All bridge bearings constructed of materials not covered by other elements, regardless of translation or rotation constraints.	Bearing

Bearing Bridge Elements - Continued
Quantity Calculation
Sum of each bearing of each type.
Element Commentary
Element 312 should be used semi-integral and integral abutments where the bearing material is not visible. The inspector shall assess the condition based on alignment, grade across the joint, persistence of debris, or other indirect indicators of the condition. Element 316 is intended for bearings constructed of materials that cannot be classified using any other bearing element.

7.7.2.3 Substructure

Substructure elements described in this section transmit loads from superstructure into the ground. These are the supporting elements of the structure and include columns, piles, pile caps/footings, pile extensions, pier walls, towers, trestles and abutments. These elements include elements of steel, concrete, timber, masonry, and other material.

Monolithic and integral wingwalls, up to the first construction joint (cold joint, water stop, etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic with the abutment shall not be included in the quantity or assessment of the abutment element.

The limits of the substructure units and backwall are shown in Figure 7-314. For bridges with semi-integral or integral abutments Element 830 – Abutment Backwall will not apply and the diaphragm above the bearings is considered superstructure and shall be rated within the superstructure elements as shown in Figure 7-315.

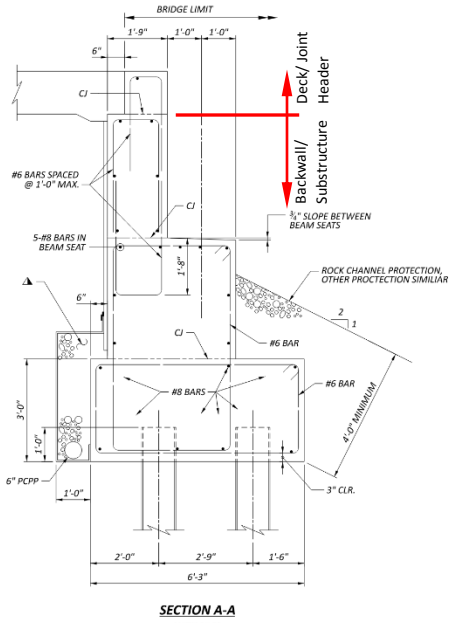


Figure 7-314: Typical abutment section with a backwall.

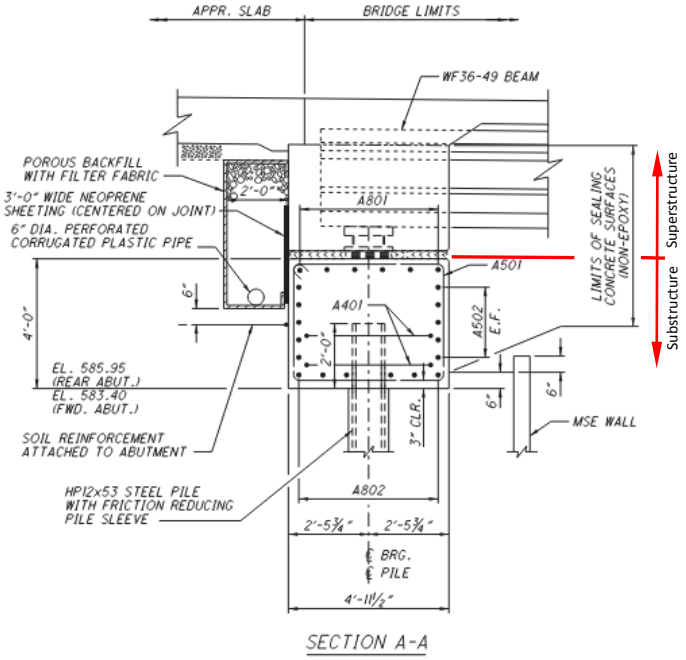


Figure 7-315: Typical section through a semi-integral

Abutment Bridge Elements

Description

These elements define abutments.

Element Number	Classification	Name	Units	Description	Condition State Table
215	NBE	Reinforced Concrete Abutment	FT	Reinforced concrete abutments, including the material retaining the embankment and monolithic wingwalls and abutment extensions.	Reinforced Concrete
216	NBE	Timber Abutment	FT	Timber abutments, including the sheet material retaining the embankment, integral wingwalls, and abutment extensions.	Timber
217	NBE	Masonry Abutment	FT	Those abutments constructed of block or stone, including integral wingwalls and abutment extensions. The block or stone may be placed with or without mortar.	Masonry
218	NBE	Other Abutments	FT	Abutment systems, including the sheet material retaining the embankment, and integral wingwalls and abutment extensions, constructed of materials not covered by other elements.	Other Materials
219	NBE	Steel Abutment	FT	Steel abutments, including the sheet material retaining the embankment, and monolithic wingwalls and abutment extensions. For all abutments regardless of protective systems.	Steel
830	ADE	Abutment Backwall	FT	Abutment backwall of all material types extending from the abutment seat to the underside of deck.	Reinforced Concrete/ Timber/ Masonry/ Steel/ Other Materials

Abutment Bridge Elements - Continued

Quantity Calculation - Abutment

Sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.

Quantity Calculation - Backwall

Sum of the width of the abutment excluding any monolithic or integral wingwalls.

Example

The bridge has a rear and forward abutment with dimensions as shown for a steel girder bridge (Figure 7-316). The wingwalls are integral with the abutment with no construction joints.

- **Report 147 FT** for Element 215.
- **Report 68 FT** for Element 830.

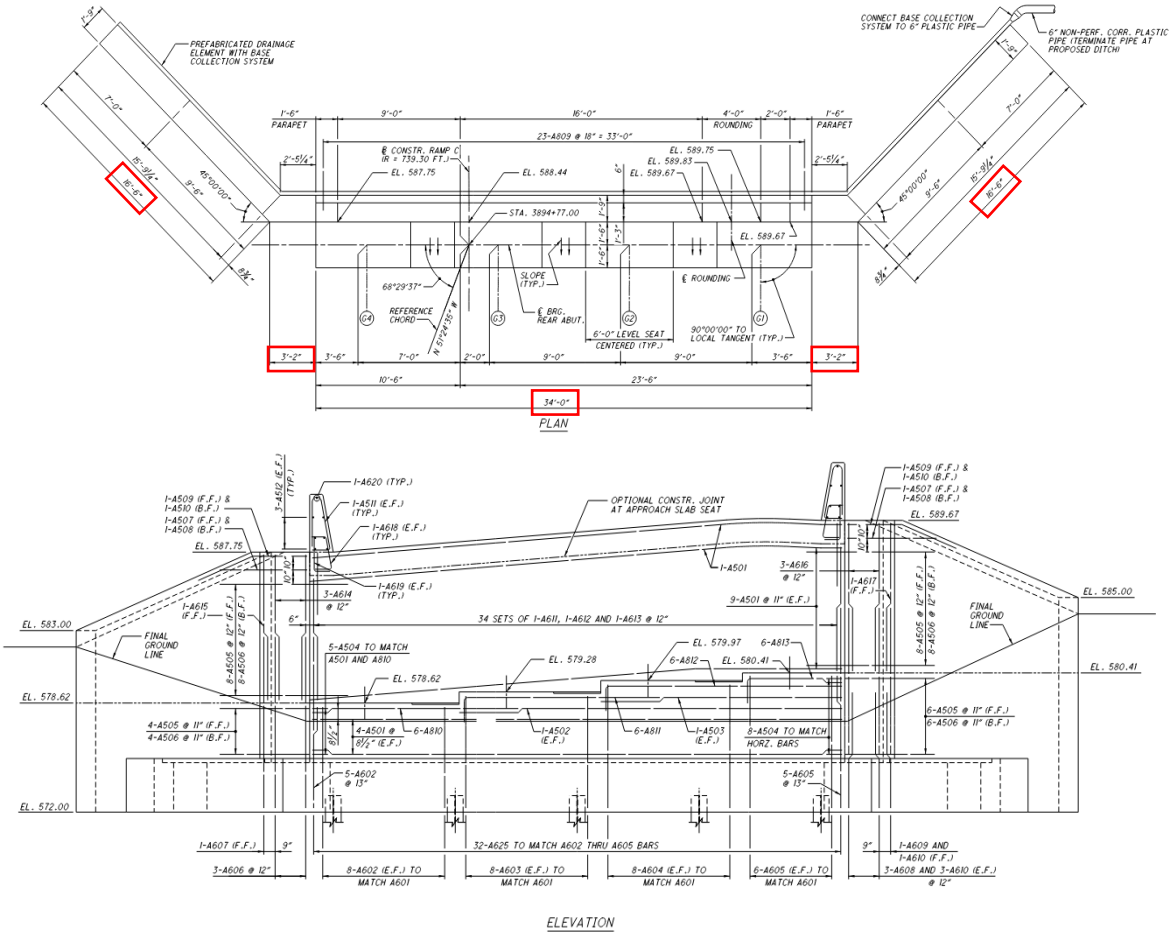


Figure 7-316:Plan and elevation of bridge abutment with integral wingwalls and backwall.

Column Bridge Elements

Description

These elements define all columns, regardless of protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
202	NBE	Steel Column	EA	All steel columns regardless of protective system.	Steel
203	NBE	Other Column	EA	All columns constructed of materials not covered by other elements.	Other Materials
204	NBE	Prestressed Concrete Column	EA	All prestressed concrete columns regardless of protective system.	Prestressed Concrete
205	NBE	Reinforced Concrete Column	EA	All reinforced concrete columns regardless of protective system.	Reinforced Concrete
206	NBE	Timber Column	EA	All timber columns, regardless of protective system.	Timber

Quantity Calculation

Sum of the number of columns.

Element Commentary

Element 203 is intended for columns constructed of composite materials, or other materials that cannot be classified using any other elements. This element is not intended for columns with protective jackets as those should be rated under the primary structural material.

Pier Wall Bridge Elements

Description

This element defines pier walls, regardless of protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
210	NBE	Reinforced Concrete Pier Wall	FT	Reinforced concrete pier walls.	Reinforced Concrete
211	NBE	Other Pier Wall	FT	Those pier walls constructed of materials not covered by other elements.	Other Materials
212	NBE	Timber Pier Wall	FT	Those timber pier walls that include pile, timber sheet material, and filler.	Timber
213	NBE	Masonry Pier Wall	FT	Those pier walls constructed of block or stone. The block or stone may be placed with or without mortar.	Masonry

Quantity Calculation

Sum of the lengths of the pier walls measured along the skew angle.

Pier Cap Bridge Elements

Description

These elements define pier caps that support girders and transfer loads to piles, columns, or pier walls where there is a change in section or material between the pier cap and wall (i.e. wall pier with a wider cap) regardless of protective systems.

Element Number	Classification	Name	Units	Description	Condition State Table
231	NBE	Steel Pier Cap	FT	For all steel pier caps regardless of protective system.	Steel
233	NBE	Prestressed Concrete Pier Cap	FT	For all prestressed concrete pier caps.	Prestressed Concrete
234	NBE	Reinforced Concrete Pier Cap	FT	For all reinforced concrete pier cap.	Reinforced Concrete
235	NBE	Timber Pier Cap	FT	For all timber pier caps.	Timber
236	NBE	Other Pier Cap	FT	Pier caps constructed of materials not covered by other elements.	Other Materials

Quantity Calculation

Sum of the pier cap lengths measured along the skew angle.

Examples

A bridge has two hammerhead style piers at Pier 1 and 2 each with a cap length of 32'-0".

- **Report 64 FT** for Element 234.

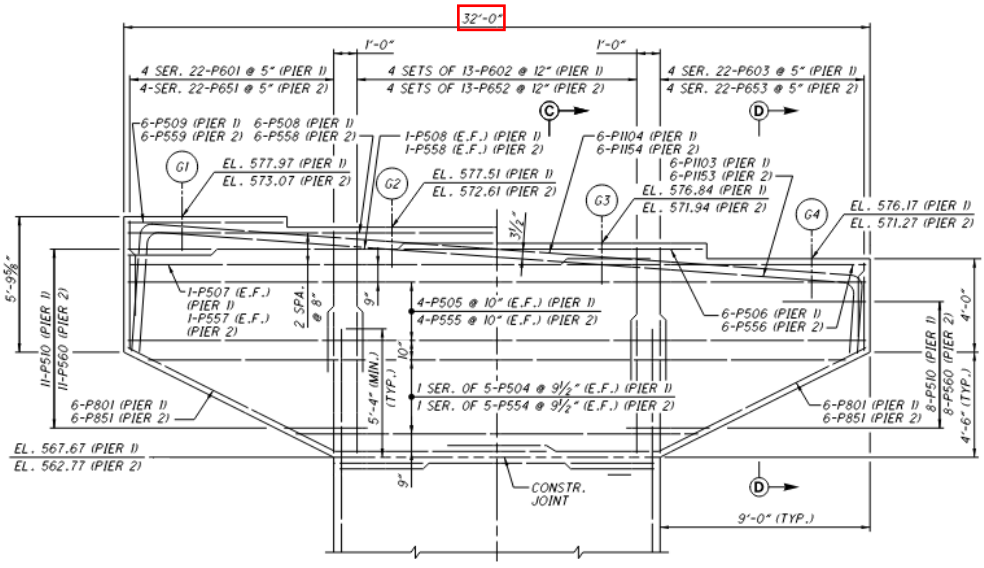


Figure 7-317: Plan elevation of pier cap of a hammerhead style pier.

Pile Bridge Elements

Description

These elements define all piles that are visible for inspection, regardless of protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
225	NBE	Steel Pile	EA	Steel casings with unreinforced concrete or steel piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection. For all steel piles regardless of protective system.	Steel
226	NBE	Prestressed Concrete Pile	EA	Prestressed concrete piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection.	Prestressed Concrete
227	NBE	Reinforced Concrete Pile	EA	Reinforced concrete piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection.	Reinforced Concrete
228	NBE	Timber Pile	EA	Timber piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection.	Timber
229	NBE	Other Pile	EA	Piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection, constructed of materials not covered by other elements.	Other Materials

Quantity Calculation

Sum of the number of piles visible for inspection.

Pile Bridge Elements - Continued

Examples

A structure is supported by an intermediate pile bent with three exposed steel piles (Figure 7-318).

- **Report 3** for Element 225.

Figure 7-318: Steel intermediate pile bent.

An underwater inspection identified two exposed steel piles at Pier 1 and one exposed pile at Pier 2 due to scour.

- **Report 3** for Element 225.

Pile Cap/Footing Bridge Elements

Description

This element defines reinforced concrete pile caps and footings.

Element Number	Classification	Name	Units	Description	Condition State Table
220	NBE	Reinforced Concrete Pile Cap/Footing	FT	Reinforced concrete pile caps/footings that are visible for inspection, including pile caps/footings exposed from erosion or scour or visible during an underwater inspection. The exposure may be intentional or caused by erosion or scour.	Reinforced Concrete

Quantity Calculation

Sum of the length of the exposed portion of the footings or pile caps along the skew angle.

Column Tower/Trestle Bridge Elements

Description

These elements define built up steel truss or framed (steel or timber) tower supports, and is for all towers regardless of protective system.

Element Number	Classification	Name	Units	Description	Condition State Table
207	NBE	Steel Tower	FT	Steel built-up or framed tower supports regardless of protective system.	Steel
208	NBE	Timber Trestle	FT	Framed timber supports. For all timber trestle/towers, regardless of protective system.	Timber

Quantity Calculation

Sum of the heights of built-up or framed tower supports.

Element Commentary

Element 207 is intended to be used for truss-framed tower supports or built-up steel towers. It is intended to capture large supports and towers associated with suspension bridges, cable stayed bridges, movable bridges, or similar structural configurations.

Element 208 is intended to be used for truss framed trestle or towers. It is intended to capture large supports and towers associated with large deck truss bridges.

7.7.2.4 Culvert

A culvert is a structure designed hydraulically to take advantage of submergence to increase water carrying capacity. Culverts, as distinguished from bridges, are usually covered with embankment (greater than 24" fill depth over the top) and are composed of structural material around the entire perimeter.

Regardless of the culvert foundation type, elements under Chapter 7.7.2.3 – Substructure will not apply.

Culvert Elements

Description

These elements define all culverts, regardless of protective system, including box, arched, round, or elliptical shapes.

Element Number	Classification	Name	Units	Description	Condition State Table
240	NBE	Steel Culvert	FT	Steel culverts, including arched, round, or elliptical pipes.	Steel and Culvert
241	NBE	Reinforced Concrete Culvert	FT	Reinforced concrete culverts, including box, arched, round, or elliptical shapes.	Reinforced Concrete and Culvert
242	NBE	Timber Culvert	FT	All timber culverts.	Timber and Culvert
243	NBE	Other Culvert		Culverts constructed of materials not covered by other elements, including arches, or round or elliptical pipes.	Other Materials and Culvert
244	NBE	Masonry Culvert	FT	Masonry block or stone culverts.	Masonry and Culvert
245	NBE	Prestressed Concrete Culvert	FT	All prestressed concrete culverts.	Prestressed Concrete and Culvert
835	ADE	Culvert End Treatment	EA	All culvert end treatments regardless of material type.	-
845	ADE	Roadway over Structure	EA	Roadway over culverts and filled arch structures.	Wearing Surface

Quantity Calculation - Culvert

Flow line length of the barrel times the number of the barrels.

Quantity Calculation – Culvert End Treatment

Sum of each end of the culvert (inlet and outlet) regardless of the end treatment and material type.

A typical culvert will have two end treatments coded for Element 835.

Quantity Calculation – Roadway over Structure

Sum of each distinct portion of the roadway over the structure.

A typical non-bridge structure will have one roadway coded over the structure unless there is a divided highway or multiple roads that cross the structure.

Commentary

Element 835 – Culvert End Treatment condition states should reference the predominant material type of the headwall, endwall, wingwall and/or end sections.

Elements 835 and 845, the Condition Rating will be an overall summary of the condition of each item, with any isolated defect affecting the stability, performance, or capacity of the culvert controlling the condition rating.

Culvert Elements - Continued

Examples

A double barrel elliptical corrugated metal arch passes under the roadway with a culvert length of 45'-10" (Figure 7-319).

- **Report 92 FT** for Element 240.
- **Report 2** for Element 835 (1 EA for the inlet and outlet ends of the structure).
- **Report 1** for Element 845 (only one roadway passes over the structure).

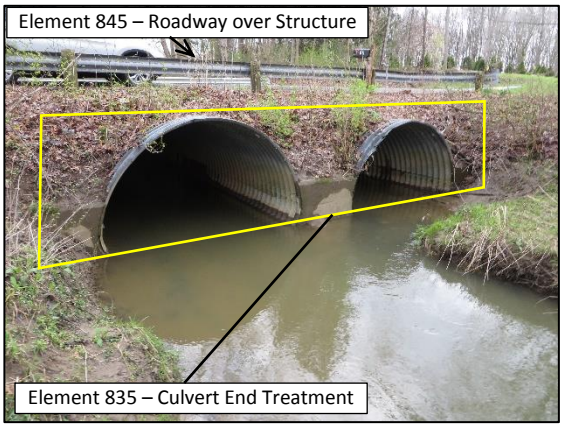


Figure 7-319: Culvert structure elevation.

7.7.3 Element Level Condition States

All elements have four defined condition states. The severity of multiple distress paths or deficiencies is defined in the following tables and within the AASHTO Manual for Bridge Element Inspection (MBEI) for each condition state based on the material type. Specific defect codes as shown in AASHTO MBEI are not required in Ohio. The general intent of the condition states is as follows: Condition State 1 (CS1) – Good, Condition State 2 (CS2) – Fair, Condition State 3 (CS3) – Poor, and Condition State 4 (CS4) – Severe. Photo examples for each material type and each condition rating can be found in the AASHTO MBEI. Spatial area estimates diagrams can be found in Chapter 7.7.1.3 and also AASHTO MBEI.

Elements that are entirely below ground and not accessible for inspection, such as piles and pile caps/footings, are not intended to be reported until they become exposed and visible for inspection. However, element data can be reported for elements that are not visible for inspection, or may become visible for inspection and subsequently covered, by reporting the best available data for those elements.

In the following tables the definition of CS4 implies that generally the condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; **or** a structural review has been completed and the defect(s) impact strength or serviceability of the element or bridge. Structural review is defined in Chapter 7.7.1.1.

Information regarding the condition states for the material types can be found within these groups:

- Reinforced Concrete
- Prestressed Concrete
- Concrete Protective Coating
- Steel
- Steel Protective Coating
- Timber
- Masonry
- Other Materials
- Wearing Surface
- Joints
- Bearings
- Truss Gusset Plates
- Pins/Hangers/Hinges
- Culvert

Reinforced Concrete Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Delamination/ Spall/Patched Area	None.	Delamination. Small spall (<1" deep or <6"diameter). Patched area that is sound.	Large spall (>1" deep or >6" diameter). Patched area that is unsound or showing distress.	Spalls causing debonded reinforcement (360° exposure), hot spots, holes in deck, or loss of bearing area.
Exposed Rebar	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Debonded (360° exposure) from concrete. Exposed reinforcement splices/laps. Section loss requiring structural review.
Efflorescence/ Rust Staining	None.	Surface white without build-up or leaching without rust staining.	Heavy build up of efflorescence. Rust staining.	
Cracking	Insignificant cracks or moderate width cracks that have been sealed.	Unsealed moderate width cracks, or unsealed moderate pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	Wide flexural cracks at midspan or over a pier on continuous spans. Wide shear cracks near the supports.
Abrasion/Wear	None.	Exposed coarse aggregate but the aggregate remains secure within concrete.	Coarse aggregate which is loose or has popped out of the concrete matrix.	
Settlement	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review. Visible misalignment of the bridge rail, joints, or levelness of substructure units.	Exceeds tolerable limits. Misalignment causing immediate safety concern.
Scour	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined. Exposed footing >1' high or <1' depth of undermining. Scour has exposed <10% of the pile or drilled shaft height.	Exposed footing with undermining >1' depth or scour has exposed >10% of the pile or drilled shaft height.

Reinforced Concrete Condition States - Continued

Commentary

Fire damage to reinforced concrete members should be documented based on the defects the fire damage causes, from scaling of the concrete surface to spalling, cracking etc.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Examples can be found in the AASHTO MBEI under the various defects for reinforced concrete.

Prestressed Concrete Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Delamination/ Spall/Patched Area	None.	Delamination. Small spall (<1" deep or <6"diameter). Patched area that is sound.	Large spall (>1" deep or >6" diameter). Patched area that is unsound or showing distress.	Spalls causing debonded reinforcement/ strands (360° exposure), hot spots, holes in deck.
Exposed Rebar	None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	Debonded (360° exposure) from concrete. Exposed reinforcement splices/laps. Section loss requiring structural review.
Exposed Prestressing/ Post-tensioning	None.	Present without section loss.	Present with section loss or exposed strands <25% of the beam width.	Broken stands or wires, debonded strands, or exposed stands >25% of the beam
Cracking	Insignificant cracks or moderate width cracks that have been sealed.	Moderate width cracks or moderate pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	Wide flexural cracks at midspan or over a pier on continuous spans. Wide shear cracks near the supports.
Efflorescence/ Rust Staining/ Leaking Shear Keys	None.	Surface white without build-up or leaching without rust staining. Evidence of leaking.	Heavy build up with or without rust staining. Active leaking.	
Abrasion/Wear	None.	Exposed coarse aggregate but the aggregate remains secure within concrete.	Coarse aggregate which is loose or has popped out of the concrete matrix.	
Live Load Movement (Box Beams)	None.	Minor misalignment but no movement under live load.	Minor independent beam movement under truck loading only.	Groups of 3 or 4 beams act independently from others.
Settlement	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review. Visible misalignment of the bridge rail, joints, or levelness of substructure units.	Exceeds tolerable limits. Misalignment causing immediate safety concern.

Prestressed Concrete Condition States - Continued

Commentary

Post-tensioned concrete members should be included and rated using the Prestressed elements and condition states tables.

When exposed or broken prestressing strands are discovered, for each broken or exposed strand, consider the adjacent strand(s) in the same row as ineffective. Consideration should also be given to the strand in the row directly above the exposed strand.

Fire damage to reinforced concrete members should be documented based on the defects the fire damage causes, from scaling of the concrete surface to spalling, cracking etc.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Examples can be found in the AASHTO MBEI under the various defects for prestressed concrete.

Concrete Protective Coating Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Wear	None.	Underlying concrete is not exposed. Coating is showing wear from UV exposure.	Underlying concrete is not exposed or thickness of protective coating is reduced.	Underlying concrete exposed. Protective system is no longer effective.
Effectiveness	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.

Commentary

Examples can be found in the AASHTO MBEI under the various defects for concrete protective coating.

Steel Condition States				
Description				
Defect	**CS1 GOOD**	**CS2 FAIR**	**CS3 POOR**	**CS4 SEVERE**
Corrosion	None.	Freckled rust. Corrosion of steel has initiated.	Section loss is evident or pack rust is present, but does not warrant structural review.	Section loss affecting capacity or altering intended load path. Corrosion hole.
Cracking	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	Crack in NSTM, crack not arrested in a tension region, crack greater than 2" long in compression region, or crack that requires structural review.
Connection	Connection in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion but does not warrant structural review.	Missing fasteners resulting in altered load path, missing fasteners in primary member connection/splice or gusset plate, any cracks between member and gusset plate. Pack rust causing distortion and compromised the connection with broken fasteners or welds.
Distortion	None.	Distortion not requiring mitigation or that has been mitigated.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	Evidence of significant distortion or torsion, especially in compression members.
Settlement	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Exceeds tolerable limits and causes misalignment with safety hazard or structural distress.

Steel Condition States - Continued

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Scour	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review. Scour has exposed less than 10% of the pile or drilled shaft height.	Exceeds critical limits established for the bridge.

Commentary

Corrosion defects requiring a Condition State 4 rating and structural review include section loss greater than 30% to the web over supports and section loss greater than 25% to flanges in maximum positive or negative moment regions (midspan for simple span and midspan and over supports for continuous spans) and greater than 20% cross-sectional area loss to any portion of piles.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Examples can be found in the AASHTO MBEI under the various defects for steel.

Steel Protective Coating Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Chalking	None.	Surface dulling.	Loss of pigment.	
Peeling/ Bubbling/ Cracking	None.	Initiated with cracking in finish coat.	Intermediate or prime coat exposed with cracking.	Exposure of bare metal.
Weathering Steel (Oxide Film Degradation Color/ Texture Adherence)	Yellow-orange or light brown for early development. Chocolate/ purple brown for fully developed. Tightly adhered, capable of withstanding hammering or vigorous wire brushing.	Granular texture. Yellow-orange color with localized flaking.	Dark brown color; flakes <1/2" diameter.	Dark black color, flakes >1/2" diameter, or laminar sheets.
Corrosion	None.	Initiated, freckled rust.	Corrosion present.	Laminar corrosion.
Effectiveness	Fully effective.	Substantial effectiveness.	Limited effectiveness.	Failed; no protection of the underlying metal.

Commentary

Examples can be found in the AASHTO MBEI under the various defects for steel protective coating.

Timber Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Connection	Connection in place and functioning as intended.	Loose fasteners are present, but the connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners. Does not warrant structural review.	25% of connection with missing or broken fasteners at connections.
Decay/ Abrasion/ Wear/ Section Loss	None.	Affects less than 10% of member section.	Affects 10% or more of member section but does not warrant structural review.	Section loss affecting capacity or altering intended load path.
Check/ Shake	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the member thickness and not in a tension zone.	Penetrates more than 50% of the member thickness, or up to 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber)	None.	Crack that has been arrested through effective measures.	Identified crack that is not arrested but does not require structural review.	Horizontal or diagonal cracks with length greater than member depth or cracks that extend through the thickness of the member.
Split/ Delamination (Timber)	None.	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth but does not warrant structural review.	Split at midspan of a simply supported span or over the pier of a continuous span. Split pile causes a loss of bearing area.
Distortion	None.	Exists but does not require mitigation. Distortion that has been mitigated.	Distortion that requires mitigation that has not been addressed.	Global deformation such as warping or sag that causes a safety hazard or structural distress, such as cracking or broken connections.
Settlement	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Exceeds tolerable limits and causes misalignment with safety hazard or structural distress.

Timber Condition States - Continued

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Scour	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review. Scour has exposed less than 10% of the pile or drilled shaft height.	Exceeds critical limits established for the bridge.
Damage	None.	Repaired or minor impact damage. Fire damage with surface charring.	Impact damage present that does not warrant structural review. Fire damage with surface charring and delaminations.	Fire damage causing loss of cross-sectional area.

Commentary

Decay/section loss defects requiring a Condition State 4 rating and structural review include section loss greater than 15% to the web over supports and section loss greater than 25% to flanges in maximum positive or negative moment regions (midspan for simple span and midspan and over supports for continuous spans) and greater than 25% cross-sectional area loss to any portion of piles.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Examples can be found in the AASHTO MBEI under the various defects for timber.

Masonry Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Delamination/ Spall/ Patched Area	None.	Delamination. Small spall (<1" deep or <6"diameter). Patched area that is sound.	Large spall (>1" deep or >6" diameter). Patched area that is unsound or showing distress.	Loss of bearing area of stones or superstructure above.
Efflorescence/ Rust Staining	None.	Surface white without build-up or leaching without rust staining.	Heavy build up with or without rust staining.	
Mortar Breakdown (Masonry)	None.	Cracking or voids in less than 10% of the joints.	Cracking or voids in 10% or more of the joints.	
Split/Spall (Masonry)	None.	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant structural review.	
Patched Area (Masonry)	None.	Sound patch.	Unsound patch.	
Masonry Displacement	None.	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	Block or stone shifted causing stability issues or loss of bearing area of stones or superstructure above.
Settlement	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Exceeds tolerable limits. Misalignment causing immediate safety concern.
Scour	None.	Exists within tolerable limits or has been arrested with effective countermeasures. Exposed footing less than 1 ft. high.	Exceeds tolerable limits but is less than the critical limits determined. Exposed footing >1' high or <1' depth of undermining.	Exposed footing with undermining >1' depth

Commentary

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Examples can be found in the AASHTO MBEI under the various defects for masonry.

Other Materials Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Corrosion	None.	Freckled rust. Corrosion of material has initiated.	Section loss is evident, or pack rust is present, but does not warrant structural review.	Section loss affecting capacity or altering intended load path. Corrosion hole.
Deterioration	None.	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	Loss of section warrants structural review. Deterioration holes in member.
Cracking (metal)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.	Crack not arrested in a tension region, active crack in a compression region, or crack that requires a structural review.
Cracking (Other)	Insignificant cracks or moderate-width cracks that have been sealed.	Unsealed moderate-width cracks or unsealed moderate pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	
Connection	Connection in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion but does not warrant structural review.	Missing fasteners resulting in altered load path, missing fasteners in primary member connection/splice or gusset plate, any cracks between member and gusset plate.
Distortion	None.	Distortion not requiring mitigation or that has been mitigated.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	Evidence of significant distortion or torsion, especially in compression members.
Settlement	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Exceeds tolerable limits and causes misalignment with safety hazard or structural distress.

Other Material Condition States - Continued

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Scour	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits but is less than the critical limits determined by scour evaluation and does not warrant structural review.	Exceeds critical limits established for the bridge.

Commentary

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Wearing Surface Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Delamination/ Spall/ Patched Area/ Pothole	None.	Delamination. Small spall (<1" deep or <6"diameter). Patched area that is sound. Shallow pothole.	Large spall (>1" deep or >6" diameter). Patched area that is unsound or showing distress. Partial-depth pothole	Full depth spall, deck surface or rebar is exposed. Full-depth pothole. Patched with non-similar materials (asphalt patches in concrete decks).
Cracking	Insignificant cracks or moderate width cracks that have been sealed.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	Cracks with active leakage or saturation on the underside of the deck.
Rutting	None.	Rutting <1" deep.	Rutting >1" deep.	
Abrasion/ Wear	None.	Exposed coarse aggregate but the aggregate remains secure within concrete.	Coarse aggregate which is loose or has popped out of the concrete matrix.	
Effectiveness	Fully effective. No evidence of leakage or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	No longer effective.

Commentary

Fire damage to the wearing surface should be documented based on the defects the fire damage causes, from scaling of the concrete surface to spalling, cracking etc.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and is no longer effectively protecting the deck element.

Examples can be found in the AASHTO MBEI under the various defects for wearing surface.

Joint Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Leakage	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less that a free flow of water.	Free flow of water through the joint.
Seal Adhesion	Fully adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of the joint height, but still some adhesion.	Complete loss of adhesion.
Seal Damage	None.	Seal abrasion without punctures.	Punctured, ripped, or partially pulled out	Punctured completely through, pulled out, or missing.
Seal Cracking	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Debris Impaction	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header	Sound. No spall, delamination, or patched areas.	Edge delamination or small spall (<1" deep or <6"diameter). Patched area that is sound.	Large spall (>1" deep or >6" diameter). Exposed rebar. Unsound patch. Delamination area that makes the joint loose.	Spall, delamination, patched area, or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage	None.	Freckled rust. Metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal, or impact damage. Joint still functioning as intended.	Metal cracking, section loss, damage, or connection failure that prevents the joint from functioning as intended.

Commentary

All components of a joint should be included in the condition rating of the joint. The components may include the joint header, armor, seal, adhesives, fasteners, and joint troughs

Leakage defect will not apply to open joints, sliding plate joints, or assembly joints without a seal.

When drainage troughs are designed as part of the joint, defects regarding the trough should be considered when assigning condition state ratings to the length of the joint.

Examples can be found in the AASHTO MBEI under the various defects for joints.

Bearing Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Corrosion	None.	Freckled rust. Corrosion of steel has initiated.	Section loss is evident, or pack rust is present, but does not warrant structural review.	Section loss or pack rust restricting movement or causing alignment issues.
Connection	Connection in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion but does not warrant structural review.	Missing or broken fasteners has altered the load path, alignment, or prevents movement.
Movement	Free to move.	Minor restriction of movement.	Movement restricted but does not warrant structural review.	Movement is restricted and causing structural distress or excessive movement causing pumping.
Alignment	Lateral and vertical alignment is as expected for temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant structural review.	Limits of lateral or vertical alignment. Location is opposite for expected temperature conditions.
Bulging/ Splitting/ Tearing	None.	Bulging <15% of the member thickness. Minor splitting.	Bulging between 15% to 30% of the member thickness. Splitting or tearing. Bearing's surfaces not parallel.	Bulging >30% of the member thickness. Splitting or tearing exposing steel plates with corrosion or section loss.
Loss of Bearing Area	None.	Bearing area loss <10%.	Bearing area loos between 10%-20%.	Bearing area loss >20%.

Commentary

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Examples can be found in the AASHTO MBEI under the various defects for bearings.

Truss Gusset Plate Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Corrosion/ Section Loss	None.	Freckled rust, minor surface corrosion, or section <10% of plate thickness.	Section loss between 10% to 25% of plate thickness.	Section loss >25% of plate thickness or significant section loss along primary stress and Whitmore areas.
Bowing	None.	Minor bowing due to pack rust or inadequate fill plate, up to the thickness of the gusset plate.	Bowing due to pack rust or inadequate fill plate, greater than the thickness of the gusset plate.	Bowing along free edges not induced by pack rust or as-built condition. Any change in bowing >1/4" from previous inspection.

Commentary

These condition states are for the primary gusset plates on a truss bridge that connect the chord members.

The high stress regions of a gusset plate include areas around the perimeter of each member and the area between the web (vertical and diagonal) members and the chord (upper or lower) members (Whitmore areas) see Figure 7-207.

These defects are specific to truss primary gusset plates and should be considered when assigning condition states to this element in addition to the material defects noted in the previous tables.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Pin/Hanger/Hinge Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Connection	Connection in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion but does not warrant structural review.	Load path is altered. Pack rust shifting hanger on pin. Missing cotter pins or nuts or excessive wear to the pin or pin plates.
Movement	Free to move.	Minor restriction of movement.	Movement restricted but does not warrant structural review.	Movement is restricted and causing structural distress or excessive movement in relation to the design.
Alignment	Lateral and vertical alignment is as expected for temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment but does not warrant structural review.	Limits of lateral or vertical alignment. Location is opposite for expected temperature conditions.
Loss of Bearing Area	None.	Bearing area loss <10%. Signs of wear visible on pin or pin plates.	Bearing area loos between 10%-20%. Wear groove on pin or pin plate <1/8" deep.	Bearing area loss >20%. Wear groove on pin or pin plate >1/8" deep.

Commentary

These defects are specific to pin and hangers or hinges and should be considered when assigning condition states to these elements in addition to the material and bearing defects noted in the previous tables.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

Culvert Condition States

Description

Defect	CS1 GOOD	CS2 FAIR	CS3 POOR	CS4 SEVERE
Distortion	None.	Shape with <6% diameter change from as-built.	Shape with >6% diameter change from as-built shape.	Distortion causing additional defects such as settlement, seam openings etc.
Backfill Infiltration/ Water Exfiltration	None.	Signs of backfill infiltration or water exfiltration.	Active infiltration or water exfiltration. Soil visible through joints or seams.	Voids along culverts or water flowing behind culvert.
Seam Opening	No opening.	Seam <1/8" opening.	Seam >1/8" opening, or cracks at bolt holes <1" long.	Crack at bolt > 1" long.

Commentary

These defects are specific to culverts and should be considered when assigning condition states to culvert elements in addition to the material defects noted in the previous tables.

Defects noted for Condition State 4 are not exhaustive. Condition State 4 includes any defect in excess of Condition State 3 and warrants a structural review to determine the strength or serviceability of the element or bridge; or a structural review has determined the defects impact the strength or serviceability of the element or bridge.

7.7.4 Appraisal

The data items in this section provide information about potential bridge vulnerabilities. These data items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge. The data for these items typically remain static once a bridge has been initially inventoried and inspected and shall be verified during subsequent inspections.

Item ID	Data Item
B.AP.01	Approach Roadway Alignment
B.AP.02	Overtopping Likelihood
B.AP.03	Scour Vulnerability
B.AP.04	Scour Plan of Action
B.AP.05	Seismic Vulnerability

Approach Roadway Alignment		
Item ID	B.AP.01	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max digits: 1	

Specification

Report the speed reduction at the bridge using one of the following codes.

Code	Description
G	Good
F	Fair
P	Poor

Commentary

This item identifies bridges that do not function adequately due to the horizontal or vertical alignment of the bridge and approach roadway. It is not intended that the alignment be compared to current standards, but rather to the existing roadway alignment.

The basic criterion is how the alignment of the bridge and approach roadway relates to the general highway alignment for the section of highway the bridge carries.

Do not consider speed reductions due to the bridge width or intersecting highways when reporting this item.

The posted speed at the bridge is compared to the posted speed of the general highway segment. Operating speed at the bridge is used in place of posted speed at the bridge when a posted speed is not present at the bridge. Operating speed of the general highway segment is used in place of posted speed of the general highway segment when a posted speed is not present on the general highway segment.

Use code G when the speed is no different at the bridge than the rest of the highway segment that crosses the bridge.

Use code F when the speed is noticeably different (moderate reduction) at the bridge than the rest of the highway segment that crosses the bridge.

Use code P when the speed is substantially different (major reduction) at the bridge than the rest of the highway segment that crosses the bridge.

Overtopping Likelihood		
Item ID	B.AP.02	SNBI
Frequency	Each Inspection	
Format	Alphanumeric Max digits: 1	

Specification

Report the likelihood of the waterway overtopping the bridge using one of the following codes.

Code	Description
0	Never
1	Remote –once every 100 years or less frequently
2	Very low – once every 51 to 99 years
3	Low – once every 26 to 50 years
4	Moderate – once every 11 to 25 years
5	High – once every 3 to 10 years
6	Very High – once every 2 years or more frequently

Commentary

An overtopping occurrence is when the waterway overtops the riding surface carried on the bridge.

Bridge overtopping likelihood, since the year built (B.W.01 – Year Built), is typically determined from historical bridge inspection or maintenance records, hydraulic studies, local residents/landowners, and/or site indicators including highwater marks on the bridge or its surroundings, debris remains on bridge upper members, etc.

For newer bridges with limited historical inspection or maintenance information, hydraulic design information can be used to establish an overtopping likelihood.

This item does not apply to the likelihood of the waterway overtopping approach roadways.

Scour Vulnerability

Item ID	B.AP.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max digits: 1	

Specification

Report the scour vulnerability of the bridge using one of the following codes.

Code	Description
0	Scour appraisal has not been completed.
A	Scour appraisal completed. Bridge determined to be stable for scour.
B	Scour appraisal completed. Bridge determined to be stable for scour, dependent upon designed, and functioning countermeasures.
C	Scour appraisal completed. Bridge could become unstable for scour. Temporary (not designed) countermeasure installed to mitigate scour. Bridge is scour critical.
D	Scour appraisal completed. Bridge is, or may become, unstable for scour. Bridge is scour critical.
E	Scour appraisal has not been completed. Temporary (not designed) countermeasure installed to mitigate scour.
U	Scour appraisal has not been completed due to unknown foundations.

Do not report this item if the bridge does not cross over a waterway as indicated in Item B.F.01 – Feature Type.

Commentary

The intent of this item is to report the status and vulnerability determination from scour appraisals required by the NBIS.

Every bridge over a waterway carrying public vehicular traffic a Scour Appraisal is required. For requirements of scour appraisals and procedures see Chapter 3.4.3.7 and Appendix D.

If the scour appraisal has been completed within the AssetWise form SNBI Scour Appraisal, B.AP.03 still needs to be coded based on the results and recommendation provided on the form for the level of appraisal completed.

Refer to Item B.C.09 – Channel Condition Rating, Item B.C.10 – Channel Protection Condition Rating, and Item B.C.11- Scour Condition Rating in the Component Condition Ratings section to address field observed scour conditions and the effect on bridge components.

Use code B when designed, installed, and functioning countermeasures are used to address potential scour and to maintain bridge stability for new or existing bridges, or bridges with unknown foundations.

Use code B when the Scour Appraisal Team determines that the in-place, non-designed countermeasures are fully functioning and are appropriate to mitigate the risk of scour.

Use code C for bridges that could become unstable for the potential scour, and temporary countermeasures are installed that were not designed.

Scour Plan of Action		
Item ID	B.AP.04	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report weather the bridge has a scour plan of action (POA) implemented using one of the following codes.

Code	Description
0	A scour POA is not required.
N	A scour POA is required, but not implemented.
Y	A scour POA is required and implemented.

Do not report this item is the bridge does not cross over a waterway as indicated in Item B.F.01 – Feature Type.

Commentary

The NBIS requires a scour POA for bridges over water that are determined to be scour critical or have unknown foundations.

A bridge is scour critical when C, D, or E is reported for Item B.AP.03 – Scour Vulnerability or when U is reported for Item B.AP.03 – Scour Vulnerability for unknown foundations.

More information on scour POA can be found at the FHWA Hydraulics Engineering website: https://www.fhwa.dot.gov/engineering/hydraulics/bridgehyd/poa.cfm

Use code 0 is a bridge was considered scour critical, but now has designed, installed, and fully functional scour countermeasures.

A scour POA is a document that addresses, based on risk, a schedule for repair or installation of scour countermeasures, and/or the monitoring, inspection, closing, and opening a bridge to traffic during and after flood events to protect the traveling public.

A scour POA is implemented when those responsible for actions under the plan are aware of their responsibilities, and are exercising them when called for during or after a triggering event.

A bridge should have a scour POA when it could become unstable for scour, and temporary countermeasures are installed that were not designed.

A Scour POA template can be found in Appendix H.

Seismic Vulnerability

Item ID	B.AP.05	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 1	

Specification

Report the seismic vulnerability of the bridge using one of the following codes.

Code	Description
0	Seismic evaluation not completed.
N	Bridge does not require seismic evaluation due to low anticipated ground motion or agency prioritization.
A	Seismic evaluation completed. Bridge determined to meet the agency's performance criteria established for the evaluation without need for retrofit.
B	Seismic evaluation completed. Satisfactory performance is dependent upon a designed, installed, and functioning retrofit. Retrofit is in place.
C	Seismic evaluation completed. Satisfactory performance is dependent upon a designed, installed, and functioning retrofit. Partial retrofit is in place.
D	Seismic evaluation completed. Satisfactory performance is dependent upon a designed, installed, and functioning retrofit. Retrofit is not in place.

Commentary

Refer to Ohio's Bridge Design Manual for guidance on evaluation criteria and vulnerability of bridges.

For bridges that have received major rehabilitation or designed based on the July 15, 2016 ODOT Bridge Design Manual, may use Code A.

For all other bridges use Code N unless evaluation was completed and then Code A.

Use code C when only certain portions of the bridge have been retrofitted but not all portions of the bridge have been retrofitted to meet the requirements of Ohio's Bridge Design Manual.

7.7.5 Work Events

The data items in this section provide information about the year the bridge was built, and subsequent work performed on the bridge. These items provide information to assist in identifying the age of the bridge, support condition rating changes, and assess service life.

Item B.W.01 – Year Built is considered part of the Primary Data Set and has a one-to-one relationship with a bridge. This item will remain static once a bridge has been inventoried.

Items B.W.02 – Year Work Performed and B.W.03 – Work Performed are considered part of the Work Data Set and have a many-to-one relationship with the bridge. These items are reported for each year regardless of whether work was completed in that year.

Item ID	Data Item
B.W.01	Year Built
B.W.01.01	Major Reconstruction Date
B.W.02	Year Work Performed
B.W.03	Work Performed

Year Built					
Item ID	B.W.01				SNBI
Frequency	Initial				
Format	Numeric	Max digits:	4	Decimal places:	0

Specification

Report the year in which original construction was completed and the bridge was able to carry traffic.

For phased construction, report the year in which the first phase was completed and the bridge was able to carry traffic.

Commentary

This date reflects the date when construction was completed, regardless of when the bridge was opened to traffic. Rehabilitation and/or widening of a bridge does not change the year built. If any portion of the bridge remains, the year built does not change.

Provide a best estimate when the year built is unknown; do not assign a default value.

B.W.01 – Year Built should match Item B.ID.01.03 – Date Built.

Major Reconstruction Date		
Item ID	B.W.01.01	Previously ODOT Item 264
Frequency	Initial	
Format	YYYYMMDD	

Specification

Report the day, month, and year of the most recent major reconstruction (rehabilitation) of the structure.

This item cannot be equal to or earlier than Item B.ID.01.03 – Date Built.

Commentary

Replacement of an entire deck, entire superstructure, or work of a greater magnitude should be termed "Major Reconstruction." Beyond these guidelines, "Major Reconstruction" will be a judgmental determination, by a qualified person in the agency.

Some types of work not to be considered as "Major Reconstruction" include, but is not limited to:

- Safety feature (bridge rail, approach rail, impact attenuator) replacement or upgrading.
- Painting of structural steel.
- Overlaying of bridge deck as part of a larger highway re-surfacing project (e.g., overlay carried across bridge deck for surface uniformity).
- Utility work.
- Emergency repair to restore structure integrity of 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 (e.g., adding supplemental substructure unit).

Year Work Performed					
Item ID	B.W.02				SNBI
Frequency	Initial				
Format	Numeric	Max digits: 4		Decimal places: 0	

Specification

Report the year that work was completed on a bridge.

For phased construction, report the year in which the first phase was completed and the bridge was able to carry traffic.

This item is reported for each year regardless of whether work was completed on a bridge in that year.

Commentary

This item identifies when work was completed to improve the functionality of a bridge, prevent deterioration from occurring, preserve a bridge, or restore the strength or performance of a bridge.

Work performed should be identifiable by inspectors conducting an initial inspection following bridge replacement or rehabilitation. For other work types, information can be obtained from the bridge owner, maintenance engineer, or maintenance department. When information is not readily accessible, estimate based on knowledge, observed changes, and condition improvements since the previous inspection, applied stencils or stamps, wear, etc.

Examples

A lane was added in 2016 during a corridor widening project.

- **Report 2016.**

The deck, superstructure, railing, deck joints, and bearings were replaced on existing abutments in 2017.

- **Report 2017.**

All bearings and two of three deck joints were replaced in 2015.

- **Report 2015.**

Major rehabilitation was performed on a deck in multiple stages. The first staged was completed and opened to traffic in 2018. The final stage was completed in 2020.

- **Report 2018.**

Work Performed		
Item ID	B.W.03	SNBI
Frequency	Initial	
Format	Alphanumeric Max characters: 120	

Specification

Report all work completed on the bridge in each year, using one or more of the codes shown in the table below.

Report multiple codes by selecting all that apply.

Report all types of work when improvement, rehabilitation, or preservation work categories were performed in combination (one or more work categories).

Do not report bridge improvement or bridge preservation when the work resulted from replacement of a bridge (including replacement of all culvert barrels), or replacement of the deck, superstructure, or substructure.

Report only major rehabilitation when both major and minor rehabilitation were completed on the same component (e.g., the deck, superstructure, substructure, or culvert).

Do not report routine maintenance or routine repair work.

Do not report when no work is completed or when work is completed that does not correspond with the work included in the following work category tables.

Code	Category	Description
BR1	Bridge replacement	Replaced
IP1	Bridge improvement	Widened
IP2	Bridge improvement	Raised
IP3	Bridge improvement	Strengthened by retrofit
IP4	Bridge improvement	Seismic retrofit
DK1	Deck	Replaced
DK2	Deck	Major Rehabilitation
DK3	Deck	Minor Rehabilitation
DK4	Deck	Overlaid
DK5	Deck	Sealed
DK6	Deck	Coating (New or Replaced)
DK7	Deck	Coating (Preserved)
SP1	Superstructure	Replaced
SP2	Superstructure	Major Rehabilitation
SP3	Superstructure	Minor Rehabilitation
SP5	Superstructure	Sealed
SP6	Superstructure	Coating (New or Replaced)
SP7	Superstructure	Coating (Preserved)

Work Performed - Continued

Item ID	B.W.03	SNBI

Specification - Continued

Code	Category	Description
SB1	Substructure	Replaced
SB2	Substructure	Major Rehabilitation
SB3	Substructure	Minor Rehabilitation
SB5	Substructure	Sealed
SB6	Substructure	Coating (New or Replaced)
SB7	Substructure	Coating (Preserved)
CU2	Culvert	Major Rehabilitation
CU3	Culvert	Minor Rehabilitation
CU4	Culvert	Overlaid
CU5	Culvert	Sealed
CU6	Culvert	Coating (New or Replaced)
CU7	Culvert	Coating (Preserved)
BG1	Bearings	Installed or Replaced
BG2	Bearings	Repaired
JT1	Deck joints	Installed or Replaced
JT2	Deck joints	Repaired
RT1	Bridge railing or transitions	Installed or Replaced
RT2	Bridge railing or transitions	Repaired
SC1	Scour countermeasures	Installed or Replaced
SC2	Scour countermeasures	Repaired
CP1	Channel protection	Installed or Replaced
CP2	Channel protection	Repaired
CH1	Channel	Condition Improved

Commentary

This item is used to indicate work that was completed to improve the functionality of a bridge, prevent deterioration from occurring, preserve a bridge, or restore the strength or performance of a bridge.

Use deck, superstructure, and substructure work codes as applicable, and only when work is performed on span configurations that are not reported as culverts in Item B.SP.01 – Span Configuration Designation (i.e., M, A, or W is reported). Use culvert work codes as applicable, and only when work is performed on span configurations that are reported as culverts in Item B.SP.01 – Span Configuration Designation (i.e., C or V is reported)

Work Performed - Continued		
Item ID	B.W.03	SNBI
Commentary - Continued		

Routine maintenance or routine repair work to be excluded from reporting include actions that may be performed on isolated deficiencies, may be reactive in nature, and do not add measurable service life given the small work quantity. Instead, they are intended to maintain a minimum acceptable performance level. Generally, routine maintenance or routine repairs that are not reported are: deck patching to correct isolated spalls or punctures that are affecting rideability or safety, sidewalk repairs to correct isolated defects that affect public safety, and repair of isolated impact damage to railings or transitions.

Use code BR1 when the bridge is replaced and the same bridge number is retained. This item is generally not reported when a bridge is replaced, because it is preferrable that a new bridge number is assigned.

Use code BR1 when all barrels of a culvert were replaced and the same bridge number is retained.

Use codes IP1, IP2, IP3, and IP4 for functional and seismic improvements. Use code IP3 when the bridge was retrofitted to increase its load capacity beyond the original design capacity.

Use codes DK1, SP1, and SB1 for replacement of the deck, superstructure, and substructure, respectively. Use these codes only when the whole component on the bridge is replaced.

Use codes DK2, SP2, and SB2 or major rehabilitation work. Major rehabilitation is defined as major work required to restore the structural integrity or serviceability of a bridge as well as the work to correct major safety defects. These codes also apply when one or more spans, barrels, or units were replaced, but not all.

Use codes DK3, SP3, and SB3 or minor rehabilitation work, not to include minor repairs. Minor rehabilitation is defined as minor work required to preserve or restore the structural integrity or serviceability of a bridge, as well as the work to correct minor safety defects. For this specification, it generally should include work that affects no more than 25% of the deck area within any span, or 25% of any one substructure unit or culvert barrel.

Use codes CU2 or CU3, as applicable, when culvert invert paving or encasement restores strength or performance, although it may also prevent deterioration.

Use deck, superstructure, substructure, and culvert preservation codes for preventative maintenance and preservation work that may also include some minor repairs.

Use code DK4 for overlay work. Also use codes DK2 or DK3, if applicable based on quantity, when work includes exposing the top mat of deck reinforcing steel.

Work Performed - Continued

Item ID	B.W.03	SNBI

Commentary - Continued

Use codes SP7, SP7, and CU7 when zone coating, spot coating, or overcoating was applied to repair and extend the life of existing coatings.

Use codes CU6 or CU7, as applicable, for culvert pipe invert paving or encasement intended to only prevent deterioration.

Use codes CP1 or CP2 when channel protection work was completed at or adjacent to the bridge to mitigate channel issues that may impact the bridge.

Use code CH1 when the channel was improved by means other than protection systems or in addition to protection systems (e.g., horizontal realignment, excavation of aggregated material, or removal or large debris deposits). Use this code when work was completed at or adjacent to the bridge to mitigate channel issues that may impact the bridge.

Examples

A lane was added during a corridor widening project.

- **Report IP1 – Bridge improvement - Widened**.

A low-build surface sealer was placed on the deck, and deck joints were repaired.

- **Report DK5 – Deck – Sealed**.
- **Report JT2 – Deck joints – Repaired**.

The deck, superstructure, railing, deck joints, and bearings were replaced on existing abutments. Since the railing, deck joints, and bearing replacement resulted from the deck and superstructure replacement:

- **Report DK1 – Deck – Replaced**.
- **Report SP1 – Superstructure – Replaced**.

The deck concrete was removed to just below the top mat of reinforcing steel over 35% of the deck area, the deck was patched and overlaid with a thin epoxy, and the superstructure coating was removed and replaced.

- **Report DK2 – Deck – Major Rehabilitation**.
- **Report DK4 – Deck – Overlaid**.
- **Report SP6 – Superstructure – Coating (New or Replaced)**.

Work Performed - Continued		
Item ID	B.W.03	SNBI
Examples - Continued		

All bearings were replaced, two of three deck joints were replaced, and one deck joint was repaired.

- **Report BG1 – Bearings – Installed or Replaced**.
- **Report JT1 – Deck joints – Installed or Replaced**.
- **Report JT2 – Deck joints – Repaired**.

The far masonry abutment had work performed to correct a local scour hole and the settled and displaced bottom course of masonry stone. The masonry was repositioned and underpinned and a designed riprap scour countermeasure was installed around the abutment.

- **Report SB3 – Substructure – Minor Rehabilitation**.
- **Report SC1 – Scour countermeasures – Installed or Replaced**.

One of six HDPE pipes was replaced, and the remaining pipes had all transverse joints repaired with inner concrete collars. Since this work includes both major and minor rehabilitation on the same component:

- **Report CU2 – Culvert – Major Rehabilitation**.

Girders had minor rehabilitation to restore multiple locations with section loss, the coating was replaced, and bolted cover plates were added to increase strength beyond the original design capacity.

- **Report SP3 – Superstructure – Minor Rehabilitation**.
- **Report SP6 – Superstructure – Coating (New or Replaced)**.
- **Report IP3 – Bridge improvement – Strengthened by retrofit**.

Appendix A: ODOT Manual of Bridge Inspection Revision History

2025 Revision

The 2025 Manual of Bridge Inspection Revision was written to combine the Bridge Inspection and Bridge Inventory and Coding Guide into one manual. Significant changes include reliability based inspection (RBI) procedures and updates to the Ohio Revised Code in regards to inspection intervals, qualification and training requirements, guidance on non-redundant steel tension members (NSTMs), and FHWA's Metric Quality Assurance. The Bridge Inventory and Coding Guide is now combined with the Bridge Inspection Manual and incorporates new items and descriptions based on the Standard Nation Bridge Inventory (SNBI) guidance. Several notable changes in the inspection program since the 2014 revision include:

- Reducing the administrative sections of the manual from 10 chapters to 6 chapters
- Incorporating update to the inspection intervals based on reliability based inspection and Ohio Revised Code updates
- Updating the inspection team leader and program manager requirements and training courses
- Adding the SNBI coding guidance to the Bridge Inspection Manual
- Updating Condition Rating Guidance based on the SNBI updates and Ohio bridge types
- Updating the Element and Condition States for Element Level inspections in accordance with the AASHTO Manual for Bridge Element Level Inspection.
- Updating references to AssetWise bridge inventory database and removed references to ODOT"s BR-86 forms.

The 2025 Manual of Bridge Inspection includes by reference to the following updated manuals:

- FHWA Bridge Inspection Reference Manual (BIRM), 2022
- AASHTO Manual for Bridge Element Inspection (2024)
- Manual for Bridge Evaluation 2nd Edition 2016
- Manual of Uniform Traffic Control Devices (MUTCHD), 2024

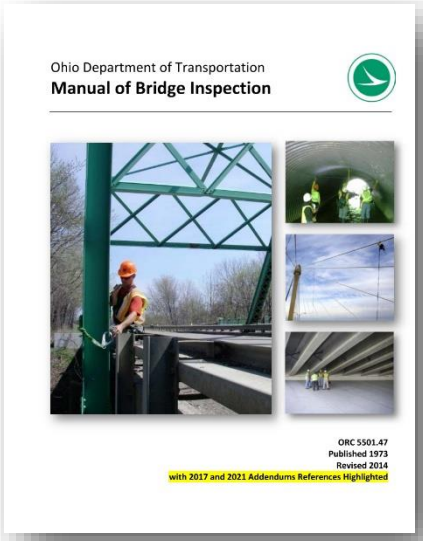
The working group for the 2025 Manual of Bridge Inspection consisted of FHWA, ODOT, CEAO, and a consultant.

2014 Revision

The 2013 Manual of Bridge Inspection Revision was written to accommodate significant, fundamental changes in National Regulations, National Quality Assurance Procedures and State policies. The most notable changes in the inspection program since the 2010 revision include the:

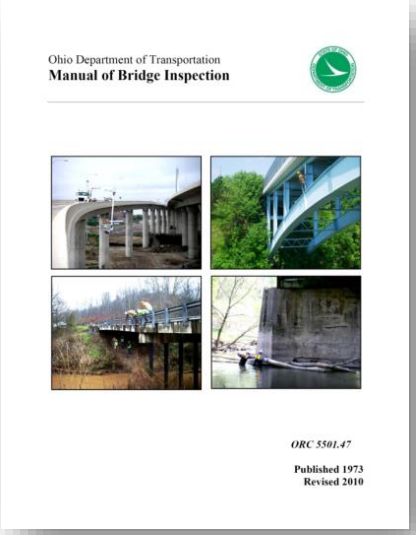
- Federal Element Level requirement in MAP-21, 2012 converting Ohio’s 1-4 Individual components into National Bridge Elements (NBE), Bridge Management Elements (BME) and Agency Developed Elements (ADE)
- Federal Highway Agency’s 23 Metric Quality Assurance protocol, 2011 with revisions in 2012 and 2013
- Introduction of Ohio’s new Structure Management System (SMS), 2014
- Revisions to the following manuals:
    - AASHTO Manual for Bridge Evaluation and its reference in the National Bridge Inspection Standards, 2010, 2013

- AASHTO Element Level Manual, 2011, 2013
- FHWA Bridge Inspectors Reference Manual, 2012
- Ohio Manual of Uniform Traffic Control Devices (OMUTCD), 2012



The notable changes include the reorganization and consolidation from eleven administrative chapters in 2010's Revision to seven in the 2013 Revision. Also, Element Level inspection requirements on the NBIS National Highway System introduced not a new way to inspect bridges but a more rigorous way to collect inspection and inventory data. In order to keep two systems of inspection consistent with one another and in order to incorporate the element level quantities users of this revision will notice new, revised and redefined inspection items. Changes to the BR-86, now called simply the Field Report, can be found on the following pages. The Working Group for the 2014 Manual of Bridge Inspection Revision consisted of FHWA, ODOT, CEAO and consultant stakeholders.

2010 Revision (7)



A fifteen-member working group from both public and private sectors (CEAO, Municipality, FHWA, ODOT and Consultant) met nine times over the course of two months in 2008 in order to update the Manual of Bridge Inspection in accordance with ORC 5501.47. The focus of the rewrite was directed toward the Condition Rating guidance in Part 2. Other than rearranging, The Administrative sections in Part 1 largely remained unchanged since the 2006 revision.

The intent for the Condition Rating update was to add a table for each and every inspection item on the BR-86 and spread out the 1-4 items into nine rows in order to prepare inspectors and reviewers for an eventual shift from the 1-4 rating scale to a 9-0 rating scale (this eventual shift never came with the subsequent Federal requirement for Element Level Ratings in July 2012).

The guidance in the 1-4 and 9-0 descriptions, except for the Protective Coating System, had largely remained the same since the 1995 revision. The working group was able to get standard practices from inspectors in the field into the manual and incorporate 'lessons-learned' from bridge collapses and items of national significance into each chart since 1995. The committee was able to add guidance regarding:

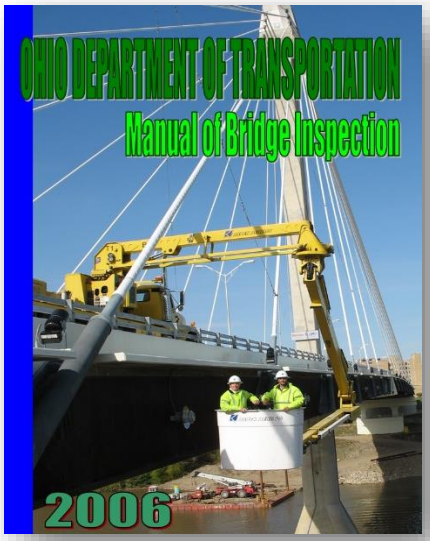
- Highly Skewed Bridge Research
- Non-composite Prestressed Box Beams Research
- Gusset Plate Research on Truss Bridges
- Mechanically Stabilized Earth (MSE)
- Elastomeric Bearings
- Stay-In-Place Pans Filled with Asphalt
- Safety Feature Standard Updates

Additionally, minor updates include:

- Full Name for Inspectors and Reviewers now required on the BR-86
- Surface area % for the individual 1-4 items are now to reflect the worst span and the % for the Summary items are to reflect the total bridge
- Deck edges reduced from two-feet to one-foot.
- Text change on the BR-86 to 9. Alignment of Members, 18. Upperchord, 28. Protective Coating System, 30. Fatigue Prone Detail (E &E'), 31. Live Load Response (E or S), 40 & 48. Scour (Inspection Type – 1, 2, 3),
- Unbold 7. Expansion Joints, 37. Backwalls, 47. Headwall/Endwalls
- Combined Lower Lateral Bracing and Upper Lateral Bracing into one item 21. Lateral Bracing. New item for Scour Inspection Type next to item 48. Scour when inspecting Culverts. New item for Culvert Abutments 49. Abutments. Changed the definition for the last four boxes of item 69. Survey to capture In-Depth, Fracture Critical, Scour Critical and Critical Findings items. Removal of concrete sealers from the Superstructure PCS inspection.
- Walking limits added for inspection Approach Items and Channel Items.

Upon completion of the 2010 Revision a one-day class was offered in each district to inform, update and refresh the entities responsible for bridge inventory and inspection throughout the state. This training class was considered 'Periodic Refresher Training' as required in the Code of Federal Regulations.

2006 Revision (6)



A ten member working group from both public and private sectors (CEAO, Municipality, FHWA, ODOT and Consultant) met several times over the course of two months in 2005 in order to update the Manual of Bridge Inspection in accordance with ORC 5501.47.

The 2006 revision was broken into 2 parts. Part 1 included an extensive overview and description of all the state and federal laws associated with bridge inspection. Guidelines, restrictions, requirements, organization, QAR, qualifications, safety, and equipment are some of the primary subjects covered. Part 2 of the manual deals with coding, it is similar to previous editions with some minor changes. The biggest and most noticeable change came with Item 28 (formerly Paint). This was renamed Protective Coating System (PCS) and it was expanded from about a half page to over 6 pages. It went from being rated on a 1-4 scale to a 0-9 scale similar to the summaries. Many details were given on how to inspect the PCS and how to correctly rate it.

Part 1 includes the following sections:

1. Bridge Inspection Program Requirements
2. Administrative Requirements
3. Inspection Requirements
4. Bridge Restrictions
5. Quality Measures for Safety Inspection
6. Training and Certification Program
7. Inspection Records, Files, and Reports
8. Safety Inspection Equipment

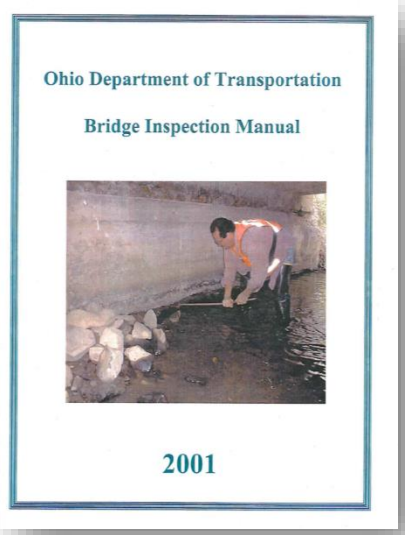
Protective Coating Systems became a focus of Department scrutiny and a more rigorous inspection standard was implemented into the Manual of Bridge Inspection. It provided detailed guidance for workmanship and degradation inspections of Painting, Galvanizing, Metalizing, 588 Weathering steel and Concrete Sealers.

Upon completion of the 2006 Revision a one-day class was offered to inform, update and refresh the entities responsible for bridge inventory and inspection throughout the state.

2001 Revision (5)

Overall, the changes were minor and included the following:

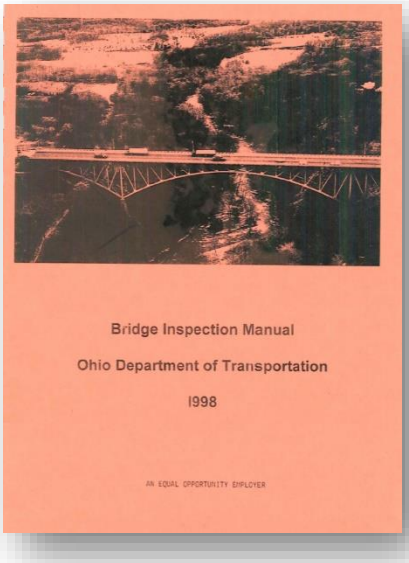
- More details were given to Items 33-36 (Abutments, Abutment Seats, Piers, and Pier Seats) descriptions on when to code them 1-4.
- Underwater investigation was included under Item 40 Scour.



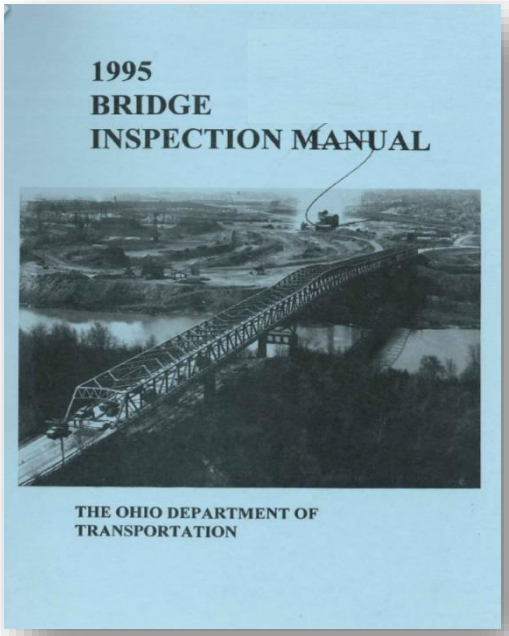
1998 Revision (4)

Overall the changes were minor and included the following:

The "coding of individual items" section was again extended, this time by an additional 15 pages. More details were given under Items 51 (alignment) and 42 (protection) under channel, and items 57 (guardrail) and 59 (embankment) under approaches.



1995 Revision (3)

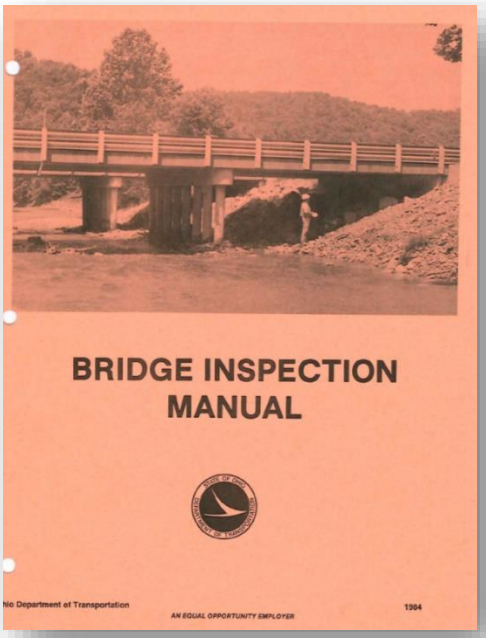


Changes in this revision were made by extending the "coding of individual items" section by 15 pages. Comparisons and differences between the 1-4 and 0-9 condition ratings were established. Explanations for each condition rating 1-4 were given with guidance on how to code each item. Different material types were also taken into account in each of the summary categories and explanations of what constitutes each rating (0-9) were given.

More items required a 1-4 rating, whereas in the previous manual the type code was only recorded for most items. Items 28-33 (suspension system, suspenders, towers, bent posts, anchorage, and bridge machinery) were moved to the rear of the manual and Paint was moved up to item 28. Also, Items 29 (pins, hangers, hinges) and 30 (fatigue prone connection) were added under superstructure with a rating of 1-4 for each. Items 40 (scour) and 41 (slope protection) were added under substructure. Items 45 (shape) and 46 (seams) were added under culvert with a rating of 1-4 for each. All different types of culverts were also taken into account in the summary section. Item 53 (waterway adequacy) was given explanations for condition ratings 1-4. Approach alignment and grade were removed under approach. Items 63 (sign supports) and 64 (utilities) were added under general. Also, sections for suspension bridges (items 68-77) and movable bridges (items 78-99) were added after the general section.

1984 Revision (2)

This served as the manual for both inventory and inspection.



The major change in the second revision included the addition of the "Coding of Individual Items" section. This added condition rating guidance to some items. Summaries were also added on a 0-9 (critical - new) scale for the deck, super, sub, culvert, channel, approach, and general sections.

Paint was made a separate 1-4 rating. All other 1-4 items and Summary 9-0 items have a generic coding.

<u>1-4 Guidance:</u>

1 Good Condition – No repair required
2 Fair Condition – Minor deficiency, item still functioning as designed
3 Poor Condition – Major deficiency, item in need of repair to continue functioning as designed
4 Critical Condition – Item no longer functioning as designed

<u>9-0 Guidance:</u>

Condition Code
9 New condition

8 Good condition – no repairs needed

7 Generally good condition – potential exists for minor maintenance

6 Fair condition – potential exists for major maintenance

5 Generally fair condition – potential exists for minor rehabilitation

4 Marginal condition – potential exists for major rehabilitation

3 Poor condition – repair or rehabilitation required immediately

2 Critical condition – the need for repair or rehabilitation is urgent. Facility should be close, or closely monitored, until the indicated repair is complete

1 Critical condition – facility is closed. Study should determine the feasibility for repair.

0 Critical condition – facility is closed and is beyond repair.

1973 Bridge Inspection Manual

The first Manual of Bridge Inspection was developed in accordance with ORC 5501.23 (later 5501.47 eff. 1973) which became effective June 11, 1968. This served as the manual for both inventory and inspection.

Individtual 1-4 items:

Individual Items. Individual items shall be rated by the inspector at the site using the following code:
(1) Good Condition — No repair required.
(2) Fair Condition — Minor deficiency, item still functioning as designed.
(3) Poor Condition — Major deficiency, item in need of repair to continue functioning as designed.
(4) Critical Condition — Item no longer functioning as designed.

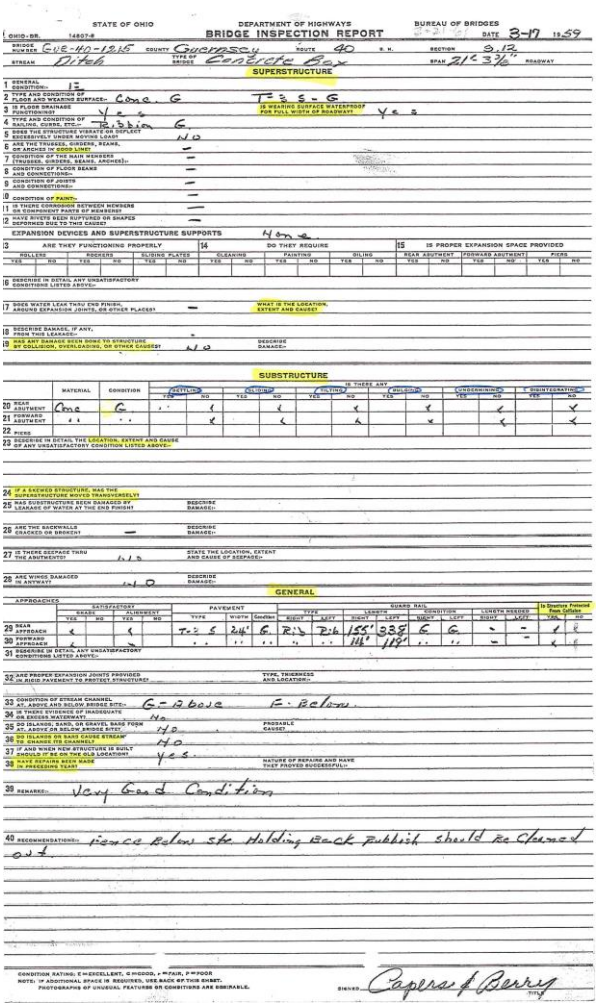
Summary ratings were to be completed by the reviewer:

7.3.2
Summary Items. Items 8, 36, 44, 48, 52 and 60, are summary items to be rated by the reviewer after careful analysis of the inspectors report using the following codes:
(9) New condition
(8) Good condition — No repair necessary
(7) Minor items in need of repair by maintenance forces
(6) Major items in need of repair by maintenance forces
(5) Major items in need of repair by contract
(4) Minimum adequacy to tolerate present traffic, immediate repair or rehabilitation required
(3) Inadequate to tolerate present heavy loads warrants closing the bridge to trucks
(2) Inadequate to tolerate any live load warrants closing the bridge to all traffic
(1) Bridge repairable, if desirable to reopen to traffic
(0) Bridge beyond repair

Before the 1973 Manual

The oldest indication of bridge inspection guidance in Ohio can be found as a reference in the State Highway Department of Ohio 11th Annual Report on December 31, 1915 (Bureau of Bridges p.233). This guidance was given after the 1911 McGuire Bill established the Intercounty Highway System and after the 1913 Hudson-Hite Bill established the Main Market Road System:

"In accordance with the laws which became effective in September 1915, requiring that all highway bridges be inspected by the county highway superintendent and an annual report made as to the condition thereof, this department has prepared **blank forms** and sent them together with **instructions** to each county highway superintendent. The record, as it is intended to be kept, will show the size and type of each structure, its location and condition at time of each annual inspection." – State Highway Department of Ohio 11th Annual Report on December 31, 1915 (Bureau of Bridges p.23



STATE OF OHIO — DEPARTMENT OF HIGHWAYS — BUREAU OF BRIDGES

BRIDGE INSPECTION REPORT

DATE 8-17 1959

OHIO-BR. 14807-8 | BRIDGE NUMBER CUE-NO-12.15 | COUNTY Guernsey | ROUTE 40 | S. H. | SECTION 5.12 | STREAM Ditch | TYPE OF BRIDGE Concrete Box | SPAN 21'-3½" | ROADWAY

SUPERSTRUCTURE

1 GENERAL DESCRIPTION: 12
2 TYPE AND CONDITION OF FLOOR AND WEARING SURFACE: Conc. G — T=5-G
3 IS FLOOR DRAINAGE FUNCTIONING? Yes — IS WEARING SURFACE WATERPROOF FOR FULL WIDTH OF ROADWAY? Yes
4 TYPE AND CONDITION OF RAILING, CURBS, ETC.: Rubble G
5 DOES THE STRUCTURE VIBRATE OR DEFLECT EXCESSIVELY UNDER MOVING LOAD? NO
6 ARE THE TRUSSES, GIRDERS, BEAMS, ARCHES FUNCTIONING PROPERLY?
7 CONDITION OF THE MAIN MEMBERS (TRUSSES, GIRDERS, BEAMS, ARCHES)
8 CONDITION OF FLOOR BEAMS AND CONNECTIONS
9 CONDITION OF JOINTS AND CONNECTIONS
10 CONDITION OF PAINT
11 IS THERE CORROSION BETWEEN MEMBERS OR COMPONENT PARTS OF MEMBERS?
12 HAVE RIVETS BEEN RUPTURED OR SHAPES DEFORMED DUE TO THIS CAUSE?

EXPANSION DEVICES AND SUPERSTRUCTURE SUPPORTS — None.

13 ARE THEY FUNCTIONING PROPERLY — ROLLERS, ROCKERS, SLIDING PLATES
14 DO THEY REQUIRE — CLEANING, PAINTING, OILING
15 IS PROPER EXPANSION SPACE PROVIDED — REAR ABUTMENT, FORWARD ABUTMENT, PIERS

16 DESCRIBE IN DETAIL ANY UNSATISFACTORY CONDITIONS LISTED ABOVE
17 DOES WATER LEAK THRU END FINISH, AROUND EXPANSION JOINTS, OR OTHER PLACES? — WHAT IS THE LOCATION, EXTENT AND CAUSE?
18 DESCRIBE DAMAGE, IF ANY, FROM THIS LEAKAGE
19 HAS ANY DAMAGE BEEN DONE TO STRUCTURE BY COLLISION, OVERLOADING, OR OTHER CAUSES? NO — DESCRIBE DAMAGE

SUBSTRUCTURE

	MATERIAL	CONDITION	BATTER	SETTLING	SCOURING	IS THERE ANY TILTING	IS THERE ANY MISALIGNMENT	UNDERMINING	DETERIORATION
20 REAR ABUTMENT	Conc	G							
21 FORWARD ABUTMENT	"	"							
22 PIERS									

23 DESCRIBE IN DETAIL THE LOCATION, EXTENT AND CAUSE OF ANY UNSATISFACTORY CONDITION LISTED ABOVE
24 IF A SKEWED STRUCTURE, HAS THE SUPERSTRUCTURE MOVED TRANSVERSELY?
25 HAS SUBSTRUCTURE BEEN DAMAGED BY LEAKAGE OF WATER AT THE END FINISH? — DESCRIBE DAMAGE
26 ARE THE BACKWALLS CRACKED OR BROKEN? — DESCRIBE DAMAGE
27 IS THERE SEEPAGE THRU THE ABUTMENTS? N.D. — STATE THE LOCATION, EXTENT AND CAUSE OF SEEPAGE
28 ARE WINGS DAMAGED IN ANY WAY? N.D. — DESCRIBE DAMAGE

GENERAL

APPROACHES — SATISFACTORY: BANKS, PAVEMENT; NEEDS ATTENTION: BANKS, PAVEMENT

PAVEMENT: TYPE, WIDTH, CONDITION

GUARD RAIL: TYPE, LENGTH (RIGHT, LEFT), CONDITION (RIGHT, LEFT), LENGTH NEEDED (RIGHT, LEFT)

	SATISFACTORY BANKS	SATISFACTORY PAVEMENT	NEEDS ATTENTION BANKS	NEEDS ATTENTION PAVEMENT	TYPE	WIDTH	CONDITION	GUARD RAIL TYPE	LENGTH RIGHT	LENGTH LEFT	CONDITION RIGHT	CONDITION LEFT	LENGTH NEEDED RIGHT	LENGTH NEEDED LEFT	Is Structure Fenced Yes / No
29 REAR APPROACH					T=5	24'	G	R-16	P-16	155' 111'	338 119'	G	G	-	-	/
30 FORWARD APPROACH					"	"	"	"	"	"	"	"	"	"	"	/

31 DESCRIBE IN DETAIL ANY UNSATISFACTORY CONDITIONS LISTED ABOVE
32 HAS PROPER EXPANSION JOINTS PROVIDED IN RIGID PAVEMENT TO PROTECT STRUCTURE? — TYPE, THICKNESS AND LOCATION
33 CONDITION OF STREAM CHANNEL AT, ABOVE AND BELOW BRIDGE SITE: G-Above — F-Below
34 IS THERE EVIDENCE OF UNDERMINING OR SCOURING AROUND ABUTMENTS? No
35 DO ANY OBSTRUCTIONS EXIST IN OR GRAVEL BARS FORM AT, ABOVE OR BELOW BRIDGE SITE? NO — PROBABLE CAUSE?
36 DO ISLANDS OR BARS CAUSE STREAM TO CHANGE ITS CHANNEL? NO
37 IF AND WHEN NEW STRUCTURE IS BUILT SHOULD IT BE ON THE OLD LOCATION? Yes.
38 HAVE REPAIRS BEEN MADE IN ANSWERING YEAR? — NATURE OF REPAIRS AND HAVE THEY PROVED SUCCESSFUL?

39 REMARKS: Very Good Condition

40 RECOMMENDATIONS: pierce Below Sta. Holding back rubbish should be Cleaned out

CONDITION RATING: E=EXCELLENT, G=GOOD, F=FAIR, P=POOR
NOTE: IF ADDITIONAL SPACE IS REQUIRED, USE BACK OF THIS SHEET. PHOTOGRAPHS OF UNUSUAL FEATURES OR CONDITIONS ARE DESIRABLE.

SIGNED Caperas & Berry TITLE

Appendix B: Select Bridge Inspection Ohio Revised Codes

5535.01 Classes of highways.

The public highways of the state shall be divided into three classes: state roads, county roads, and township roads.

(A) State roads include the roads and highways on the state highway system.

(B) County roads include all roads which are or may be established as a part of the county system of roads as provided in sections 5541.01 to 5541.03 , inclusive, of the Revised Code, which shall be known as the county highway system. Such roads shall be maintained by the board of county commissioners.

(C) Township roads include all public highways other than state or county roads. The board of township trustees shall maintain all such roads within its township. The board of county commissioners may assist the board of township trustees in maintaining all such roads. This section does not prevent the board of township trustees from improving any road within its township.

Effective Date: 10-01-1953

Department of Transportation

5501.47 Bridge inspections.

(A) The director of transportation is responsible for inspection of all bridges on the state highway system inside and outside of municipalities, all bridges connecting Ohio with another state for which the department of transportation has inspection authority, and all other bridges or portions of bridges for which responsibility for inspection is by law or agreement assigned to the department.

Such inspection shall be made on a schedule established by the director, but at least once every twenty-four months, by a professional engineer or other qualified person under the supervision of a professional engineer, in accordance with the manual of bridge inspection described in division (B) of this section.

The director shall cause to be maintained in each district of the department an updated inventory of all bridges within such district that are on the state highway system, including those located within municipalities, and all other bridges for which the department has responsibility for inspection. The inventory record shall indicate who is responsible for inspection and for maintenance, and the authority for such responsibilities.

On those bridges where there exists joint maintenance responsibility, the director shall furnish a copy of reports to each party responsible for a share of maintenance.

"Maintenance" as used in this division means actual performance of maintenance work.

(B)

(1) As used in this division:

(a) "Inspection" means the inspection described in the manual of bridge inspection adopted by the department.

(b) "Highway" means those highway systems in section 5535.01 of the Revised Code, highways, streets, and roads within municipalities, and any other highway, street, and road on which the public travels.

(c) "Bridge" means any structure of ten feet or more clear span or ten feet or more in diameter on, above, or below a highway, including structures upon which railroad locomotives or cars may travel.

(2) The director shall have general responsibility for initiating, developing, and maintaining procedures and practices that provide for and promote professional inspection of bridges. The director shall:

(a) Prepare, maintain, and update a manual of bridge inspection that will provide standards applicable to the inspection of all bridges on, above, or below highways. The manual shall include, but is not limited to, standards relating to frequency of inspection, qualifications of persons inspecting or supervising inspections, procedures and practices facilitating professional inspection of bridges;

(b) Develop and furnish inspection forms and other forms relating to inspection, and approve forms used in lieu of the departmental forms;

(c) Assist and cooperate with governmental units, upon request, with inspection, disseminate information to appropriate governmental officials and agencies with regard to responsibility and inspection practices, and confer with public officials and other individuals on inspection of bridges; such assistance may be in the form of contracts with counties or municipal corporations for transportation department inspection services;

(d) Inspect any bridge on a highway, with a designated representative of the owner, where he has reason to believe that the report of inspection does not reflect the condition of such bridge or that the inspection did not accord with the standards contained in the manual of bridge inspection.

Effective Date: 09-28-1973

5501.49 Lift bridge inspection.

(A) The director of transportation is responsible for the construction, reconstruction, major maintenance and repair, and operation of all bridges located on the state highway system within a municipal corporation. The public entity responsible for maintaining the pavements and sidewalks on either end of the bridge is responsible for the routine maintenance of all bridges located on the state highway system within the municipal corporation.

(B) The director may enter into an agreement with the legislative authority of a municipal corporation or a county, upon mutually agreeable terms, for the municipal corporation or county to operate and perform major maintenance and repair on any bridge located on the state highway system within the municipal corporation or county.

(C) The director is not required to obtain the consent of a municipal corporation prior to the performance of any major bridge maintenance and repair. Except in an emergency, the director shall give a municipal corporation reasonable notice prior to the performance of any work that will affect the flow of traffic. No utilities, signs, or other appurtenances shall be attached to a bridge without the prior written consent of the director.

(D) As used in this section:

(1) Major and routine maintenance and repair relates to all elements of a bridge, including abutments, wingwalls, and headwalls but excluding approach fill and approach slab, and appurtenances thereto.

(2) "Major maintenance" includes the painting of a bridge, and the repair of deteriorated or damaged elements of bridge decks, including emergency patching of bridge decks, to restore the structural integrity of a bridge.

(3) "Routine maintenance" includes without limitation, clearing debris from the deck, sweeping, snow and ice removal, minor wearing surface patching, cleaning bridge drainage systems, marking decks for traffic control, minor and emergency repairs to railing and appurtenances, emergency patching of deck, and maintenance of traffic signal and lighting systems, including the supply of electrical power.

(4) "Operation" relates solely to lift bridges and to those expenses that are necessary for the routine, daily operation of a lift bridge, such as payroll, workers' compensation and retirement payments, and the cost of utilities.

Effective Date: 06-30-1991; 2007 HB67 07-03-2007

5523.17 Improvement to be kept in repair - responsibility for bridge inspection.

After the completion of the work of constructing, reconstructing, widening, or realigning a separated crossing by the director of transportation, in accordance with sections 5523.01 to 5523.20 of the Revised Code, the separated crossing and approaches thereto shall be kept in repair as follows:

(A) When the public way crosses the tracks of any railroad company by a structure carrying the highway over such tracks the responsibility for inspection and the cost of maintenance shall be borne by the state;

(B) When the public way passes under the tracks of any such company:

(1) The responsibility for inspection and cost of maintaining the bridge and its abutments shall be borne by such company;

(2) When there is more than one company involved the bridge and abutments shall be maintained by the companies in such proportion as is fixed by agreement between them and responsibility for inspection shall rest upon the company actually performing the greatest share of maintenance work;

(3) In the absence of any such agreement the cost shall be borne in such proportion as is found by the court of common pleas of the county within which the crossing is located to be just and equitable and responsibility for inspection shall rest upon the company actually performing the greatest share of maintenance work;

(C) All such public ways and their approaches shall be inspected, maintained, and kept in repair by the state.

Effective Date: 09-28-1973

Turnpike Commission

5537.17 Maintenance and repair of turnpike project - restoration or repair of damaged property - cooperation by governmental agencies - bridge inspection - annual audit.

(A) Each turnpike project open to traffic shall be maintained and kept in good condition and repair by the Ohio turnpike and infrastructure commission. The Ohio turnpike system shall be policed and operated by a force of police, toll collectors, and other employees and agents that the commission employs or contracts for.

(B) All public or private property damaged or destroyed in carrying out the powers granted by this chapter shall be restored or repaired and placed in its original condition, as nearly as practicable, or adequate compensation or consideration made therefor out of moneys provided under this chapter.

(C) All governmental agencies may lease, lend, grant, or convey to the commission at its request, upon terms that the proper authorities of the governmental agencies consider reasonable and fair and without the necessity for an advertisement, order of court, or other action or formality, other than the regular and formal action of the authorities concerned, any property that is necessary or convenient to the effectuation of the purposes of the commission, including public roads and other property already devoted to public use.

(D) Each bridge constituting part of a turnpike project shall be inspected at least once each year by a professional engineer employed or retained by the commission.

(E) On or before the first day of July in each year, the commission shall make an annual report of its activities for the preceding calendar year to the governor and the general assembly. Each such report shall set forth a complete operating and financial statement covering the commission's operations and funding of any turnpike projects and infrastructure projects during the year. The commission shall cause an audit of its books and accounts to be made at least once each year by certified public accountants, and the cost thereof may be treated as a part of the cost of operations of the commission. The auditor of state, at least once a year and without previous notice to the commission, shall audit the accounts and transactions of the commission.

(F) The commission shall submit a copy of its annual audit by the auditor of state and its proposed annual budget for each calendar or fiscal year to the governor, the presiding officers of each house of the general assembly, the director of budget and management, and the legislative service commission no later than the first day of that calendar or fiscal year.

(G) Upon request of the chairperson of the appropriate standing committee or subcommittee of the senate and house of representatives that is primarily responsible for considering transportation budget matters, the commission shall appear at least one time before each committee or subcommittee during the period when that committee or subcommittee is considering the biennial appropriations for the department of transportation and shall provide testimony outlining its budgetary results for the last two calendar years, including a comparison of budget and actual revenue and expenditure amounts. The commission also shall address its current budget and long-term capital plan.

(H) Not more than sixty nor less than thirty days before adopting its annual budget, the commission shall submit a copy of its proposed annual budget to the governor, the presiding officers of each house of the general assembly, the director of budget and management, and the legislative service commission. The office of budget and management shall review the proposed budget and may provide recommendations to the commission for its consideration.

Amended by 130th General Assembly File No. 7, HB 51, §101.01, eff. 7/1/2013.

Effective Date: 06-30-1993; 03-29-2005; 2006 HB699 03-29-2007

County Engineer

5543.20 Responsibility for bridge inspection.

The county engineer shall inspect all bridges or portions thereof on the county highway system inside and outside of municipalities, bridges on township roads, and other bridges or portions of bridges for which responsibility for inspection is by law or agreement assigned to the county. If the responsibility for inspection of a bridge is not fixed by law or agreement and the county performs the largest share of maintenance on a bridge, inspection shall be made by the engineer.

This section does not prohibit a board of township trustees from inspecting bridges within a township.

Such inspection shall be made on a schedule established by the director of transportation, but at least once every twenty-four months, or more frequently if required by the board of county commissioners, in accordance with the manual of bridge inspection described in section 5501.47 of the Revised Code.

Counties may contract for inspection services.

The engineer shall maintain an updated inventory of all bridges in the county, except those on the state highway system and those within a municipality for which the engineer has no duty to inspect, and indicate on the inventory record who is responsible for inspection and for maintenance, and the authority for such responsibilities.

The engineer shall report the condition of all bridges to the board of county commissioners not later than sixty days after his annual inspection or he shall report more frequently if the board so requires. Any bridge for which the county has inspection or maintenance responsibility which, at any time, is found to be in a condition that is a potential danger to life or property shall be identified in the reports, and if the engineer determines that the condition of any bridge represents an immediate danger he shall immediately report the condition to the board. With respect to those bridges where there exists joint maintenance responsibility, the engineer shall furnish a copy of his report to each party responsible for a share of maintenance. The engineer shall furnish each board of township trustees with a report of the condition of bridges on the township road system of such township and furnish the legislative authority of each municipality in the county with a report of the condition of bridges in such municipality for which the county has responsibility for inspection.

"Maintenance" as used in this division means actual performance of maintenance work.

Effective Date: 09-28-1973

Municipality (City and Village)

723.54 Inspection of bridges.

The legislative authority of a municipality shall designate a municipal official to have responsibility for inspection of all or portions of bridges within such municipality, except for bridges on the state highway system and the county highway system.

This section does not prohibit the municipality from inspecting any bridge within its limits.

Such inspection shall be made by a professional engineer or other qualified person under the supervision of a professional engineer on a schedule established by the director of transportation, but at least once every twenty-four months, or more frequently if required by the legislative authority, in accordance with the manual of bridge inspection described in section 5501.47 of the Revised Code. The legislative authority may contract for inspection services.

The municipal official responsible for inspection shall maintain an updated inventory record of all bridges in the municipality and indicate on such inventory record who is responsible for inspection and maintenance, and the authority for such responsibilities.

He shall report the condition of all bridges to the municipal legislative authority not later than sixty days after his annual inspection, or shall report more frequently if required by the legislative authority. Any bridge for which the municipality has inspection or maintenance responsibility which, at any time, is found to be in a condition that is or may be a potential danger to life or property shall be identified in reports, and if such official determines that the condition of such a bridge represents an immediate danger he shall immediately report the condition to the legislative authority. With respect to those bridges where there exists joint maintenance responsibility, the municipal official shall furnish a copy of his report to each party responsible for a share of maintenance.

"Maintenance" as used in this section means actual performance of maintenance work.

Effective Date: 11-20-1985

Toll Bridge

5501.48 Toll bridge inspection.

The operator of a toll bridge located entirely or partly in the state shall inspect such bridge on a schedule established by the director of transportation, but at least once every twenty-four months. The operator shall file a copy of the inspection report with the director. Inspection shall be made or supervised by a professional engineer.

Effective Date: 09-28-1973

Appendix C: Global Statement for County, Municipality, and State Bridge Inspection Jurisdictions

Global Statements for

County, Municipality and State Bridge Inspection Jurisdictions

a. Bridges with County Engineer Inspection Responsibility

The County Engineer in Ohio is an elected position, and therefore they must reside in the county where they hold office. By living in the county with an average professional tenure of 26 years, the 88 County Engineers in Ohio have firsthand knowledge of the behavior of the streams in both normal flow and flood conditions.

The County Engineer is responsible for all disciplines of Civil Engineering (Hydraulic, Geotechnical, Structural, Transportation etc.) in the county where they hold office. They are a registered Professional Engineer (P.E.) and a registered Professional Surveyor (P.S.). Achieving both accreditations requires a college degree in engineering and surveying, four years additional experience in engineering and surveying, and 16 hours of testing for each license. Ohio has the most rigorous standards in the United States for qualifying its County Engineers.

County Engineers are familiar with their local watershed(s), factors that affect long-term bed elevation changes, runoff behavior, stream hydraulics and soils in their county. Therefore, the County Engineer is able to apply their professional judgment to assess the potential for bridge scour and hereby affirms the Assetwise scour coding in “Item B.AP.03 - Scour Vulnerability” for bridges in their county.

b. Bridges with Municipality Inspection Responsibility

Since 1985, the legislative authority of a municipality has designated a municipal official to have responsibility for inspection of all or portions of bridges within such municipality, except for bridges on the state highway system and the county highway system.

Such inspection has been made at least annually until 2021 and on a Risk Based interval since 2021 by a professional engineer or other qualified person under the supervision of a professional engineer, or more frequently if required by the legislative authority, in accordance with ODOT’s manual of bridge inspection. The legislative authority may contract for inspection services directly with a consultant firm or opt-into ODOT’s Municipal Bridge Inspection Program. This task order contract has been in effect since 2012 by tasking consulting firms to perform all aspects of the bridge inspection program, as detailed in the 23 Metrics, up to and including, scour appraisals and assessments. The consultants inspect all municipal bridges according to Ohio’s Risk Based Inspection (RBI) policy and they will look for any signs of unusual scour conditions each time. Item B.AP.03 in Assetwise is assessed and revised, if needed, with associated documentation of the justification for the change. Additionally, ODOT’s Office of Structural Engineering routinely evaluates the scour condition to monitor for condition changes in previous inspections and consequently sets up the new task orders to include scour plan of action for the bridges in concern. Consulting firms are required to have multiple professional engineers on staff that meet the minimum requirements of an NBIS Program Manager and supervise all aspects of the inspection.

Municipalities must report the condition of all bridges to the municipal legislative authority no later than sixty days after the inspection, or shall report more frequently if required by the legislative authority. Any bridge for which the municipality has inspection or maintenance responsibility which, at any time, is found to be in a condition that is or may be a potential danger to life or property, shall be identified in reports and if such official determines that the condition of such a bridge represents an immediate danger, he shall immediately report the condition to the legislative authority. With respect to those bridges where there exists joint maintenance responsibility, the municipal official shall furnish a copy of his report to each party responsible for a share of maintenance.

c. Bridges with State Inspection Responsibility

The director of transportation is responsible for inspection of all bridges on the state highway system inside and outside of municipalities, all bridges connecting Ohio with another state for which the department of transportation has inspection authority, and all other bridges or portions of bridges for which responsibility for inspection is by law or agreement assigned to the department. Such inspection shall be made per Ohio's Risk Based Inspection (RBI) policy by a professional engineer or other qualified person under the supervision of a professional engineer, or more frequently if required by the director, in accordance with the manual of bridge inspection.

Team Leaders are required to complete a bridge inspection report during every bridge inspection. Bridge inspectors in Ohio code multiple fields pertaining to the waterway and its effect on the bridge during every inspection. These fields include the 9-0 FHWA SNBI guide condition fields B.C.03 Substructure, B.C.04 Culvert, B.C.09 Channel, B.C.10 Channel Protection and B.C.11 Scour and appraisal field B.AP.03 Scour Vulnerability. Item B.AP.03 is assessed and revised if needed with associated documentation of the justification for the change. ODOT's Office of Structural Engineering supports scour condition evaluations, if requested, to monitor condition changes in previous inspections, and coordinates with the Office of Hydraulics for the bridges in concern. ODOT has also updated its scour appraisal policy which requires all NBIS bridges over water to have scour appraisals on file in Assetwise. The Ohio bridge inspection manual requires that such inspections and appraisals be performed by a professional engineer or Team Leader under the supervision of a professional engineer. Each annual inspection is reviewed and approved by a professional engineer.

Protecting channels and bridges from scour has been a consistent effort throughout the past several decades:

- Before 1970: Annual inspections have been performed on the state system in Ohio beginning as early as 1915.
- 1970's: The ODOT Bridge Design Manual (BDM) has called for all waterway bridges to be founded on deep foundations since the 1970's. The current Bridge Inspection regulation was established in 1973. Since then, inspectors have been monitoring and assigning condition codes directly and indirectly related to scour in the field every year.
- 1980's: The BDM has required design scour evaluations for all bridge rehabilitation and new bridge projects since 1987.
- 1990's: In response to updates to the FHWA Coding Guide guidance, ODOT started to evaluate state bridges for scour in the late 1990s in accordance with FHWA Technical Advisory T 5140.23, Evaluating Scour at Bridges, dated October 28, 1991. Prior to 1991, Ohio has historically been a deep foundation state. Early in the process, it became apparent that the scour analysis equations, which were based on granular bed material, were not predicting reasonable scour depths in cohesive soil. Ohio's soils are largely cohesive material and the equations were predicting excessive scour depths. ODOT opted to evaluate bridges for scour using non analytic methods as allowed by the HEC-18 Ver. 3 guidance at the time. Scour specific presentations were made at: Ohio Technical Engineering Conference (OTEC), Ohio Bridge Conference, District Bridge Engineers Meetings, and dedicated training sessions since the early 1990's. Scour analysis training instructed the bridge be rated considering a variety of factors, including: Watersheds, channel morphology, bed material, velocities, flow volume, foundations, bridge age and attributes and historic data.
- 2000's: As most analysis consisted of visual on-site evaluation rather than design calculations, many bridge files do not contain documentation of the process and details used in the analysis process. ODOT completed evaluating all bridges prior to the local agencies. ODOT effectively completed evaluations for scour in 2008. ODOT had multiple contracts with USGS and universities working on evaluating bridges for scour in Ohio.
- 2023: ODOT Office of Structures collaborated with Iowa DOT and ODOT department of Hydraulics to created a standardized scour appraisal form in Assetwise. All Ohio bridge owners are required to have Scour Appraisals on file in Assetwise by March 2028.

Appendix D: Scour Appraisal Documentation

Scour Appraisal

Scour Appraisals are the risk-based and data-driven determination of a bridge's vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated through a scour evaluation or a scour assessment. Both observed scour and estimated scour must be performed to determine the least stable result. All observed scour results are recorded in the inspection report(s). All estimated scour results must be recorded on the Scour Appraisal form in AssetWise. The terms can best be organized in an outline:

Scour Appraisals are:

1. Observed Scour **AND**
2. Estimated Scour
    a. Scour Evaluation **OR**
    b. Scour Assessment: All assessments performed after January 1, 2023 consist of three Levels

(1) Level 1 – Stability Screening	*Answer all 5 Questions. If all are answered "No" then the Assessment is complete and (B.AP.03) Scour Vulnerability code will be assigned accordingly. If any answers are "Yes" then continue to Level 2*
(2) Level 2 – Susceptibility Screening	*Answer all 18 questions. Each answer has a point total. Total points determine a triage-range of three (3) options. If the point total is low or high, then assign the (B.AP.03) Scour Vulnerability code will be assigned accordingly. If the point total is in the middle-range, or inconclusive, then continue to Level 3.*
(3) Level 3 – Vulnerability Screening	*Answer questions progressively in three groups (three (3), eight (8) or eleven (11) questions). Based on the results the appropriate (B.AP.03) Scour Vulnerability code will be assigned.*

Scour Evaluation

Scour Evaluations are performed by a bridge, geotechnical and/or hydraulic engineer. The purpose of an evaluation is to calculate the depth of scour so that the foundation can be designed with sufficient depth, stability, and capacity. The hydraulic calculations are commonly performed during early design-stages for new-construction or rehabilitation bridge projects. Refer to the latest ODOT Location & Design Manual, Volume 2 - Drainage Design section 1008.10 Bridge Foundations for ODOT's Scour Evaluation process.

The Scour Evaluation results must be documented in the Scour Appraisal form in AssetWise. Bridge engineers or inspectors will need to locate the Scour Evaluation in one of the following documents:

- Plan-Set Cover Sheet (Check Flood and Design Flood Elevations) (Figure 1).
- Structure Type Study (Figure 2)
- Hydraulic Analysis
- Plan-Set General Notes (Piles or Piling Notes)
- Plan-Set Site Plan (Piles or Piling Notes)

Furnish the following note in all bridge plans where Scour Evaluations are performed:

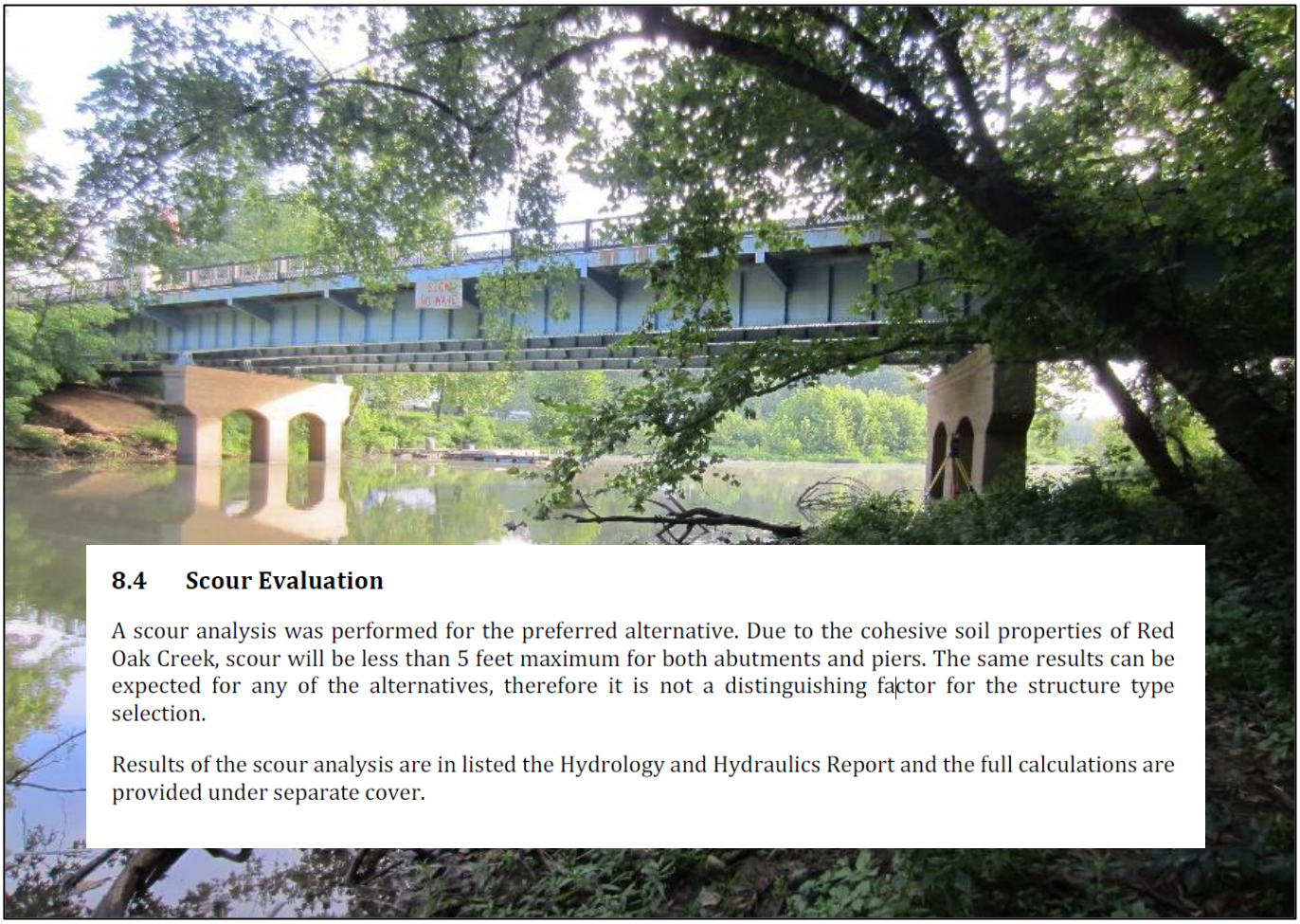
[602.7-1] SCOUR ELEVATIONS: The Design Flood and Check Flood scour elevations are provided below:

	Rear Abutment	Pier 1	Pier 2	Forward Abutment
Design Flood				
Check Flood				

Figure 1 - 2022 BDM Requirement for Scour Evaluation Elevations on the Plans

In AssetWise there are three fields to document the Scour Evaluation. When a Scour Evaluation has been performed the following items in AssetWise must be coded (AssetWise input items are in blue text). When the documentation cannot be found then skip this portion and continue to the Scour Assessment documentation.

1. Scour Evaluation Performed – Y/N (If "No" then skip to Assessment)
2. Scour Evaluation Documentation:
    a. *Original Bridge Structure Type Study*
    b. *Original Bridge Plans: Cover Sheet with Check or Design Flood Scour Elevations (Figure 1)*
    c. *Original Bridge Plans: General Notes, Piles or Piling Notes*
    d. *Original Bridge Plans: Site Plan, Piles or Piling Notes*
    e. *Rehabilitation Bridge Structure Type Study (Figure 2)*
    f. *Rehabilitation Bridge Plans: Cover Sheet with Check or Design Flood Scour Elevations*
    g. *Rehabilitation Bridge Plans: General Notes, Piles or Piling Notes*
    h. *Rehabilitation Bridge Plans: Site Plan, Piles or Piling Notes*
    i. *Standalone Scour Evaluation*
    j. *Other*
3. Scour Evaluation Results (Figure 3): Free form text to record the conclusions from the scour evaluation ideally the critical scour elevations at each substructure unit.



8.4 Scour Evaluation

A scour analysis was performed for the preferred alternative. Due to the cohesive soil properties of Red Oak Creek, scour will be less than 5 feet maximum for both abutments and piers. The same results can be expected for any of the alternatives, therefore it is not a distinguishing factor for the structure type selection.

Results of the scour analysis are in listed the Hydrology and Hydraulics Report and the full calculations are provided under separate cover.

Figure 2 - Structure Type Study "Scour Evaluation" Documentation Example

Scour Appraisals

Refer to the ODOT Scour Appraisal procedure for guidance.

1. Observed Scour

Performed By: Team Leaders and P.E. Review during normally scheduled inspections.

2. Estimated Scour

Either a Scour Evaluation or a Scour Assessment documented below.

2a. Scour Evaluation Documentation

Performed by: Bridge Engineer, Hydraulic Engineer or Geotechnical Engineer in accordance with the ODOT L&D Manual, Volume 2 section 1008.10.

(1) Scour Evaluation Performed	Y - Yes
(2) Scour Evaluation Documentation	5 - Rehab Plans Structure Type Study
(3) Scour Evaluation Results	Structure Type Study Page 4 8.4 Scour Evaluation A scour analysis was performed for the preferred alternative. Due to the cohesive soil properties of Red Oak Creek, scour will be less than 5 feet maximum for both abutments and piers. The same results can be expected for any of the alternatives; therefore, it is not a

Figure 3 – Screenshot in AssetWise; Scour Evaluation Documentation Example

After documenting the Scour Evaluation results, the Bridge Engineer and/or Bridge Inspection Team Leader must code SNBI (B.AP.03) Scour Vulnerability as described in the Specification for the National Bridge Inventory (SNBI). When a documented evaluation exists then the Scour Appraisal is complete. If there are no bridge-threatening observed scour defects then the bridge engineer or bridge inspector familiar with documenting Scour Evaluations may code SNBI (B.AP.03) Scour Vulnerability based on the results of the scour evaluation and the descriptions provided.

Table 4 - SNBI (B.AP.03) Scour Vulnerability Code

Code	Scour Appraisal	Description
A	A - Scour appraisal completed.	Bridge determined to be stable for scour.
B	B - Scour appraisal completed.	Bridge determined to be stable for scour, dependent upon designed, and functioning countermeasures. • *Use code B when designed, installed, and functioning countermeasures are used to. address potential scour and to maintain bridge stability for new or existing bridges, or bridges with unknown foundations.* • *Use code B when the Scour Appraisal Team determines that the in-place, non-designed countermeasures are fully functioning and are appropriate to mitigate the risk of scour.*
C	C - Scour appraisal completed.	Bridge could become unstable for scour. Temporary (not designed) countermeasure installed to mitigate scour. Bridge is scour critical. Follow POA Requirement. • *Use code C for bridges that could become unstable for the potential scour, and temporary countermeasures are installed that were not designed.*
D	D - Scour appraisal completed.	Bridge is, or may become, unstable for scour. Bridge is scour critical. Follow POA Requirement.
0	0 - Scour appraisal has not been completed.	
E	E - Scour appraisal has not been completed.	Temporary (not designed) countermeasure. installed to mitigate scour.
U	U - Scour appraisal has not been completed	Due to unknown foundations.

Scour Assessment

A Scour Assessment is the determination of bridge's vulnerability to scour which considers stream stability and scour potential as described in HEC 20 and other scour-related data sources. In the absence of a documented Scour Evaluation, a Scour Assessment must be completed and documented in AssetWise (Figure 4). There are three levels of an Assessment. Each Assessment Level is a progressive screening process that affectively documents the scour and directs the bridge engineer, bridge inspector or scour appraisal team in coding the Appraisal field (B.AP.03) Scour Vulnerability Code. Legacy Assessment checklists will be accepted however it is recommended that the new progressive screening process is completed. The following fields are required when completing all types of Assessments in AssetWise (blue text represents AssetWise items):

1. Scour Assessment Level(s) Performed
   - *1 – Level 1*
   - *2 – Level 2 (Includes Level 1)*
   - *3 – Level 3 (Includes Level 1 and Level 2)*
   - *O - Other, Documented File or Checklist on File prior to January 1, 2023*
2. Scour Assessment Date
3. Scour Assessment PE Number - *Required for Level 2 and Level 3 Assessments*
4. Countermeasure Type – Countermeasures are material, devices, or structures designed to prevent, slow, or stop the occurrence of scour. Select the most appropriate answer in the dropdown. Refer to HEC 23 - Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance 3rd edition, Volume 1 & 2 for determining the nature of the countermeasures.
   a. *Designed, installed, and functioning countermeasures are used to address potential scour and to maintain bridge stability for new or existing bridges, or bridges with unknown foundations.*
   b. *Scour Appraisal Team determines that the in-place, non-designed countermeasures are fully functioning and are appropriate to mitigate the risk of scour.*
   c. *Temporary countermeasures are installed that were not designed. Bridge could become unstable for scour*
   d. *None*

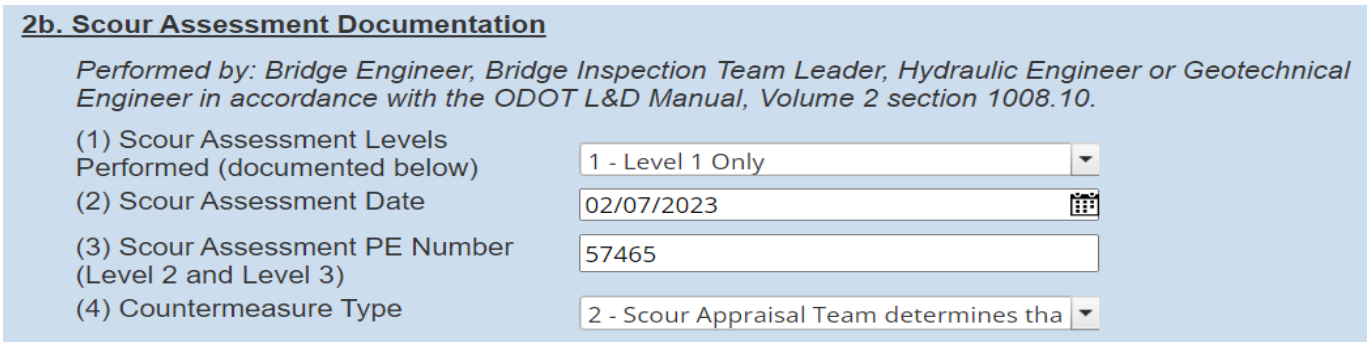


Figure 4 - Scour Assessment Input Example

Scour Assessment Level 1 - Stability Screening

Performed by Bridge Engineer and or Bridge Inspection Team Leader familiar with Scour Assessments. If any of the following Level 1 questions are answered "yes", then continue to the Level 2 Assessment.

If all Level 1 answers are "no", the Scour Assessment is complete, and the bridge is deemed "stable" unless conditions change. Code (B.AP.03) Scour Vulnerability A or B. The difference between A and B is the Countermeasure Type identified previously.

1. *Unknown Foundations*	**Yes / No**
2. *Visibly Scoured Rock (Figure 5)* • *Scour Resistant Rock = No.* • *Ex. Layers of scoured interbedded shale code "Yes" (Figure 5)*	**Yes / No**
3. *Shallow Foundations* • *Pipe culverts and 4-sided boxes code "NA – Not applicable"* • *Spread footing on soil code "Yes"* • *Spread footing keyed into rock code "No"*	**Yes / No**
4. *Evidence or history of overtopping* • *When B.AP.02 "Overtopping Likelihood" is coded 1-6 then code "Yes"* • *When debris is stuck in cross frames or on an abutment or pier seats then code "Yes".* • *When historical photos or witness-accounts indicate high-water touching the underside of the superstructure then code "Yes".*	**Yes / No**
5. *Are any of the Scour, Underwater or Channel component ratings rated 5 or worse?* • *Underwater Inspection Condition, Culvert Condition Rating, Channel Condition Channel Protection Condition, Scour Condition Rating*	**Yes / No**

Figure 5 - Example Bridge with non-scour-resistant rock

Scour Assessment Level 2 - Susceptibility Screening Score

Performed by Bridge Engineer, Hydraulic Engineer, Geotechnical Engineer and/or Bridge Inspection Team Leader team familiar with Scour Assessments. The PE number must be recorded in AssetWise for the engineer the performed or supervised the Assessment. Answer all eighteen (18) questions in AssetWise and record the point total. The point total will determine the Scour Vulnerability code or next steps.

STRUCTURE	PTS
1. Bridge Category	
Single span and pile foundations	4
Single span and spread footing	5
Multi-span, piers on spread footings, and continuous superstructure	6
Multi-span, piers on spread footings, and non-continuous superstructure	7
Superstructure is routinely overtopped	8
2. Number of piers in the main channel	
No piers in the main channel	0
One pier in the main channel	1
Two to three piers	2
Four or more piers	4
3. Pier foundation	
No piers or all piers above flood flows (flood flows as determined by site Conditions, hydraulic calculations, or historical information)	0
Spread footing foundations:	
Spread footings on scour resistant bedrock	0
Spread footings on non-scour resistant rock	2
Unknown foundation type	5
Spread footings on soil or gravel	6
Pile bents, footing/piling or drilled shaft, depth below existing stream bed:	
Pile depth greater than 40'	0
Pile depth 20' to 40'	2
Unknown pile depth	3
Pile depth less than 20'	5
4. Abutment foundation	

Abutments located above flood flows (flood flows as determined by site Conditions, hydraulic calculations, or historical information)	0
Spread footing foundations:	
Spread footing on erosion resistant bedrock	0
Spread footing on erodible rock	2
Unknown foundation type	4
Spread footing on soil or gravel	6
Pile bents, footing/piling or drilled-shaft, depth below existing stream bed:	
Pile depth greater than 40'	0
Pile depth 20' to 40'	1
Unknown pile depth	2
Pile depth less than 20'	2
High timber abutment	6
5. Road low point elevation vs. low member submergence:	
Submergence of low member or overtopping of road low point is improbable.	0
Low member elevation is above road low point, submergence possible.	1
Low member elevation is below road low point, submergence possible.	4

HISTORY

6. Observed scour at piers:	
No piers or all piers above flood flows (flood flows as determined by site Conditions, hydraulic calculations, or historical information)	0
Spread foundations:	
No scour hole	0
Scour hole above top of footing	2
Scour hole within limits of footing	8
No measurement taken at piers	7
Footing/piling foundations:	
No scour hole	0
Scour hole above top of footing	2

Scour hole within limits of footing	4
Piling exposed	6
No measurement taken at piers	5
Pile bent foundations:	
No scour hole	0
Less than 5' scour	2
More than 5' scour	4
No measurement taken at piers	3
7. Abutment type and condition:	
Stub/Integral abutments, effective berm slope:	
2:1 or flatter	0
Steeper than 2:1 but flatter than 1.5:1	3
1.5:1 or steeper	6
High abutments, depth of footing or backwall planking below stream bed:	
More than 5'	0
0 to 5'	4
Footing is above stream bed	8

8. Abutment protection:	
No protection necessary.	0
Wing dikes or revetment protection in good condition.	0
Other protection in good condition.	1
Protection condition poor or not provided but needed.	3
9. Measure the minimum horizontal level distance from the closest abutment down to the waterline.	
More than 25’ away.	0
5’ to 25’.	2
Less than 5’.	6
Abutment with stream banks.	8
10. Observed local scour at or around abutments:	
No problems.	0
Minor scour problems.	4
Major scour problems observed in past inspections.	8
11. Observed debris (or ice) lodged against bridge	
Remote or none.	0
Slight amount of occasional – every 3 years or more.	3
Frequent – more than once every 3 years.	6
No available information.	4
Moderate to heavy debris or continually present (Figure 6).	8

Figure 6 - Heavy Debris will promote scour

STREAM GEOMORPHICS

12. Average degradation of stream bed since construction, not including local scour:	
Less than 4’ or stream aggrading	0
4’ to 6’	2
Greater than 6’	6
No comparative cross-sections	4
13. Observed lateral movement of stream:	
Stable	0
Movement, no threats to bridge	2
Unstable, threatens bridge	8
No information available	4
14. Channel bottom material	

Bedrock	0
Boulders and cobbles	1
Clay or silty clay	2
Gravel, sand, and silt	4
15. Lowest SNBI Component Conditions for Channel, Channel Protection or Scour (Figure 7)	
Rated a 6 or more	0
Rated a 5 or less	4

Code	Condition Description
N	Bridge does not cross over water.
9	No scour.
8	Insignificant scour.
7	Some minor scour.
6	Widespread minor or isolated moderate scour.
5	Moderate scour; strength and stability of the bridge are not affected.
4	Widespread moderate or isolated major scour; strength and/or stability of the bridge is affected.
3	Major scour; strength and/or stability of the bridge is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	Major scour; strength and/or stability of the bridge is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
1	Bridge is closed to traffic due to scour condition. Channel rehabilitation may return the bridge to service.
0	Bridge is closed due to scour condition, and is beyond corrective action. Bridge replacement is needed to restore service.

Figure 7 - Scour Component Condition Rating Scale

SITE GEOMORPHICS

16. Bridge location:	
Bridge over mainstream, tributary or spillway nearby:	
No tributary nearby	0
Tributary downstream within 100 ft	1
Tributary or spillway upstream within 1,000 ft	4
Bridge over tributary, mainstream nearby:	
No mainstream within 1,000 ft	0
Mainstream within 1,000 ft	2
Mainstream within 500 ft	4
17. Upstream Stream bend within 150 feet of bridge:	
0-to-15-degree bend	1
15-to-45-degree bend	3
45-to-90-degree bend	6
18. Alignment of piers to flood flows:	
No piers or all piers above flood flows (flood flows as determined by site Conditions, hydraulic calculations, or historical information)	0
0 to 5 degrees skew	1
5 to 15 degrees skew	3
15 to 90 degrees skew	6

Add up all the points answered for each of the 18 questions, ensure no questions are blank. **Assessment Level 2 Scour Assessment Screening Score =**	

Points are organized into three ranges: Low, High, and In-Between.

- Low
  - Point totals in the low range are stable, or less than 35 points. Code Scour Vulnerability (B.AP.03) A or B (Table 1).
- High
  - Point totals in the high range should be considered scour critical and code Scour Vulnerability (B.AP.03) C or D (Table 1).
    - Greater than 45 points for a single span bridge or
    - Greater than 55 points for a multi-span bridge
- In-Between

- All other point totals are neither high nor low. The mid-range point totals must continue to the Level 3 assessment.
  - Between 35 - 45 range for a single span bridge or
  - Between 35 - 55 range for a multi-span bridge

Scour Assessment Level 3 - Scour Vulnerability Screening

Performed by Bridge Engineer, Hydraulic Engineer, Geotechnical Engineer and/or Bridge Inspection Team Leader team familiar with Scour Assessments. The PE number must be recorded in AssetWise. Answer the progressive sections of questions in AssetWise. The answers will determine the Scour Vulnerability coding.

Section 1 Questions – If any of the following are yes, code Scour Vulnerability A or B. If all 3 are no, continue to section 2.

a.	Is the bridge over a flat and straight drainage ditch AND spans a channel? (Does not apply to channelized natural streams)	Yes / No
b.	Is the bridge over still water? (Lake, pond, wetland, etc.)	Yes / No
c.	Is the bridge a single span with designed rip rap and no scour issues?	Yes / No

Section 2 Questions – If any of the following 5 are yes, code Scour Vulnerability C or D. If all are no, continue to section 3.

a.	Does the bridge have piles driven more than 35' below the streambed?	Yes / No
b.	Does the bridge have piles driven to refusal on bedrock?	Yes / No
c.	Does the bridge have piles driven 25' - 35' below the streambed with less than 10' of highly erodible soils?	Yes / No
d.	Does the bridge have spread footings on scour resistant rock?	Yes / No
e.	Is the bridge a single span with an effective floodplain width less than 5x the span length AND one of the following are true: *i. Concrete abutments on piles* *ii. Timber abutments less than 6' high on piles* *iii. Stream slope less than 5' per mile*	Yes / No

Section 3 Questions - Answer the following 3 questions to complete the assessment. Code Scour Vulnerability C or D

a.	Has the bridge been previously overtopped, and no evidence of scour problems exist?	Yes / No
b.	Is the bridge scheduled for replacement or scour countermeasures within 5 years?	Yes / No
c.	Is the bridge on a local street with an ADT less than 25?	Yes / No

REFERENCES

- Specifications for the National Bridge Inventory (dot.gov)

- Location & Design Manual, Volume 2 - Drainage Design | Ohio Department of Transportation, Latest Version
- Bridge Design Manual (BDM)| Ohio Department of Transportation, Latest Version
- Scour - Hydraulics - Bridges & Structures - Federal Highway Administration (dot.gov)

Appendix E: Nonredundant Steel Tension Member Inspection Procedure Checklist

The following pages include a Nonredundant Steel Tension Member Inspection Procedure Checklist and an example of an NSTM Inspection Procedure to be used as a guide for each NSTM bridge.

Bridge Number

_____ -_____ -_____ Spec Des _____

Bridge SFN_____

Feature Intersected _____

Nonredundant Steel Tension Member Inspection Procedure Checklist

Inspectors may consider using this checklist for each Nonredundant Steel Tension Member (NSTM) bridge as a guide. The NSTM Inspection Procedure must have Identified NSTM Members and shall be placed in the bridge file and accessible to future Team Leaders. NSTMs must be inspected according to the written inspection procedures for the bridge, which should contribute to thorough inspections yielding accurate condition assessments. The non-redundant nature of NSTMs, especially when coupled with risk factors, leads to a heightened concern for the performance of these members. The procedure should also identify risk factors or unique circumstances or conditions at the site. The proper development of good inspection procedures, and concerted attention to follow those procedures, will mitigate most risks.

Check all that apply to the Bridge:

☐ **Identified Nonredundant Steel Tension Members on framing plan or sketch (attached)**

☐ **Risk Factors**

- ○ **Structural Risk Factors** (☐Table, ☐Photos or ☐Locations in bridge file)

  Specific risk factors include, but are not limited to:

  - ☐ **fatigue and fracture prone details**, notably the E & E' details
  - ☐ Material specific factors, including **welded:**
    - ○ T1 steel
    - ○ ASTM A514
    - ○ Grade 100 Steel
    - ○ Quenched & Tempered (Q&T) Steel
    - ○ High-Strength Steel
    - ○ Heat-treated Steel
    - ○ Combinations of the above or any above used with the adjective "alloy"
    - ○ Field or Poor welding techniques
    - ○ potential out-of-plane
    - ○ previous cracking or repairs
    - ○ cold service temperatures
    - ○ load posted
    - ○ superstructure condition code of 4 or less
    - ○ subject to overloads or impact damage
    - ○ older service life
    - ○ high ADTT (can be taken as ADTT>5,000 but may be less depending on the # of fatigue cycles)
    - ☐ Other_____ _____ _____

☐ **Sources of Prior cracking** – important for determining proper inspection procedures:

- load induced (typically the most predictable) _____
- distortion induced _____
- constraint induced (pop-in fracture), _____
- fabrication flaws (hydrogen, weld defect), _____
- _____ F = lowest anticipated service temperature is an important factor in determining susceptibility to cracking.

☐ Bridge posted because of a controlling NSTM

☐ Gusset Plates

☐ Bowing Gusset Plates have documented and quantitatively repeatable procedures for measuring bowing change within a tolerance of 1/16".

☐ **Inspector Access Risk Factors** (☐Table, ☐Photos, ☐ Contacts, ☐Locations in bridge file)

☐ clearly detail any inspection methods (include specifically what needs looked at and what the inspector is looking for)

☐ needed access (snooper, manlift, climbing, consider including contact for property owners, driveway location, key location, etc.)

☐ scheduling for equipment rental, bridge maintenance, RR or river traffic under bridge

☐ maintenance of traffic [Referenced MT_SCD: _____]

☐ detour of traffic or closure of bridge necessary

☐ unique inspection methods and frequencies if within the minimum 24 months

☐ are there time periods of high water preventing access to floor beams or Lower chord?

☐ specific inspection devices or safety equipment utilized

☐ permits/permission required for access, from landowner, agency governing land/water, Railroad [Contact:_____]

☐ necessity to clean or open access hatches prior to the inspection

☐ confined space needs

ODOT District 9

Nonredundant Steel Tension Member (NSTM) Inspection Procedure

Reference: ODOT Manual of Bridge Inspection, Chapter 4

Inspection Responsibility: ODOT District 9

County-Route-SLM: LAW-007-0240

Structural File Number: 4400038

Inspection Frequency: 24 Months

Fatigue Life Study: Year of Study: Not Calculated Remaining Fatigue Life: Not Calculated

Load Path Redundant: Main Span – No, Parker truss span is a two-truss system and floorbeam spacing exceeds 14'.

Approach Spans – Yes, multi-beam system.

Structurally Redundant: No, truss span and approach spans are simple span.

Internally Redundant: No, tension members are rolled members (only select lower chord members consist of multiple riveted plates).

System Redundant: No rigorous analysis performed (i.e. finite element, 3-D modeling)

Figure 1 – LAW-7-0240 south elevation looking northeast.

Location: The LAW-7-2.40 Bridge **(see Figure 1)** carries one lane of State Route 7 northbound and one lane of State Route 7 southbound over Symmes Creek in Chesapeake, Ohio **(see Figure 2)**. It is located 0.11 miles north of SR 527.

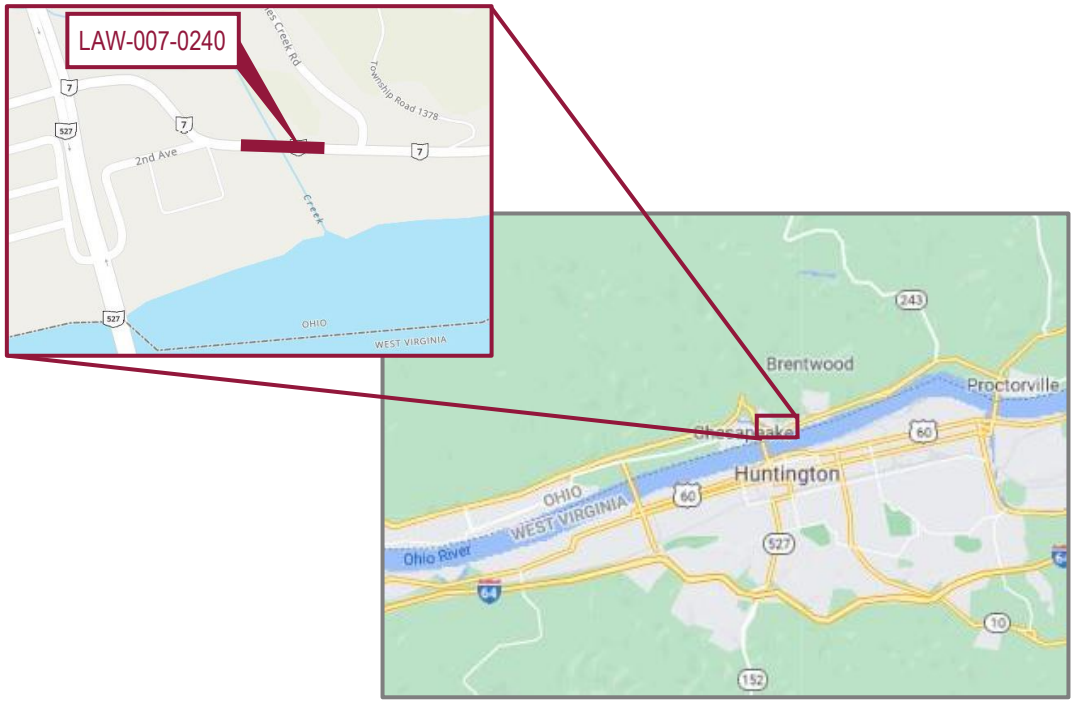
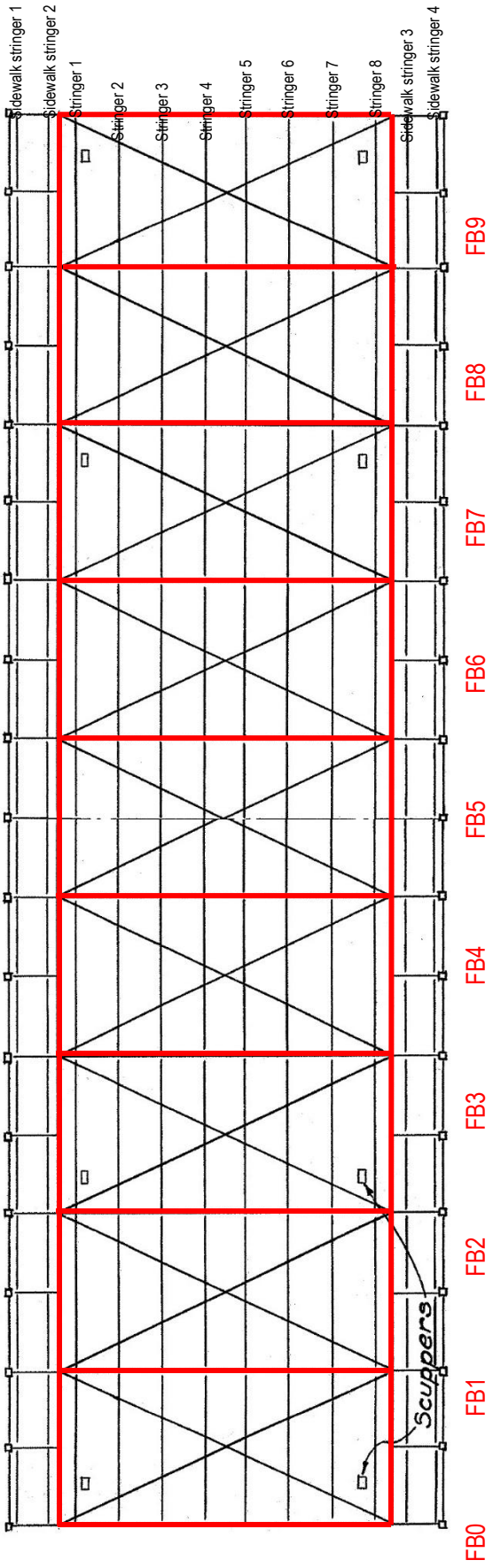


Figure 2 – LAW-007-0240 location

Structure Description: This structure is composed of 4 spans for a total length of 348'-8" with a maximum span length of 162'. It carries two lanes of traffic with a 34'-0" roadway width, and it also carries two sidewalks outside the truss lines. Spans 1, 2, and 3 are original to the structure, and Span 4 was added at an unknown date prior to 1990. During this rehabilitation, the original forward abutment was retained and renamed to Pier 3, and a new forward abutment and forward approach slab were added. Span 2, the main span, is a 162'-0" long Parker through truss while Spans 1, 3, and 4 are simple span rolled steel multi-beam spans **(see Figure 1).**

The truss is comprised of riveted built-up box sections (channels with cover plates and lacing bars) for the upper chord and end posts, rolled beams for the diagonals and verticals, two plates or two sets of riveted plates with internal diaphragms for the lower chord, riveted gusset plates, rolled floorbeams, and rolled stringers. Floorbeams are spaced at 18'-0". The nonredundant steel tension members are the primary truss members that experience tension (lower chord, diagonals, select verticals) and the floorbeams **(see Figure 3).**



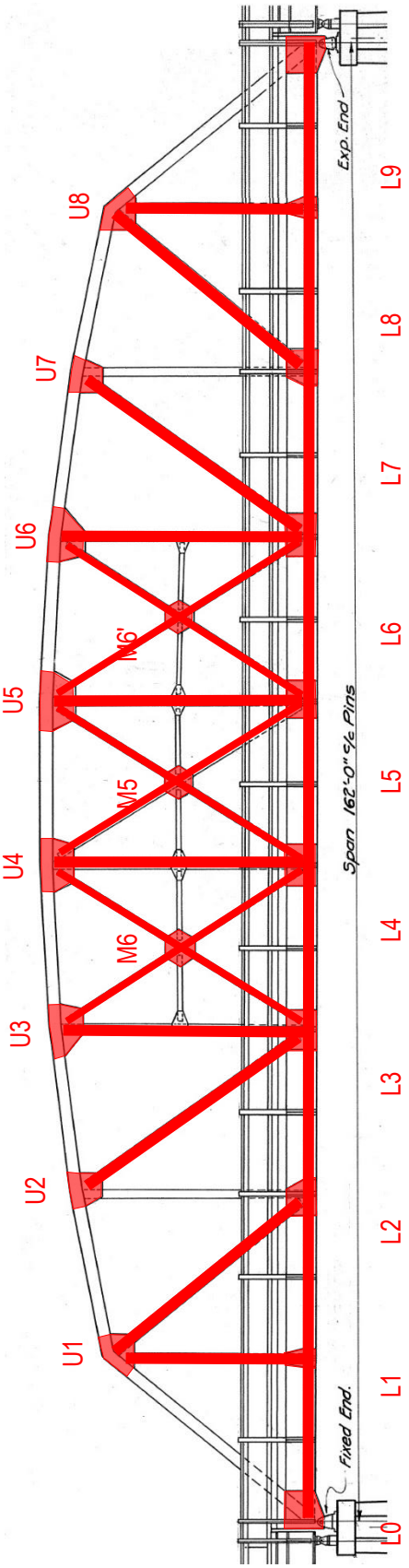


Figure 3 – Span 2 framing plan and truss south elevation (Images taken from the 1932 design drawings).

Lower chord members, diagonals, verticals (except U2-L2 & U7-L7), gusset plates, and floorbeams are nonredundant steel tension members.

Inspector Risk Factors

Inspection Procedure and Inspector Access Risk Factors: A combination of rope access techniques, protected climbing techniques, ladders, and/or rigging are required to access all the nonredundant steel tension members and their tension regions. In the 2020 inspection, all nonredundant steel tension members were accessed with protected climbing techniques and rope access techniques.

- Inspection Methods
    - Primary truss members (including gusset plates): Inspect the entire member for the full length especially for distress at fatigue prone details.
    - Floorbeams: Inspect the bottom flange and bottom half of the web of the beam and the web in the primary shear regions, especially at the copes for cracks and for distress at fatigue prone details.
- Access
    - Protective climbing & rope access: Used to gain hands on access to all primary truss members including gusset plates and floorbeam tension areas.
- Maintenance of Traffic – None
- Inspectors Risks
    - Work at heights
    - Cold/Hot extreme temperatures
    - Traffic on the bridge
    - Working over water

Structural Risk Factors			
Risk Factor	**Location**	**Description**	**Photo** (photos on following pages)
Nonredundant Steel Tension Member Structure	Superstructure	Primary truss member (including gusset plates) or floorbeam failure would be catastrophic.	-
Fatigue Prone Detail – E	Vertical members U3-L3, U4-L4, U5-L5 & U6-L6	Base metal of the vertical member interior flange at the sway bracing connection angle attached by fillet welds with no transition radius (Category E)	1
Previous Cracking and Repairs	Floorbeam upper web at cope adjacent to inboard truss connection	Cracks in the web of the copes at Floorbeams 0 and 9 and overcuts in the webs of various floorbeams. No crack arrest holes have been drilled.	2, 3
High ADTT	All primary truss members and floorbeams	Average daily truck traffic is 568.	-

Fatigue prone detail categories are in accordance with AASHTO LRFD specifications Table 6.6.1.2.3-1

Photo 1 – Sway bracing connection angle attached by fillet welds with no transition radius **(Category E)**. U6-L6 of the Right Truss is shown (looking northeast).

Photo 2 – Cracking in the web of a floorbeam at the upper cope

(looking west at Floorbeam 9 adjacent to the Right Truss).

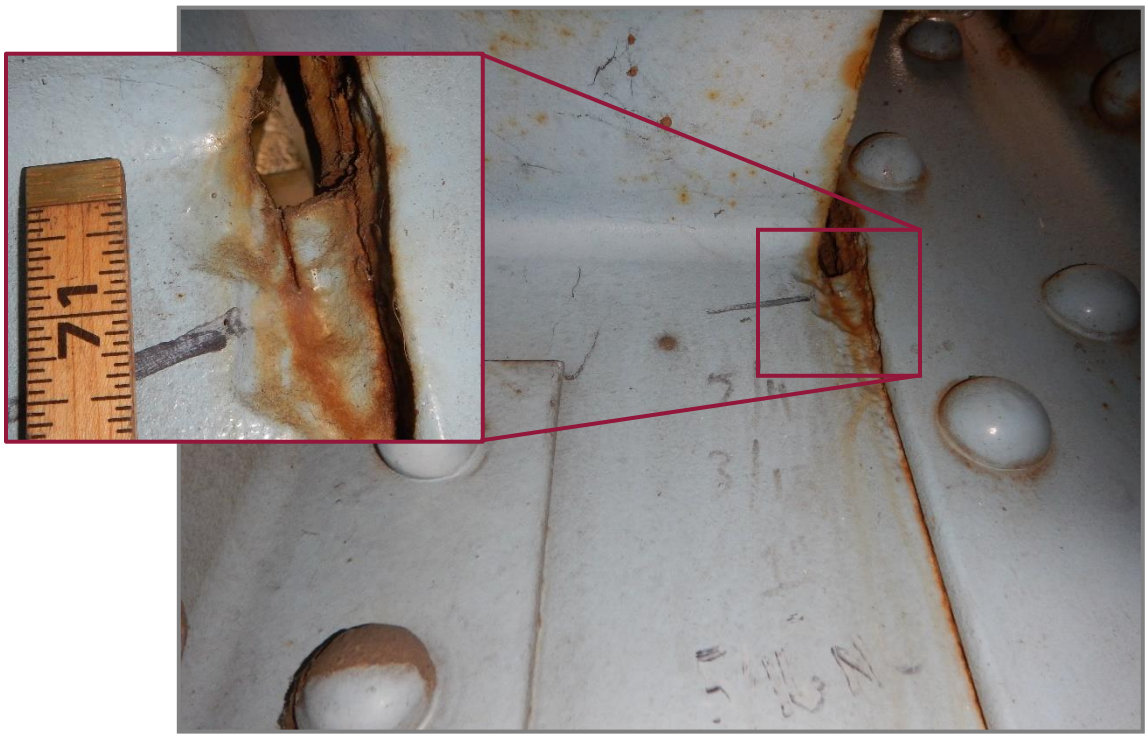


Photo 3 – Overcut in a floorbeam web at the cope at the connection to the truss

(looking east at Floorbeam 3 adjacent to the Right Truss).

Appendix F: Fatigue Prone Details

The following pages include the latest Detail Categories for Load-Induced Fatigue according to the American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, Ninth Edition (2020).

Table 6.6.1.2.3-1—Detail Categories for Load-Induced Fatigue

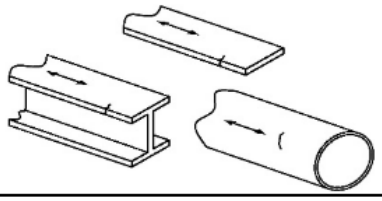
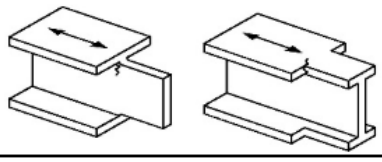
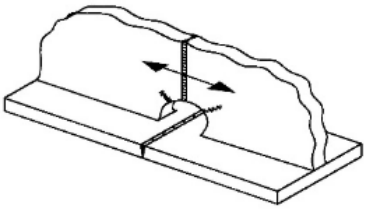
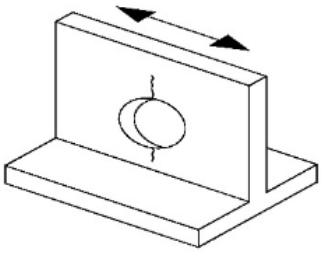
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 1—Plain Material away from Any Welding					
1.1 Base metal, except noncoated weathering steel, with rolled or cleaned surfaces, or base metal with thermal-cut edges with a surface roughness value of 1,000 µ-in. or less, but without re-entrant corners.	A	250×10^8	24	Away from all welds or structural connections	
1.2 Noncoated weathering steel base metal with rolled or cleaned surfaces designed and detailed in accordance with FHWA (1989), or noncoated weathering steel base metal with thermal-cut edges with a surface roughness value of 1,000 µ-in. or less, but without re-entrant corners.	B	120×10^8	16	Away from all welds or structural connections	
1.3 Base metal of members with re-entrant corners at copes, cuts, block-outs or other geometrical discontinuities made to the requirements of AASHTO/AWS D1.5, except weld access holes.	C	44×10^8	10	At any external edge	
1.4 Base metal of rolled cross sections with weld access holes made to the requirements of AASHTO/AWS D1.5.	C	44×10^8	10	In the base metal at the re-entrant corner of the weld access hole	
1.5 Base metal at the net section of open holes in members made to the requirements of AASHTO/AWS D1.5 (Brown et al. 2007), except as specified in Condition 1.6. All stresses shall be computed on the net section. (Note: See Condition 2.1 for holes with pretensioned high-strength bolts installed in standard-size holes.)	D	22×10^8	7	In the net section originating at the side of the hole	

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

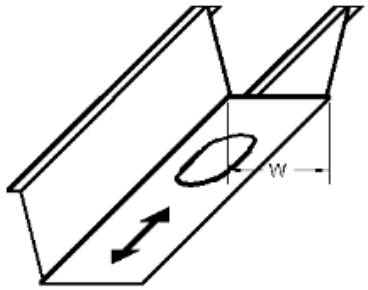
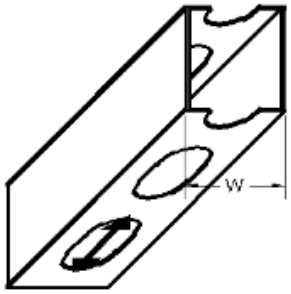
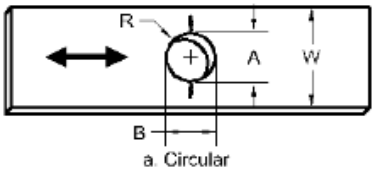
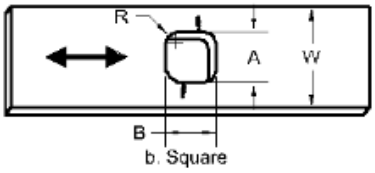
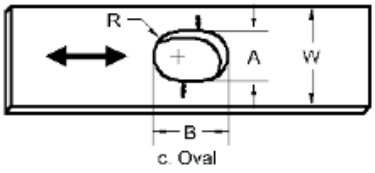
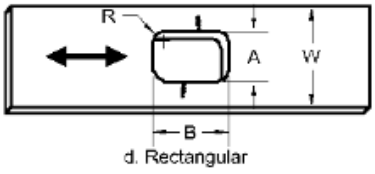
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
1.6 Base metal at the net section of manholes or hand holes made to the requirements of AASHTO/AWS D1.5, in which the width of the hole is at least 0.30 times the width of the plate ($A \geq 0.30W$) (Bonachera Martin and Connor, 2017). The geometry of the hole shall be: a. circular; or b. square with corners filleted at a radius at least 0.10 the width of the plate ($R \geq 0.10W$); or c. oval ($B > A$), elongated parallel to the primary stress range; or d. rectangular ($B > A$), elongated parallel to the primary stress range, with corners filleted at a radius at least 0.10 times the width of the plate ($R \geq 0.10W$). All holes shall be centered on the plate under consideration, and all stresses shall be computed on the net section. (Note: Condition 1.5 shall apply for all holes in cross sections in which other smaller open holes or holes with nonpretensioned fasteners are located anywhere within the net section of the larger hole, and minimum edge distance requirements specified in Article 6.13.2.6.6 are satisfied for the smaller holes.)	C	44×10^8	10	In the net section originating at the side of the hole	   a. Circular  b. Square  c. Oval  d. Rectangular

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

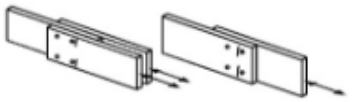
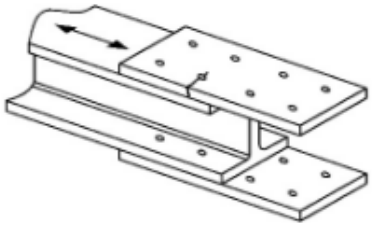
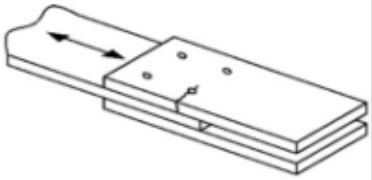
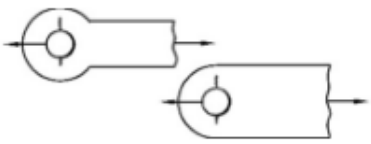
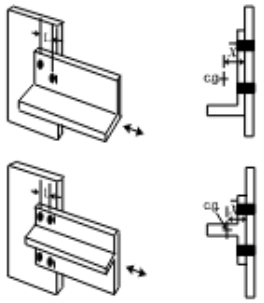
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 2—Connected Material in Mechanically Fastened Joints					
2.1 Base metal at the gross section of high-strength bolted joints designed as slip-critical connections with pretensioned high-strength bolts installed in holes drilled full size or subpunched and reamed to size—e.g., bolted flange and web splices and bolted stiffeners. (Note: see Condition 2.3 for bolt holes punched full size; see Condition 2.5 for bolted angle or T-section member connections to gusset or connection plates.)	B	120×10^8	16	Through the gross section near the hole	
2.2 Base metal at the net section of high-strength bolted joints designed as bearing-type connections but fabricated and installed to all requirements for slip-critical connections with pretensioned high-strength bolts installed in holes drilled full size or subpunched and reamed to size. (Note: see Condition 2.3 for bolt holes punched full size; see Condition 2.5 for bolted angle or T-section member connections to gusset or connection plates.)	B	120×10^8	16	In the net section originating at the side of the hole	
2.3 Base metal at the net or gross section of high-strength bolted joints with pretensioned bolts installed in holes punched full size (Brown et al., 2007); and base metal at the net section of other mechanically fastened joints, except for eyebars and pin plates, e.g., joints using ASTM A307 bolts or non-pretensioned high-strength bolts. (Note: see Condition 2.5 for bolted angle or T-section member connections to gusset or connection plates).	D	22×10^8	7	In the net section originating at the side of the hole or through the gross section near the hole, as applicable	
2.4 Base metal at the net section of eyebar heads or pin plates (Note: for base metal in the shank of eyebars or through the gross section of pin plates, see Condition 1.1 or 1.2, as applicable.)	E	11×10^8	4.5	In the net section originating at the side of the hole	
2.5 Base metal in angle or T-section members connected to a gusset or connection plate with high-strength bolted slip-critical connections. The fatigue stress range shall be calculated on the effective net area of the member, $A_e = UA_g$, in which $U = (1 - \bar{X}/L)$ and where A_g is the gross area of the member. $\bar{X}$ is the distance from the centroid of the member to the surface of the gusset or connection plate and L is the out-to-out distance between the bolts in the connection parallel to the line of force. The effect of the moment due to the eccentricities in the connection shall be ignored in computing the stress range (McDonald and Frank, 2009). The fatigue category shall be taken as that specified for Condition 2.1. For all other types of bolted connections, replace A_g with the net area of the member, A_n, in computing the effective net area according to the preceding equation and use the appropriate fatigue category for that connection type specified for Condition 2.2 or 2.3, as applicable.	See applicable Category above	See applicable Constant above	See applicable Threshold above	Through the gross section near the hole, or in the net section originating at the side of the hole, as applicable	

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

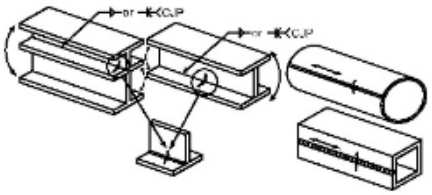
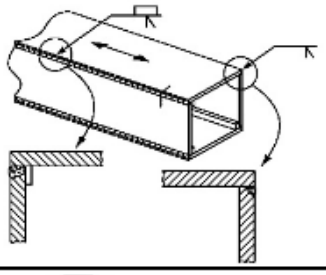
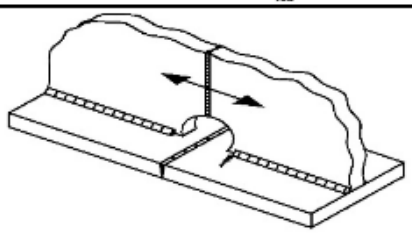
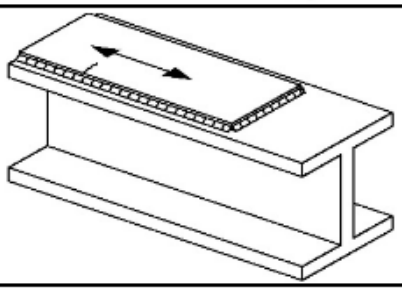
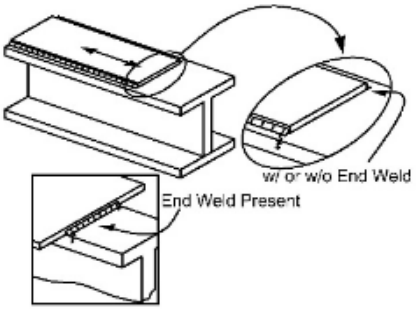
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 3—Welded Joints Joining Components of Built-up Members					
3.1 Base metal and weld metal in members without attachments built up of plates or shapes connected by continuous longitudinal complete joint penetration groove welds back-gouged and welded from the second side, or by continuous fillet welds parallel to the direction of applied stress.	B	120×10^8	16	From surface or internal discontinuities in the weld away from the end of the weld	
3.2 Base metal and weld metal in members without attachments built up of plates or shapes connected by continuous longitudinal complete joint penetration groove welds with backing bars not removed, or by continuous partial joint penetration groove welds parallel to the direction of applied stress.	B′	61×10^8	12	From surface or internal discontinuities in the weld, including weld attaching backing bars	
3.3 Base metal and weld metal at the termination of longitudinal welds at weld access holes made to the requirements of AASHTO/AWS D1.5 in built-up members. (Note: does not include the flange butt splice).	D	22×10^8	7	From the weld termination into the web or flange	
3.4 Base metal and weld metal in partial length welded cover plates connected by continuous fillet welds parallel to the direction of applied stress.	B	120×10^8	16	From surface or internal discontinuities in the weld away from the end of the weld	
3.5 Base metal at the termination of partial length welded cover plates having square or tapered ends that are narrower than the flange, with or without welds across the ends, or cover plates that are wider than the flange with welds across the ends:				In the flange at the toe of the end weld or in the flange at the termination of the longitudinal weld or in the edge of the flange with wide cover plates	
Flange thickness ≤ 0.8 in.	E	11×10^8	4.5		
Flange thickness > 0.8 in.	E′	3.9×10^8	2.6		

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

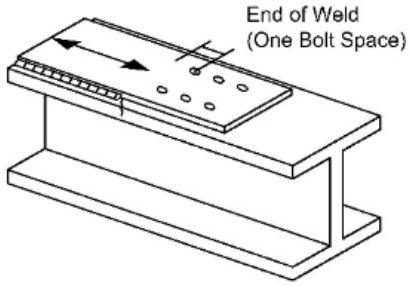
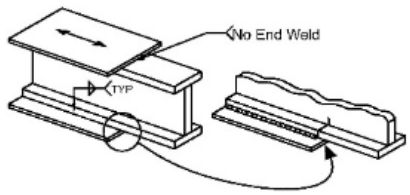
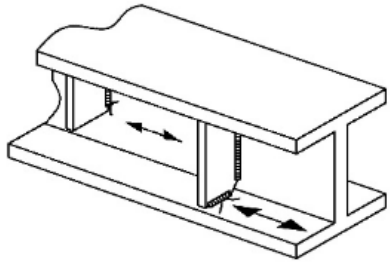
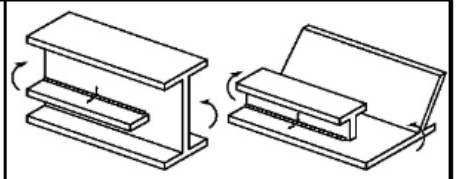
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 3—Welded Joints Joining Components of Built-Up Members (continued)					
3.6 Base metal at the termination of partial length welded cover plates with slip-critical bolted end connections satisfying the requirements of Article 6.10.12.2.3.	B	120×10^8	16	In the flange at the termination of the longitudinal weld	
3.7 Base metal at the termination of partial length welded cover plates that are wider than the flange and without welds across the ends.	E′	3.9×10^8	2.6	In the edge of the flange at the end of the cover plate weld	
Section 4—Welded Stiffener Connections					
4.1 Base metal at the toe of transverse stiffener-to-flange fillet welds and transverse stiffener-to-web fillet welds. (Note: includes similar welds on bearing stiffeners and connection plates). Base metal adjacent to bearing stiffener-to-flange fillet welds or groove welds.	C′	44×10^8	12	Initiating from the geometrical discontinuity at the toe of the fillet weld extending into the base metal	
4.2 Base metal and weld metal in longitudinal web or longitudinal box-flange stiffeners connected by continuous fillet welds parallel to the direction of applied stress.	B	120×10^8	16	From the surface or internal discontinuities in the weld away from the end of the weld	

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

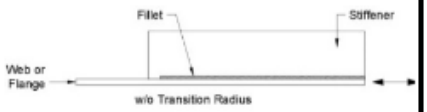
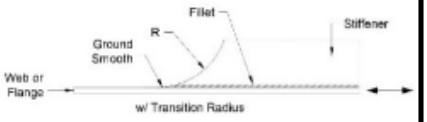
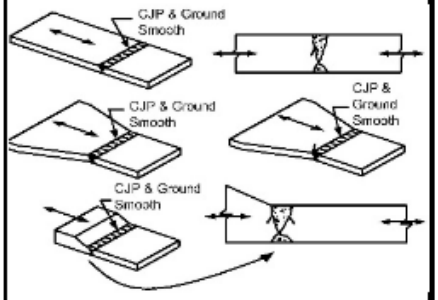
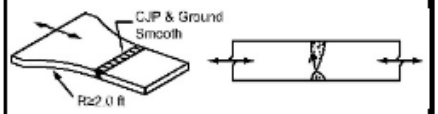
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 4—Welded Stiffener Connections (continued)					
4.3 Base metal at the termination of longitudinal stiffener-to-web or longitudinal stiffener-to-box flange welds:					
With the stiffener attached by welds and with no transition radius provided at the termination:				In the primary member at the end of the weld at the weld toe	
Stiffener thickness < 1.0 in.	E	11×10^8	4.5		
Stiffener thickness ≥ 1.0 in.	E′	3.9×10^8	2.6		
With the stiffener attached by welds and with a transition radius R provided at the termination with the weld termination ground smooth:					
$R \geq 24$ in.	B	120×10^8	16	In the primary member near the point of tangency of the radius	
24 in. $> R \geq 6$ in.	C	44×10^8	10		
6 in. $> R \geq 2$ in.	D	22×10^8	7		
2 in. $> R$	E	11×10^8	4.5		
Section 5—Welded Joints Transverse to the Direction of Primary Stress					
5.1 Base metal and weld metal in or adjacent to complete joint penetration groove welded butt splices, with weld soundness established by NDT and with welds ground smooth and flush parallel to the direction of stress. Transitions in thickness or width shall be made on a slope no greater than 1:2.5 (see also Figure 6.13.6.2-1).				From internal discontinuities in the filler metal or along the fusion boundary or at the start of the transition	
$F_y < 100$ ksi	B	120×10^8	16		
$F_y \geq 100$ ksi	B′	61×10^8	12		
5.2 Base metal and weld metal in or adjacent to complete joint penetration groove welded butt splices, with weld soundness established by NDT and with welds ground parallel to the direction of stress at transitions in width made on a radius of not less than 2 ft with the point of tangency at the end of the groove weld (see also Figure 6.13.6.2-1).	B	120×10^8	16	From internal discontinuities in the filler metal or discontinuities along the fusion boundary	

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

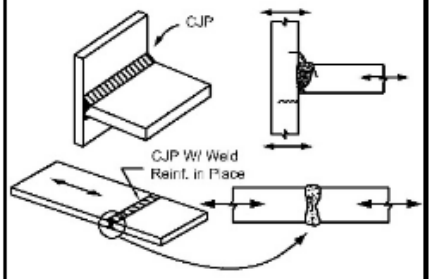
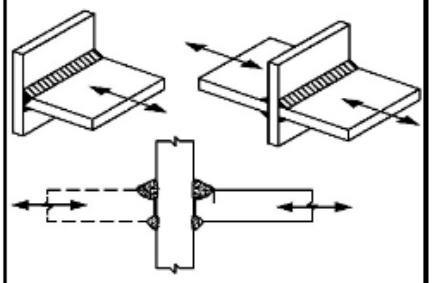
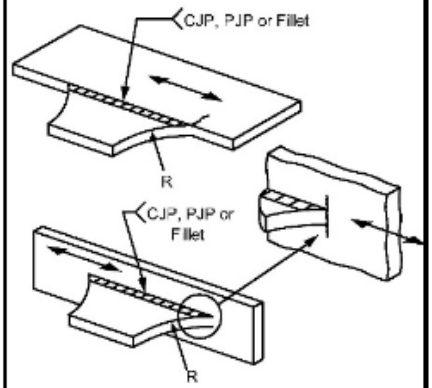
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
5.3 Base metal and weld metal in or adjacent to the toe of complete joint penetration groove welded T or corner joints, or in complete joint penetration groove welded butt splices, with or without transitions in thickness having slopes no greater than 1:2.5 when weld reinforcement is not removed. (Note: cracking in the flange of the "T" may occur due to out-of-plane bending stresses induced by the stem).	C	44×10^8	10	From the surface discontinuity at the toe of the weld extending into the base metal or along the fusion boundary	
5.4 Base metal and weld metal at details where loaded discontinuous plate elements are connected with a pair of fillet welds or partial joint penetration groove welds on opposite sides of the plate normal to the direction of primary stress.	C as adjusted in Eq. 6.6.1.2.5-4	44×10^8	10	Initiating from the geometrical discontinuity at the toe of the weld extending into the base metal or initiating at the weld root subject to tension extending up and then out through the weld	
Section 6—Transversely Loaded Welded Attachments					
6.1 Base metal in a longitudinally loaded component at a transversely loaded detail (e.g., a lateral connection plate) attached by a weld parallel to the direction of primary stress and incorporating a transition radius R: With the weld termination ground smooth:				Near point of tangency of the radius at the edge of the longitudinally loaded component or at the toe of the weld at the weld termination if not ground smooth	
$R \geq 24$ in.	B	120×10^8	16		
24 in. $> R \geq 6$ in.	C	44×10^8	10		
6 in. $> R \geq 2$ in.	D	22×10^8	7		
2 in. $> R$	E	11×10^8	4.5		
For any transition radius with the weld termination not ground smooth. (Note: Condition 6.2, 6.3 or 6.4, as applicable, shall also be checked.)	E	11×10^8	4.5		

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

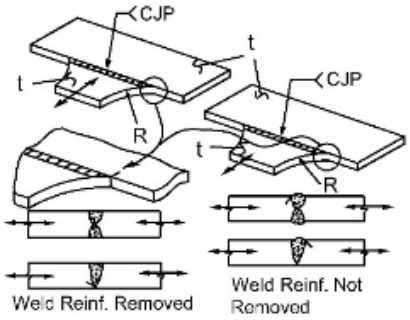
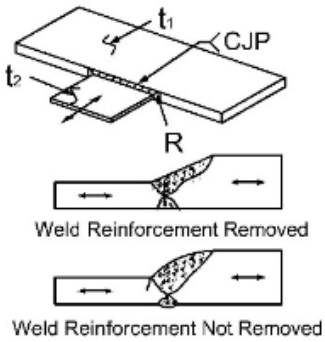
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 6—Transversely Loaded Welded Attachments (continued)					
6.2 Base metal in a transversely loaded detail (e.g., a lateral connection plate) attached to a longitudinally loaded component of equal thickness by a complete joint penetration groove weld parallel to the direction of primary stress and incorporating a transition radius R, with weld soundness established by NDT and with the weld termination ground smooth:					
With the weld reinforcement removed:					
$R \geq 24$ in.	B	120×10^8	16	Near points of tangency of the radius or in the weld or at the fusion boundary of the longitudinally loaded component or the transversely loaded attachment	
24 in. $> R \geq 6$ in.	C	44×10^8	10		
6 in. $> R \geq 2$ in.	D	22×10^8	7		
2 in. $> R$	E	11×10^8	4.5		
With the weld reinforcement not removed:				At the toe of the weld either along the edge of the longitudinally loaded component or the transversely loaded attachment	
$R \geq 24$ in.	C	44×10^8	10		
24 in. $> R \geq 6$ in.	C	44×10^8	10		
6 in. $> R \geq 2$ in.	D	22×10^8	7		
2 in. $> R$	E	11×10^8	4.5		
(Note: Condition 6.1 shall also be checked.)					
6.3 Base metal in a transversely loaded detail (e.g., a lateral connection plate) attached to a longitudinally loaded component of unequal thickness by a complete joint penetration groove weld parallel to the direction of primary stress and incorporating a weld transition radius R, with weld soundness established by NDT and with the weld termination ground smooth:				At the toe of the weld along the edge of the thinner plate In the weld termination of small radius weld transitions At the toe of the weld along the edge of the thinner plate	
With the weld reinforcement removed:					
R ≥ 2 in.	D	22×10^8	7		
$R < 2$ in.	E	11×10^8	4.5		
For any weld transition radius with the weld reinforcement not removed.	E	11×10^8	4.5		
(Note: Condition 6.1 shall also be checked.)					

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

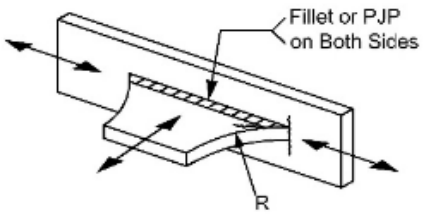
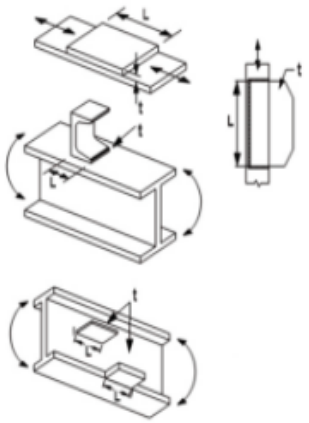
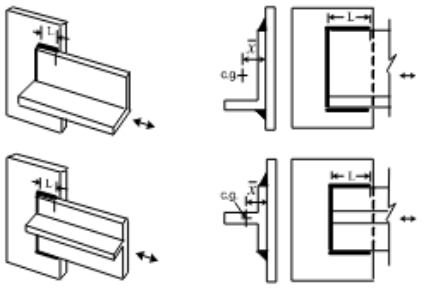
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 6—Transversely Loaded Welded Attachments (continued)					
6.4 Base metal in a transversely loaded detail (e.g., a lateral connection plate) attached to a longitudinally loaded component by a fillet weld or a partial joint penetration groove weld, with the weld parallel to the direction of primary stress (Note: Condition 6.1 shall also be checked.)	See Condition 5.4				
Section 7—Longitudinally Loaded Welded Attachments					
7.1 Base metal in a longitudinally loaded component at a detail with a length L in the direction of the primary stress and a thickness t attached by groove or fillet welds parallel or transverse to the direction of primary stress where the detail incorporates no transition radius:				In the primary member at the end of the weld at the weld toe	
$L < 2$ in.	C	44×10^8	10		
2 in. $\le L \le 12t$ or 4 in.	D	22×10^8	7		
$L > 12t$ or 4 in.					
$t < 1.0$ in.	E	11×10^8	4.5		
$t \ge 1.0$ in.	E′	3.9×10^8	2.6		
(Note: see Condition 7.2 for welded angle or T-section member connections to gusset or connection plates.)					
7.2 Base metal in angle or T-section members connected to a gusset or connection plate by longitudinal fillet welds along both sides of the connected element of the member cross section, and with or without backside welds. The fatigue stress range shall be calculated on the effective net area of the member, $A_e = UA_g$, in which $U = (1 - \bar{X}/L)$ and where A_g is the gross area of the member. $\bar{X}$ is the distance from the centroid of the member to the surface of the gusset or connection plate and L is the maximum length of the longitudinal welds. The effect of the moment due to the eccentricities in the connection shall be ignored in computing the stress range (McDonald and Frank, 2009).	E′	3.9×10^8	2.6	Toe of fillet welds in connected element	

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Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

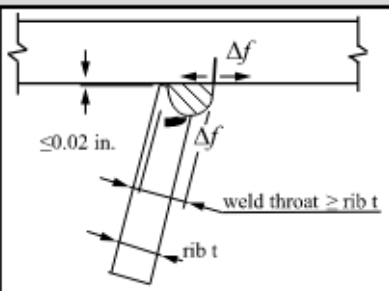
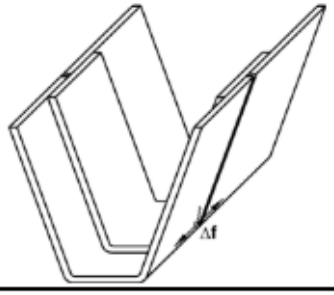
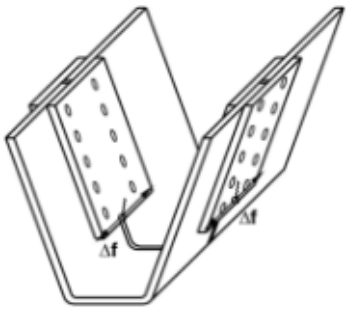
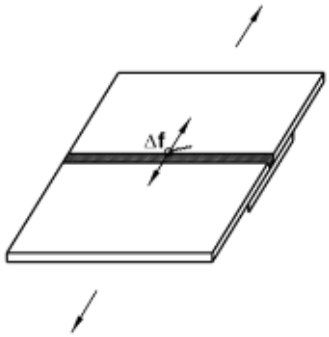
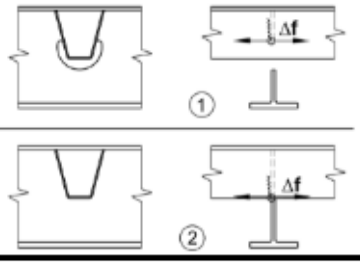
Description	Category	Constant A $(ksi)^3$	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 8—Orthotropic Deck Details					
8.1 Rib to Deck Weld—One-sided (60% min) penetration weld with root gap ≤ 0.02 in. prior to welding. Weld throat ≥ rib wall thickness. Allowable Design Level 1, 2, or 3	C	44×10^8	10	See Figure	
8.2 Rib Splice (Welded)—Single groove butt weld with permanent backing bar left in place. Weld gap > rib wall thickness Allowable Design Level 1, 2, or 3	D	22×10^8	7	See Figure	
8.3 Rib Splice (Bolted)—Base metal at gross section of high-strength slip-critical connection Allowable Design Level 1, 2, or 3	B	120×10^8	16	See Figure	
8.4 Deck Plate Splice (in Plane)—Transverse or Longitudinal single groove butt splice with permanent backing bar left in place Allowable Design Level 1, 2, or 3	D	22×10^8	7	See Figure	
8.5 Rib to FB Weld (Rib)—Rib wall at rib to FB weld (fillet or CJP) Allowable Design Level 1, 2, or 3	C	44×10^8	10	See Figure	

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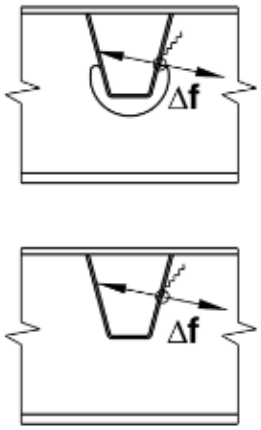
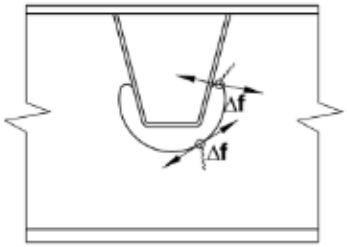
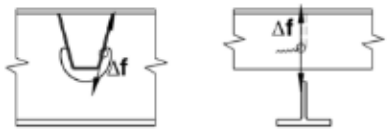
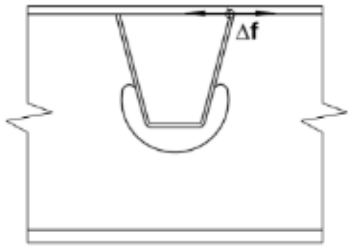
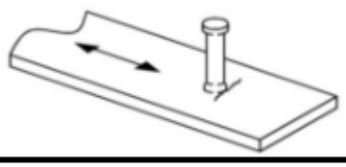
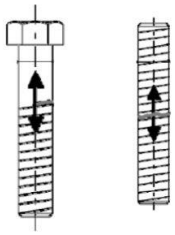
Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

Description	Category	Constant A (ksi)[1]	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 8—Orthotropic Deck Details (cont.)					
8.6 Rib to FB Weld (FB Web)—FB web at rib to FB weld (fillet, PJP, or CJP) Allowable Design Level 1 or 3	C (see Note 1)	44×10^8	10	See Figure	
8.7 FB Cutout—Base metal at edge with "smooth" thermal-cut finish as per AWS D1.5 Allowable Design Level 1 or 3	A	250×10^8	24	See Figure	
8.8 Rib Wall at Cutout—Rib wall at rib to FB weld (fillet, PJP, or CJP) Allowable Design Level 1 or 3	C	44×10^8	10	See Figure	
8.9 Rib to Deck Plate at FB Allowable Design Level 1 or 3	C	44×10^8	10	See Figure	
Note 1: Where stresses are dominated by in-plane component at fillet or PJP welds, Eq. 6.6.1.2.5-4 shall be considered. In this case, Δf should be calculated at the mid-thickness and the extrapolation procedure as per Article 9.8.3.4.4 need not be applied.					
Section 9—Miscellaneous					
9.1 Base metal at stud-type shear connectors attached by fillet or automatic stud welding	C	44×10^8	10	At the toe of the weld in the base metal	

continued on next page

Table 6.6.1.2.3-1 (cont.)—Detail Categories for Load-Induced Fatigue

Description	Category	Constant A (ksi^3)	Threshold $(\Delta F)_{TH}$ ksi	Potential Crack Initiation Point	Illustrative Examples
Section 9—Miscellaneous (continued)					
9.2 Nonpretensioned high-strength bolts, common bolts, threaded anchor rods, and hanger rods with cut, ground, or rolled threads. Use the stress range acting on the tensile stress area due to live load plus prying action when applicable.				At the root of the threads extending into the tensile stress area	
(Fatigue II) Finite Life	E′	3.9×10^8	N/A		
(Fatigue I) Infinite Life	D	N/A	7		

Appendix G: Underwater Inspection Procedure Checklist

The following pages include an Underwater Inspection Procedure Checklist to be used as a guide for each bridge requiring underwater inspection.

Underwater Inspection Procedure Checklist

Acceptable written procedures communicate to the next field inspection team leader what is necessary to ensure a safe and successful inspection. Each bridge requiring underwater diving techniques must have written inspection procedures specific to each bridge which address items unique to that bridge. The prior inspection report condition ratings and inspection comments, by themselves, do not suffice for the required procedures. It is valuable to review these items but they do not serve the same purpose as the inspection procedures. The inspection report records what an inspector actually did, what was looked at, and what was found. Procedures lay out what should be done, looked at, for the life of the structure. This checklist is a framework and shall be completed for all underwater diving inspections when inspection procedures do not exist.

I. Bridge Identification

a. Agency with Inspection Responsibility: _____

Dive Frequency: _____ months

SFN: _____ Bridge Number (County-Route-SLM-SD): _____

Superstructure Type Main Span Type: _____

Approach Span: _____

Substructure Type Abutment Type: _____

Pier Type: _____

Total Pier Count: _____

Total Pier Count in water: _____

Foundations: _____

Feature Intersected: _____

b. Photographs

☐ Endview

☐ Elevation

☐ Underside

II. Office and Field Assessment

Prior to the inspection, obtain and review copies of the previous underwater inspection reports, routine inspection reports and design plans in preparation of the inspection. Divers should pay particular attention given to any observed areas of deterioration, the channel conditions and factors that may accelerate material deterioration. Changes shall be noted in the inspection procedure. Site conditions should be reviewed prior to diving

a. Channel Conditions

____Waterway features

____Rapid stream flows,

____Significant debris accumulation

____Constricted waterway openings

____Soft or unstable streambeds

____Meandering channels

____Other which may promote scour and undermining of substructure elements

____Navigable Waterway

____Flow Controls

b. Anticipated Water conditions which may affect the inspection

____Cold Water (Apprx. Temp____)

____Black water

____Rapid stream flows

____Near military facility

____Tribal fishing

____Water quality

____History of Log jams

c. Identify factors that may accelerate the deterioration of the bridge elements:

____Highly corrosive water

____Unprotected steel members

____Other

Risk Factor Narrative:

III. Contacts Prior to Work

(TO BE COMPLETED BY THE BRIDGE OWNER)

Point of contact for immediate action such as closing the bridge due to findings)

Contact Bridge Owner _____ (number) days before the proposed underwater inspection.

Special contracting and scheduling procedures prior to inspection, include recommended lead time

Entity	Contact Name and Title	Contact Phone	Lead Time
Coast Guard			
Property Owner			
Access Equipment			
Lake or River draw-down			
Canal dry time			
Tree removal			
Other:			
Other:			

IV. Dive Team Shall Include the Following:

Dive Team Narrative:

Example: The Bridge shall be investigated using a three-member dive team: one supervisor to monitor rack box and take notes, one diver, and one tender/standby diver. There shall be one NBIS Team Leader onsite at all times.

V. Site Information

Navigable waterway: Y / N

Anticipated current _____ ft

If Yes, waterway river point _____

B.AP.03 - Scour Vulnerability: _____

Anticipated water visibility depth _____ ft

POA in place: Y/N

Anticipated Dive depth _____ ft

Scour Monitoring devices present: Y/N

Verify the Scope of Services when work is contracted for the procedure for underwater elements that are not in water during an inspection.

Site Information Narrative:

The underwater inspection consists of a visual and tactile examination of the accessible surfaces of the substructure items in water. Additional items should reference the scope of services in the contract. For reference the following items are in water:

Item	Number of Units	Level of Inspection (1, 2 or 3) with Commentary
Piers and Number of Columns		
Abutment		
Culvert		
Scour Countermeasures		
Fenders or Dolphins		

Photographs should be taken, if water clarity permits, for typical conditions, conditions that have changed since last inspection and significant or noteworthy deficiencies. The type of channel bottom material, the presence or extent of scour, the presence or extent of riprap, the presence or extent of drift and debris, and the location of any foundation exposure or undermining shall be quantified. Include depth, length, height, and location of deficiencies.

VI. Equipment and Field Logistics

a. The inspection should be conducted using:

____Chest waders

____Hip waders

____Diving equipment

____SCUBA (Note that ADCI Consensus Standards require communication systems be employed for both SCUBA and Surface-Supplied (whether air or mixed-gas) dive modes)

____SCUBA with communication

____Surface Supplied with communication

b. The channel bottom should be sounded utilizing

____Digital fathometer

____Telescoping survey rod

____ acoustic imaging

c. During the inspection, the divers should work from

____Shore

____Boat

____Either

The note taker should work alongside the dive team.

d. Access to the waterway should be obtained from the shore (north bank, southwest quadrant, driveway 30 yards north etc.)

_____

_____

_____

e. The maximum depth of the channel is typically measured_____ feet from _____

_____

_____

Reference Datum_____

Soundings should be dictated by the scope of work. When not detailed in the scope they should be repeated from the previous soundings. If neither exist then they need to be taken in a grid pattern between substructure units 100’ upstream and 100’ downstream

Other Narrative Not Included In Previous Section

Appendix H: Scour Critical Vulnerability Plan of Action Form

SCOUR CRITICAL BRIDGE - PLAN OF ACTION

1. GENERAL INFORMATION

Structure number: _____	**City, County, State:** _____	**Waterway:** _____
Structure name: _____	**State highway or facility carried:** _____	**Owner:** _____

Year built: ____ **Year rebuilt:** ____ **Bridge replacement plans (if scheduled):** _____
Anticipated opening date: _____

Structure type: ☐ Bridge ☐ Culvert
Structure size and description: _____

Foundations: ☐ Known, type: _____ Depth: _____ ☐ Unknown

Subsurface soil information (*check all that apply*): ☐ Non-cohesive ☐ Cohesive ☐ Rock

Bridge ADT: _____	**Year/ADT:** _____	**% Trucks:** _____

Does the bridge provide service to emergency facilities and/or an evacuation route (Y/N)? _____
If so, describe: _____

2. RESPONSIBILITY FOR POA

Author(s) of POA (name, title, agency/organization, telephone, pager, email): _____
Date: _____

Concurrences on POA (name, title, agency/organization, telephone, pager, email): _____

POA updated by (name, title, agency, organization): _____ **Date of update:** _____
Items update: _____

POA to be updated every _____ **months by (name, title, agency/organization):** _____
Date of next update: _____

3. SCOUR VULNERABILITY

a. Current Item 113 Code: ☐ 3 ☐ 2 ☐ 1 Other: _____

b. Source of Scour Critical Code: ☐ Observed ☐ Assessment ☐ Calculated Other: _____

c. Scour Evaluation Summary: _____

d. Scour History: _____

4. RECOMMENDED ACTION(S) (see Sections 6 and 7)

	Recommended		Implemented	
a. Increased Inspection Frequency	☐ Yes	☐ No	☐ Yes	☐ No
b. Fixed Monitoring Device(s)	☐ Yes	☐ No	☐ Yes	☐ No
c. Flood Monitoring Program	☐ Yes	☐ No	☐ Yes	☐ No
d. Hydraulic/Structural Countermeasures	☐ Yes	☐ No	☐ Yes	☐ No

5. NBI CODING INFORMATION

	Current	Previous
Inspection date		
Item 113 Scour Critical		
Item 60 Substructure		
Item 61 Channel & Channel Protection		
Item 71 Waterway Adequacy		
Comments: (drift, scour holes, etc. - depict in sketches in Section 10)	_____	_____

6. MONITORING PROGRAM

☐ **Regular Inspection Program** ☐w/surveyed cross sections
Items to Watch: _____

☐ **Increased Inspection Frequency of __ mo.** ☐w/surveyed cross sections
Items to Watch: _____

☐ **Underwater Inspection Required**
Items to Watch: _____

☐ **Increased Underwater Inspection Frequency of __ mo.**
Items to Watch: _____

☐ **Fixed Monitoring Device(s)**
Type of Instrument: _____
Installation location(s): _____
Sample Interval: ☐ 30 min. ☐ 1 hr. ☐ 6 hrs. ☐ 12 hrs. ☐ Other: _____
Frequency of data download and review: ☐ Daily ☐ Weekly ☐ Monthly ☐ Other _____
Scour alert elevation(s) for each pier/abutment: _____
Scour critical elevations(s) for each pier/abutment:_____
Survey ties: _____
Criteria of termination for fixed monitoring: _____

☐ **Flood Monitoring Program**
Type: ☐ Visual inspection
☐ Instrument (*check all that apply*):

☐ Portable ☐ Geophysical ☐ Sonar ☐ Other: _____
Flood monitoring required: ☐ Yes ☐ No
Flood monitoring event defined by (*check all that apply*):
☐ Discharge _____ ☐ Stage _____
☐ Elev. measured from _____ ☐ Rainfall _____ (in/mm) per _____ (hour)
☐ Flood forecasting information: _____
☐ Flood warning system: _____
Frequency of flood monitoring: ☐1 hr. ☐3 hrs. ☐6 hrs. ☐ Other: _____
Post-flood monitoring required: ☐ No ☐Yes, within _____ days
Frequency of post-flood monitoring: ☐Daily ☐Weekly ☐Monthly ☐Other: _____
Criteria for termination of flood monitoring: _____
Criteria for termination of post-flood monitoring: _____
Scour alert elevation(s) for each pier/abutment: _____
Scour critical elevation(s) for each pier/abutment: _____

Note: Additional details for action(s) required may be included in Section 8.
Action(s) required if scour alert elevation detected (*include notification and closure procedures*): _____
Action(s) required if scour critical elevation detected (*include notification and closure procedures*): _____

Agency and department responsible for monitoring: _____

Contact person (*include name, title, telephone, pager, e-mail*): _____

7. COUNTERMEASURE RECOMMENDATIONS

Prioritize alternatives below. Include information on any hydraulic, structural or monitoring countermeasures.

☐ **Only monitoring required (see Section 6 and Section 10 – Attachment F)**
Estimated cost $_____

☐ **Structural/hydraulic countermeasures considered (see Section 10, Attachment F):**

Priority Ranking	Estimated cost
(1) _____	$ _____
(2) _____	$ _____
(3) _____	$ _____
(4) _____	$ _____
(5) _____	$ _____

Basis for the selection of the preferred scour countermeasure: _____

Countermeasure implementation project type:
☐ Proposed Construction Project ☐ Maintenance Project
☐ Programmed Construction - Project Lead Agency:
☐ Bridge Bureau ☐ Road Design ☐ Other _____

Agency and department responsible for countermeasure program (if different from Section 6 contact for monitoring): _____

Contact person (*include name, title, telephone, pager, e-mail*): _____

Target design completion date: _____

Target construction completion date: _____

Countermeasures already completed: _____

8. BRIDGE CLOSURE PLAN

Scour monitoring criteria for consideration of bridge closure:

- ☐ Water surface elevation reaches _____ at _____
- ☐ Overtopping road or structure
- ☐ Scour measurement results / Monitoring device (See Section 6)
- ☐ Observed structure movement / Settlement
- ☐ Discharge: _____ cfs/cms
- ☐ Flood forecast: _____
- ☐ Other: ☐ Debris accumulation ☐ Movement of riprap/other armor protection ☐ Loss of road embankment

Emergency repair plans (*include source(s), contact(s), cost, installation directions*): _____

Agency and department responsible for closure: _____

Contact persons (name, title, agency/organization, telephone, pager, email): _____

Criteria for re-opening the bridge: _____

Agency and person responsible for re-opening the bridge after inspection: _____

9. DETOUR ROUTE

Detour route description (route number, from/to, distance from bridge, etc.) - Include map in Section 10, Attachment E.

Bridges on Detour Route:

Bridge Number	Waterway	Sufficiency Rating/ Load Limitations	Item 113 Code

Traffic control equipment (detour signing and barriers) and location(s): _____

Additional considerations or critical issues (susceptibility to overtopping, limited waterway adequacy, lane restrictions, etc.): _____

News release, other public notice (include authorized person(s), information to be provided and limitations): _____

10. ATTACHMENTS

Please indicate which materials are being submitted with this POA:

☐ **Attachment A: Boring logs and/or other subsurface information**

☐ **Attachment B: Cross sections from current and previous inspection reports**

☐ **Attachment C: Bridge elevation showing existing streambed, foundation depth(s) and observed and/or calculated scour depths**

☐ **Attachment D: Plan view showing location of scour holes, debris, etc.**

☐ **Attachment E: Map showing detour route(s)**

☐ **Attachment F: Supporting documentation, calculations, estimates and conceptual designs for scour countermeasures.**

☐ **Attachment G: Photos**

☐ **Attachment H: Other information: _____**

Appendix I: Cross Channel Profile Measurements

Channel Cross Section Requirement and Procedure

I. Background:

FHWA notified ODOT on October 31, 2016 that the State's practice for bridge files does not meet the requirements of the National Bridge Inspection Program 23 CFR 650.313(d), specifically Metric 15 – Bridge Files. An Intermediate Assessment found that the majority of bridge files (sample) did not have documented scour evaluations and channel cross sections. A systematic process is required to identify and address bridges that are vulnerable to scour. The procedure contained in this document is intended to meet this goal and must be completed by October 31, 2018.

II. Requirement for Channel Sections:

The first step to inspect waterways is through visual observation. After a visual inspection of the bridge site, the next step is to probe for any scour or undermining. Extra effort should be taken to probe through soft silt layers that are filling in local scour holes. Structures that cannot be inspected by wading and/or probing at low water within a 60-month interval require dive techniques.

At regular intervals, measurements to obtain the cross section should be taken. These measurements are used to determine change due to general channel scour, channel migration, aggradation or degradation. The measurements should capture scour, degradation or other channel properties that may cause distress to the foundation. Certain types of bridges will require channel cross sections:

a) **Dive Inspections:** Bridges that are coded "Y-Yes" for Item B.IR.03 – Underwater Inspection Required shall have a Channel Cross Section performed and on file. Channel Cross Sections can be done separately from the dive inspection or made part of the dive inspection scope. The dive inspection includes accessing and probing in a grid pattern around each abutment or pier in water. The channel section is in addition to the dive inspection. Due to access and simplicity, it is recommended that the language in current and future diving contracts is updated to include Channel Cross Sections as part of the scope of work. The dive inspector should be able to easily perform these measurements as part of the dive inspection. In the event the next dive inspection will be performed after October 31, 2018 and there is not a channel cross section on file within 60 months then the baseline channel cross section must be performed using one of the methods described in the policy prior to October 2018.

b) **Scour Critical:** Bridges with B.AP.03 – Scour Vulnerability coded C or D shall have a Channel Cross Section on file. Channel Cross Sections shall be updated every 60 months or at any obvious change or worsening of the channel condition. It is required that the Channel Cross Section file is in the bridge file for future reference. It is recommended that the Channel Cross Section file is uploaded to AssetWise for future reference and FHWA sampling.

Channel Cross Sections shall be updated every 60 months. More frequent measurements should be taken when, for example, channel condition worsens or changes abruptly. Along with the above requirements, it is recommended that Channel Cross Sections be performed when the Items B.C.03 – Substructure Condition Rating, B.C.04 – Culvert Condition Rating, B.C.09 Channel Condition Rating, B.C.10 – Channel Protection Condition Rating, B.C.11 - Scour Condition Rating, or B.C.15 – Underwater Inspection Condition is rated below a 6 – Satisfactory Condition.

III. Procedure for Performing Channel Cross Sections:

The goal of a Channel Cross Section is to monitor the channel's horizontal and vertical movement over time, identify size and depth of scour holes and monitor flow line. They must be compared with past measurements in order to monitor change. Priority for choosing a side should follow the precedent:

a) Choose the side that exhibits the most scour, degradation or other channel properties that may cause distress to the foundation units or

b) Choose the same side as the last cross section or

c) Choose the upstream side of the channel or

d) Do both sides.

Flowline characteristics that could directly affect the substructure stability must be entered into the bridge file. Also, channel cross sections may lead to more dive inspections, soil sampling, robust channel profiles and/or LIDAR scanning in order to perform scour analysis.

Figure 1 – Example Set of Measuring Devices & Tools

The channel cross sections must contain objective and repeatable dimensions. Performing a Channel Cross Section can be done from underneath, or most often, will be performed from on top of the deck. Measurements need two components, the horizontal distance from the rear abutment (X-axis) and the vertical 'drop' distance (Y-axis) from a reference point to the ground. In lieu of an in-depth fathometer sounding, below is a procedure that is repeatable and objective:

1. Obtain tools for measuring from either top or bottom (Figure 1).

2. Measure the vertical distance, vertical offset, between the reference location and the underside of the superstructure. Describe the offset dimension or draw a picture. This measurement is the vertical distance (Figure 2) and is relatively easy to get to and should be accessible during flood or high water.

3. Mark and document where the vertical measurements will be taken on the bridge and on the form. Use a wheel or fixed objects and walk upstation away from the rear abutment on the appropriate side and mark on the railing or wearing surface where the vertical drop will be taken (Figure 3). For structures longer than 50 feet it must include at a minimum:

    a) Both abutments, and

    b) Every pier, and

    c) Points that are susceptible to change such as:

        a. Top and bottom of a channel cut/slope change

        b. Edge of water (EOW)

        c. Maximum water depth or channel bottom

        d. Scour holes

        e. Edges and highpoints of debris and

    d) 1/2- span points and fields

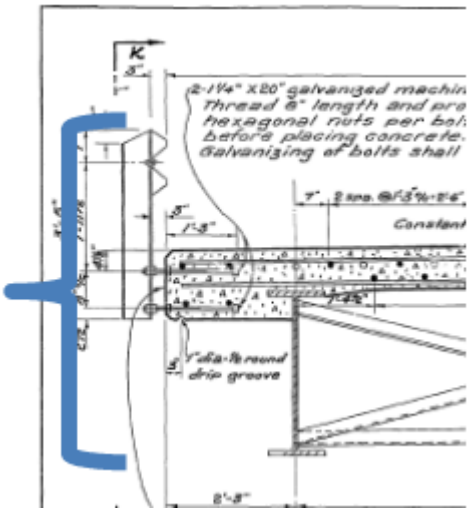


Figure 2 – Offset Distance in this example is not on the plans and needed to be field

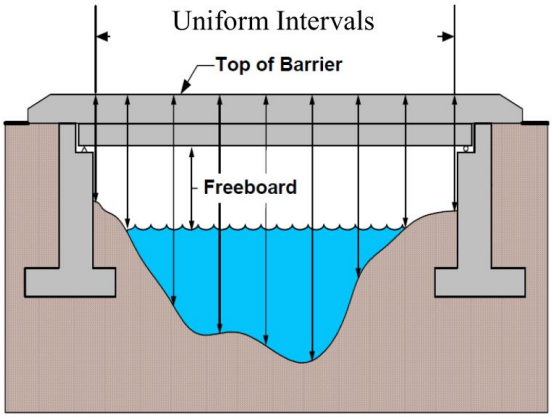


Figure 3 – Channel Cross Section Intervals (NHI)

On smaller structures less than 50 feet long or structures with active channel misalignment (B.C.09 - Channel Condition Rating or B.C.10 – Channel Protection Condition Rating of 4-Poor or worse), smaller distances between measurements are required such as every guardrail post or every 5 foot increment.

4. At each drop-point, lower weighted end of a 100’ tape attached to a rope supporting a 5-10 lb weight until the weight touches the ground below.

5. Record the dimension on the tape at the reference point and the horizontal distance. Documentation must be in the bridge file. It is recommended that the measurements are uploaded or typed into Assetwise (Figure 4).

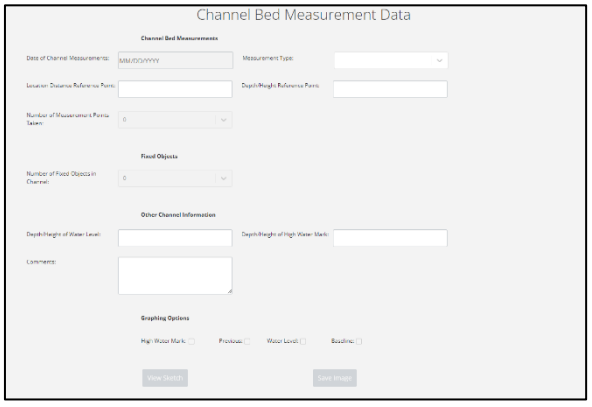


Figure 4 –Assetwise can be used for Channel Cross Section Measurements

If it is easier to record the vertical measurements from underneath, they can be obtained with a survey rod or laser distance measure from the ground-line to the underside of the superstructure. The same horizontal measurements and vertical drop locations described above shall be taken and documented.

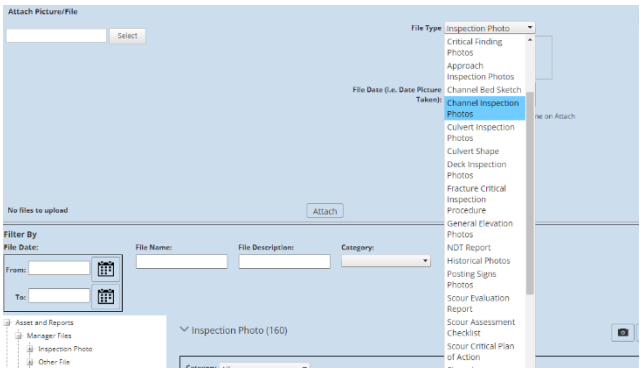


Figure 5 – File Type Upload into Assetwise

IV. Requirement for Baseline Photographs:

All bridges not meeting the requirement for Channel Cross Sections must have baseline channel photographs on file. Channel Cross Sections should be taken when baseline photographs are inadequate or not feasible. Bridges over waterways shall, at a minimum, have baseline Channel Cross Section Photographs that are readily available for monitoring change. Bridge staff shall be able to effectively compare channel conditions with the baseline photos. When Public Entities opt to perform baseline photographs, they are also agreeing to the respective global statement in Appendix C. If the responsibility statements do not best represent the bridges in the entity's jurisdiction, the staff must perform a Channel Cross Section instead of the baseline photographs.

It is required that these photos exist and are on file. It is recommended that the baseline photos are uploaded into the bridge file in Assestwise as "Channel Inspection Photos" (Figure 5). Under the files tab, choose Channel Inspection Photos from the drop-down selection, and upload the photos.

A minimum of two photographs shall be taken. At least one upstream looking toward the bridge and one looking downstream. The photographs shall be taken from a far enough distance as to include all substructure units that are in the channel. Additional photographs are recommended in order to adequately monitor the changes in channel alignment, stream aggradation and stream degradation.

V. Procedure for Performing Baseline Photographs:

While taking the baseline photographs, it may be difficult to access a suitable location for either, or both, of the required photos (Figures 6-9 example). In this case, additional photos shall be taken to more accurately show the channel or channel degradation or a Channel Cross Section should be taken.

- Find a good angle of the bridge that includes substructure units in water from the upstream side and downstream side
- Take photos or videos. It is recommended that photos are timestamped for documentation and future comparison. Document and label the photos or videos were taken for future comparison.
- Put photos or videos in the bridge file
- Recommend uploading photos to AssetWise
- Recommend taking photos when the waterway is low

Figure 6 – Poor Example of Baseline Photo Looking Upstream from Pedestrian Bridge (Too Far)

Figure 7 – Poor Example of Baseline Photo Looking Downstream from the south peninsula (Too Far)

Figure 8 – Good Example of Baseline Photo Looking Downstream from SE Corner (Best Downstream Option)

Figure 9 – Example of a Supplemental Baseline Photo Looking Downstream and Undercut Bank at SE Corner

Example 1 – Stable Stream with ½ Span Measurements

Bridge: BEL-001SP-0051 (0726184)
Feature: North Fork BARKCAMP CREEK
Year Built: 1965
Profile Date, Insp: 11/30/2016, MB
Channel Condition (B.C.09): 7-Good
Overtopping Likelihood (B.AP.02): 2-Once every 51 to 99 years
Scour Vulnerability (B.AP.03): A-Scour Appraisal completed. Bridge determined to be stable for scour
Offset Distance: 3'-4" Top of Concrete Surface of Railing to underside of slab
Notes: Measurements begin at 0'-0" at rear abutment (cardinal west) on the upstream fascia (cardinal south). Vertical drops taken at the Substructure units, edge of water, abrupt change in elevation and ½ span.

Feature at Upstream (Cardinal South) Side	Horizontal Distance from Rear Abutment	Date: 11/30/2016 Drop Distance (Vertical Offset 3'-4", included)	Date: Drop Distance (Vertical Offset ___,)
Rear Abut (A1)	0	6'-5"	
Top Slope	12	8'-3"	
Waterline	16	10'-2"	
Pier 1	23	13'-5"	
½ Span	37	15'-5"	
Pier 2	51	13'-7"	
Waterline	57	10'-3"	
Top of Slope	61	8'-3"	
Fwd Abut (A2)	74	7'-0"	

Example 2 – Poor Channel With Measurements at each Rail Post

Bridge: FRA-00674-0248 (2517302)
Feature: LITTLE WALNUT CREEK #
Year Built: 1963
Profile Date, Insp: 1/5/2017, MB
Channel Condition (B.C.09): 4-Poor
Overtopping Likelihood (B.AP.02): 2-Once every 51 to 99 years
Scour Vulnerability (B.AP.03): A-Scour Appraisal completed. Bridge determined to be stable for scour
Offset Distance: 70" top railing to underside of bottom flange
Notes: Measurements begin at 0'-0" at rear abutment (cardinal south) on the upstream fascia (cardinal east). Vertical drops taken at each rail post roughly 6'-2" apart.

Feature at Upstream	Horizontal Distance (FT)	Date: 1/5/2016 Drop Distance (Vertical Offset 5'-10", included)	Date: Drop Distance (Vertical Offset____, _____)
Rear Abut (A1) South	0.0	19'-10"	
Rail Post 1	2.5	20'-6"	
Rail Post 2	8.7	22'-3"	
Rail Post 3	14.8	23'-4"	
Rail Post 4	21.0	24'-0"	
Rail Post 5 (debris field)	27.2	17'-7"	
Rail Post 6 (debris field)	33.4	17'-10"	
Rail Post 7 (debris field)	39.5	18'-3"	
Rail Post 8 (debris field)	45.7	17'-1"	
Rail Post 9 (Pier 1)	51.9	22'-6"	
Rail Post 10 (new post)	58.0	25'-0"	
Rail Post 11 (new post)	64.2	24'-2"	
Rail Post 12	70.4	24'-8"	
Rail Post 13	76.5	23'-4"	
Rail Post 14	82.7	22'-1"	
Rail Post 15	88.9	23'-8"	
Rail Post 16	95.1	24'-2"	
Rail Post 17	101.2	23'-4"	
Rail Post 18 (Pier 2)	107.4	21'-5"	
Rail Post 19 (edge of bank)	113.6	18'-8"	
Rail Post 20	119.7	17'-6"	
Rail Post 21	125.9	17'-0'	
Rail Post 22	132.1	15'-9"	
Rail Post 23	138.2	14'-9"	
Rail Post 24	144.4	14'-3"	
Rail Post 25	150.6	13'-10"	
Fwd Abut (A2) North	153.1	13'-10"	

Appendix J: Over-Height Steel Beam Bridge Strike Form

DAMAGE INSPECTION

Over height Bridge Hit

Severity & Extent of Damage for Steel Beam Superstructure

Bridge _____

Co - Rte - SLM

Route On _____

Lanes Closed: _____

_____

Route Under _____

Lanes Closed: _____

_____

Date _____

Time _____

Inspectors: _____

_____

Contacted: _____

(ex. Owner, EMS, etc.) _____

_____

_____

Documents Attached:	Y	N
Accident Patrol Report		
Bridge Inspection Report		
Critical Findings Report		
Pictures		
Estimate of Damage		

See Tables 1 and 2 below with attached dwgs.

Controlling **Minimum Vertical Clearance** (xx'-xx") with location and additional pertinent information _____

_____

_____

_____

Table No. 1 - Damaged Main Member to be Heat Straightened

Damage Section	Beam No.	Pier/Abut Reference	B	C	D	E	F1	F2	G	J	Grind Nicks and Gouges

Table No. 2 - Damaged Secondary Member to be replaced (i.e.. crossframe)

Between Beams	Pier/Abut	N	ID	2D	3S	4S

N- Number of crossframes from abutment of pier referenced in

Notes: _____

_____

_____

_____

_____

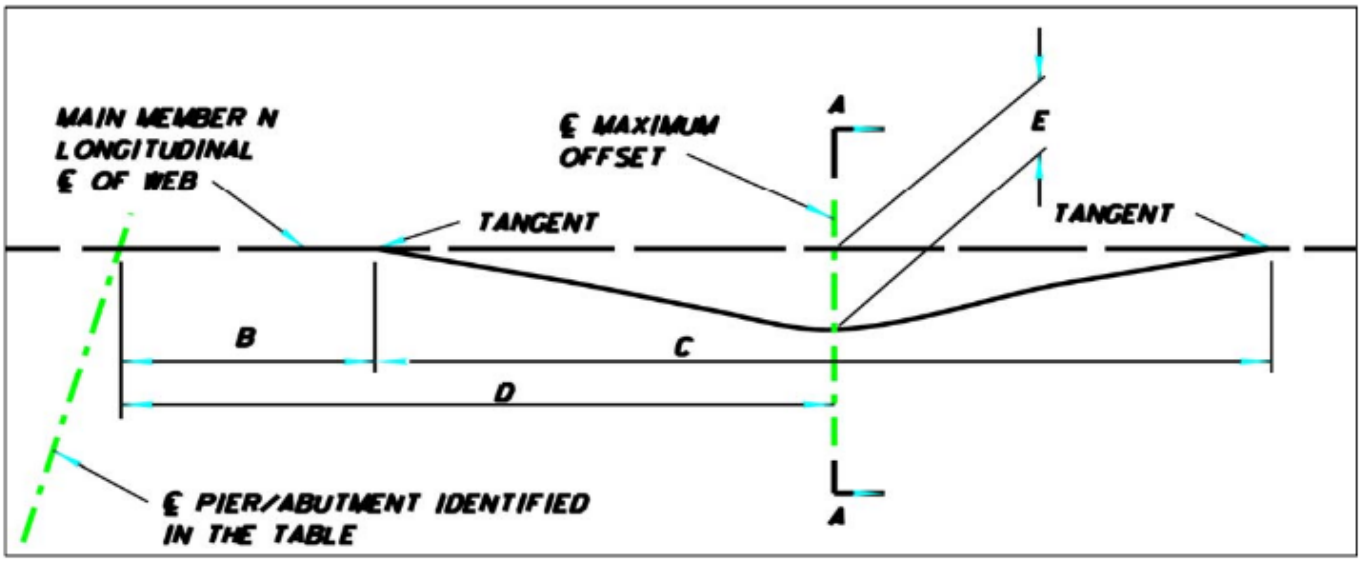
_____

DAMAGE INSPECTION

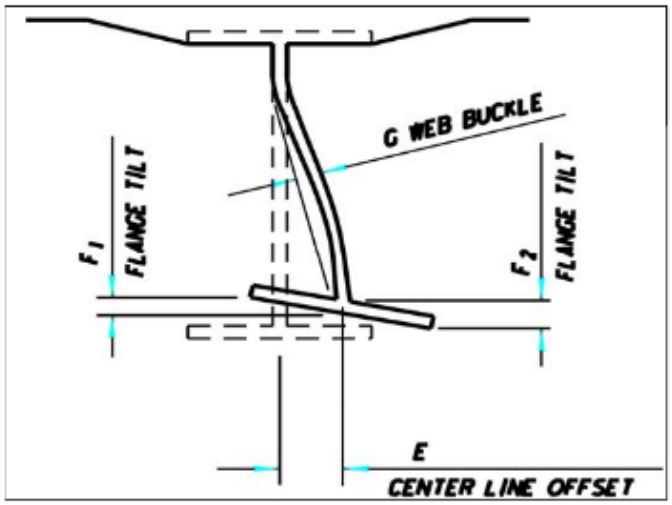
Over height Bridge Hit (cont)

Severity/Extent of Damage for Steel Beam Superstructure

Use for Table 1



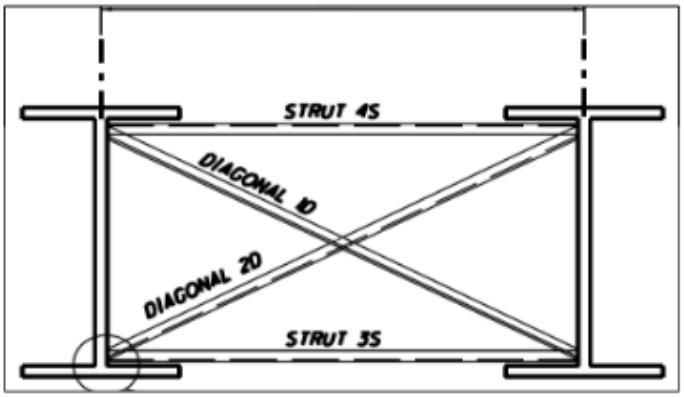
Use for Table 1



Section A-A

Negative E Values are bent left
Negative F Values are bent down
Negative G values are bent left
J = Length of epoxy injection

Use for Table 2



Remove according to Item 202-Portions of secondary members removed, as per plan, replace by matching existing detail, see GSD-1-96 for additional clarification

Appendix K: District Railroad Communication and Ohio Railroad Emergency Contacts

INTEROFFICE COMMUNICATION

TO: ODOT Districts
FROM: Dave Slatzer, Chief Engineer
DATE: March 15, 2024
SUBJECT: Guidance for Railroad Bridges Concerns

This document was developed to standardize the way ODOT communicates bridge conditions with railroad owners. These bridges carry railroad traffic over a US Route, State Route, or Interstate Route. ODOT's policy is to perform a cursory bridge inspection of these bridges to the limits of ODOT's right-of-way per Section 5523.17 of the Ohio Revised Code. Currently, the way ODOT communicates with railroad owners varies from District to District. As the class 1 railroads run through all 12 districts, senior leadership has requested more standardization for this communication.

FOR EMERGENCY SITUATIONS REQUIRING IMMEDIATE REMEDIAL ACTION BY RAILROAD OWNER

If District personnel determine a railroad structure over a US Route, State Route, or Interstate Route pose immediate safety risk warranting a closure of the roadway, the following procedures should be followed:

For HMA and County Maintenance Staff:

1. Close the portion of the roadway affected by the fallen or potential loose material, per district standard procedures for emergency closures and community notifications.

2. Notify District Bridge Engineer of situation and request assistance.

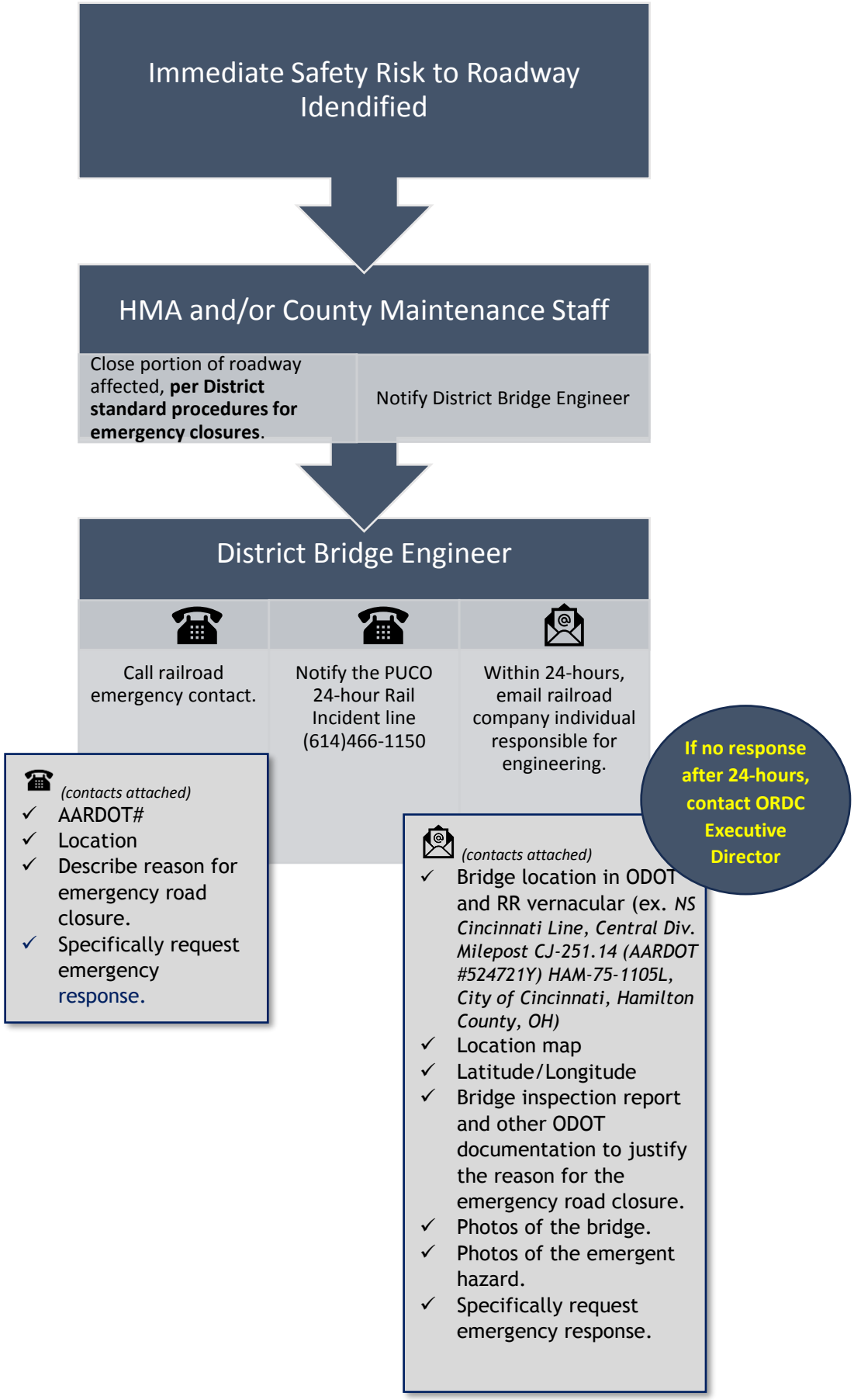
For District Bridge Engineer

1. Place a phone call to the railroad emergency contact (See list provided). Be prepared to provide the following information to the affected railroad company:
    a. AARDOT#
    b. Location of bridge structure (as a minimum be prepared to provide the following information which may be found using the "What's here?" feature in Google Maps):
        i. Latitude/Longitude of the bridge.
        ii. Affected Street Name and nearby address (City, township, zip code, etc.)
        iii. Closest intersection
    c. Describe the reason for the road closure.
    d. Request one of the following emergency responses:
        i. Provide an emergency response team that can remove the danger presented by the loose material within 24-hours, or
        ii. Provide a representative that can be on-site at the bridge location within 24-hours and direct ODOT forces to remove the danger presented by the loose material.
    e. Provide ODOT contact information (i.e. HMA phone number)
2. Notify the PUCO 24-hour Rail Incident line **(614) 466-1150**. Leave a brief description of the issue (location, risk etc.) as well as ODOT contact information (I.e. HMA phone number).
3. Within 24-hours of district personnel placing the call to the railroad emergency contact, provide a follow-up email to the affected railroad company individual responsible for engineering (see list provided). Include the following information in the email communication:
    a. The bridge location in both ODOT and railroad vernacular. Do not expect the railroad to understand ODOT's way of locating a bridge. Here is an example for a Norfolk Southern

bridge: ***NS Cincinnati Line, Central Div. Milepost CJ-251.14 (AARDOT #524721Y) HAM-75-1105L, City of Cincinnati, Hamilton County, OH.*** Railroad inventory information is available from the Federal Rail Authority website: https://fragis.fra.dot.gov/GISFRASafety/.

b. A location map for the bridge.
c. The latitude/longitude of the bridge.
d. The bridge inspection report and other ODOT documentation regarding the railroad structure condition that justified the emergency road. Include the comments noting the location and extent of the material that has the potential to fall from the bridge.
e. General photos of the bridge.
f. Photos of the material that has fallen or has the potential to fall from the bridge.
g. Request one of the following emergency responses:
    i. Provide an emergency response team that can remove the danger presented by the loose material within 24-hours, or
    ii. Provide a representative that can be on-site at the bridge location within 24-hours and direct ODOT forces to remove the danger presented by the loose material.
h. The following should be copied on the communication:
    i. The PUCO Rail Division (raildivision@puco.ohio.gov).
    ii. District personnel as follows:
        1. District Deputy Director
        2. District Capital Programs Administrator
        3. District Highway Management Administrator
        4. District Rail Coordinator.
    iii. Central Office personnel as follows:
        1. Administrator, Office of Structural Engineering
        2. Deputy Director of Engineering
        3. ORDC Executive Director
        4. Chief Engineer
        5. Chief Legal Council

4. If the railroad does not respond within 24 hours of sending the email communication, ODOT should take appropriate action to keep the roadway safe.
    a. Keep the affected portions of roadway closed.
    b. Contact ORDC Executive Director


Immediate Safety Risk to Roadway Idendified
HMA and/or County Maintenance Staff
Close portion of roadway affected, per District standard procedures for emergency closures.
Notify District Bridge Engineer
District Bridge Engineer
Call railroad emergency contact.
Notify the PUCO 24-hour Rail Incident line (614)466-1150
Within 24-hours, email railroad company individual responsible for engineering.
(contacts attached)
✓ AARDOT#
✓ Location
✓ Describe reason for emergency road closure.
✓ Specifically request emergency response.
(contacts attached)
✓ Bridge location in ODOT and RR vernacular (ex. NS Cincinnati Line, Central Div. Milepost CJ-251.14 (AARDOT #524721Y) HAM-75-1105L, City of Cincinnati, Hamilton County, OH)
✓ Location map
✓ Latitude/Longitude
✓ Bridge inspection report and other ODOT documentation to justify the reason for the emergency road closure.
✓ Photos of the bridge.
✓ Photos of the emergent hazard.
✓ Specifically request emergency response.
If no response after 24-hours, contact ORDC Executive Director

NON-EMERGENCY ISSUES ON RAILROAD STRUCTURES

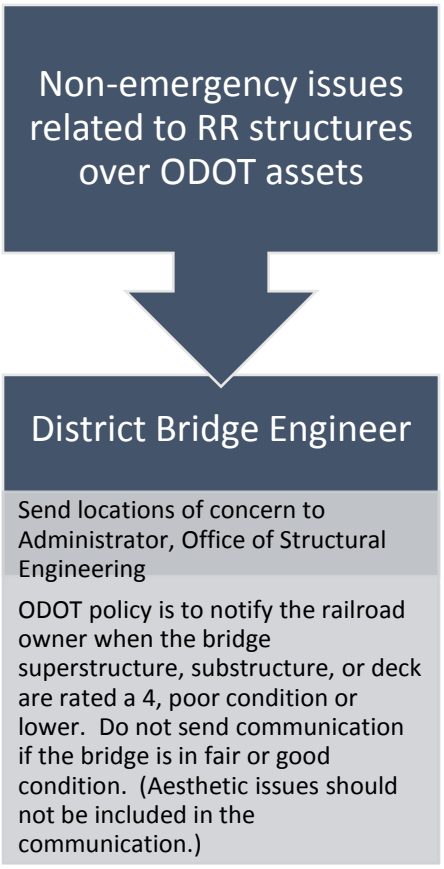
For District Bridge Engineer:

For all other non-emergency issues related to railroad structures over ODOT assets, ODOT policy is to notify the railroad owner when the bridge superstructure, substructure, or deck are rated a 4, poor condition or lower. Do not send communication if the bridge is in fair or good condition. (Aesthetic issues should not be included in the communication.)

Locations of concern should be sent to the Administrator, Office of Structural Engineering.

1. The communication with the railroad owner must include the ODOT bridge inspection Summary Report along with photos.
2. The photos should show the specific concern on the bridge.

The Office of Structural Engineering will review and compile these locations and send to the ORDC for discussion with the appropriate railroad on a quarterly basis.



Escalation of Issues:

1. If the bridge inspector believes the bridge is in imminent danger of failure (GA = 1), close the roadway and contact the HMA and follow the Emergency Situation protocol.
2. If the bridge inspector believes the bridge condition has changed from the previous "Poor" condition rating (e.g. From GA = 4 to GA = 3 or 2; From GA = 3 to GA = 2) notify the District Bridge Engineer immediately.
3. If the District Bridge Engineer concurs that the "Poor" condition rating has changed, email the Central Office, Administrator, Office of Structural Engineering, and ORDC Rail Coordinator, copy the District Capital Programs Administrator, and provide the following information:
    a. The bridge location in both ODOT and railroad vernacular. Do not expect the railroad to understand ODOT's way of locating a bridge. Here is an example for a Norfolk Southern bridge: ***NS Cincinnati Line, Central Div. Milepost CJ-251.14 (AARDOT #524721Y) HAM-75-1105L, City of Cincinnati, Hamilton County, OH***. Railroad inventory information is available from the Federal Rail Authority website: https://fragis.fra.dot.gov/GISFRASafety/.
    b. A location map for the bridge.
    c. The latitude/longitude of the bridge.
    d. The bridge inspection report. Include the comments noting the location and extent of the change in condition rating.
    e. General photos of the bridge.
    f. Photos documenting the change in condition rating.
4. The Central Office, Administrator, Office of Structural Engineering will notify the Chief Engineer and Deputy Director of the Division of Engineering
5. The ORDC Executive Director will notify the Railroad and PUCO

OHIO RAILROADS EMERGENCY CONTACT LIST

Source – Ohio Rail Development Commission (ORDC)

(Sample emergency notification sign)

Look for the emergency phone number and crossing identification number at each crossing.

HIGHLIGHTED NUMBERS – CLASS 1 REGIONAL OR LARGER SHORTLINE RAILROADS

CODE	RAILROAD	NUMBER
AA	Ann Arbor Railroad (Watco) Brad Walker, WATCO Transportation Services Safety bwalker@watco.com	(316) 262-1700
AB	Akron Barberton Cluster Railway Company (WLE) Herb Shanklin, General Manager hshanklin@abcrwy.com – (330) 697-0857	(330) 745-4431
ACJR	Ashtabula, Carson & Jefferson Railroad Robert Callahan, COO acjrr@acjrailroad.com - (440) 813-2308 cell	(440) 576-1212
ASRY	Ashland Railway, Dispatch Matt Smith, General Manager msmith@asrwy.com - (419) 631-3396 cell	(215) 795-8082
BIP	Belpre Industrial Railroad (Cathcart Rail) Connie Vail, VP of Rail Services connie.vail@biprailroad.com– (607) 651-6106 cell	(380) 390-2058
BLE	Bessemer & Lake Erie Railroad (CN)	(708) 206-6708
BIR	Bucyrus Industrial Railroad (Cathcart Rail) Connie Vail, VP of Rail Services connie.vail@biprailroad.com– (607) 651-6106 cell	(380) 390-2058

CAMY	Camp Chase Railroad (Gulf & Atlantic Railways) Todd Marklin, VP Engineering todd.marklin@garailways.com	(888) 783-4316
CN	Canadian National Jeffrey Price, Manager, Public & Government Affairs, US jeffrey.price@cn.ca – (312) 465-6983	(800) 465-9239
CCRL	Cleveland & Cuyahoga Railway (OmniTrax) Nate Mazo, Operations nmazo@omnitrax.com – (216) 243-6649	(802) 774-5084
CFE	Chicago, Fort Wayne & Eastern Railroad (G&W) Derick Mann derick.mann@gwrr.com	(802) 527-3499 (866) 527-3499
CIND	Central Railroad of Indiana (G&W) John Keffer, General Manager john.keffer@gwrr.com – (513) 682-4641	(802) 527-3499 (866) 527-3499
CSX	CSX Transportation Rusty Orben, Director – Director, State Relations (Ohio & Michigan) rusty_orben@csx.com – (614) 370-4369 cell	(800) 232-0144
CCET	Cincinnati Eastern Railroad Wayne Carnahan, Director of RR Operations jg@cinrail.com – (888) 280-8906 ext. 2	(888) 280-8906
CUOH	Columbus & Ohio River Railroad (G&W) Tim Slusser, General Manager tslusser@gwrr.com - (740) 202-0843	(802) 527-3499 (866) 527-3499
CVSX	Cuyahoga Valley Scenic Railroad James Lawson, Director of Railroad Operations	(330) 439-5708
CWRO	Cleveland Works Railway Co.	(216) 429-7267
EOVR	East Ohio Valley Railway (Transtar) Joseph Blasko, Civil Engineer – Track & Structures jblasko@transtarrail.com – (412) 592-5211	(800) 406-3545
GTR	Germantown Rail Siding Co. (The Dupps Co)	(937) 855-6555
GRRW	Grand River Railway Terry Feichtenbiner, CEO	(330) 718-3727
HVSR	Hocking Valley Scenic Railroad	(740) 753-9531

IERR	Indiana Eastern Railroad (Regional Rail, LLC) Jason Bynum, General Manager jbynum@regional-rail.com - (513) 604-9777 cell	(610) 925-0131
IN	Indiana Northeastern Railroad Company	(517) 439-4677
IORY	Indiana & Ohio Railway (G&W) John Keffer, General Manager john.keffer@gwrr.com - – (513) 682-4641	(802) 527-3499 (866) 527-3499
KNWA	Kanawha River Railroad (WATCO) Thomas Nicholson, General Manager tenicholson@watco.com – (607) 592-0844 Frank McKinney, Roadmaster – (304) 550-6824	(316) 262-1700
LT	Lake Terminal Railroad (Transtar)	(800) 406-3545
MVRY	Mahoning Valley Railway (G&W) Tim Slusser, General Manager tslusser@gwrr.com - (740) 202-0843	(802) 527-3499 (866) 527-3499
MRTA	Metro RTA	(330) 762-0341
NDW	Napoleon, Defiance & Western Railroad (Patriot Rail)	(855) 258-4514
NSR	Newburgh & South Shore Railroad (OmniTRAX) Nate Mazo, Operations nmazo@omnitrax.com – (216) 243-6649	(888) 533-9416
NOW	Northern Ohio & Western Railway (OmniTRAX) Nate Mazo, Operations nmazo@omnitrax.com – (216) 243-6649	(888) 533-9416
NS	Norfolk Southern Corporation	(800) 453-2530
OHCR	Ohio Central Railroad, Inc. (G&W) Timothy Slusser, General Manager tslusser@gwrr.com – (740) 202-0843	(802) 527-3499 (866) 527-3499
OSCR	Ohio South Central Railroad (Regional Rail, LLC) Phil Dawson - 513-594-5141 pdawson@regional-rail.com	(610) 925-0131
OSRR	Ohio Southern Railroad (G&W) Timothy Slusser, General Manager tslusser@gwrr.com – (740) 202-0843	(802) 527-3499 (866) 527-3499

RJCL	RJ Corman Railroad Group Danny Puckett, Director of Operations danny.puckett@@rjcorman.com–(859)544-0659	(802) 774-1108 (877) 533-6913
TLEW	Toledo, Lake Erie & Western Railway (Scenic)	(419) 878-2177
WE	Wheeling & Lake Erie Railway Corporation Ed Steiner, Superintendent of Safety - (330) 904-5872 Tim Andrews, Signals & Communications Supervisor - (330) 417-5541	(330) 767-3401

WTRM	Warren & Trumbull Railroad Company (G&W) Timothy Slusser, General Manager tslusser@gwrr.com–(740)202-0843	(802) 527-3499 (866) 527-3499
YARR	Youngstown & Austintown Railroad (G&W) Timothy Slusser, General Manager tslusser@gwrr.com–(740)202-0843	(802) 527-3499 (866) 527-3499
YB	Youngstown Belt Railroad (G&W) Timothy Slusser, General Manager tslusser@gwrr.com–(740)202-0843	(802) 527-3499 (866) 527-3499
YSRR	Youngstown & Southeastern Railroad (MBRail) Bill Schnierle, Trainmaster b.schnierle@mbrail.com–(330)407-4455 Jimmy Kelly, Highway/Rail Coordination j.kelley@mbrail.com - (859) 338-4991	(800) 736-0412

Updated: March 2024

Appendix L: Comprehensive Features Examples

- Single span bridge over a waterway
- Four-span bridge over a divided highway
- Single span bridge over a railroad

Comprehensive Example - Single Span Bridge over Waterway

This section includes a comprehensive example to illustrate the proper recording of data items that are required to develop a complete Features Data Set. The bridge in the comprehensive example is Structure File Number (SFN) 7661002 in Stark County, Ohio. The bridge is a single span multi-girder bridge that carries Mill Street, over the Nimishillen Creek. Two-way traffic travels northbound and southbound across the bridge. There is a pedestrian walkway (sidewalk) on the east side of the bridge.

Photo 2 – Approach view to SFN 7661002, looking north.

4: FEATURES

4.1: Feature Identification

B.F.01.1: Feature Type Selection	H - Highway	P - Pathway	W - Waterway
B.F.01: Feature Type	H01	P01	W01
B.F.02: Feature Location	C - Carried on bridge	C - Carried on bridge	B - Below bridge
B.F.03: Feature Name	Mill Street | TR-259	Sidewalk	Nimishillen Creek

4.3: Highways

B.H.01: Functional Classification	5 - Major Collector		
B.H.01.01: Priority System Code (ODOT 5.01)	U - Urban		
B.H.02: Urban Code	13375		
B.H.03: NHS Designation	N - Non-NHS		
B.H.04: National Highway Freight Network	N - Not on the NHFN		
B.H.05: STRAHNET Designation	N - not a STRAHNET rc		
B.H.06: LRS Route ID (NLFID)	TSTATR00259**C		
B.H.07: LRS Mile Point (SLM)	1.058		
B.H.08: Lanes on Highway	2		
B.H.09: Annual Average Daily Traffic	1791		
B.H.10: Annual Average Daily Truck Traffic	89		
B.H.11: Year of Annual Average Daily Traffic	2015		
B.H.12: Highway Maximum Usable Vertical Clearance	99.9		
B.H.13: Highway Minimum Vertical Clearance	99.9		
B.H.14: Highway Minimum Horizontal Clearance, Left			
B.H.15: Highway Minimum Horizontal Clearance, Right			
B.H.16: Highway Maximum Usable Surface Width	33.1		
B.H.17: Bypass Detour Length	3		
B.H.18: Crossing Bridge Number			

4.4: Railroads

B.RR.01: Railroad Service Type			
B.RR.02: Railroad Minimum Vertical Clearance			
B.RR.03: Railroad Minimum Horizontal Offset			

4.5: Navigable Waterways

B.N.01: Navigable Waterway			N - Not a navigable wat
B.N.02: Navigation Minimum Vertical Clearance			
B.N.03: Movable Bridge Maximum Navigation Vertical Clearance			
B.N.04: Navigation Channel Width			
B.N.05: Navigation Channel Minimum Horizontal Clearance			
B.N.06: Substructure Navigation Protection			

4.2: Routes

B.RT.H: Route Highway Mapping	H01 - Highway 1
B.RT.01: Route Designation	R01
B.RT.02: Route Number	259
B.RT.03: Route Direction	NS - Northbound and
B.RT.04: Route Type	4 - County Route
B.RT.05: Service Type	1 - Mainline

Table L-1 – Summary Table of Features Data Set for SFN 7661002

Features Data Set
Feature Identification - Commentary
B.F.01 – Feature Type The structure SFN 7661002 carries Mill Street over the Nimishillen Creek. Since Mill Street is the only highway feature, code it as H01. The structure SFN 7661002 carries a pedestrian sidewalk on the east side of the bridge over the Nimishillen creek. Since the sidewalk is the only pathway feature, code it as P01. The structure SFN 7661002 carries Mill Street and a pedestrian sidewalk over the Nimishillen creek. Since the structure crosses over a waterway feature, code Nimishillen Creek as W01.
B.F.02 – Feature Location Mill Street is carried on the bridge, therefore code C - Carried on bridge. The sidewalk on the east side is carried on the bridge, therefore code C - Carried on bridge. Nimishillen Creek is located below the bridge, therefore code B - Below bridge.
B.F.03 – Feature Name Mill Street is also a numbered township route that is carried on the bridge, therefore code Mill Street|TR-259. There is one sidewalk on the east side that is carried on the bridge, therefore code Sidewalk. Nimishillen Creek is located below the bridge, therefore code Nimishillen Creek.
Routes - Commentary
B.RT.H. – Route Highway Mapping Each highway feature should be related to at least one route. Mill Street is the only highway feature for SFN 7661002, therefore code H01- Highway 1.
B.RT.01 – Route Designation There is one route associated with the highway feature, code R01.

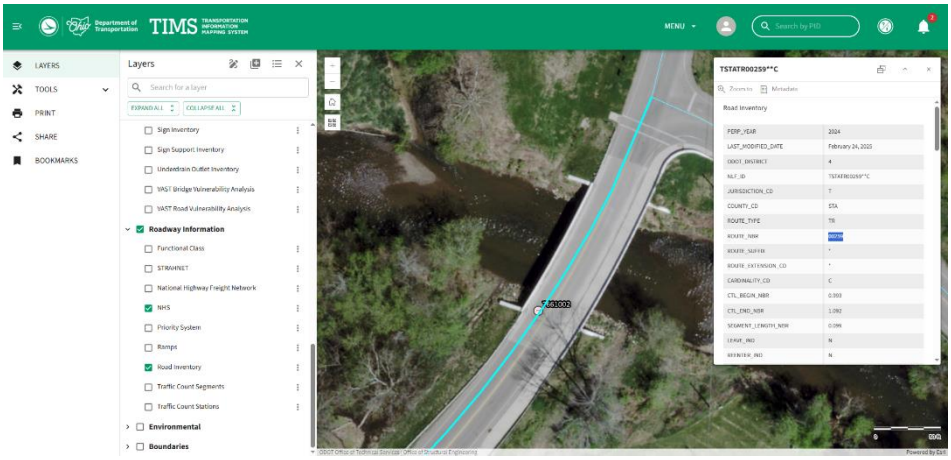
Features Data Set (continued)

Routes – Commentary (continued)

B.RT.02 – Route Number

The route number for Mill Street is 259.

TIMS can be utilized to obtain this information by selecting the data layer for ROUTE_NBR under the Road Inventory tab.

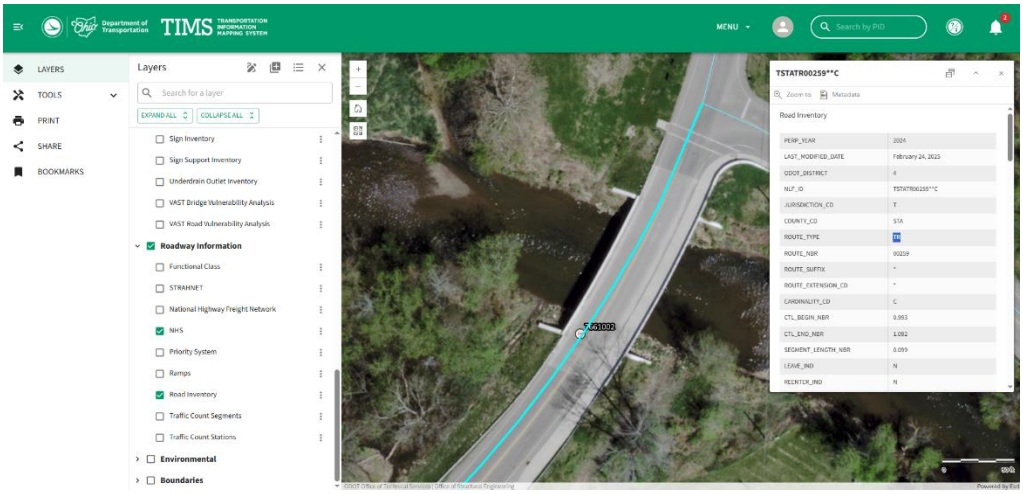


B.RT.03 – Route Direction

SFN 7661002 carries two-way traffic from Mill Street northbound and southbound over the Nimishillen Creek. Report NS – Northbound and Southbound.

B.RT.04 – Route Type

Mill Street is a Township Route, which is coded as a township route, report 4 - County route.



Within TIMS utilize the Road Inventory data under Roadway Inventory. Within the Roadway Inventory, ROUTE_TYPE corresponds to Item B.RT.04 – Route Type. TR indicates a county route in accordance with *ODOT's Roadway Information Manual.*

Features Data Set (continued)

Routes – Commentary (continued)

B.RT.05 – Service Type

Mill Street is a mainline route, report 1 - Mainline.

Highways - Commentary

B.H.01 – Functional Classification

Mill Street is coded as a 5-Major Collector according to the guidelines for assigning functional classification to roadways and streets within Ohio at the following link:
https://www.transportation.ohio.gov/working/funding/resources/ohio-roadway-functional-class

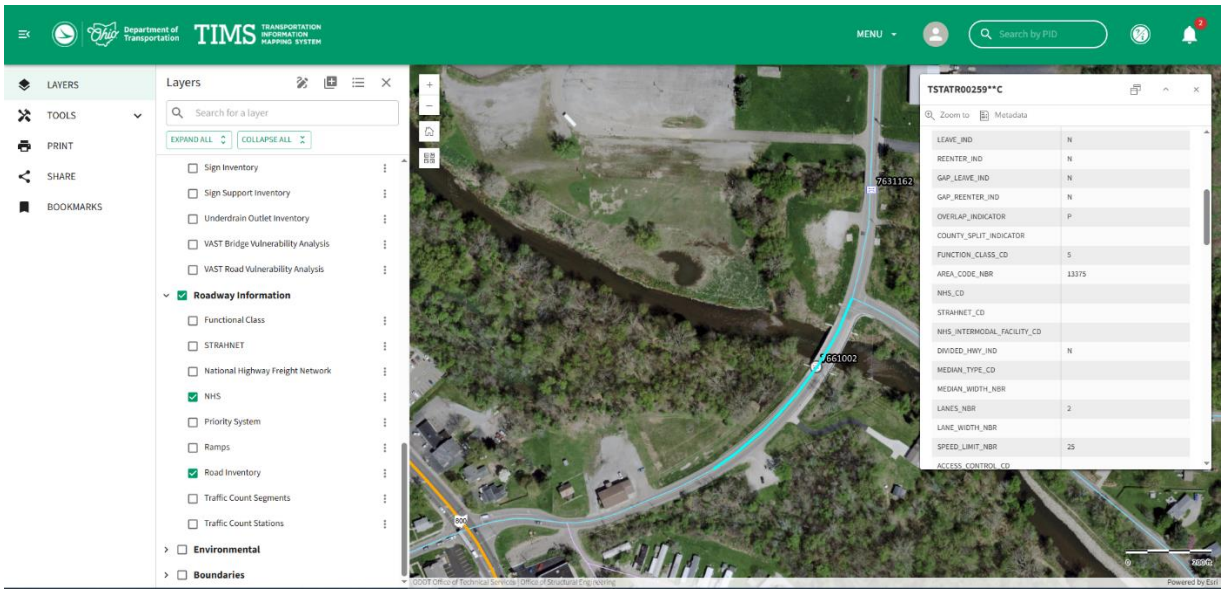
B.H.02 – Urban Code

Mill street urban code is 13375. Refer to Appendix XX for a list of Urban Codes or use the following link:
https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html

B.H.03 – NHS Designation

Mill Street is coded as N-Non-NHS. Refer to the Ohio state map of NHS routes at the following link:
https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/

TIMS can be utilized to obtain this information by selecting the data layer for NHS under the Roadway Inventory tab.



Features Data Set (continued)

Highways – Commentary (continued)

B.H.05 – STRAHNET Designation

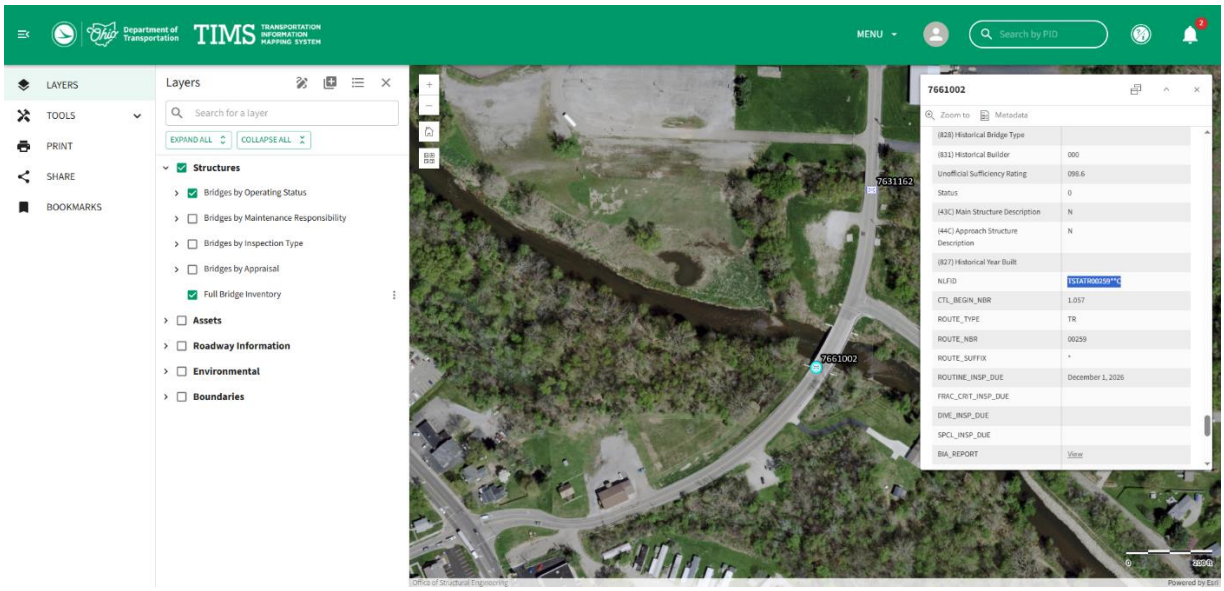
Mill street is not a STRAHNET route and is coded N – not a STRAHNET route.

STRAHNET routes and STRAHNET Connector routes specific to Ohio can be found on NHS Ohio State map and the maps associated with the urbanized areas of the state at:

https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/ohio/

B.H.06 – LRS Route ID

*The LRS Route ID for Mill Street is the NLFID which is TSTATR00259**C.*



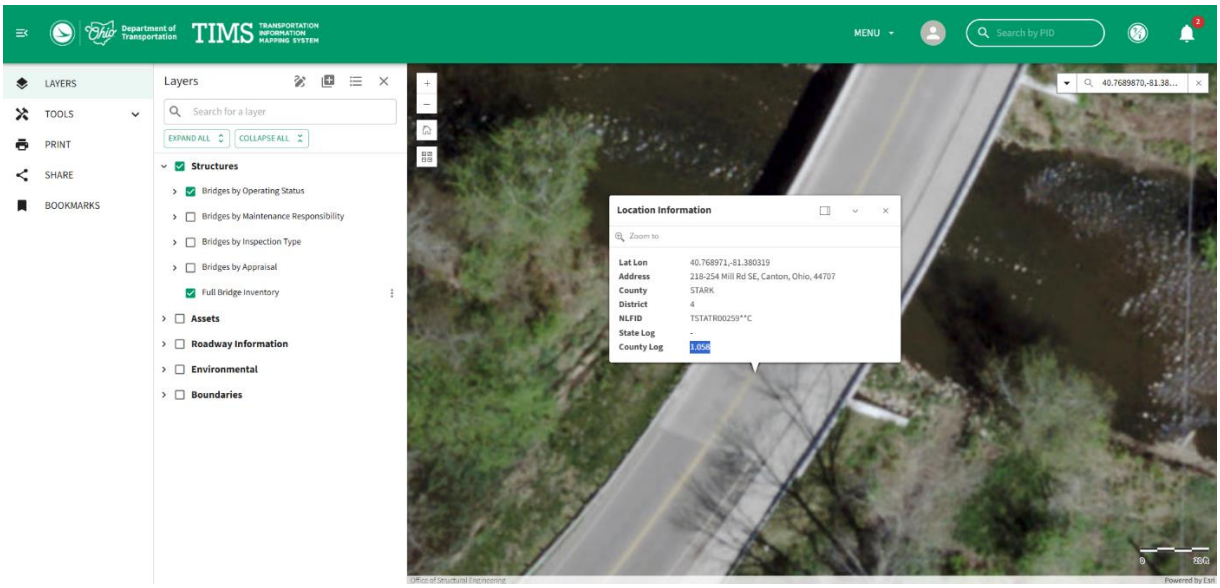
TIMS can be utilized to obtain this information by selecting the data layer for LRS under the Roadway Inventory tab.

Features Data Set (continued)

Highways – Commentary (continued)

B.H.07 – LRS Mile Point

The LRS Mile Point of Mill Street at the beginning of SFN 7661002 is 1.058.



TIMS can be utilized to obtain this information by right-clicking and selecting 'Location Information' at the beginning of the structure.

B.H.12 – Highway Maximum Usable Vertical Clearance

SFN 7661002 carries Mill Street with no vertical clearance restrictions, therefore code 99.9.

B.H.13 – Highway Minimum Vertical Clearance

SFN 7661002 carries Mill Street with no vertical clearance restrictions, therefore code 99.9.

B.H.14 – Highway Minimum Horizontal Clearance, Left and **B.H.15 - Highway Minimum Horizontal Clearance, Right**

These items are not reported since Mill Street is carried on the bridge.

Features Data Set (continued)

Highways – Commentary (continued)

B.H.16 – Highway Maximum Usable Surface Width

The width between the toe of the reinforced concrete railing and the concrete curb is measured to be 33'-1 1/2". Report 33.1.

Navigable Waterways - Commentary

B.N.01 – Navigable Waterway

The Nimishillen Creek is not a navigable water, therefore code N – Not a navigable waterway.

Comprehensive Example - Four-Span Over a Divided Highway

This section includes a comprehensive example to illustrate the proper recording of data items that are required to develop a complete Features Data Set. The bridge in the comprehensive example is Structure File Number (SFN) 7710569 in Summit County, Ohio. The bridge is a four span continuous multi-beam bridge that carries Middleton Road over Interstate 480. Two-way traffic travels eastbound and westbound across the bridge. Interstate 480 is a divided highway with two lanes of northbound and southbound traffic.

Photo 3 – Elevation view of SFN 7710569, looking northwest.

Photo 4 – Approach view to SFN 7710569, looking northwest.

4: FEATURES

4.1: Feature Identification

B.F.01.1: Feature Type Selection	H - Highway	H - Highway	H - Highway
B.F.01: Feature Type	H01	H02	H03
B.F.02: Feature Location	C - Carried on bridge	B - Below bridge	B - Below bridge
B.F.03: Feature Name	Middleton Road	EB I-480	WB I-480

4.3: Highways

B.H.01: Functional Classification	5 - Major Collector	1 - Interstate	1 - Interstate
B.H.01.01: Priority System Code (ODOT 5.01)	U - Urban	P- Priority	P- Priority
B.H.02: Urban Code	17668	17668	17668
B.H.03: NHS Designation	N - Non-NHS	Y - NHS	Y - NHS
B.H.04: National Highway Freight Network	N - Not on the NHFN	1 - Primary Highway F	1 - Primary Highway Fr
B.H.05: STRAHNET Designation	N - not a STRAHNET ro	1 - STRAHNET Route	1 - STRAHNET Route
B.H.06: LRS Route ID (NLFID)	MSUMMR05634**C	SSUMIR00480**C	SSUMIR00480**N
B.H.07: LRS Mile Point (SLM)	3.293	8.147	8.137
B.H.08: Lanes on Highway	2	2	2
B.H.09: Annual Average Daily Traffic	1199	19568	19568
B.H.10: Annual Average Daily Truck Traffic	16	1937	1937
B.H.11: Year of Annual Average Daily Traffic	2023	2023	2023
B.H.12: Highway Maximum Usable Vertical Clearance	99.9	16.3	18.3
B.H.13: Highway Minimum Vertical Clearance	99.9	16.3	18.3
B.H.14: Highway Minimum Horizontal Clearance, Left		40.3	45.5
B.H.15: Highway Minimum Horizontal Clearance, Right		12	12
B.H.16: Highway Maximum Usable Surface Width	30	40	40
B.H.17: Bypass Detour Length	3	2	2
B.H.18: Crossing Bridge Number			

4.4: Railroads

B.RR.01: Railroad Service Type			
B.RR.02: Railroad Minimum Vertical Clearance			
B.RR.03: Railroad Minimum Horizontal Offset			

4.5: Navigable Waterways

B.N.01: Navigable Waterway			
B.N.01.01: Scenic River (ODOT 651)			
B.N.02: Navigation Minimum Vertical Clearance			
B.N.03: Movable Bridge Maximum Navigation Vertical Clearance			
B.N.04: Navigation Channel Width			
B.N.05: Navigation Channel Minimum Horizontal Clearance			
B.N.06: Substructure Navigation Protection			

4.2: Routes

B.RT.H: Route Highway Mapping	H01 - Highway 1	H02 - Highway 2	H02 - Highway 3
B.RT.01: Route Designation	R01	R01	R01
B.RT.02: Route Number	5634	480	480
B.RT.03: Route Direction	EW - Eastbound and W	EB - Eastbound	WB - Westbound
B.RT.04: Route Type	5 - City Street	1 - Interstate Route	1 - Interstate Route
B.RT.05: Service Type	1 - Mainline	1 - Mainline	1 - Mainline

Table L-2 – Summary Table of Features Data Set for SFN 7710569

Features Data Set
Feature Identification - Commentary
B.F.01 – Feature Type The structure SFN 7710569 carries Middleton Road over Interstate 480, which is a divided highway. Middleton Road is the highway feature carried by SFN 7710569, code it as H01. Interstate 480 is a divided highway feature below SFN 7710569 that has two lanes of eastbound traffic and two lanes of westbound traffic, code the eastbound direction as **H02** and the westbound direction as **H03**.
B.F.02 – Feature Location Middleton Road is carried on the bridge, therefore code C - Carried on bridge. Interstate 480 eastbound is located below the bridge, therefore code B - Below bridge. Interstate 480 westbound is located below the bridge, therefore code B - Below bridge.
B.F.03 – Feature Name Middleton Road is carried on the bridge, therefore code Middleton Road. Interstate 480 eastbound is located below the bridge, therefore code EB I-480. Interstate 480 westbound is located below the bridge, therefore code WB I-480.
Routes - Commentary
B.RT.H. – Route Highway Mapping Each highway feature should be related to at least one route. The feature carried on the bridge should be reported first, therefore code Middleton Road as H01- Highway 1. Each highway feature below the bridge should be coded in order in which they are encountered by the structure above, beginning from the rear end of the structure, therefore code Interstate 480 eastbound as H02 – Highway 2 and Interstate 480 westbound as H03- Highway 3.
B.RT.01 – Route Designation There is only one route associated with each highway feature, therefore code R01.

Features Data Set (continued)

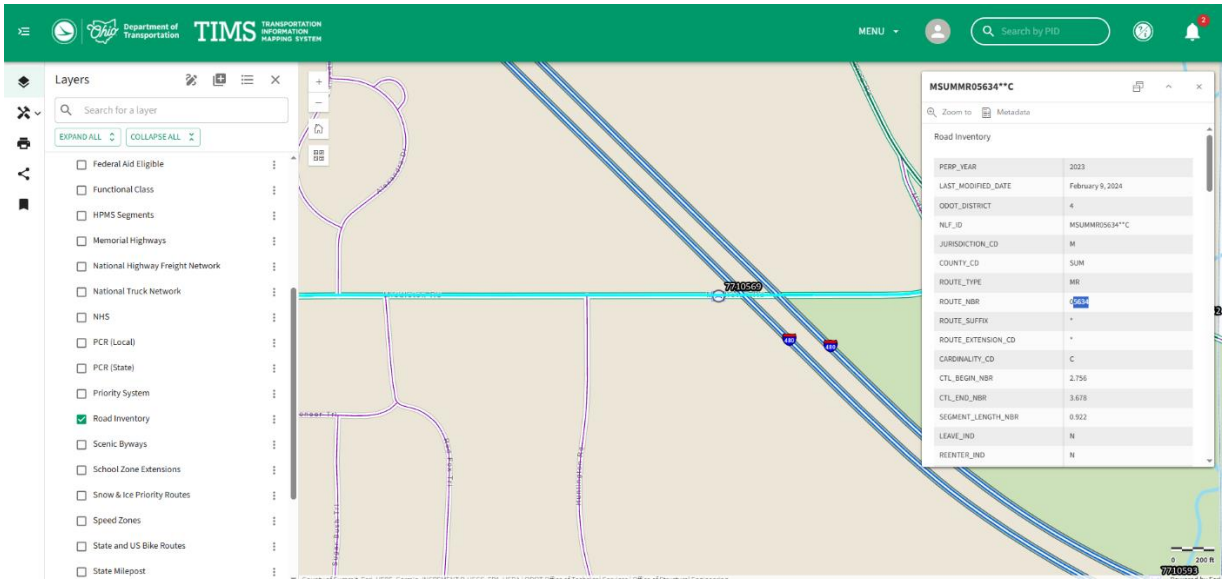
Routes – Commentary (continued)

B.RT.02 – Route Number

The route number for Middleton Road is 5634.

The route number for I-480 eastbound and westbound is 480.

TIMS can be utilized to obtain this information by selecting the data layer for NHS under the Bridge Inventory tab.



B.RT.03 – Route Direction

SFN 7710569 carries two-way traffic from Middleton Road eastbound and westbound over the Interstate 480. Report NS – Northbound and Southbound for Highway 1.

Interstate 480 is a divided highway with traffic in both the eastbound and westbound direction.

Report EB – Eastbound for Highway 2.

Report WB – Westbound for Highway 3.

Features Data Set (continued)

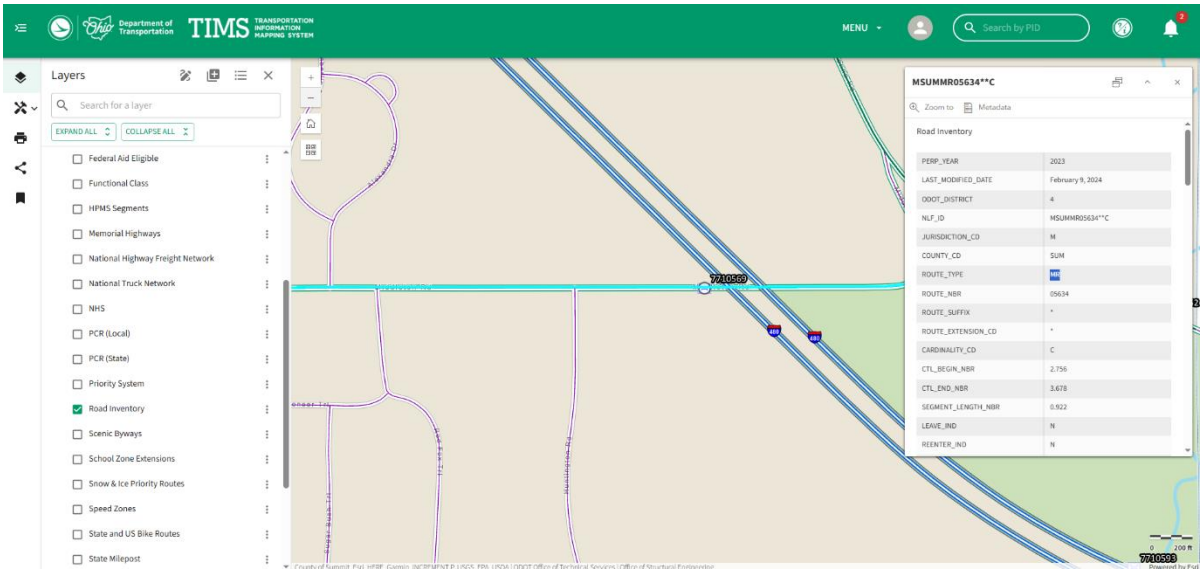
Routes – Commentary (continued)

B.RT.04 – Route Type

Middleton Road is a city street, report 5 – City Street.

Interstate 480 should be reported as 1 – Interstate Route for Highway 2 and Highway 3.

Within TIMS utilize the Road Inventory data under Roadway Information. Within the Roadway Inventory, ROUTE_TYPE corresponds to Item B.RT.04 – Route Type. MR indicates a city street and IR indicates an interstate route in accordance with ODOT's Roadway Information Manual.



B.RT.05 – Service Type

Middleton Road and Interstate 480 are mainline routes, report 1 - Mainline.

Highways - Commentary

B.H.01 – Functional Classification

Middleton Road is coded as a 5-Major Collector and Interstate 480 is coded as a 1 – Interstate according to the guidelines for assigning functional classification to roadways and streets within Ohio at the following link:

https://www.transportation.ohio.gov/working/funding/resources/ohio-roadway-functional-class

B.H.02 – Urban Code

Middleton Road and Interstate 480 urban code is 17668. Refer to Appendix XX for a list of Urban Codes or use the following links:

https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html

https://tims.dot.state.oh.us/tims/map/sid/LRLbDY

Features Data Set (continued)

Highways – Commentary (continued)

B.H.03 – NHS Designation

Middleton Road is coded as N-Non-NHS and Interstate 480 is coded as Y - NHS. Refer to the Ohio state map of NHS routes at the following link:
https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/

TIMS can be utilized to obtain this information by selecting the data layer for NHS under the Roadway Information tab.

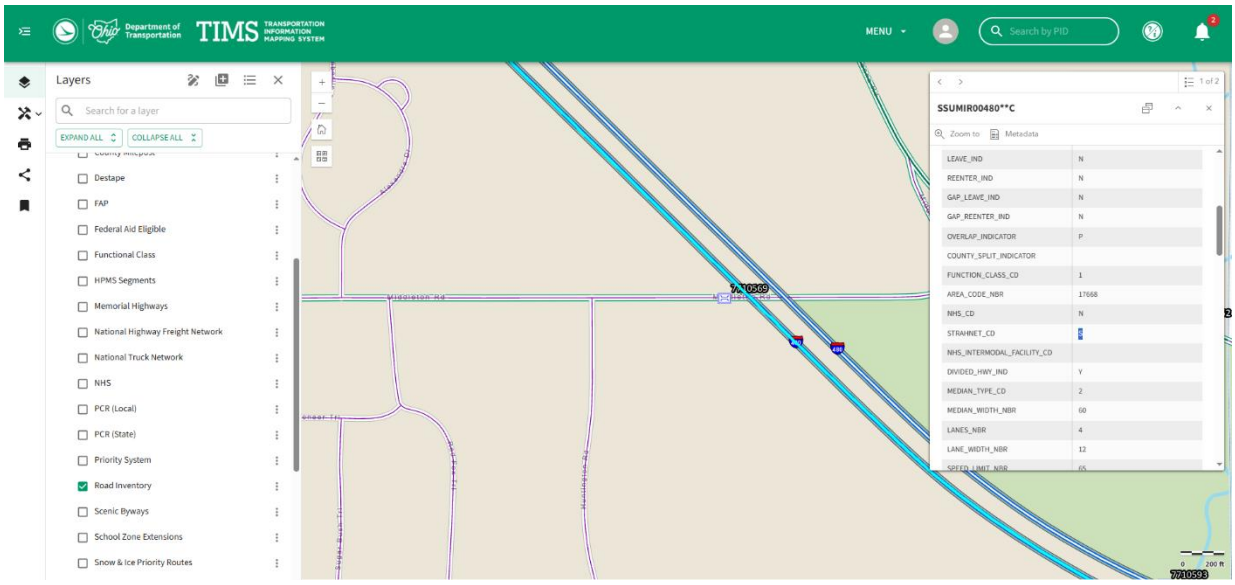
B.H.05 – STRAHNET Designation

Middleton Road is not a STRAHNET route and is coded N – not a STRAHNET route.

Interstate 480 is a STRAHNET route and is coded 1 – STRAHNET Route.

STRAHNET routes and STRAHNET Connector routes specific to Ohio can be found on NHS Ohio State map and the maps associated with the urbanized areas of the state at:
https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/ohio/

TIMS can be utilized to obtain this information by selecting the data layer for STRAHNET under the Roadway Inventory tab. 'S' indicates that Interstate 480 is a STRAHNET route in accordance ODOT's Roadway Information Manual.



https://tims.dot.state.oh.us/tims/map/sid/oP35zx

Features Data Set (continued)

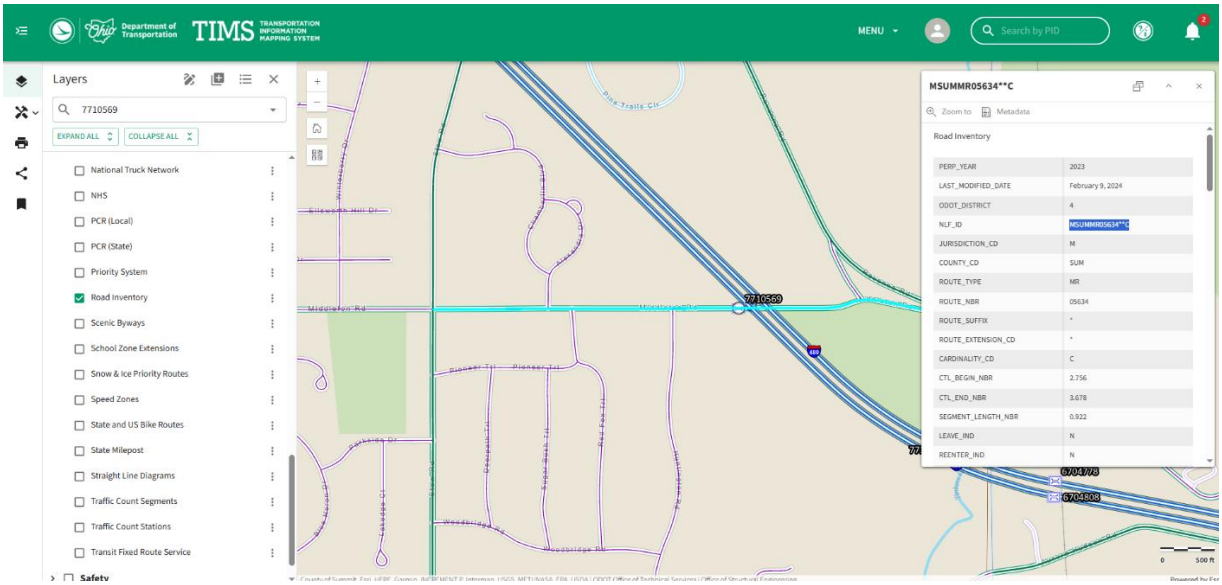
Highways – Commentary (continued)

B.H.06 – LRS Route ID

The LRS Route ID for Middleton Road is the NLFID which is MSUMMR05634**C.

The LRS Route ID for Interstate 480 eastbound is SSUMIR00480**C and Interstate 480 westbound is SSUMIR00480**N.

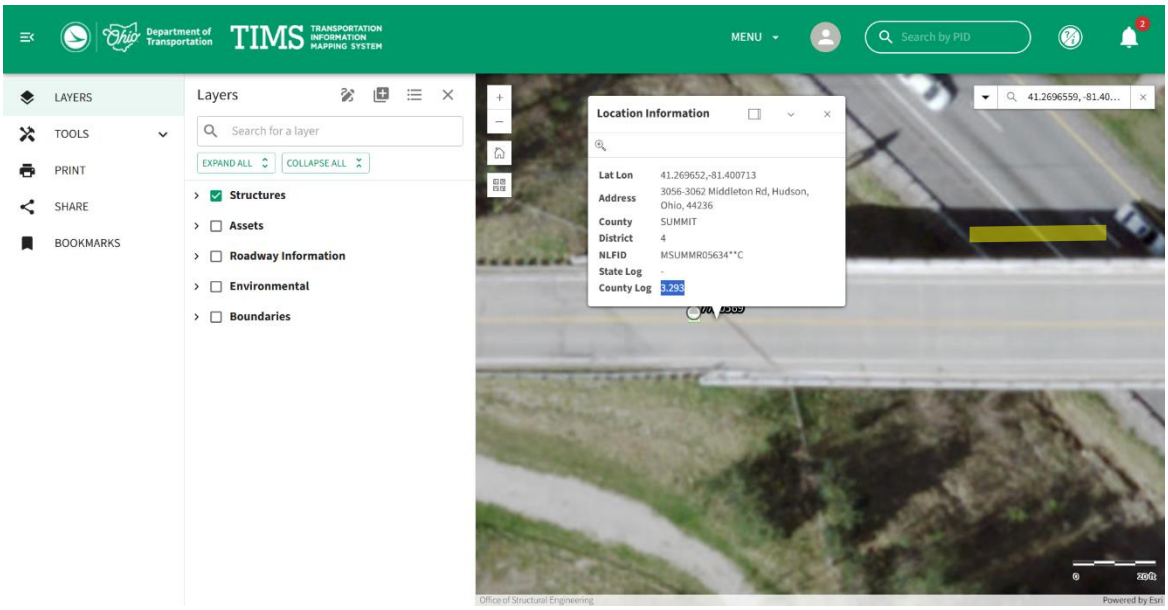
TIMS can be utilized to obtain this information by selecting the data layer for LRS under the Roadway Information tab.



Features Data Set (continued)

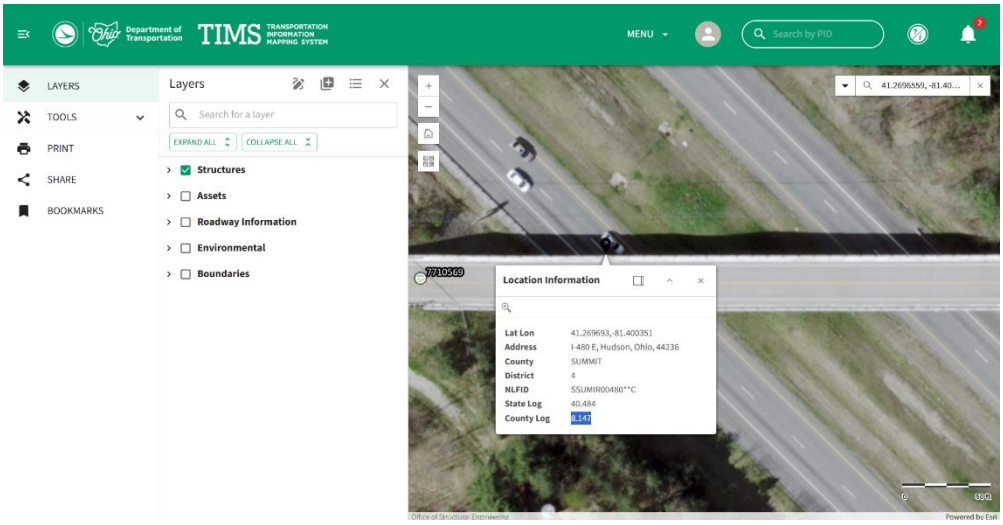
Highways – Commentary (continued)

B.H.07 – LRS Mile Point



The LRS Mile Point of Middleton Road at the start of SFN 7710569 is 3.293. The county log is always recorded. The Mile Point is taken at the end of the rear approach slab.

TIMS can be utilized to obtain this information by right-clicking on the map and selecting 'Location Information'.



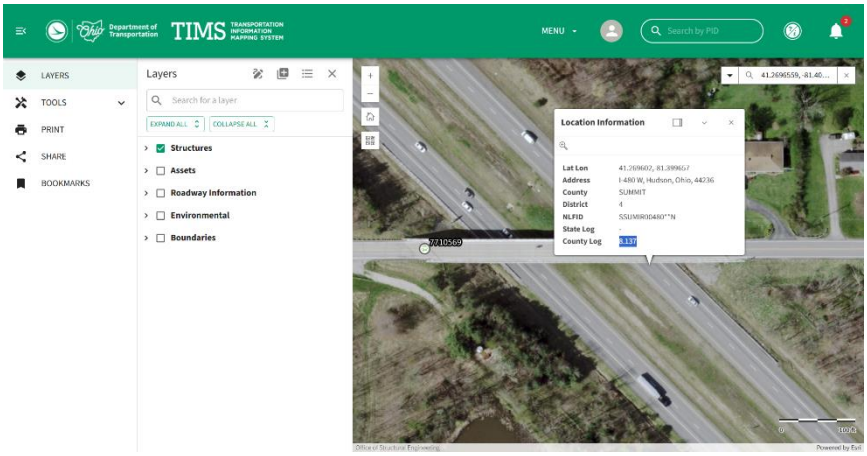
The LRS Mile Point for Interstate 480 eastbound is 8.147. The county log is always recorded. The Mile Point is taken at the point of which the centerline of Interstate 480 eastbound intersects SFN 7710569.

TIMS can be utilized to obtain this information by right-clicking on the map and selecting 'Location Information'.

Features Data Set (continued)

Highways – Commentary (continued)

B.H.07 – LRS Mile Point (continued)



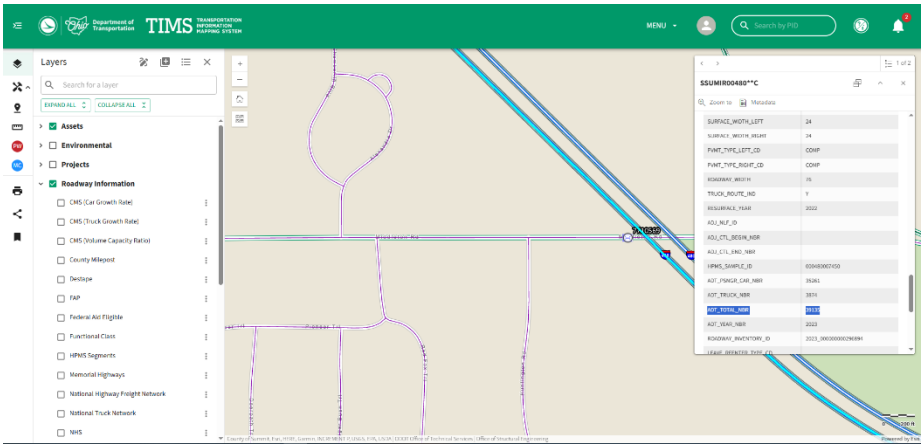
The LRS Mile Point for Interstate 480 westbound is 8.137. The county log is always recorded. The Mile Point is taken at the point of which the centerline of Interstate 480 westbound intersects SFN 7710569.

TIMS can be utilized to obtain this information by using the "Find log point' function.

B.H.09 – Annual Average Daily Traffic

Middleton Road is not divided at the bridge, therefore code the reported value in 2023 from TIMS, 1199 for Highway 1.

Since Interstate 480 is divided at the structure, the reported value of AADT should be divided in half to represent AADT for each direction.



Utilizing TIMS, the total reported AADT in 2023 for Interstate 480 is 39135. This value shall be divided by two to give the actual AADT for Interstate 480 in each direction. Therefore code 19568 for Highway 2 and Highway 3.

Features Data Set (continued)
Highways – Commentary (continued)
B.H.12 – Highway Maximum Usable Vertical Clearance SFN 7710569 carries Middleton Road with no vertical clearance restrictions, therefore code 99.9. SFN 7710569 spans over Interstate 480 in the eastbound direction with a vertical clearance of 16.3, report 16.3. This value should be measured in the field. SFN 7710569 spans over Interstate 480 in the westbound direction with a vertical clearance of 18.3, report 18.3. This value should be measure in the field.
B.H.13 – Highway Minimum Vertical Clearance SFN 7710569 carries Middleton Road with no vertical clearance restrictions, therefore code 99.9. SFN 7710569 spans over Interstate 480 in the eastbound direction with a vertical clearance of 16.1, report 16.1. This value should be measured in the field. SFN 7710569 spans over Interstate 480 in the westbound direction with a vertical clearance of 18.1, report 18.1. This value should be measure in the field.

Features Data Set (continued)

Highways – Commentary (continued)

B.H.14 – Highway Minimum Horizontal Clearance, Left

H01: This item is not reported for Middleton Road since it is carried on the bridge.

H02: The minimum horizontal clearance, left for Interstate 480 eastbound is 40'-4". The measurement is taken from the left edge (yellow) line to the rear face of the middle pier column. Report 40.3.

H03: The minimum horizontal clearance, left for Interstate 480 westbound is 45'-6". The measurement is taken from the left edge (yellow) line to the forward face of the middle pier column. Report 45.5.

Features Data Set (continued)

Highways – Commentary (continued)

B.H.15 - Highway Minimum Horizontal Clearance, Right

H01: This item is not reported for Middleton Road since it is carried on the bridge.

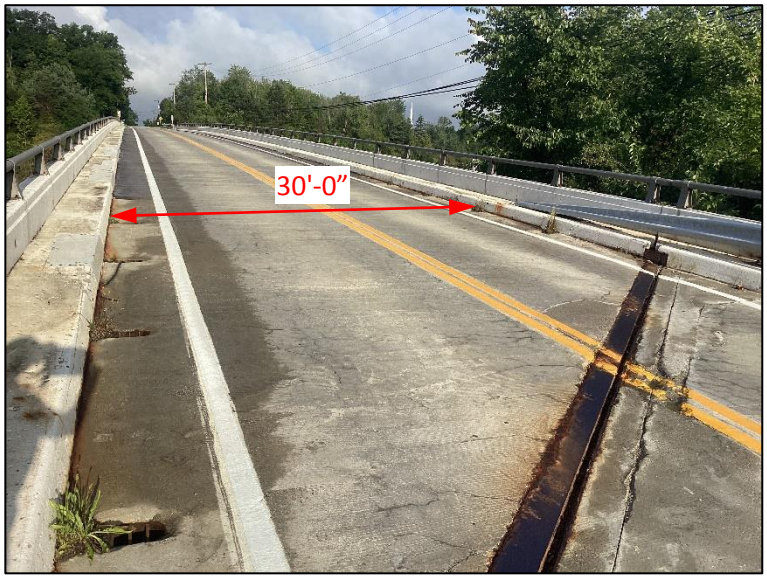
H02: The minimum horizontal clearance, right for Interstate 480 eastbound is 12'-0". The measurement is taken from the right edge (white) line to the face of the guardrail. Report 12.

H03: The minimum horizontal clearance, right for Interstate 480 westbound is 12'-0". The measurement is taken from the right edge (white) line to the face of the guardrail. Report 12.

Features Data Set (continued)

Highways – Commentary (continued)

B.H.16 – Highway Maximum Usable Surface Width



The width between the toe of the concrete curbs on Middleton Road is measured to be 30'-0". Report 30.

The width between the edge of the left shoulder and the right shoulder of both Interstate 480 eastbound and westbound is 40'-0", therefore code 40 for Highway 2 and Highway 3.

Comprehensive Feature Example - Single Span Bridge over Railroad

This section includes a comprehensive example to illustrate the proper recording of data items that are required to develop a complete Features Data Set. The bridge in the comprehensive example is Structure File Number (SFN) 7767919 in Summit County, Ohio. The bridge is a single span multi-beam bridge that carries Veterans Way over a Norfolk Southern Railway. Two-way traffic travels eastbound and westbound across the bridge. There is a pedestrian sidewalk that is carried over the bridge in either direction.

Photo 5 – Elevation view of SFN 7767919, looking west.

Photo 6 – Approach view to SFN 7767919, looking north.

4: FEATURES

4.1: Feature Identification

B.F.01.1: Feature Type Selection	H - Highway	P - Pathway	R - Railroad
B.F.01: Feature Type	H01	P01	R01
B.F.02: Feature Location	C - Carried on bridge	C - Carried on bridge	B - Below bridge
B.F.03: Feature Name	Veterans Way	Sidewalks	Norfolk Southern

4.3: Highways

B.H.01: Functional Classification	7 - Local		
B.H.01.01: Priority System Code (ODOT 5.01)	U - Urban		
B.H.02: Urban Code	17668		
B.H.03: NHS Designation	N - Non-NHS		
B.H.04: National Highway Freight Network	N - Not on the NHFN		
B.H.05: STRAHNET Designation	N - not a STRAHNET rc		
B.H.06: LRS Route ID (NLFID)	MSUMMR03567A*C		
B.H.07: LRS Mile Point (SLM)	0.058		
B.H.08: Lanes on Highway	2		
B.H.09: Annual Average Daily Traffic	4900		
B.H.10: Annual Average Daily Truck Traffic	245		
B.H.11: Year of Annual Average Daily Traffic	2005		
B.H.12: Highway Maximum Usable Vertical Clearance	99.9		
B.H.13: Highway Minimum Vertical Clearance	99.9		
B.H.14: Highway Minimum Horizontal Clearance, Left			
B.H.15: Highway Minimum Horizontal Clearance, Right			
B.H.16: Highway Maximum Usable Surface Width	34.1		
B.H.17: Bypass Detour Length	1		
B.H.18: Crossing Bridge Number			

4.4: Railroads

B.RR.01: Railroad Service Type			F - Freight
B.RR.02: Railroad Minimum Vertical Clearance			23.1
B.RR.03: Railroad Minimum Horizontal Offset			25.9

4.5: Navigable Waterways

B.N.01: Navigable Waterway			
B.N.02: Navigation Minimum Vertical Clearance			
B.N.03: Movable Bridge Maximum Navigation Vertical Clearance			
B.N.04: Navigation Channel Width			
B.N.05: Navigation Channel Minimum Horizontal Clearance			
B.N.06: Substructure Navigation Protection			

4.2: Routes

B.RT.H: Route Highway Mapping	H01 - Highway 1
B.RT.01: Route Designation	R01
B.RT.02: Route Number	3567
B.RT.03: Route Direction	EW - Eastbound and W
B.RT.04: Route Type	5 - City Street
B.RT.05: Service Type	1 - Mainline

Table L-3 – Summary Table of Features Data Set for SFN 7767919

Features Data Set

Feature Identification - Commentary

B.F.01 – Feature Type

The structure SFN 7767919 carries Veterans Way over a Norfolk Southern Railway. Since Veterans Way is the only highway feature, code it as H01.

The structure SFN 7767919 carries a pedestrian sidewalk on both sides of the bridge over a Norfolk Southern railway. Since the sidewalk is the only pathway feature, code it as P01.

The structure SFN 7767919 carries Veterans Way and a pedestrian sidewalk on either side of the bridge over a Norfolk Southern Railway. Since the structure crosses over a railroad feature, code Norfolk Southern Railway as R01.

B.F.02 – Feature Location

Veterans Way is carried on the bridge, therefore code C - Carried on bridge.

The sidewalks on both sides are carried on the bridge, therefore code C - Carried on bridge.

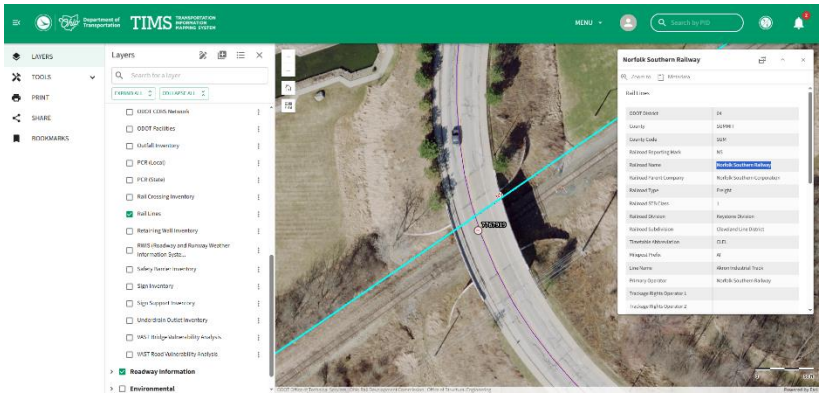
Norfolk Southern Railway is located below the bridge, therefore code B - Below bridge.

B.F.03 – Feature Name

Veterans Way is carried on the bridge, therefore code Veterans Way.

The sidewalks on both sides are carried on the bridge, therefore code Sidewalks.

Norfolk Southern Railway is located below the bridge, therefore code Norfolk Southern Railway.



TIMS can be utilized by selecting the 'Rail Lines' layer under the Assets tab.

Routes - Commentary

B.RT.H. – Route Highway Mapping

Each highway feature should be related to at least one route. Veterans Way is the only highway feature for SFN 7767919, therefore code H01- Highway 1.

B.RT.01 – Route Designation

There is one route associated with the highway feature, code R01.

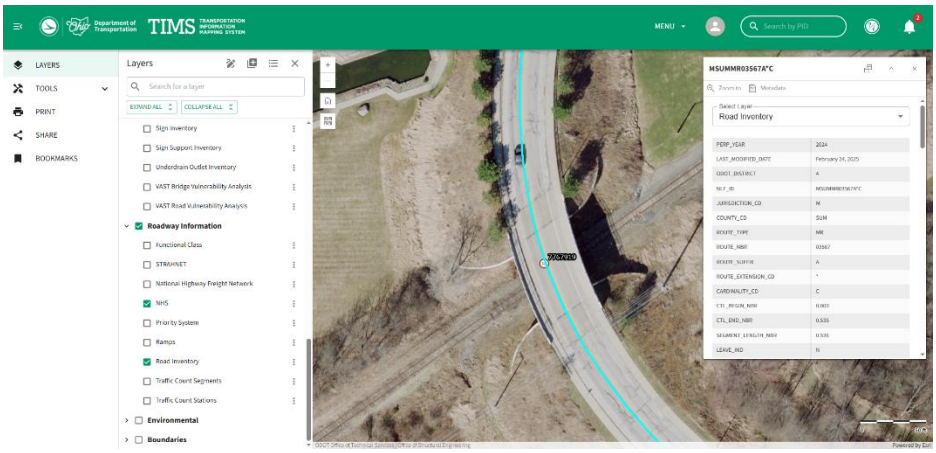
Features Data Set (continued)

Routes – Commentary (continued)

B.RT.02 – Route Number

The route number for Veterans Way is 3567.

TIMS can be utilized to obtain this information by selecting the data layer for ROUTE_NBR under the Roadway Inventory tab.

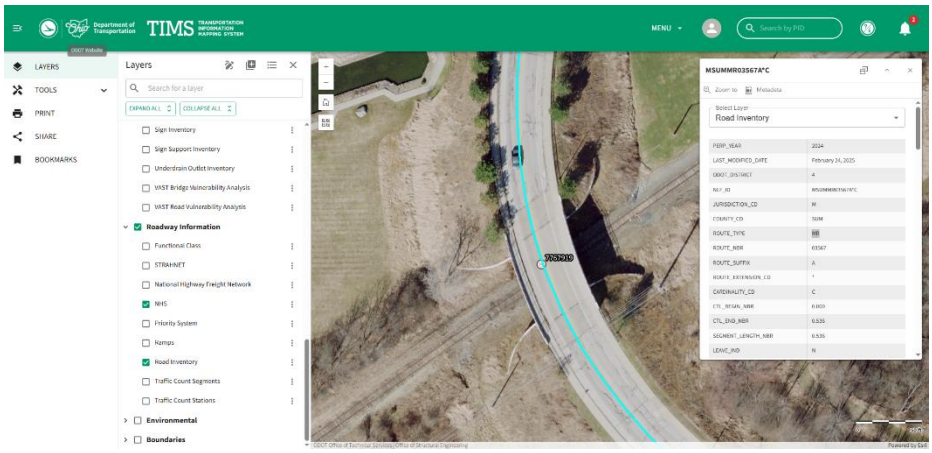


B.RT.03 – Route Direction

SFN 7767919 carries two-way traffic from Veterans Way eastbound and westbound over a Norfolk Southern Railway. Report EW – Eastbound and Westbound.

B.RT.04 – Route Type

Veterans Way is a city street, report 5 – City Street.



Within TIMS utilize the Road Inventory data under Road Inventory. Within the Road Inventory, ROUTE_TYPE corresponds to Item B.RT.04 – Route Type. MR indicates a city street in accordance with ODOT's Roadway Information Manual.

Features Data Set (continued)

Routes – Commentary (continued)

B.RT.05 – Service Type

Veterans Way is a mainline route, report 1 - Mainline.

Highways - Commentary

B.H.01 – Functional Classification

Veterans Way is coded as a 7 - Local according to the guidelines for assigning functional classification to roadways and streets within Ohio at the following link:
https://www.transportation.ohio.gov/working/funding/resources/ohio-roadway-functional-class

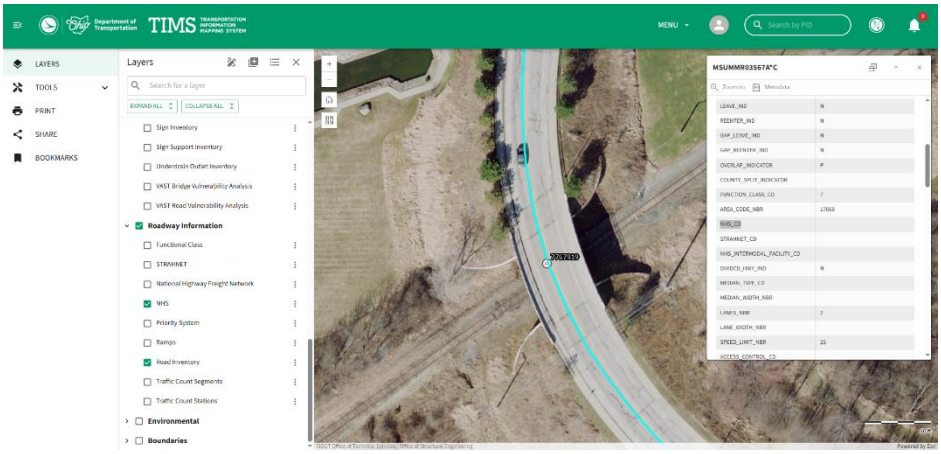
B.H.02 – Urban Code

Veterans Way urban code is 17668. Refer to the following link for a list of Urban Codes:
https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html

B.H.03 – NHS Designation

Veterans Way is coded as N-Non-NHS. Refer to the Ohio state map of NHS routes at the following link:
https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/

TIMS can be utilized to obtain this information by selecting the data layer for NHS under the Road Inventory tab.



Features Data Set (continued)

Highways – Commentary (continued)

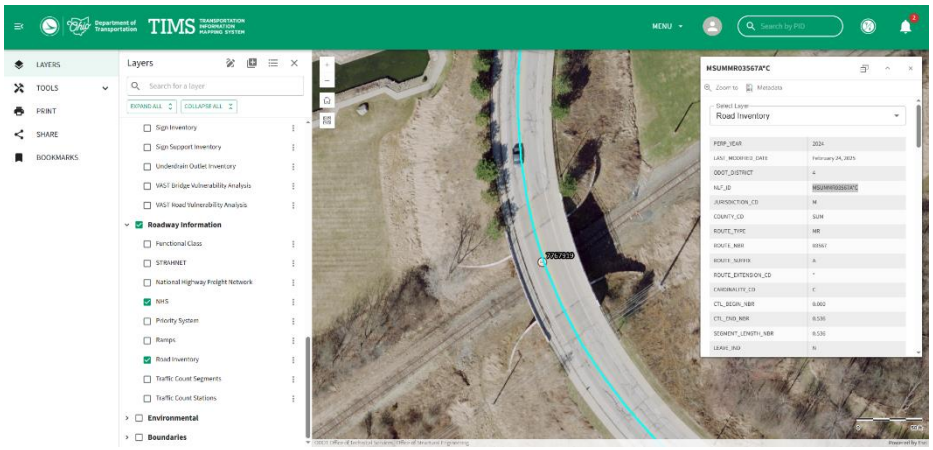
B.H.05 – STRAHNET Designation

Veterans Way is not a STRAHNET route and is coded N – not a STRAHNET route.

STRAHNET routes and STRAHNET Connector routes specific to Ohio can be found on NHS Ohio State map and the maps associated with the urbanized areas of the state at:
https://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/ohio/

B.H.06 – LRS Route ID

The LRS Route ID for Veterans Way is the NLFID which is MSUMMR03567A*C.



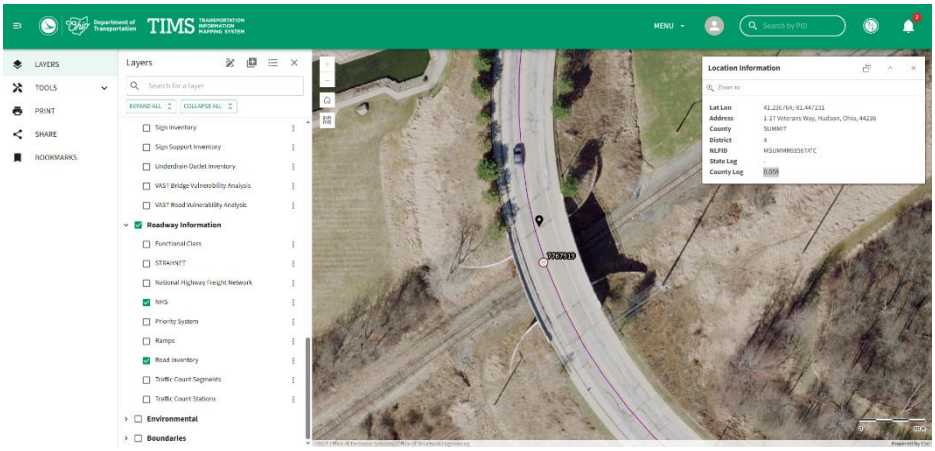
TIMS can be utilized to obtain this information by selecting the data layer for LRS under the Road Inventory tab.

Features Data Set (continued)

Highways – Commentary (continued)

B.H.07 – LRS Mile Point

The LRS Mile Point of Veterans Way at the beginning of SFN 7767919 is 0.058.



TIMS can be utilized to obtain this information by right-clicking on the map and selection 'Location Information' at the beginning of the structure.

B.H.12 – Highway Maximum Usable Vertical Clearance

SFN 7767919 carries Veterans Way with no vertical clearance restrictions, therefore code 99.9.

B.H.13 – Highway Minimum Vertical Clearance

SFN 7767919 carries Veterans Way with no vertical clearance restrictions, therefore code 99.9.

B.H.14 – Highway Minimum Horizontal Clearance, Left and **B.H.15 - Highway Minimum Horizontal Clearance, Right**

These items are not reported since Veterans Way is carried on the bridge.

Features Data Set (continued)

Highways – Commentary (continued)

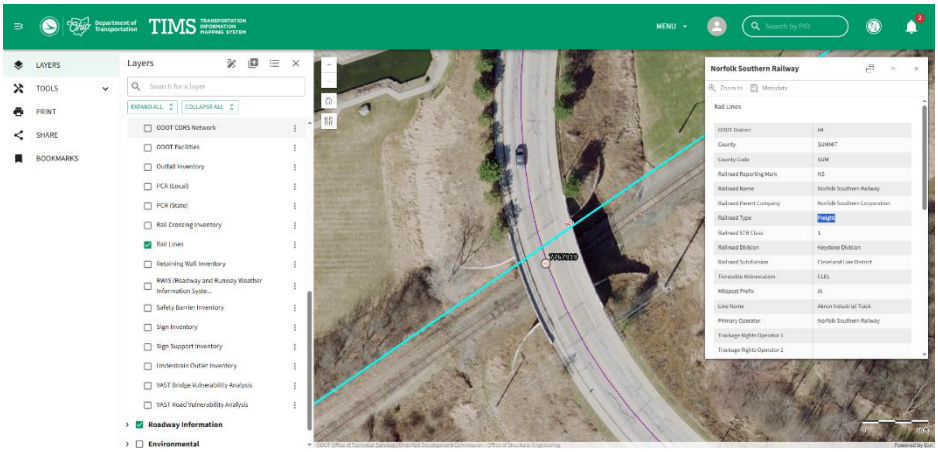
B.H.16 – Highway Maximum Usable Surface Width

The width between the toe of the concrete curbs is measured to be 34'-1 1/2". Report 34.1.

Railroads - Commentary

B.RR.01 – Railroad Service Type

SFN 7767919 carries Veterans Way over a Norfolk Southern Railway. Utilizing TIMS, under the 'Rail Lines' Asset tab, this railroad is classified as a freight line, therefore code F- Freight.



Features Data Set (continued)

Railroads – Commentary (continued)

B.RR.02 – Railroad Minimum Vertical Clearance

This value is measured from the top of the rails to the lowest bridge restriction. The measurement from the top of the Norfolk Southern Railway rail and bottom of the lowest reinforced concrete beam of SFN 7767919 is 23'-1 1/2", therefore code 23.1.

Features Data Set (continued)

Railroads – Commentary (continued)

B.RR.03 – Railroad Minimum Horizontal Offset

The measurement is taken from the centerline of the railroad to the nearest bridge obstruction. The Norfolk Southern Railway centerline measures 25'-11" to the bridge abutment, therefore code 25.9.

Appendix M: Snooper Operational Manual

Ohio Department of Transportation

Division of Engineering

Office of Structural Engineering (OSE)

Snooper Operations Manual

Revised March 2025

Office of Structural Engineering

1980 West Broad Street (MS5180)

Columbus, Ohio 43223

https://www.transportation.ohio.gov/working/engineering/structural/home

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I. Overview

The Ohio Department of Transportation (ODOT) is responsible for the oversight of all federally qualified bridges in the State per Title 23 CFR-650 subpart C. These are bridges that carry public vehicular traffic and whose clear span is greater than 20-feet in length. ODOT has direct inspection authority for more than 14,000 Ohio qualified bridges on or over the State Highway System per Ohio Revised Code 5501.47. These are bridges whose clear span are greater than or equal to 10-feet in length. Many bridges do not have adequate access to structural components because a river, a deep valley or the feature intersected prohibits visibility or entry. One vital operation used to support the professional inventory and inspection of bridges in Ohio is a specialized truck that provides quick, safe, and easy access to many critical components of the structure that are otherwise inaccessible (Figure 1). ODOT operates and maintains two under bridge inspection vehicles (Aspen Aerials) and the operation is coordinated by Central Office in the Office of Structural Engineering (OSE). For the purpose of this document the under bridge inspection vehicles shall be referred to as Snooper Trucks.

Figure 320 - Snooper Bucket Deployed for Right-Side Operation

1. Staffing Levels

Bridge Specialists (BS) from the Office of Structural Engineering (OSE) currently operate two Snooper Trucks. For the purposes of this manual the term Operators will be used to identify the Central Office Bridge Specialists. Equipping each truck with two trained Operators from the Bridge Specialist series is vital not only for the truck transport and mechanical operation but also for the professional inspection of the in-service bridges.

- Transport - two operators allow one to drive the Snooper and the second to drive and offer support in the chase or 'support' vehicle.
- Inspection - At minimum, a two-person operation is required when the snooper is deployed; one person in the bucket and one person available on top of the bridge.

Alternates are permitted to fill in on a case-by-case basis however one trained Operator must be with the truck during inspection or transport at all times.

Inspections that require any of the following activities shall be performed using a 3-person operation (two people in the bucket and one trained Operator on the topside) to promote the integrity of the inspection and ensure the safety of the inspector and vehicular traffic:

- Night inspection
- NSTM Inspection
- Any Bridge Maintenance
- Load-rating Inspection
- Scoping
- Confined space
- In-Depth Inspection
- Complex Inspection

2. Safety

Only trained people shall operate the Snooper equipment. A body harness and lanyard shall be always worn and connected to the bucket cleat when operating from the bucket. Employees shall stand on the floor of the bucket and not sit or climb on the edge of the bucket or use ladders in the bucket. The boom and bucket load limits specified by the manufacture shall not be exceeded.

While certain inspections may dictate special personal protective equipment requirements all jobs require permitted protective clothing which is defined as follows: Hard Hat, Safety Vest ANSI II or III (depending on day vs. night and low vs. high speed traffic), T-Shirt with non-altered sleeves that cover the shoulder and upper bicep, long pants such as jeans, sturdy leather boots/shoes that cover, protect, and support the ankle.

When working over water from the snooper truck personnel are not required to use a personal flotation device (PFD) or provide a rescue boat for maintenance activities, including inspection, as long as they are 100% tied off at all times. Life vests are located on the truck with at least 90 feet of line at all times when working over water and will be available.

All non-participating inspection vehicles and equipment should be parked off the roadway. If other means are impractical and appropriate traffic control exists, vehicles can be parked inside the safe work zone at the discretion of the technicians setting the traffic control zone.

3. The Trucks

The department currently owns two units a 2019 A62 Aspen Aerial, and a 2009 A62 Aspen Aerial rebuilt in 2021 with a new chassis. The current A-62 snooper has a maximum reach of 61'-9" horizontally under a bridge, a 10' fence clearance, a maximum 13' sidewalk clearance, and a maximum working super elevation of 8%. Refer to Appendix A for the Flight Diagram. It can be deployed from the right or left side of the truck. The basket capacity is 600 lbs. and is equipped with compressed air and wired for 110-volt electricity.

Figure 321 - Snooper Truck

The vehicle has a Gross Vehicle Weight (GVW) of approximately 66,200 lbs. or 33.1 tons and,

when driving, a width of 8', a vertical clearance of 12'-11" and a length of 40'. Refer to Appendix A for the footprint and axle loads.

II. Organization and Responsibilities

Conducting a Snooper inspection on a State Route (see "Local Agency Responsibilities" within this section for non-State Routes) requires significant advanced planning with three unique divisions within ODOT, each with a distinctive chain of command (Figure 3).

- **District, Planning and Engineering** (P&E) -Technical Lead
- **District, Highway Management** (HM) - Implementing the Temporary Traffic Control (TTC)
- **Central Office, Office of Structural Engineering** (OSE) - Snooper Truck and Scheduling

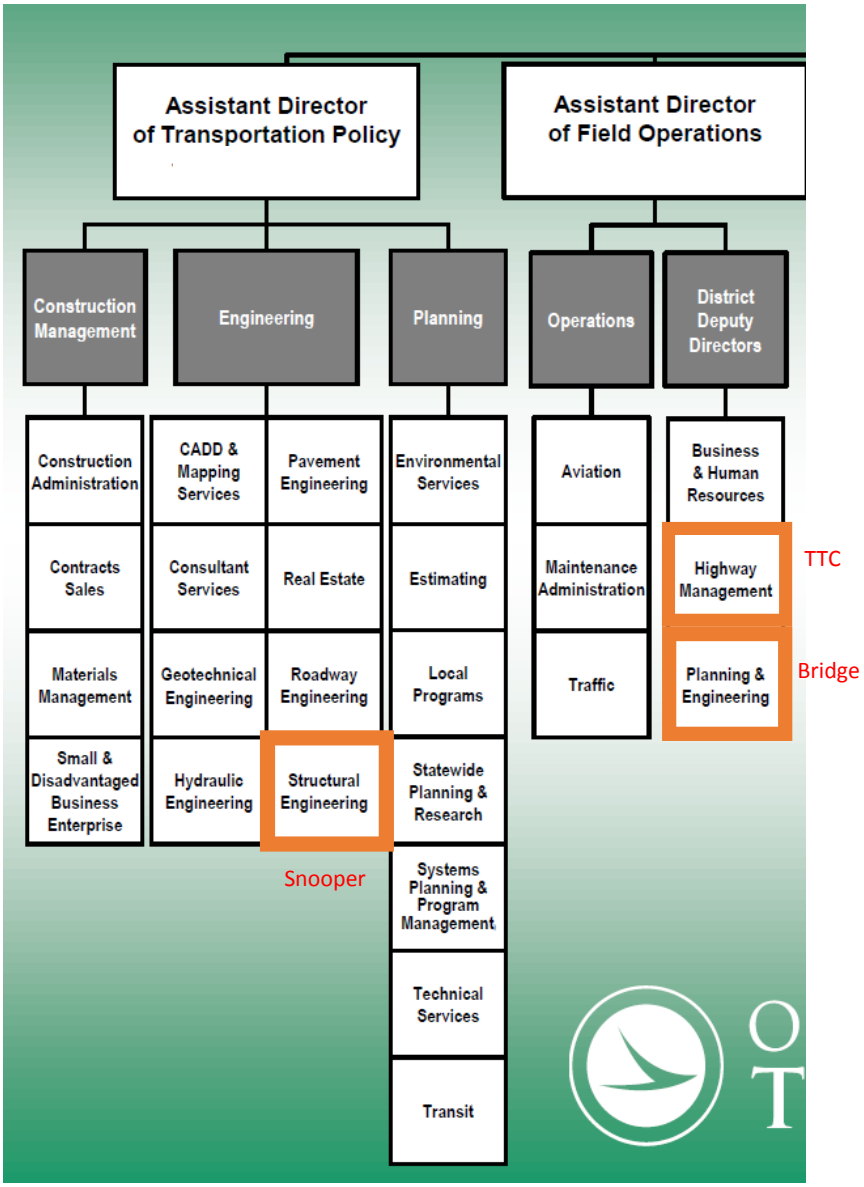


Figure 322 - ODOT Organizational Chart

Methodically and efficiently navigating through a bridge inspection and into the next temporary traffic control zone is a team effort. ODOT Personnel onsite from the District, Central Office and County are expected to contribute their best effort toward ensuring the safety of the traveling public, ensuring safety of the personnel in and around the traffic control zone, and optimizing the snooper truck usage. This will most likely require the District and/or the County switching to four-ten-hour-days (4-10's Monday-Thursday), coordinating two adjacent zones and in general being flexible and communicating with the Team Leader.

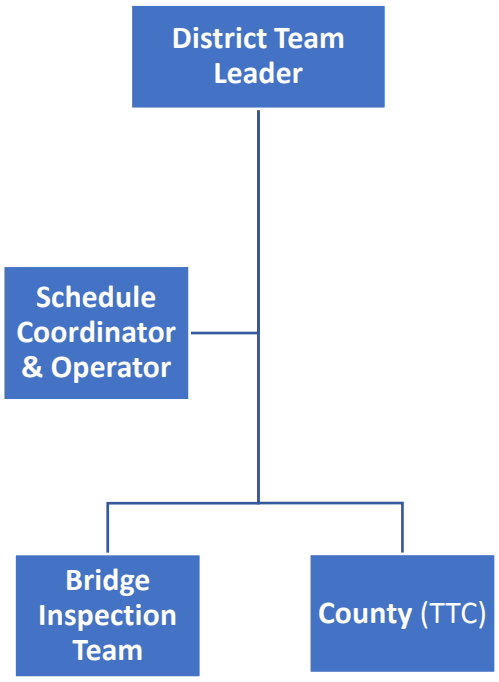


Figure 323 - On-Site Responsibility (Operator will function as alternate Team Leader when mutually agreed upon between OSE and DBE)

The Bridge Specialist 2 (BS2) onsite shall be the inspection Team Leader (TL) and is the one individual in charge of planning, preparing, and performing (or while onsite delegating team activities) field inspection of the bridge; of which Snooper-access is one part. It is imperative that the Team Leader relays accurate, appropriate clear direction to the traffic control and the inspection team. Any unsafe traffic control conditions should be corrected before performing the inspection. They must ensure the inspection conforms to National and State standards while public safety and inspector safety is maintained.

Delays more than 30 minutes incurred due to incorrect signage, substandard MOT or hours waiting for the Truck Mounted Attenuators (TMA's) must be communicated from the Team Leader to Highway Technicians in the field and their immediate supervisor, TM or TA by phone while onsite. Delays in excess of 60 minutes shall also be communicated from the Team Leader to the HMA.

1. District Planning and Engineering Responsibilities

District Bridge Engineers are the Program Managers and function as the technical lead for the bridges in their jurisdiction. They personally review and stamp the vast majority of the inspection reports. They are the individual assigned the duties and responsibilities for bridge inspection, reporting, and inventory. They provide overall leadership and are available to inspection team leaders to provide guidance. The District is responsible for:

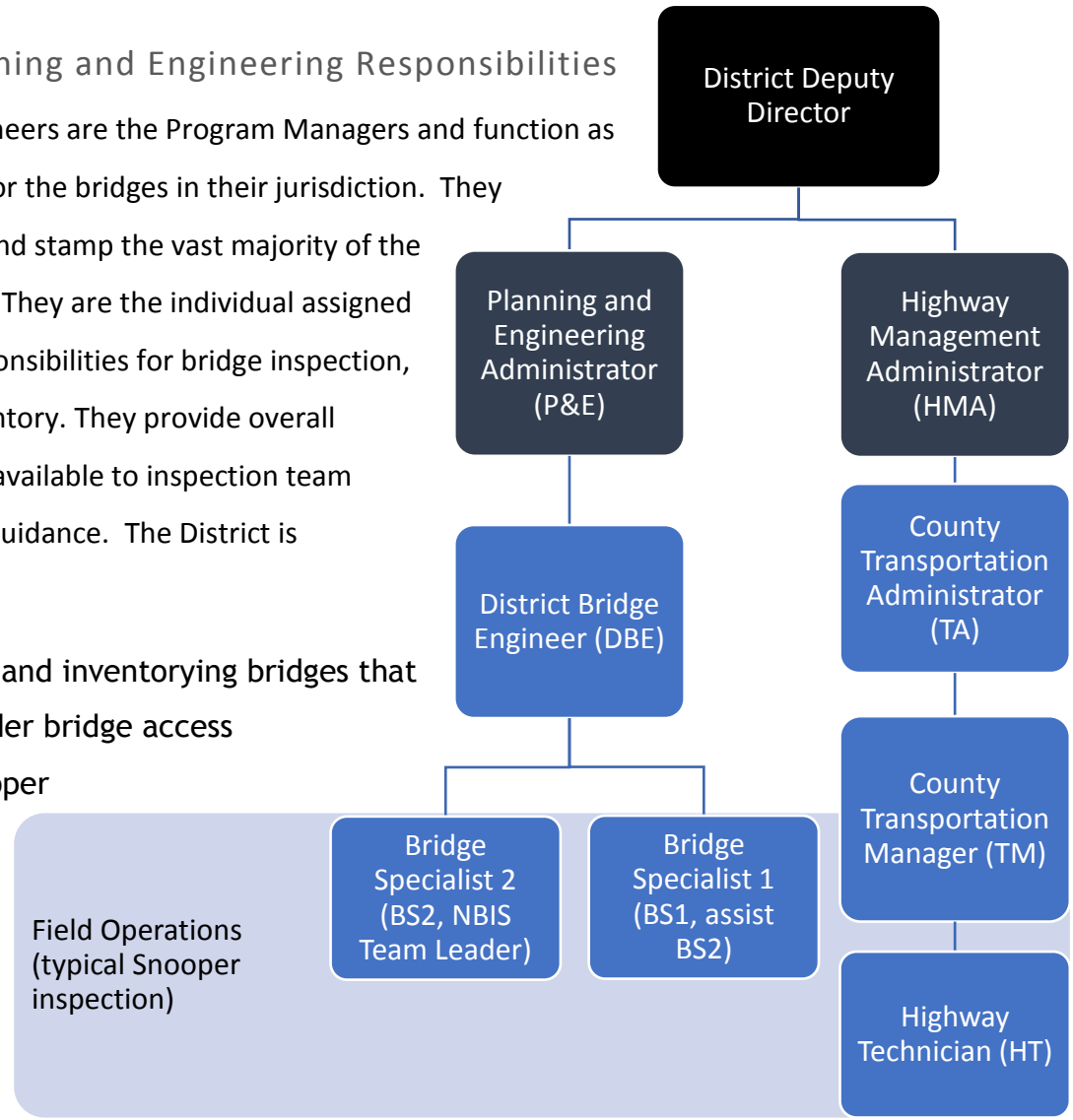


Figure 324 - District Bridge Inspection Operations

- Identifying and inventorying bridges that require under bridge access
- Assign Snooper Inspection Frequency
- Determine estimated inspection time
- Assign Schedule Coordinator: Coordinate, Communicate and Schedule Operations on State Routes

- Coordination and funding of flagman or permits to access bridges over rail roads, local roads or within municipalities
- Coordinating with the counties that provide traffic control
- Providing evening storage locations
- Providing equipment maintenance support as necessary
- Providing an alternate equipment operator or transport as necessary
- Providing the NSTM Inspection Procedure when an NSTM inspection is scheduled
- Scheduling the removal of debris, trees and shrubs for the snooper access
- Press releases, when necessary, when lane(s) are reduced due to anticipated snooper usage
- Participate in training and daily operations to develop backup operators and mechanics
- Assigning Team Leader, providing Bridge Specialists as agreed upon

The District is the technical lead for the bridges on State Routes in their jurisdiction, therefore the District BS2, as designated by the District Bridge Engineer (if not designated then the most senior District BS2), will function as the technical lead for the inspection when BS2's from different offices are present.

a) District Staff Augmented with OSE Staff

Snooper Operators may perform the inspection if requested in writing by the District Bridge Engineer and mutually agreed-upon by OSE; denoted with "CO" on the schedule, prior to the inspection cycle. These inspection reports will be approved in AssetWise by the OSE Bridge Inspection Engineer unless directed otherwise by the DBE. The "CO" request must be mutually agreed upon before the schedule is finalized in March in order to allocate appropriate resources and other District requests.

Operators and District Bridge Specialists may also share inspection tasks denoted with a "SH" on the schedule with a written request from the District Bridge Engineer before the schedule is finalized. "SH" indicates that the Operator will perform a routine inspection, unless directed otherwise, within the flight path of the bucket and share their photos, notes and maintenance

recommendations (e-mail, AssetWise created report or shared-drive) to the District Bridge Specialist. Specific methods of sharing must be communicated among Bridge Specialists. The district will follow up within a reasonable time-frame in the same year to perform the ground-work by walking, using a ladder or operating a bucket truck in order to finalize and submit the inspection. If "CO" or "SH" is established for a bridge it is expected that the District will not be onsite unless there is a specific request due to an emergency or questionable bridge defect. In cases "CO" is agreed-upon and where the District Bridge Specialist is in attendance then the "SH" protocol will be followed.

2. District Highway Management: County Responsibilities

The County shall be responsible for supplying and implementing the temporary traffic control in accordance with the department's Temporary Traffic Control (TTC) Manual.

Transportation Managers are encouraged to be present on the first day the Snooper is in the County to ensure a smooth start to the MOT operations and verify the TTC meets minimum standards.

Figure 325 - Truck Mounted Attenuator (TMA)

Snooper operations run most proficiently in Districts where TM's take an active role and when the MOT is transferred to the absolute fewest number of counties i.e. when HT's cross county. The most proficient Districts provide one MOT team capable of setting up multiple TTC's throughout the District to allow the Snooper operation to move out of one zone and into the next.

Delays more than 30 minutes incurred due to incorrect signage, substandard MOT or hours waiting for the Truck Mounted Attenuator (TMA) must be communicated from the Team Leader to Highway Technicians in the field and their immediate supervisor, TM or TA, by phone

while onsite. Delays in excess of 60 minutes shall also be communicated from the Team Leader to the HMA. All delays must be coded appropriately in the time management system.

Daytime inspections are typically used. Day inspection can be limited by Permitted Lane Closure (http://plcm.dot.state.oh.us/) for shortened windows of time. Night work is an option but poses new and different challenges. Night work can be more dangerous and more time consuming and should include Police detail.

a) The Following are required at each Snooper Inspection

- ***Truck Mounted Attenuators (TMA's).***
- **Our crash attenuator (TMA) requirements have changed due to using unballasted TMA's. Please communicate these changes with traffic control in advance. We now require the following:**
- **1 TMA for speeds less than 60 mph preferably attached to a tandem axle truck.**
- **2 TMA's for speeds equal to or greater than 60 mph preferably attached to tandem axle trucks.**

- The one exception to this rule is a complete road closure (MT-101.60).
- *Established TTC plan.* The Maintenance of Traffic Standard Construction Drawings (MT-SCD) shall be used, and each bridge shall have a MT-SCD assigned and executed at each snooper inspection. These traffic standards are

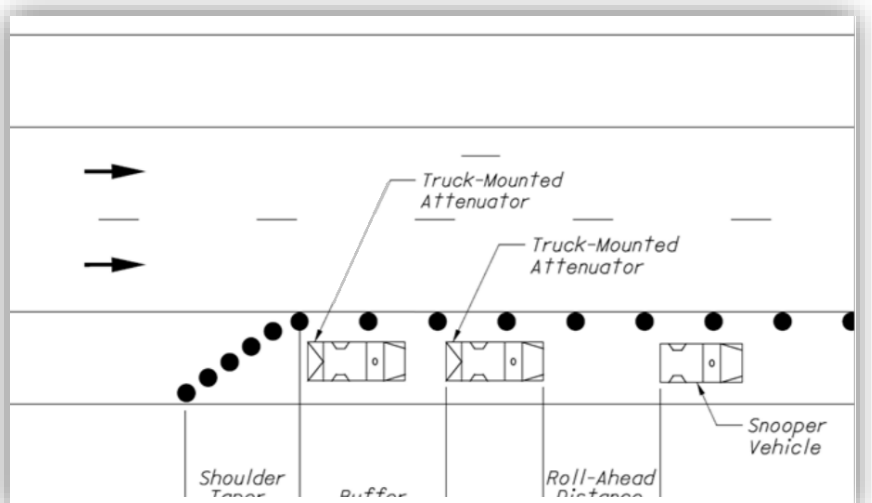


Figure 326 - Shoulder may be utilized with appropriate clearance on a case-by-case basis

located within the Office of Roadway Engineering website (http://www.dot.state.oh.us/Divisions/Engineering/Roadway/DesignStandards/traffic/SCD/Pages/CurrentMaintainingTraffic(MT)SCDs.aspx). Shoulders may be used with no road channelization only when horizontal clearance is sufficient in the TTC zone, and the Operator approves depending upon safety and boom clearance. Some of the more common standards for the Snooper Operation include the following:

*Common MT SCD's for Snooper Operations**

1. MT-95.30 Closing Right or L. Lane of a Multi-Lane Divided Highway*
2. MT-95.31 Closing Right Lane of a Multi-Lane Undivided Highway*
3. MT-97.11 Flagger Closing 1 Lane of a 2-Lane Highway-Stat. Operation*
4. MT-101.60 Road Closure Using Type 3 Barricades
5. Ramps:
    a) MT-98.10 Lane Closure at Entrance Ramp*
    b) MT-98.11 Lane Closure at Entrance Ramp Acceleration Lane*
    c) MT-98.20 Lane Closure at Exit Ramp*
    d) MT-98.22 Lane Closure in Deceleration Lane*
    e) MT-98.28 Lane Closure with Exit Ramp*
    f) MT-98.29 Exit Ramp Closure*

    **** TMA Required***

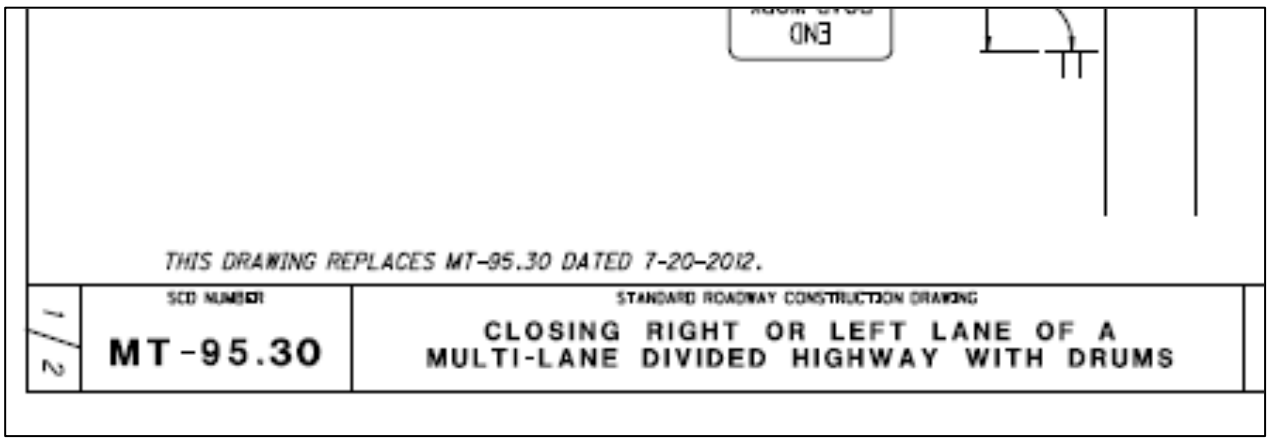


Figure 327 - MT SCD Example Sheet

3. The Office of Structural Engineering Responsibilities

The scheduling, operating, training and maintenance for the under bridge inspection equipment and program is primarily within the Office of Structural Engineering. This involves optimizing the route, communicating with advance notice, coordinating with 30-45 County TTC crews, and District bridge operations. Approximately 190-250 bridges per year will be inspected using one of the snoopers. Central Office supplies operators from the Bridge Specialist series to staff the snooper truck.

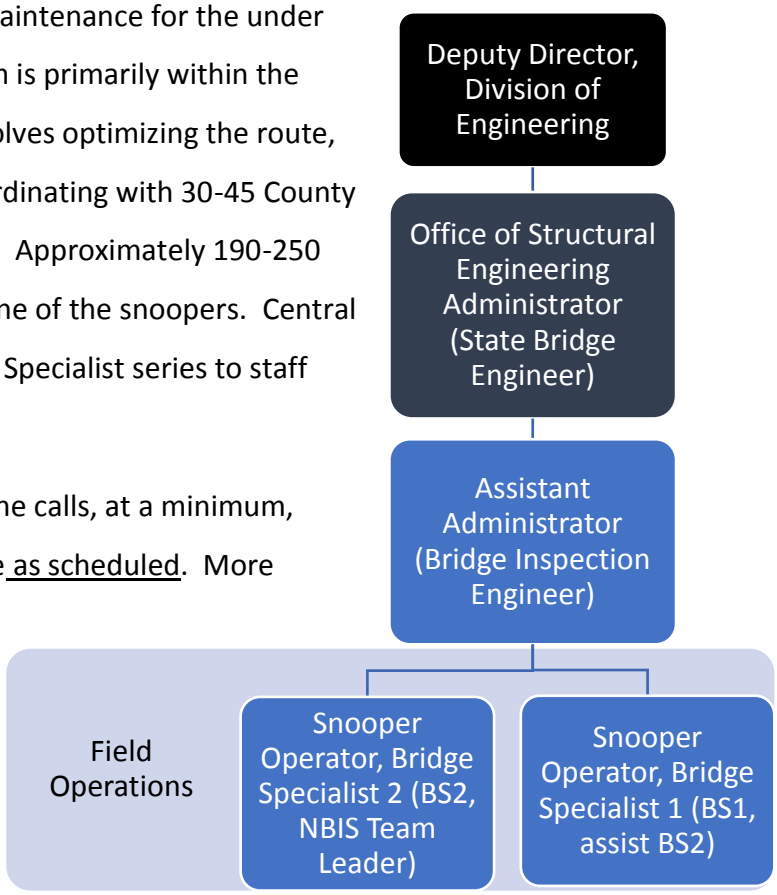


Figure 328 - Division of Engineering Snooper Operations

Snooper Operators must make three phone calls, at a minimum, when District and County arrival dates are as scheduled. More phone calls or emails may be required when changes are anticipated.

1. Snooper Operators must call the District Bridge Engineer the week prior to arrival into the District notifying them of anticipated arrival dates, start time for the first bridge, Team Leader responsibilities, expectations etc.
2. Snooper Operators must call the County Manager (TA) or Local Agency Traffic Control **one week in advance** prior to arrival in their jurisdiction.
3. Snooper Operators must call the County Manager (TA) or Local Agency Traffic Control **one working day** (or as close as reasonable) before arrival into their jurisdiction (reminders such as TMA, TTC plan, truck storage, location, changes due to construction, start time, unique MOT, potential 4-10's must be communicated)

4. Local Agency Responsibilities

Requests for Snooper usage must be made in December of the previous year and must be made by the public entity with inspection responsibility as designated by the Ohio Revised Code. Request must be made through:

- County or Township Bridges: The County Engineer's Association of Ohio (CEAO) QA/QC representative
- Municipal Bridges: The Local Bridge Program Manager in the Office of Structural Engineering (Cities and Villages)

The schedule will be populated with up to 40 County and Township bridges at the discretion of the CEAO Schedule Coordinator. Municipalities will be scheduled when it is feasible and reasonable but are encouraged to hire a third-party snooper contractor. The local government must provide traffic control in accordance with the Maintaining Traffic Standards. The local government must provide Bridge Inspection Team Leaders that take the technical lead and are responsible for the inspection; denoted with a "LC" on the schedule.

a) Restrictions

The Local Agency representative will meet the Snooper Operator(s) at the agreed-upon facility, often the DOT County outpost or District office, in order to escort the truck onto roads and bridges that have sufficient capacity for the snooper truck. **It is expected that any bridge with a 4F1 Rating Factor (RF) between 125 and 150% should have restrictions and any between 100 and 125% shall have restrictions.** See Appendix A and B for truck footprint and axle loads. Where special routes or instructions are required the County Engineer or City Engineer/Mayor shall explicitly communicate to the Operator each bridge detailing the specific restrictions (height, weight and width), directions and detours. Such restrictions may include:

- Snooper vehicle must cross structure at walking speed.
- Maximum permitted speed on structure must not exceed 5 MPH.
- Maximum permitted speed on structure must not exceed 10 MPH.
- Maximum permitted speed on structure must not exceed 20 MPH.

- Isolation: No other vehicles are permitted on structure while Snooper is crossing or inspecting.
- *** Do not cross structure!!
- ODOT approved planking system must be used on bridge deck to better distribute wheel loadings.
- Snooper vehicle must not stop abruptly while crossing structure.
- Snooper vehicle must cross structure while centered laterally (transversely) on bridge roadway.
- No portion of vehicle and /or load is permitted to extend beyond the outermost edge of the bridge deck.

OSE personnel will support the bridge inspection program; therefore, they reserve the right to non-perform inspections already scheduled that will cause harm or damage to personnel or equipment. Conditions such as: lack of bridge capacity, obstructive power lines or tree branches, absent railroad flagger, timber decks, overpass restriction or other site conditions impeding the truck or boom/bucket flight path.

5. Engineering Firm Responsibilities

Requests in writing through the public entity that has inspection responsibility must be made in December prior to the inspection. Due to ODOT's programmatic timeline and notice-to-proceed the snooper schedule may be set before the engineering firm is given the work. Therefore, Districts are asked to estimate a number of hours or days within the schedule for bridges requiring the snooper and request in the RFP that the engineering firm provide costs for renting appropriate access equipment.

The bridge will be scheduled when it is feasible and reasonable. The Engineering Firm must provide Bridge Inspection Team Leaders that take the technical lead and are responsible for the inspection; denoted with an "EF" on the schedule.

III. Bridges Requiring a Snooper Inspection

A list of bridges requiring snooper access shall be identified. The intent of this list is to manage the snooper trucks on a needs-based criteria and to optimize the snooper truck route. The following year's list must be revisited each December.

The Team Leader should anticipate the need for access equipment. For typical Routine Inspections, access equipment may not be required. If access equipment is needed, the bridge and the snooper limitations need to be evaluated to determine if the truck can provide the required visual "hands-on" inspection and non-destructive testing of all critical members and/or components.

1. Updating AssetWise

In order to maintain the list of bridges, appropriate inventory and appraisal values must be correctly updated in AssetWise:

- Bridge coordinates - LATITUDE and LONGITUDE must be correct.
- County-Rte-SLM – The location of the bridge on the route system, including a numerical XX.XXX straight line mileage.
- Snooper Inspection – This value is populated with a Yes or No value and will be largely static, with the exception of minor updates, for the life of the bridge.
- Frequency – This value is populated with a number of months "Not to Exceed" (Figure 5) the snooper inspection cycle values will be rounded for scheduling purposes only
    - 1-year (NTE 0-18 months),
    - 2-year (NTE 19-30 months),
    - 3-year (NTE 36-42 months) or
    - 5-year (NTE 43-66 months).

- Snooper Inspection Required, Interval (Months) and Date Performed updated every snooper inspection on the SNBI form, section 6.1
- For the applicable inspection type, B.IE.12 Inspection Equipment, should have A03 coded for "Under Bridge Inspection Vehicle"

2. Bridges That Require Snooper Access

Inspecting a bridge with the Snooper truck requires several support operations and has large associated costs. Arranging schedules to meet the operational goals in all twelve districts is a demanding task. Bridges that require a Snooper inspection must meet the minimum requirements below and must be vetted by the DBE:

- Bridge spans greater than 35 feet in height or sight-distance with no access from below
- Bridges where alternative access methods would require large amounts of additional resources - *the Snooper usage is based on need not convenience. When inspectors are able to safely and reasonably access bridge components with a ladder, bucket truck, boat or other available means, the bridge should not require snooper access.*

DBE's may remove bridges that meet the selection guidelines when a reasonable level of confidence of the bridge condition can be achieved. A statement justifying the need should be added to AssetWise under the Review Form in the text box "Inspection Procedures". Only bridges on the Snooper List will receive a Snooper inspection.

a) Snooper inspection frequency

The Frequency is established based on the level of risk (or priority) associated with the time period selected. Note that these priorities are important when the schedule must be changed in the middle of the season:

Guidelines for a one year cycle (Priority 1)

- Non-Redundant Steel Tension Member present

- Fatigue related details (E and E') or history or out-of-plane bending with high ADTT
- Curved bridges subject to out-of plane bending with 4 or less longitudinal main members
- Structures with components coded "Poor" or worse and are only accessible with the snooper.
- Bridges with retrofits, unusual or inaccessible features (pin and hangers, seated hinges) that require 12-month inspection per Ohio RBI policy.

Guidelines for two (Priority 2) or three year cycle (Priority 3)

- Structures with components coded "Fair" and are only accessible with the snooper.
- Fatigue related details (E and E')
- Curved bridges subject to out-of plane bending.

Guidelines for five year cycle or greater

- Structures meet the two bridge selection requirements mentioned in this section
- Do not meet the 1-year, 2-year or 3-year frequency guidelines

IV. Scheduling

The Snooper inspection season begins in the last half of March and typically ends in the last week of November (Thanksgiving). In the event one Snooper truck completes their schedule first they will likely help the second truck complete their schedule. QA follow up and scheduling is performed from November through March with the bulk of the route optimization coordination in January and February.

Each District and Local Agency must designate a primary schedule coordinator; the DBE will be the default coordinator unless delegated. This person will take an active role in coordinating the snooper list in light of PLC, NSTM due dates, unique MOT requirements, County MOT capabilities and time allotted for inspection, travel and TTC setup between bridges.

Figure 10 - Deployed Bucket

The following criteria are milestones or priorities, in order, when setting the Snooper inspection schedule. After the vertical line denotes when the Operators work on the detailed route optimization:

Figure 11 - Bridge Scheduling Priority

1. Truck Assignment:

Trucks requiring left-side operation must be communicated and always associated with the bridge.

2. NSTM Dates

The snooper is utilized on the majority of ODOT's NSTM Bridges. The NSTM dates must not exceed 24 months between inspections. In order to achieve compliance these dates are followed closely and scheduled within 24-months of the previous inspection.

3. District Geography

In order to adjust for expected seasonal weather patterns both trucks start in the southern regions and move in a logical and systematic way around the state to the northern regions and finally end in the mid-to-southern regions. Both trucks are scheduled in different districts, and ideally in opposite regions of the state, in order to better respond to emergencies. The Snooper operators now begin optimizing the route and will consider cross-boundary TTC setups.

4. Permitted Lane Closures

Lane and shoulder closures are dictated by the Permitted Lane Closure maps. Night work operations are scheduled together so operators are able to safely switch between nights. An appropriate buffer is allotted for operators to switch from day to night inspections.

5. County Geography

The trucks are moved in an orderly fashion through the district avoiding back-tracking and revisiting counties. Local snooper requests are placed into the schedule depending on district location. Float days are built into the schedule, to account for inevitable but unforeseen changes to the schedule. They are often placed at the end of a district or between significant transitions. Float days will allow:

a. Flexibility due to the weather. Acceptable cancellations due to weather include manufacturer's guidelines, lightening, hail, torrential downpour or unsafe wind-gusts
b. Scheduled truck maintenance
c. Transporting across large distances or travel between districts

d. Traffic volumes and PLC's prior to a holiday weekend
e. Report Time for "CO" inspections
f. Make-up inspections
g. Schedule training

With the exception of large urban centers, the Snooper should not revisit or have the second Snooper visit in any one year. The number of Counties is limited, and when advantageous, County TA's are asked to permit crews to cross county or even district boundaries.

5. Timeline

a) November

The schedule is verified and opportunities for improvement are discussed with Administrators, Bridge Engineers and Bridge Inspectors. Districts and local agencies designate a primary schedule coordinator.

- Schedule Annual Aspen Aerials inspection with Office of Equipment Management for December 15th.
- E mail master list in the last week of November to district schedule coordinator requesting *verification* and *modification* for consultant inspected bridges and corrections to the master list by December 15th.
- E mail master list in the last week of November to CEAO schedule coordinator requesting *verification* and *modification* for consultant inspected bridges and corrections to the master list by December 15th
    - *Verification*: The bridges, NSTM dates, PLC's and the safest routes to the bridge must be verified thoroughly in order to limit undue back-and-forth communications that negatively affect all districts' inspection programs. **Inaccuracies in the bridge list at this stage may result in non-performing the snooper inspection.** Specific guidance must be communicated where clearance or load posting restrictions exist on or traveling to the site. The list is generated based on the assigned frequency and the last recorded time the structure received a snooper inspection from time management records.

- *Modification:* If bridges need to be added or the list needs modified, coordinators must provide accurate information. The information must include:
  - SFN
  - Latitude and Longitude – correct in AssetWise
  - Bridge Number
  - Snooper Inspection Frequency
  - Feature intersection
  - Type of Inspection to be performed
  - NSTM Inspection Procedure
  - Maintaining Traffic Standard Construction Drawing (MT-SCD) Reference
  - Maintenance of Traffic restrictions (including PLC, unique setups, night work)
  - Contact name and number for traffic control
  - Estimated snooper inspection time (hrs.) including time for maintenance of traffic set-up
  - Lead Inspector (DT, LC, EF, CO, SH)
  - Contact name and number for inspection
  - Truck Required, not preference (leave blank if either truck can reach)

b) December

December 15th is the cutoff for the next year's schedule verification. The master list is verified by OSE and discussed with Districts potential additions or subtractions.

c) January

Truck assignments are made as a group in light of District and County geography, NSTM dates and Permitted Lane Closure restrictions. OSE will provide data for map-making.

Operators will take bridges assigned to their truck and work on optimizing a route. Optimization includes discussing with District bridge inspectors, District Bridge Engineers, County managers, determining available resources and performing site visits.

d) February

Operators will put together the optimized schedule and confirm with the Bridge Inspection Engineer. The schedule will be shared with the schedule coordinators by February 15th for review. The schedule **must be reviewed** in light of inspection time, RR Permits, geography, MOT restrictions and County MOT capabilities. Minor adjustments are acceptable but significant changes, additions or movement would likely result in non-performing the inspections with the snooper.

e) March

After vetting any challenges with the schedule the confirmed final list of bridge and dates will be re-sent to the schedule coordinators and posted on the OSE website by the first Friday of March.

Districts Schedule Coordinators must share with the Public Information Officer, District Highway Management Administrator, District Bridge Engineer, County Managers, Municipal MOT, District Bridge Specialists, Engineering Firm and anyone else affected by the snooper operations.

Implementing the schedule begins on the second or third Monday of March.

6. Changes to the Schedule

Changing the schedule is a decision that must take into account public safety, the economics of a multi-faceted operation and the complications associated with affecting several entities statewide mid-schedule. OSE is committed to maintaining the established snooper schedule, submitted in March, with minimal disruption to other Counties or Districts. However, operational need may require the Bridge Inspection Engineer to move the snooper to other Districts or Counties ahead, behind or not scheduled i.e. comprehensive changes (Figure 14).

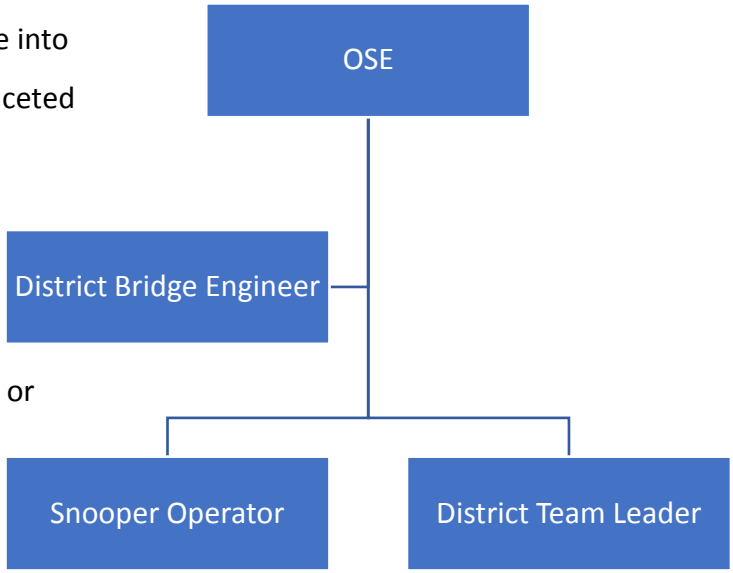


Figure 12 - Authority for Comprehensive Changes to Snooper Schedule

Snooper Operators are committed to supporting the bridge inspection program as well. They are most familiar with the trucks and on a case-by-case basis they reserve the right to deny schedule changes or non-perform inspections on bridges that have already been scheduled that would potentially cause damage or impairment to personnel or equipment. Conditions such as: lack of bridge capacity based on load ratings, obstructive power lines or tree branches, absent railroad flagger, overpass restriction, oversights from the schedule coordinator, fence height or other site conditions impeding the inspectors, truck or boom/bucket flight path.

Statewide: As previously mentioned, comprehensive changes to the schedule may be required and the authority for such changes is within the Office of Structural Engineering. The following two scenarios may cause a wide-ranging alteration in the schedule:

1. Unscheduled Emergencies where the Snooper is the only option for inspection or maintenance in order to return serviceability to a high priority state route on the National Highway System

2. Special inspections that may be identified with construction, research or special investigations Nationally or within the State (ex. Gusset Plates, Pin & Hanger, Fatigue Connections, Protective coating systems)

***Within the District**:* In the event of weather delays, truck maintenance or unforeseen complications hinder an inspection. Then the District Bridge Engineer has the authority to 'triage' their higher priority inspections and save the lower-priority inspections for the next inspection cycle. The highest priority bridges that shall be inspected are those bridge inspections on state routes that require snooper access and directly affect Federal and State compliance:

- NSTM inspections NTE 24 months that are 'due' that cycle
- Annual Snooper Cycle Inspections (1-year)
- Scheduled, paid and permitted Railroad Flagging for Bridges on the 2-year cycle

Most of the time float days will be utilized to account for minor fluctuations. If the scheduled float days cannot accommodate the unforeseen changes even when performing the highest priority inspections, then adjustments to the next District may be necessary. This must be communicated as soon as reasonable to the OSE Bridge Inspection Engineer for consideration. The next scheduled District may have to adjust and triage their priority structures as well or, when applicable, the second snooper truck may have to add the non-performed highest priority inspections when in the district.

If the District schedule goes faster than planned, then next years' Snooper cycle may be added to the schedule. These bridges may **not** be added to the Float days but rather to days already scheduled. This must be a team decision, with the final determination made by the District Bridge Engineer, and the decision shall incorporate the following:

- Logical movement of the snooper trucks (geography and route optimization)
- Compliance
- Snooper operators
- District inspectors
- County work plan

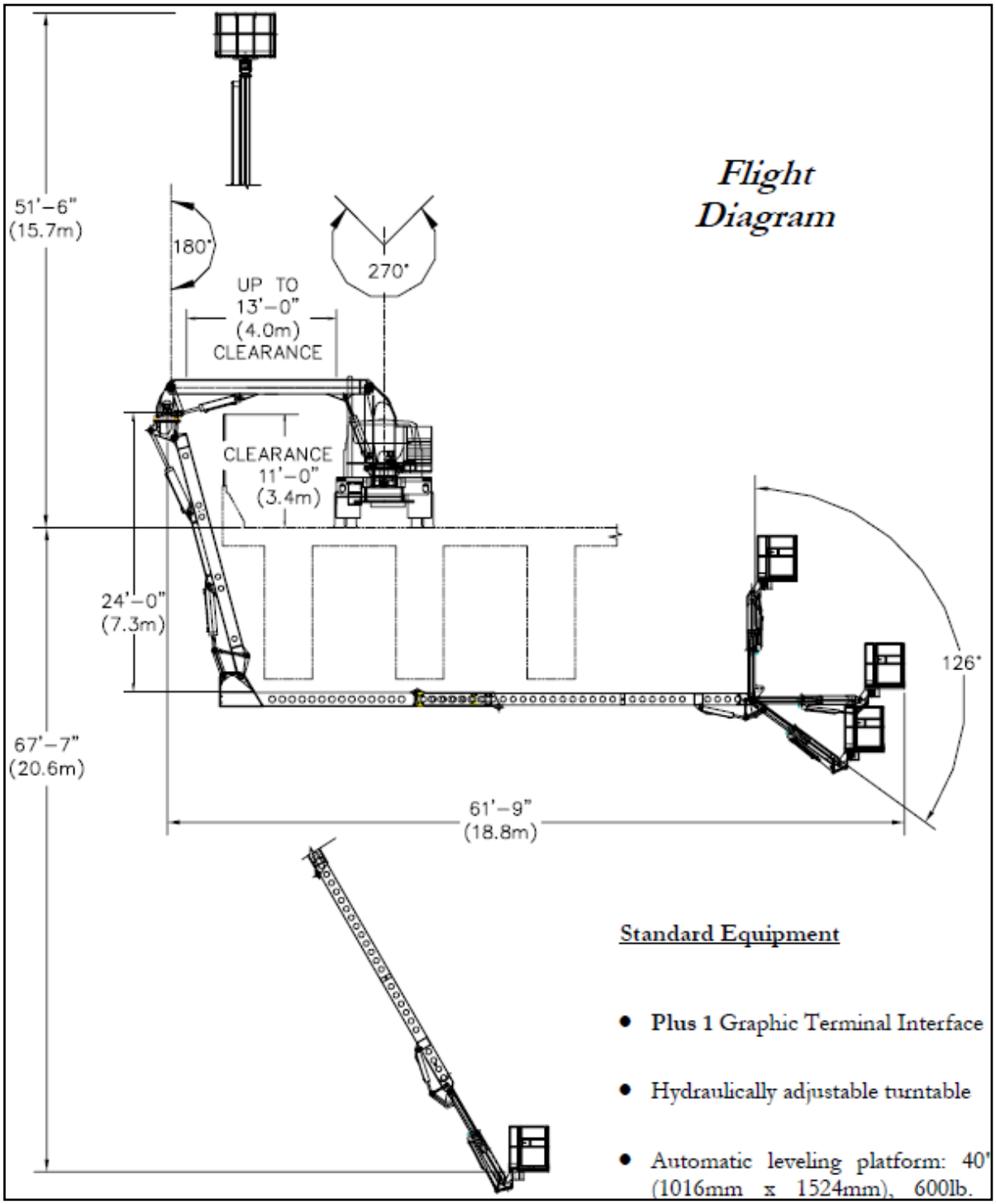
The following bridges shall take priority when adding them to the schedule:

1. Bridges on State Routes on the Snooper List
2. NSTM Inspections due in the next annual cycle
3. Inspections or maintenance where the Snooper is the only option to access a component affecting public safety on the state right-of-way or in changing or 4-Poor condition.

Within the County: Minor adjustments to the schedule are anticipated within the county and should be made as a team. Modifications may be expected when scheduled inspections are non-performed due to construction or traffic patterns. The Team Leader has the authority to make these adjustments. Changes that improve efficiency, add value and are reasonable at the County level are welcomed and encouraged.

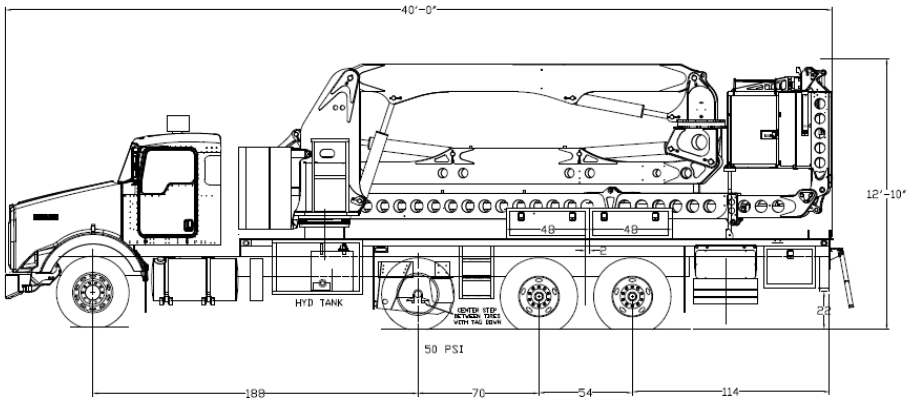
Appendix A

62-foot Snooper Flight Diagram and Footprint



A62 Axle Load

VEHICLE: 2019 KENWORTH T880
VIN: 1NKZX4TX8KJ359028
ASPEN S/N : 10328

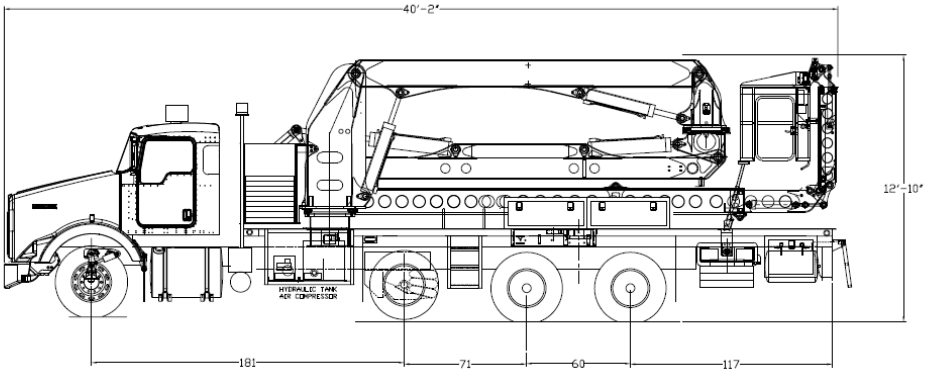


ESTIMATED FRONT AXLE WEIGHT	ESTIMATED TOTAL CURB WEIGHT	ESTIMATED LIFT AXLE WEIGHT	ESTIMATED TANDEM AXLE WEIGHT
18,960 LB	65,600 LB	12,920 LB	33,720 LB
TIRES		TIRES	TIRES
(2) 425/65R22.5		(4) 295/75R22.5	(8) 11R22.5G

INDIVIDUAL AXLE WEIGHTS MAY VARY +/- 2% OF FIGURE SHOWN

ASPEN AERIALS
MOUNTING INSTALL A62
OHIO DOT
B
10328

VEHICLE: 2021 KENWORTH T880
VIN: 1NKZX4TX3MJ470461
ASPEN S/N : 10147



ESTIMATED STEER AXLE WEIGHT	ESTIMATED TOTAL CURB WEIGHT	ESTIMATED LIFT AXLE WEIGHT	ESTIMATED TANDEM AXLE WEIGHT
18,760 LB	65,340 LB	11,420 LB	35,160 LB
TIRES		TIRES	TIRES
(2) 425/65R22.5		(4) 295/75R22.5	(8) 11R22.5G

INDIVIDUAL AXLE WEIGHTS MAY VARY +/- 2% OF FIGURE SHOWN

ASPEN AERIALS
WEIGHT DRAWING
OHIO DOT A62 REMOUNT
B
10147