# Updating Ohio's Bridge Inspection Manual to Align with SNBI

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# Ohio Background


- Decentralized state
  - 12 ODOT Districts
  - 88 Counties
  - 357 Municipalities
  - Ohio Turnpike
- Bridge definition 10' or greater
- Risk based routine inspection interval dictated by Ohio law
  - 12-month routine interval if:
    - Bridge rated “Fair” or lower, NSTM, scour vulnerable,  posted, new within 3 years

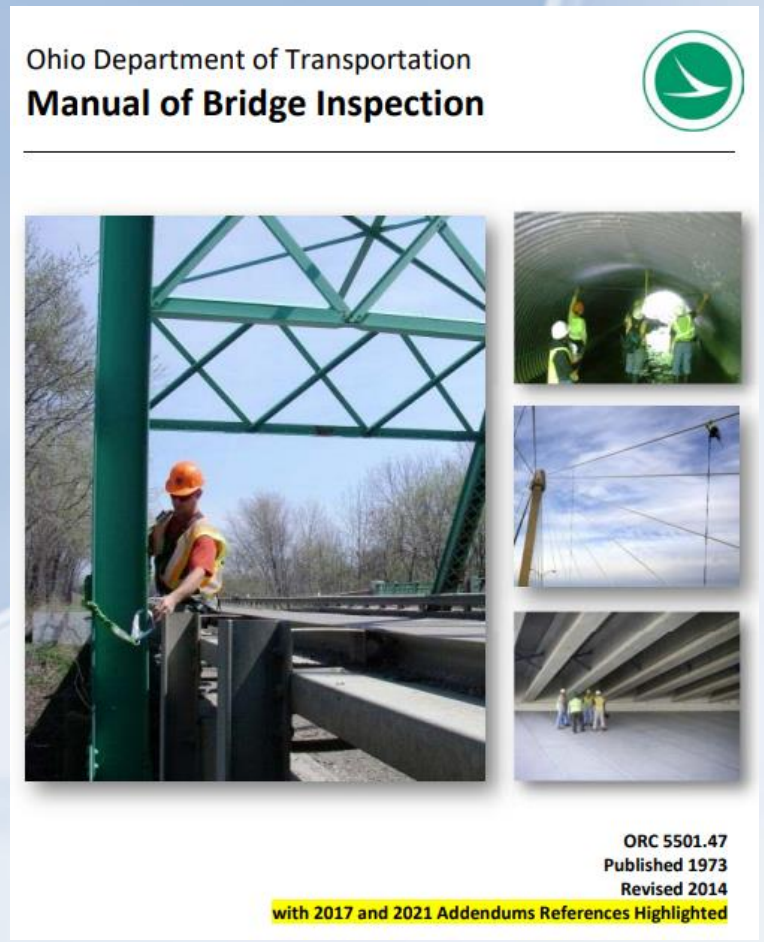
# Ohio’s Unique Bridge System

- Ohio has roughly:
  - 27,200 NBIS bridges
  - 18,500 10'- 20’ spans or non-vehicular carrying
  - Inventories non-vehicular bridges that cross over public roads
    - Railroads, pedestrian, other structures (excluding ancillary sign structures)
- All 45,700 are managed as bridges, so they all need consistent inventory
  - Full SNBI inventory for all vehicular carrying Ohio bridges
  - Abbreviated SNBI inventory for non-vehicular bridges

# Ohio's Need for an Updated Inspection Manual

- Current bridge inspection manual not updated since 2014
- 5 addendums over 10 years
  - Change to Ohio Revised Code pertaining to routine inspections
  - Inspection comments requirement
  - Substructure condition ratings
  - Scour appraisal and cross channel update
- SNBI Inventory
- Updated NBIS

# SNBI presented the opportunity to combine Ohio's two bridge manuals

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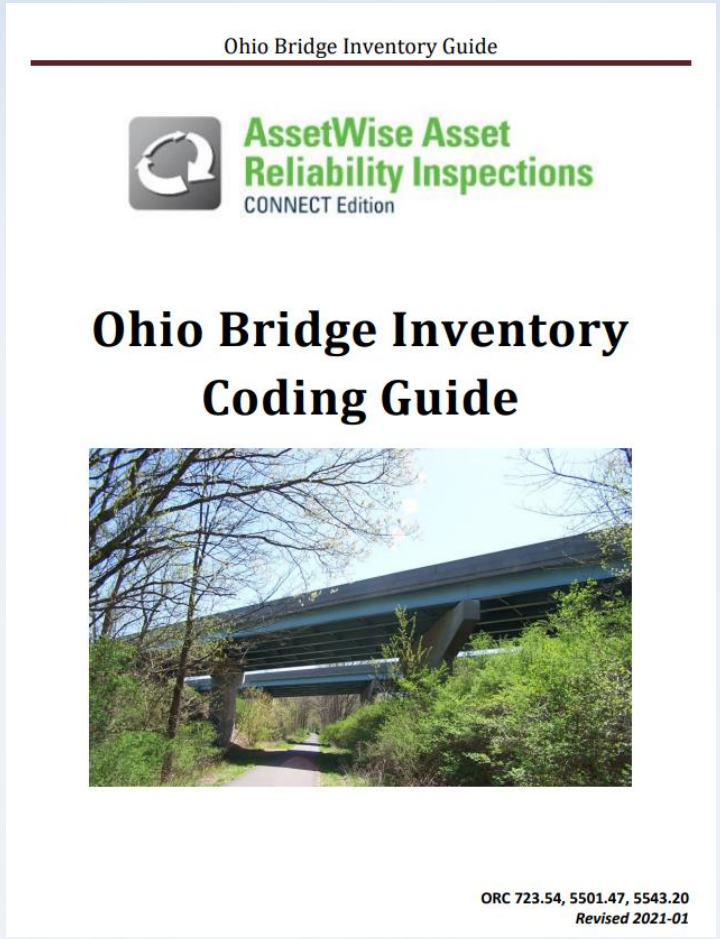
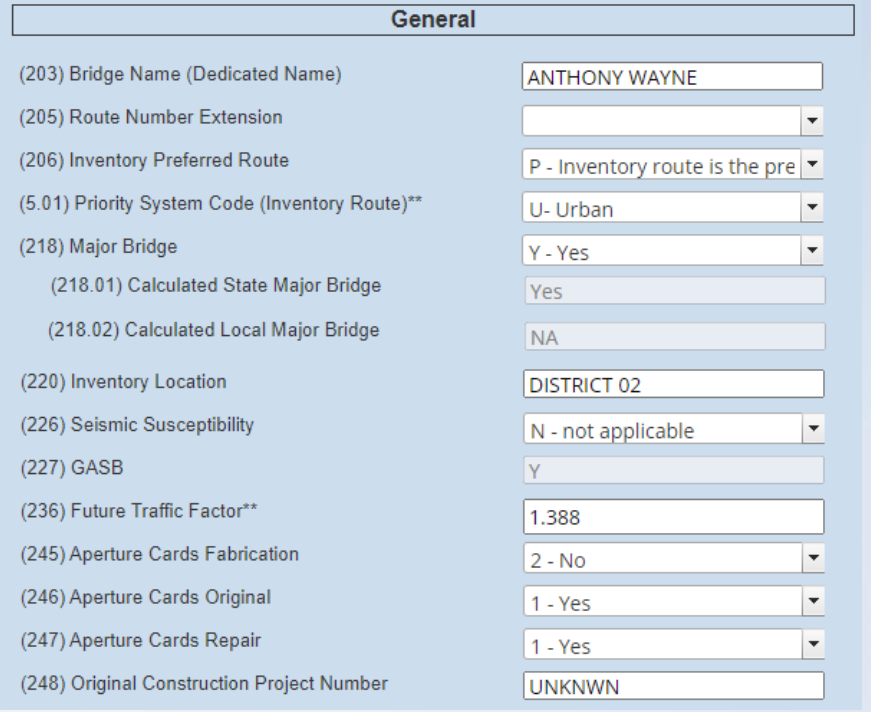


# Ohio's Need for an Updated Inspection Manual

- In-house update stopped in 2022 after announcement of SNBI
- Decided to combine Ohio BIM and Ohio bridge inventory manual
- Updated Ohio manual to contain
  - Updates from 2022 NBIS
  - Previous Ohio BIM addendums
  - Inventory and condition based on SNBI
  - Additional Ohio inventory fields merged with SNBI inventory

# Managing Multiple Inventories



| General | |
|---|---|
| (203) Bridge Name (Dedicated Name) | ANTHONY WAYNE |
| (205) Route Number Extension | |
| (206) Inventory Preferred Route | P - Inventory route is the pre |
| (5.01) Priority System Code (Inventory Route)** | U- Urban |
| (218) Major Bridge | Y - Yes |
| (218.01) Calculated State Major Bridge | Yes |
| (218.02) Calculated Local Major Bridge | NA |
| (220) Inventory Location | DISTRICT 02 |
| (226) Seismic Susceptibility | N - not applicable |
| (227) GASB | Y |
| (236) Future Traffic Factor** | 1.388 |
| (245) Aperture Cards Fabrication | 2 - No |
| (246) Aperture Cards Original | 1 - Yes |
| (247) Aperture Cards Repair | 1 - Yes |
| (248) Original Construction Project Number | UNKNWN |

- New SNBI inventory
- 160 Ohio Bridge fields
  - Inventory fields that Ohio records on top of NBI
  - Fields for deck, super, sub, culvert, load rating, clearances, inspection access, structure management
- Had to decide what fields to keep
- Many Ohio specific inventory fields that match new SNBI fields
- Decision made to insert OH fields into SNBI, where applicable, for easier user inventory

# Managing Multiple Inventories

- TranSystems tasked with developing new Item IDs for Ohio inventory fields to match SNBI format.
- Ohio inventory fields inserted within the SNBI fields where applicable
- This will be easier for the user when inventorying a bridge

| Subgroup | ID | SNBI/ ODOT | Attribute Name | Matching NBI/ODOT Field ( |
|---|---|---|---|---|
| 2.1: Span Material and Type | B.SP.01 | SNBI | Span Configuration Designation | |
| 2.1: Span Material and Type | B.SP.02 | SNBI | Number of Spans | NBI 045 |
| 2.1: Span Material and Type | B.SP.02 | SNBI | Number of Spans | NBI 046 |
| 2.1: Span Material and Type | B.SP.03 | SNBI | Number of Beam Lines | ODOT 475.01 |
| 2.1: Span Material and Type | B.SP.04 | SNBI | Span Material | NBI 043A |
| 2.1: Span Material and Type | B.SP.04 | SNBI | Span Material | NBI 044A |
| 2.1: Span Material and Type | *B.SP.04.01* | *ODOT* | *Structural Member Steel Type* | ODOT 487 |
| 2.1: Span Material and Type | B.SP.05 | SNBI | Span Continuity | |
| 2.1: Span Material and Type | B.SP.06 | SNBI | Span Type | NBI 043B |
| 2.1: Span Material and Type | B.SP.06 | SNBI | Span Type | NBI 044B |
| 2.1: Span Material and Type | B.SP.07 | SNBI | Span Protective System | |
| 2.1: Span Material and Type | *B.SP.07.01* | *ODOT* | *Protective Coating System Type* | ODOT 482 |
| 2.1: Span Material and Type | *B.SP.07.02* | *ODOT* | *Protective Coating System Date* | ODOT 483 |
| 2.1: Span Material and Type | B.SP.08 | SNBI | Deck Interaction | ODOT 408 |
| 2.1: Span Material and Type | B.SP.09 | SNBI | Deck Material and Type | NBI 107 |
| 2.1: Span Material and Type | *B.SP.09.01* | *ODOT* | *Deck Concrete Type* | ODOT 411 |
| 2.1: Span Material and Type | B.SP.10 | SNBI | Wearing Surface | NBI 108A |
| 2.1: Span Material and Type | *B.SP.10.01* | *ODOT* | *Wearing Surface Description* | ODOT 108A.01 |
| 2.1: Span Material and Type | *B.SP.10.02* | *ODOT* | *Wearing Surface Thickness* | ODOT 423 |
| 2.1: Span Material and Type | *B.SP.10.03* | *ODOT* | *Wearing Surface Date* | ODOT 422 |
| 2.1: Span Material and Type | B.SP.11 | SNBI | Deck Protective System | NBI 108B |
| 2.1: Span Material and Type | B.SP.12 | SNBI | Deck Reinforcing Protective System | NBI 108C |
| 2.1: Span Material and Type | B.SP.13 | SNBI | Deck Stay-In-Place Forms | |

# Steering Committee

- Ohio BIM steering committee was formed to help with rating guidance
- Committee included:
  - ODOT Central Office
  - ODOT District Bridge Engineers
  - County Engineers
  - Municipal Bridge Owners
  - County and Municipal QA Managers
  - FHWA Ohio Bridge Division
  - FHWA Resource Center

# Steering Committee Benefits

- Allowed different Ohio users to be involved
- Gave users an opportunity to share their opinions and what they needed from the updated BIM
- Manual team was able to listen and understand from users of the manual what was most important and where additional guidance was needed
- Created a sense of ownership between different jurisdictions for a statewide manual

# Steering Committee – Goals

- Development of Condition Ratings
  - SNBI Table 20
  - Feedback: need further guidance
  - Goal was to provided feedback and guidance specific to Ohio and their regions
  - Discussions centered around component and material type
  - Define isolated, some, and widespread
  - Define minor/moderate/major

# Steering Committee

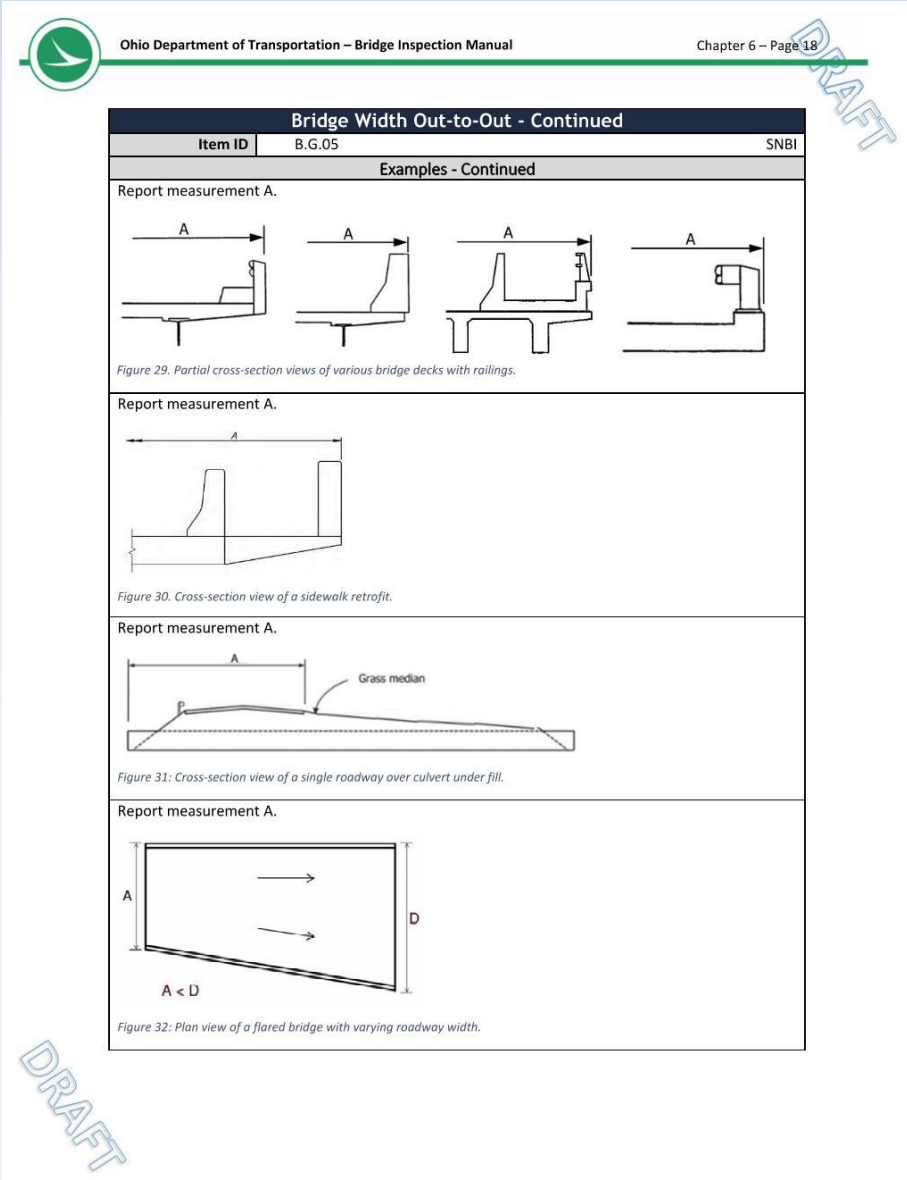
- Unintended Benefits
  - Found unknown structures types to us:
    - Lined Culverts (Ohio specific issue)
  - How their teams plan to use the manual
    - Paper copies
    - Condensed version
    - Ability to print out specific sections (i.e., Condition Ratings)

# Development of Manual

- TranSystems Role
  - Develop individual chapters in Microsoft Word Documents
  - Provide a compiled manual with links
  - Provide Training to ODOT on how to update and maintain documents

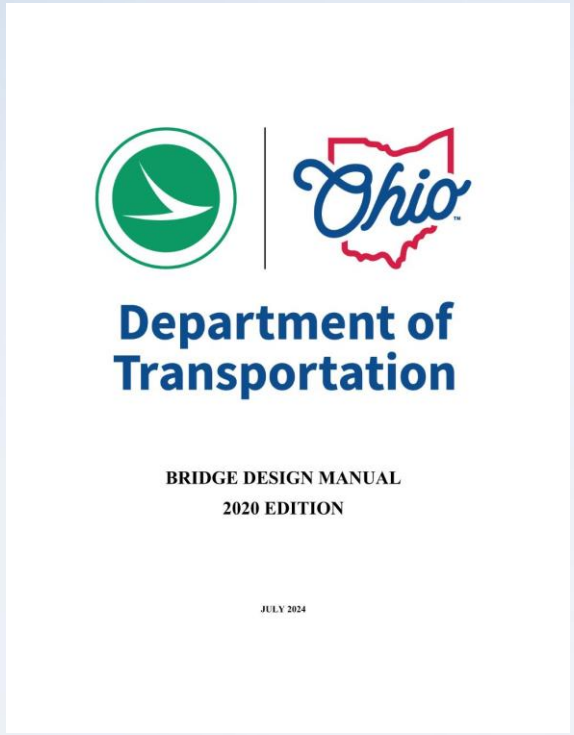
# Manual Goals

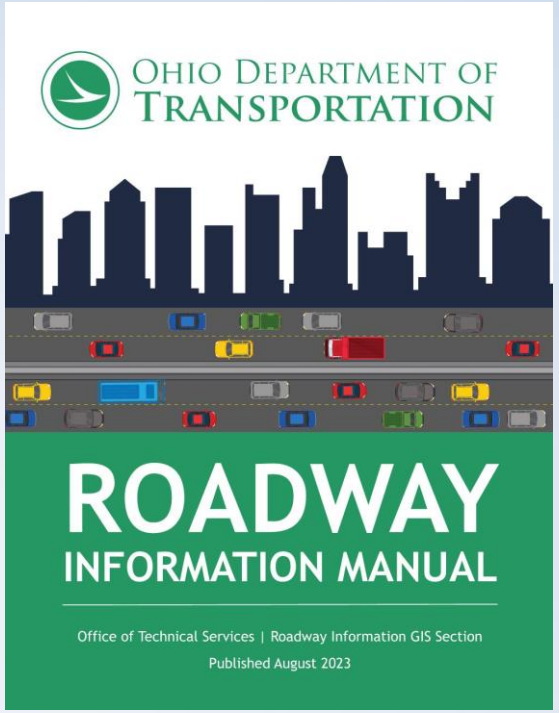
- User Friendly Manual
  - Simple format
  - Concise
- Links, Links, Links, and more Links!
- Graphics
- Tables
- Ohio specific examples



# User Friendly Manual

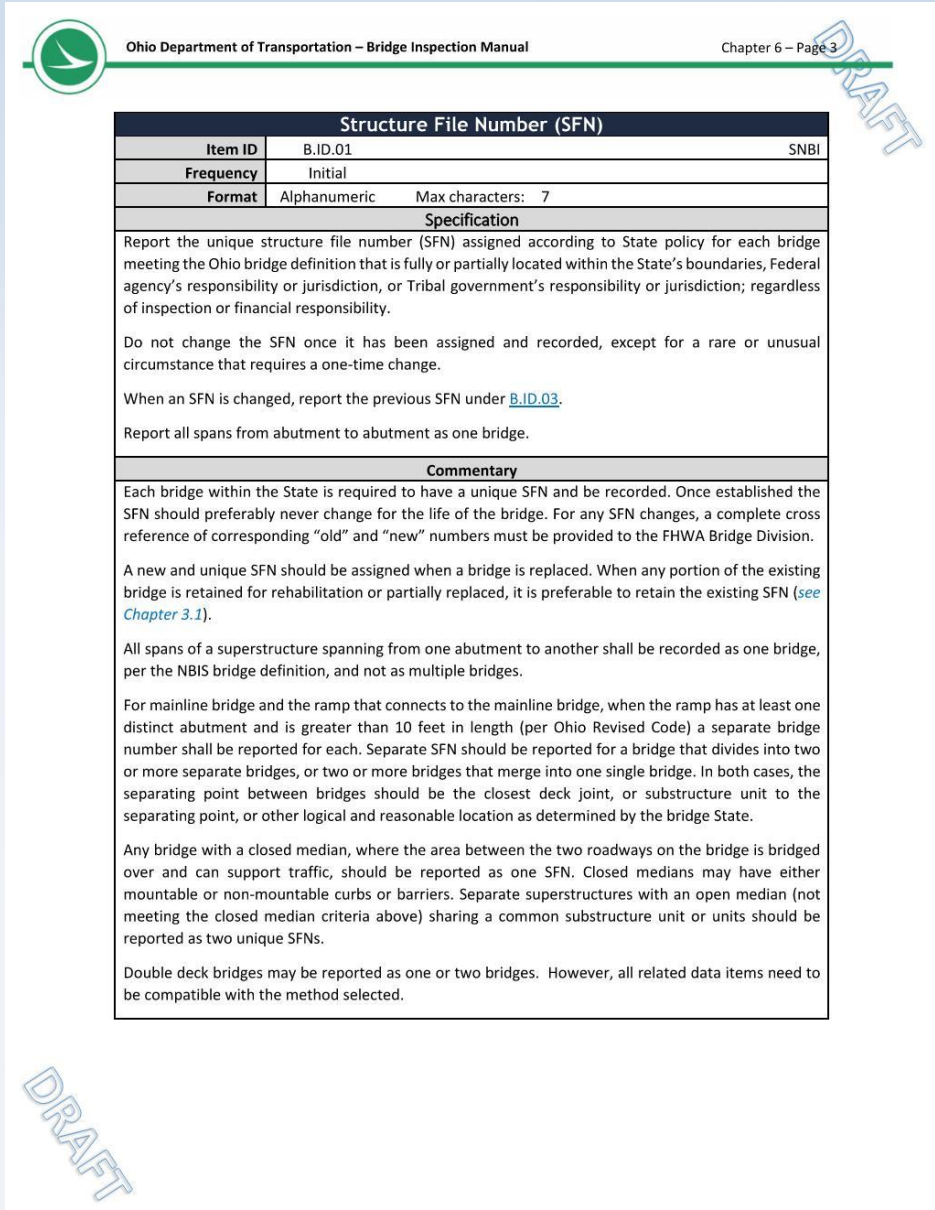
- Simple format and concise
  - Similar to other ODOT Manuals
    - Roadway Inventory
    - Bridge Design Manual



# User Friendly Manual

- Simple format and concise
  - Concise
    - Remove duplicate information
    - Incorporate information in by reference
    - Align with SNBI but provide Ohio directions where applicable
  - Links!







| 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.

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. For any SFN changes, a complete cross reference of corresponding "old" and "new" numbers must be provided to the FHWA Bridge Division.

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 (not meeting the closed median criteria above) 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.

# User Friendly Manual

- Tailoring items to Ohio specific options
- Linking new codes to previous NBI codes
- Utilizing current and historic ODOT Construction and Material Standards to link to items in Subsection 2.1 and 2.2





| Metropolitan Planning Organization | | |
|---|---|---|
| **Item ID** | B.L.12 | SNBI |
| **Frequency** | Initial | |
| **Format** | Alphanumeric Max characters: 2 | |

**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 NN if Bridge is not located in an MPO.

| *Code* | *Description* |
|---|---|
| 01 | AMATS (Akron) |
| 02 | BHJ (Steubenville) |
| 03 | BOMTS (Wheeling) |
| 04 | Eastgate (Youngstown) |
| 05 | KYOVA (Huntington) |
| 06 | LCATS (Newark) |
| 07 | MORPC (Columbus) |
| 08 | NOACA (Cleveland) |
| 09 | OKI (Cincinnati) |
| 10 | SCATS (Canton) |
| 11 | MVRPC (Dayton) |
| 12 | LACRPC (Lima) |
| 13 | RCRPC (Mansfield) |
| 14 | CCSTCC (Springfield) |
| 15 | TMACOG (Toledo) |
| 16 | WWW (Parkersburg) |
| 17 | ERPC (Sandusky) |
| NN | Not located in MPO |


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

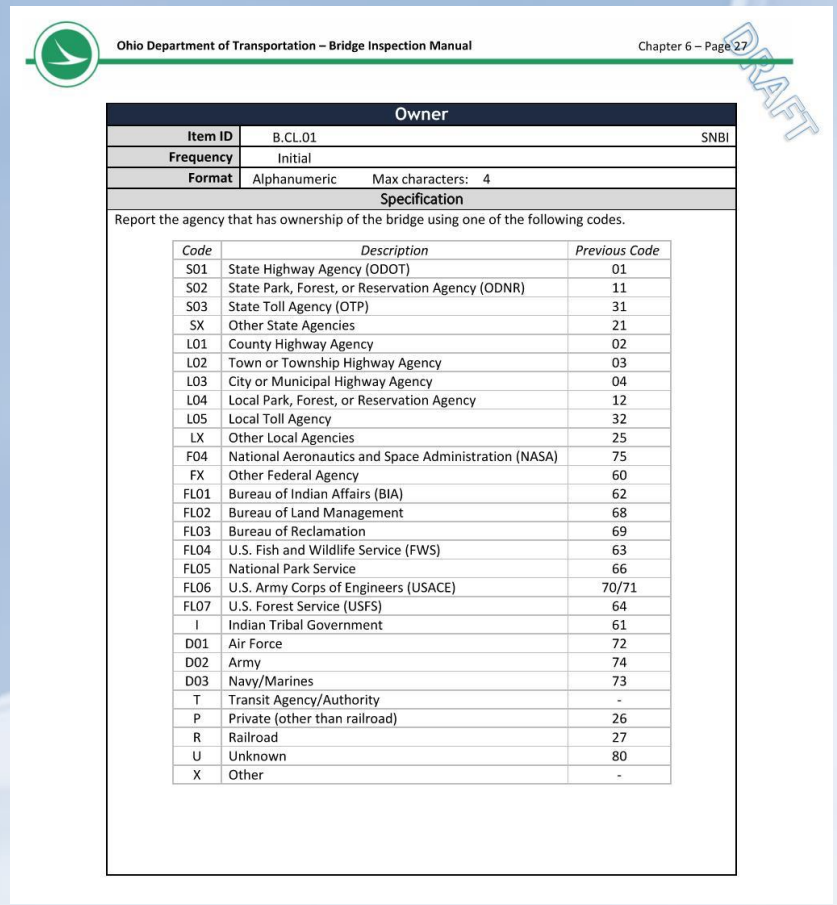
**Commentary**

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.

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.

# Tables



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**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 (OTP) | 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 | - |

B.SP.10 - Wearing Surface

| ODOT Wearing Surface Descriptions | | |
|---|---|---|
| Code | Description | ODOT Description |
| B01 | Bituminous (asphalt) | Asphalt |
| | | 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 | N/a |
| CX | Concrete - other | Superplasticized Dense Concrete (SDC) |
| | | Ultra high performance concrte (UHPC) |
| CU | Concrete - unknown | |
| *C01-CX are all Portland cement based with admixtures* | | |
| **P01 | Polymer - epoxy | Epoxy Overlay |
| ***P02 | Polymer - polyester | Polyester |
| PX | Polymer - other | |
| *P01-P02 are polymerized cements* | | |

*1995-Present ODOT standard on new bridges

** Current ODOT standard overlays

*** Utilized in District 8 (not statewide specification)

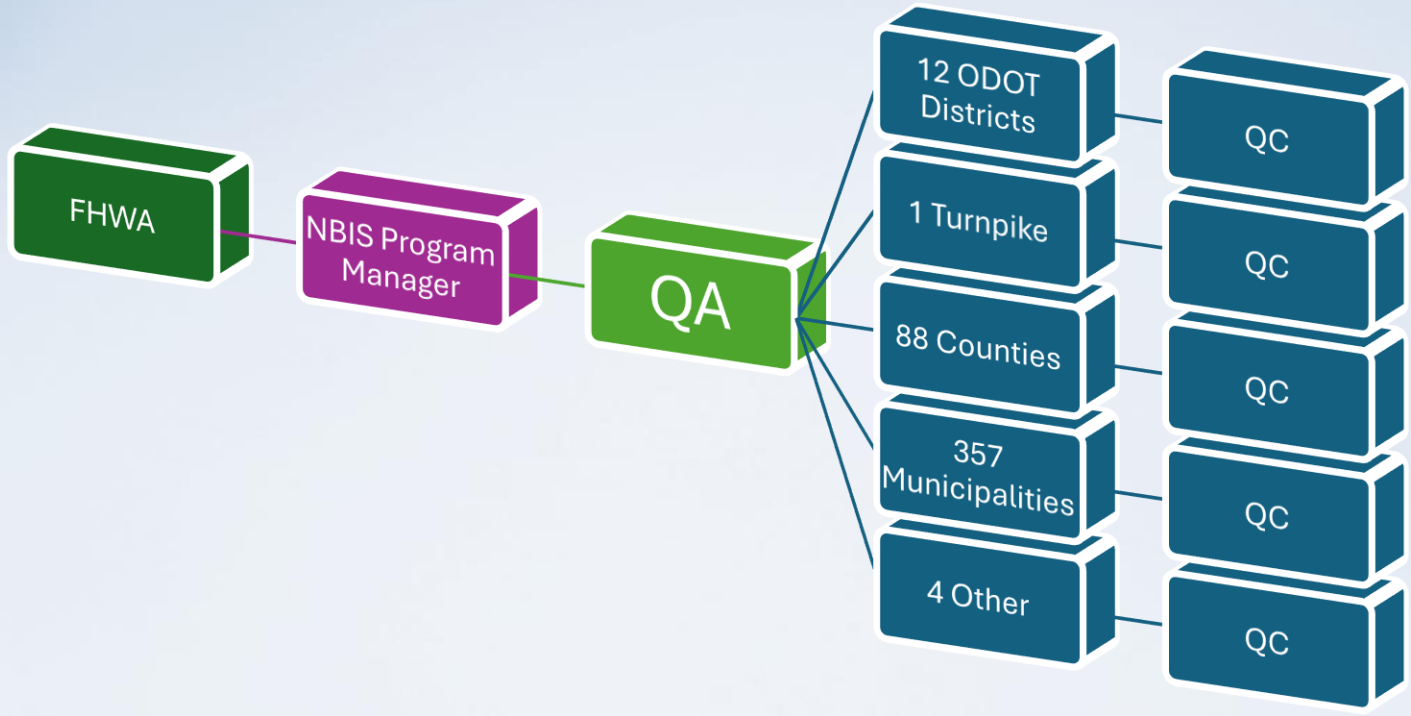
# Tables

| B.SP.07 - Span Protective System - Coding Assistance | | |
|---|---|---|
| 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 |

| B.SP.12 - Deck Reinforcing Protective System | | |
|---|---|---|
| Years | Code | Description |
| Prior to 1974. | 0 | None |
| 1975 to 2019 | 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 |

# User Friendly Manual

- Graphics
  - Flow Charts



# User Friendly Manual

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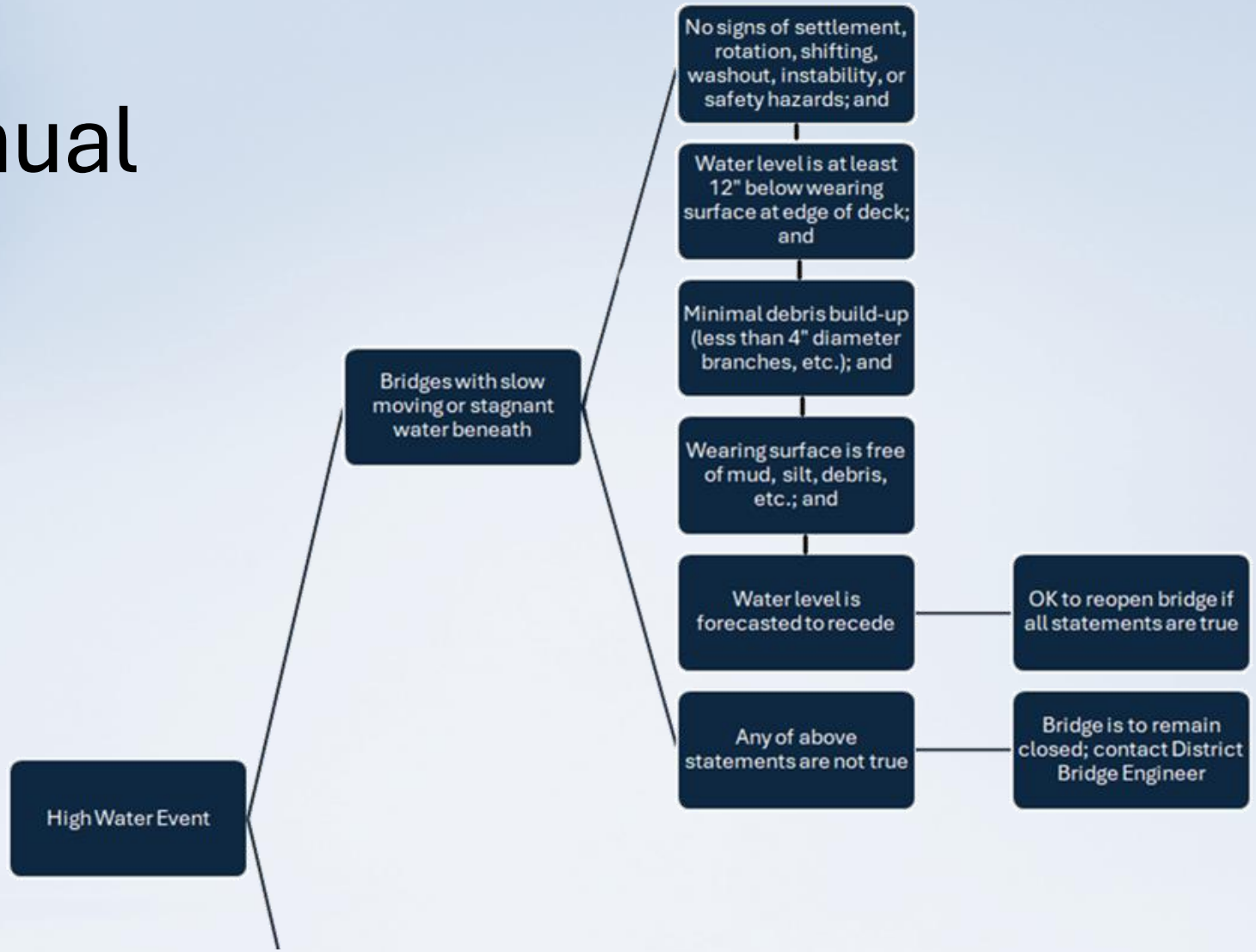

# Condition Ratings and Examples

- Provide additional guidance over SNBI Table 20

Table 20. Codes and descriptions for component condition ratings.

| Code | Condition | Description |
|---|---|---|
| N | NOT APPLICABLE | Component does not exist. |
| 9 | EXCELLENT | Isolated inherent defects. |
| 8 | VERY GOOD | Some inherent defects. |
| 7 | GOOD | Some minor defects. |
| 6 | SATISFACTORY | Widespread minor or isolated moderate defects. |
| 5 | FAIR | Some moderate defects; strength and performance of the component are not affected. |
| 4 | POOR | Widespread moderate or isolated major defects; strength and/or performance of the component is affected. |
| 3 | SERIOUS | Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. |
| 2 | CRITICAL | Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions in order to keep the bridge open. |
| 1 | IMMINENT FAILURE | Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service. |
| 0 | FAILED | Bridge is closed due to component condition, and is beyond corrective action. Replacement is required to restore service. |

**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 construction or fabrication defects or inherent 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, exposed reinforcement with 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 with section loss, 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 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 |

# Condition Ratings and Examples

**Deck Condition Rating (cont.)**

| Item ID | B.C.01 | SNBI |
|---|---|---|

**Condition Rating – Reinforced Concrete**

| Defect | Minor | Moderate | Major |
|---|---|---|---|
| Delamination/ Spall/ Patched Area | Delamination, small spall, or patched area that is sound. (Up to 1%) | Large spall or patched area that is unsound or showing distress. (Up to 10%) | Full depth spalls; widespread edge of deck spalls/delaminations which is encroaching into the travel way; . Spalls Delaminations >10%. |
| Exposed Rebar | Present without measurable section loss. | Present with measurable section loss but does not warrant structural review. | Debonded from concrete in multiple locations; multiple locations present with measurable section loss. |
| Cracking | Unsealed medium width cracks or unsealed medium pattern (map) cracking. | Wide cracks or heavy pattern (map) cracking. | |
| 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. | Extensive or heavy leaching or rust staining. |
| 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. | |
| Deterioration of Metal SIP Forms | Corrosion and or section loss (no holes) | Corrosion holes through SIP forms; leaching of deck. | |

**Bridge Joints Condition Rating (cont.)**

| 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.

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.

# Condition Rating Examples

## Reinforced Concrete Deck - Condition Rating 6 - Example

This section includes an example of a reinforced concrete deck with a component condition rating (Item *B.C.01 – Deck Condition Rating*) of 6 – Satisfactory.

**Deck Condition Rating - 6 (Satisfactory)**

| Item ID | B.C.01 | SNBI |
|---|---|---|

**Example**

A three-span continuous reinforced concrete slab structure exhibits the following conditions:

*Photo 1 – Typical wearing surface (Item B.C.01.01 – 7 (Good))*

Span 1 Findings:

- Span 1 with the centerline of the slab exhibiting moderate water staining, moderate efflorescence, areas of minor rust staining, and a spall 15'L x 24"W x up to 2"D with exposed reinforcement in the rear half (150 SF).

*Photo 2 – Underside of deck in Span 1 with medium width cracks, minor efflorescence, isolated saturation, and a spall with exposed reinforcement*

Span 2 Findings:

- Full length longitudinal minor (<1/32" wide) cracks with light efflorescence typically spaced at 5' - 10' with isolated delaminations up to 24"L x 6"W

*Photo 3 – Underside of deck in Span 2 with typical minor longitudinal cracks*

Span 3 Findings:

- The center 30' in Span 3 is delaminated and spalled up to 2"D with exposed reinforcement for the forward end 24"L (60 SF).

*Photo 4 – Isolated spall with exposed reinforcement at the interface with the Forward Abutment*

Based on the presented findings, Report 6 (Satisfactory) for Item B.C.01 – Deck Condition Rating.

## Reinforced Concrete Deck - Condition Rating 4 - Example

This section includes an example of a reinforced concrete deck with a component condition rating (Item *B.C.01 – Deck Condition Rating*) of 4 – Poor.

**Deck Condition Rating - 4 (Poor)**

| Item ID | B.C.01 | SNBI |
|---|---|---|

**Example**

A three-span reinforced concrete slab with a monolithic wearing surface exhibits the following conditions:

*Photo 1 – Typical wearing surface (Item B.C.01.01 – 7 (Good))*

Span 1 Findings:

- 24 square feet spall near pier 1 with 360 degree rebar exposure. 184 square feet of areas that are spalled with rebar exposed and areas cracked and delaminated with rust stains.

*Photo 2 – Typical spall with exposed reinforcement in Span 1*

Span 2 Findings:

- 256 square feet of spalls with 360 degree rebar exposure or severe section loss to steel. 68 square feet of spall with rebar exposed.
- Remaining portions of the slab in Span 1 and 2 with cracks at every location at the longitudinal bars, 1,046 square feet.

*Photo 3 – Underside of slab with spalls surrounded by isolated wide cracks and delaminations*

Span 3 Findings:

- 30 square feet of spalled area and areas that are cracked, delaminated, and loose. 72 square feet of dark and discolored area at centerline. 72 square feet of areas with longitudinal cracks.

*Photo 4 – Underside of slab with widespread moderate to heavy rust staining and efflorescence near spalls*

Based on the presented defects and findings, Report 4 (Poor) for Item B.C.01 – Deck Condition Rating.

# Implementation Plan

- New inspection and inventory manual to be a one stop shop for SNBI/OBI and bridge management
- Statewide webinar on manual once released
- Statewide training for SNBI specific sections
  - Section 4 Features
  - Section 5 Load Rating
- TranSystems to train ODOT staff on how to update manual as necessary

# Thank You

Question?

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