

# INTRODUCTION AND PURPOSE OF THE COURSE

## VIRTUAL EDITION

3/6/2024 IL NBI Refresher Course 2024

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### Introduction

- **Class Instructor: Mike Cima**
- **Background:**
  - Over 30 years of bridge related structure experience
  - 17+ with IDOT BB&S, now with Quigg Engineering
  - Past experience includes bridge inspection, planning, design and policy development
  - Inspection background includes most types of structures, large and small
  - Licensed PE and SE in Illinois
  - Licensed PE in four other states

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## Introduction

### **IDOT Virtual BI Refresher Class**

- Similar to 12 hr version - covers same topics plus 6 new modules – expanded to 18 hrs over 4 days
- Must be logged on using the Zoom Software not thru your browser to answer questions
- Each participant must be logged on separately
- Have a copy of your bridge inspection items from the SIP Manual handy
- No camera or mic needed – communicate using Chat Button for any questions
- You will receive a PDH certificate from IDOT after successfully completing the class



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## Introduction

### **Participant Testing**

- Questions for participants are found in many class modules
- You will answer the questions through the class interface software – Zoom
- The questions will pop up periodically on your screen
- We will discuss the results of each question once you have answered
- You will take a Final Exam at the end of the class



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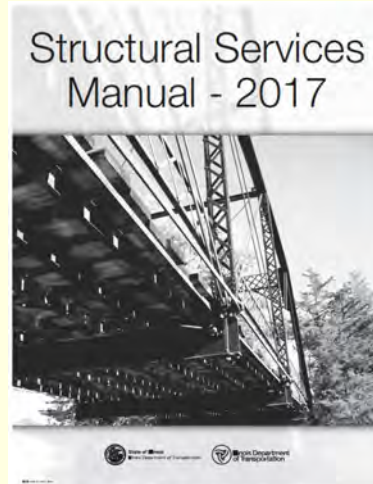
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## Introduction

### Focus of the Class

- Consistent application of inspection policies
- Determining bridge ratings
- Discuss new and recently revised policies
- Discuss current procedures with “room for improvement”
- Chapter 3 of the IDOT Structural Services Manual – Bridge Inspection Policy & SIP Manual



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## Introduction

### DAY 1:

- Introduction & Purpose
- General Policies & Requirements
- Types of Inspections & Forms
- Element Level Inspections
- Personnel Qualifications and Duties
- Deck Condition & Wearing Surfaces
- Traffic Safety Features

### DAY 2:

- Access Methods, Test Equip. and MOT
- Inspector Safety
- Bridge Mechanics
- Waterway Adequacy
- Reinforced Concrete Superstructures
- Substructures
- Inventory Data

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# Introduction

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**DAY 3:**

- **Timber Superstructures**
- PPC Deck Beam Superstructures
- PPC I-Beam Superstructures
- Steel Superstructures
- Fatigue, Fracture & Gusset Plates

**DAY 4:**

- Culverts
- Bearings
- Approach Roadway Alignment
- Scour & Channel Conditions
- **Final Exam**
- Conclusion & Summary

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# Introduction

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**Course Objectives:**

1. **Improve the understanding of key indicators affecting bridge condition ratings to achieve consistent & accurate BI reporting**
2. **Update participants on changes in policy and inspection methods**
3. **Increase awareness of existing deficiencies in inventory data so they can be corrected**

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## Introduction

### Why Do We Inspect Bridges?

- To ensure public safety
- Inspection of highway bridges is mandated by the NBIS
- NBIS requirements first published in 1971 (over 50 yrs!)
- Inspection data serves as a programming tool to allocate resources
- Deficiencies noted during inspections identify maintenance needs for owners

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## Introduction

### Why do we need a refresher course?

- The NBIS includes a requirement for refresher training of bridge inspectors – this class fills that requirement
- Consistency across various bridge programs is needed. Several hundred inspectors are involved in Illinois.
  - The rating of a bridge in “poor” condition should not vary based on the location of the bridge and who inspected it
  - We need to maintain consistent bridge inspection standards
  - Maintain awareness of policy and inspection standard changes
- Quality of information in the database is important
  - Distribution of bridge funds is affected
  - Decisions (permits, detours, etc.) are made using this information

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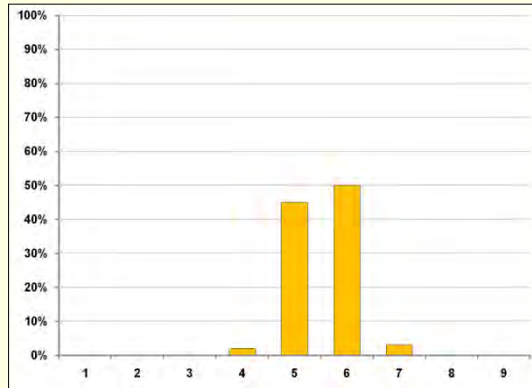
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# Introduction

## Typical Example of Reported Condition Ratings

Process audits of agencies with well-trained inspectors typically find agreement with Condition Ratings within "1" rating of the correct number

Refresher training is intended to improve consistency by clarifying the boundaries between ratings



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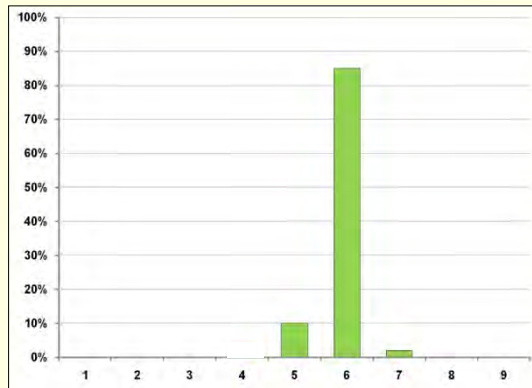
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# Introduction

## Example of Condition Ratings Reported by Well Trained Inspectors

The desired result of refresher training for inspectors is less variability in data

Some variation will exist, but almost all Condition Ratings will be within "1" rating category of the "correct" rating



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## Introduction

How do we achieve consistent ratings between inspectors?

1. Use consistent inspection practices
2. Use uniform rating guidelines

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## Introduction

### 1. Bridge Inspector's Reference Manual (BIRM)

- Provides detailed information for bridge inspection
- Available at no cost
- Establishes “consistent inspection practices”

<https://www.nhi.fhwa.dot.gov>



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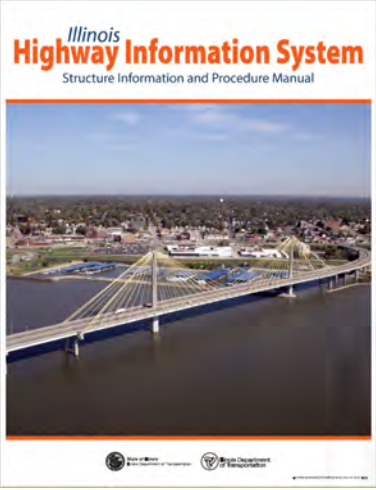
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# Introduction

## 2. IDOT Structure Information and Procedure Manual

- Provides detailed information for coding of ISIS data items
- Primary guidance for determining the Condition Rating of bridge elements (“establishes **uniform rating guidelines**”)
  - **2022 FHWA Guidance**
- Course focuses on the application of these guidelines
- Watch for revisions on IDOT’s web site / subscription service



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# Introduction

Code	General Description
N	<b>Not Applicable</b>
9	<b>Excellent Condition (New)</b>
8	<b>Very Good Condition</b> - No problems noted.
7	<b>Good Condition</b> - Some minor problems (No section loss).
6	<b>Satisfactory Condition</b> - Structural elements show some minor deterioration (Up to 2% section loss on primary member(s) in critical areas).
5	<b>Fair Condition</b> - All primary structural elements are sound but may have minor section loss, cracking, spalling or scour (Up to 10% section loss on primary member(s)).
4	<b>Poor Condition</b> - Advanced section loss, deterioration, spalling or scour (Up to 30% section loss on primary member(s) in critical areas). A drop in Item 59, 60 or 62 to a rating of 4 or lower or Item 58 to a 3 or lower will require a load rating inspection by the BB&S to determine any change in the inventory and operating ratings, items 66 and 64.
3	<b>Serious Condition</b> - Loss of section, deterioration, spalling or scour have seriously affected primary structural components (Up to 50% section loss on primary member(s)). Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	<b>Critical Condition</b> - Advanced deterioration of primary structural elements (Greater than 50% section loss on primary member(s) in critical areas). Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. It may be necessary to close the bridge until corrective action is taken. When a bridge component is appraised at this level, a special inspection of that component is required at intervals not to exceed 6 months as directed by the Bureau of Bridges and Structures.*The Bureau of Bridges and Structures must be notified immediately.
1	<b>"Imminent" Failure Condition</b> - Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put it back in service with load restrictions.
0	<b>Failed Condition</b> - Out of service; beyond corrective action.

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## Introduction

Code:	Description:	Commonly Employed Actions:
9	EXCELLENT CONDITION	<ul style="list-style-type: none"> <li>• Little concern from a safety perspective</li> <li>• <b>Preventive Maintenance</b> (painting, washing, clean deck drains, concrete sealers, joint repairs, deck overlays, etc...)</li> </ul>
8	VERY GOOD CONDITION	
7	GOOD CONDITION	
6	SATISFACTORY CONDITION	<ul style="list-style-type: none"> <li>• May be possible to “save” elements at this stage of deterioration with maint. or repair</li> <li>• <b>Preventive Maintenance and/or</b></li> <li>• <b>Repairs</b> (concrete/steel, replace joints, deck overlays, etc...)</li> </ul>
5	FAIR CONDITION	
4	POOR CONDITION	Safety concerns & Load Rating Inspections <ul style="list-style-type: none"> <li>• Traffic disruptions due to load postings and/or detours possible</li> </ul>
3	SERIOUS CONDITION	
2	CRITICAL CONDITION	<ul style="list-style-type: none"> <li>• <b>Rehabilitation</b> (deck replacement, super replacement and major repairs) <b>or</b></li> <li>• <b>Complete Replacement</b></li> </ul>
1	IMMINENT FAILURE CONDITION	
0	FAILED CONDITION	

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## Introduction

### References:

- National Bridge Inspection Standard (NBIS) – (FHWA)
- “Bridge Inspector’s Reference Manual” – (FHWA)
- “Structural Services Manual” – Chapter 3 – (IDOT)
- “Structure Information and Procedure Manual”- (IDOT)
- “Bridge Preservation Guide”- (IDOT)
- “Manual For Bridge Evaluation” – (AASHTO)

**Make sure you have the current version of each!**

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## Introduction

**Let's answer some questions to identify our class participant makeup using the Zoom interface...**

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# GENERAL POLICIES AND REQUIREMENTS

3/13/2024 IL NBI Refresher Course 2024

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## General Policies and Requirements

- Illinois Bridge Inventory
- NBIS Requirements
- NBIS Metrics
- NBIS Program Managers for Local Public Agencies
- Inspection Due Dates
- Critical Findings
- Bridge Files
- Quality Control & Quality Assurance
- Local Bridge Issues

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## General Policies and Requirements

### IL Bridge Inventory - 2023: (change from previous year)

- **Total Bridges = 26,831 (+0)**
    - IDOT = 7,869 (+10)
    - Non-IDOT = 18,962 (-10)
  - **Average Age**
    - IDOT = 45 yrs. (+1)
    - Non-IDOT = 42 yrs. (+1)
  - **Scour Critical**
    - IDOT = 13 (-13)
    - Non-IDOT = 91 (+3)
  - **Load Posted**
    - IDOT = 82 (+4)
    - Non-IDOT = 815 (-17)
  - **Fracture Critical**
    - IDOT = 168 (-2)
    - Non-IDOT = 309 (-1)
  - **Structurally Deficient**
    - IDOT = 688 (-35)
    - Non-IDOT = 1,704 (+68)
- Non-IDOT = Local, ISTHA, IDNR, Private, etc...

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## General Policies and Requirements

### New NBIS Regulations Effective 6/6/2022:

#### **New NBIS Regulations published May/6/2022**

- ✓ Effective as of 6/6/2022
- ✓ Implementation required by 6/6/2024 per FHWA
- ✓ IDOT plans to accelerate implementation in many cases
- **Definitions - Inspection Date**
  - Date inspection is completed
  - Effective **immediately**
- **Personnel - Refresher Training**
  - Must be 18 hrs and nationally recognized
  - Effective October 2022 (pending FHWA approval)

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## General Policies and Requirements

### New NBIS Regulations Effective 6/6/2022 (cont'd):

- **Personnel - Inspection Experience for PE/SE – PM Quals**
  - 6 months required per NBIS
  - Effective July 2023
- **Personnel – Nonredundant Steel Tension Member-NSTM (FC) Member Inspection Training Requirement**
  - NHI 130078 Fracture Critical Insp. Techniques class required for TL/PM with FCM structures
  - Effective 1/1/2024
  - IDOT has 1 NHI FCM classes scheduled for Apr-May 2024

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## General Policies and Requirements

### New NBIS Regulations Effective 6/6/2022 (cont'd):

- **Personnel – Comprehensive Bridge Insp. Class Req'd for all TL/PM's**
  - 2004/2005 FHWA approved waiver for Agency PMs to take NHI Refresher Course in lieu of Comprehensive Course
  - Approx. 85 TL/PMs in IL do not meet this requirement – notifications sent
  - Effective **1/1/2024**
- **Inspection Frequency – Extended Routine Interval**
  - 48 month inspection interval criteria added to NBIS
  - IL has the most 48 month inspection intervals (+10,000) will lose approx. 600 from this interval
  - IDOT policy already includes much of NBIS - no negative impacts expected
  - Effective **June 2024**

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## General Policies and Requirements

### New NBIS Regulations Effective 6/6/2022 (cont'd):

- **Inspection Procedures - Scour**
  - “Unknown Foundations” types require scour POA = 250-500 bridges
  - IDOT to develop short Scour POA form – awaiting example
  - Include bridges in IDOT Scour Monitoring Program – *Bridge Watch*™
  - Effective **late 2024**
- **Inspection Procedures – Critical Findings**
  - NBIS has specific criteria for automatic CF – closure, posting, etc...
  - IDOT CF policy to be updated to new criteria
    - Better define CF
    - Timeliness of reporting CF to Statewide PM & FHWA
  - Effective June 2022

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## General Policies and Requirements

### New NBIS Regulations Effective 6/6/2022 (cont'd):

- **Inventory**
  - Several new Inventory Items for each bridge
  - Estimated to take approx. 3+ hrs per bridge to determine new data
  - IDOT already started collecting some data
  - Party responsible for inspection (PM) is responsible for data collection
  - IDOT SIP Manual/ISIS Manual & Inventory Forms updates **mid 2024**
  - Full implementation effective **3/2028 with intermittent milestones**

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## General Policies and Requirements

### FHWA - NBIS Metrics Review:

- FHWA developed 23 metrics to measure compliance with the NBIS
  - Intended to provide consistent oversight nationwide
  - They are used to measure compliance with FHWA policy
  - FHWA rates States in each category as: Compliant, Substantially Compliant or Non-Compliant
  - Possible basis for sanctions in cases with lack of improvement
- *IDOT responds with Plans of Corrective Action to the FHWA to fix all areas not rated "Compliant" following each yearly review*
- GREAT improvements have been made by IL in compliance since the start of the program in 2011

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## General Policies and Requirements

### FHWA - NBIS Metrics Review:

#### 2023 top 5 FHWA findings and **corrective actions** for Illinois

1. Bridges are inspected late with no justification or pre-approval for the delinquency – **ALL delinquent inspections must have a reason! If > 30 days must be coord w/BBS & submitted to FHWA for approval.**
2. Inspection Documentation – **Missing proper comments and photos**
3. Load Ratings for Emergency Vehicles not completed – **All bridges need to be evaluated for emergency vehicle loads**
4. Documentation proving underwater inspection not required – **Provide documentation—photos & cross sections**
5. Scour Critical Bridges – **Lack scour documentation & foundation type**

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## General Policies and Requirements

### Structure Program Managers & Team Leaders:

- All Entities with NBIS structures must have an IDOT certified NBIS Program Manager (over 500 required in IL!!)
- Inspections must be led by an IDOT certified Team Leader
- Designated NBIS Program Manager must sign off on NBIS Inspection Reports prior to submittal to IDOT. Sign as “Agency PM” regardless if local or consultant.
- Program Managers & Team Leaders not performing their duties IAW policy could have their certification revoked

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## General Policies and Requirements

### Inspection Interval Dates

- Inspections must be completed prior to or on the due date calendar month based on the last date of inspection.
- On very rare occasion you may be unable to inspect a structure on time due to conditions beyond your control. For delinquencies > 30 days the Statewide NBIS PM for IL must be notified. Include the delinquency reason and expected inspection date. The FHWA must approve.
- For 2023 IL inspection delinquencies were:
  - Routine = 3.02% (2.52%)
  - Fracture Critical = 9.13% (5.93%)
  - Underwater = 1.68% (2.27%)
  - Special = 12.00% (12.56%)
  - Element = 0.65%
- IDOT Bridge Inspection Tracking website (ISIS-BIS)



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## General Policies and Requirements

### Inspection Interval Dates

#### IDOT *Structural Services Manual* Section 3.4.1

- “Routine, Fracture Critical, Underwater, Element Level and Special Inspection **with an interval  $\geq 12$  months** shall be completed by the end of the calendar month in which they are due.
- Special Inspections **with an interval  $< 12$  months** must be completed by the date it is due.”



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## General Policies and Requirements

### Bridge Inspection Entry into BIS

#### Appropriate and reasonable timeframes for entry:

- Routine, Fracture Critical, Underwater and Element Level with interval  $\geq 12$  months:
  - 30 Days** – Sufficient time for data entry and allows BBS Bridge Management Group to identify inspection delinquencies before they become a problem
- Special Inspection interval  $< 12$  months:
  - 7 Days** – These are “Special Inspections”, which target specific structural deficiencies/problem structure details and allow structures to remain open



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## General Policies and Requirements

### Delinquent Inspections:

#### IDOT CL 2020-19 – Delinquent NBIS Inspection Policy

- **Published November 2020**
- **45 Days Delinquent:** The BM&I Unit will email the entity responsibility for the bridge indicating the inspection must be completed immediately and entered in BIS within 30 days, and failure to do so will result in the Department having the inspection completed by a consultant and hold the entity accountable for all costs.
- **60 Days Delinquent:** The BM&I Unit will notify the entity responsible for the bridge of the cost to perform the delinquent inspection and if it is not completed before becoming 75 days delinquent, the Department will have it completed by their consultant.



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## General Policies and Requirements

### Delinquent Inspections: (con't)

#### IDOT CL 2020-19 – Delinquent NBIS Inspection Policy

- **75 Days Delinquent:** The Department's consultant completes the delinquent inspection and enters it in BIS. The District BLRS will not authorize the owner to expend their Motor Fuel Tax funds until the Department has been reimbursed for the inspection cost.
- **90 Days Delinquent:** The BM&I Unit will provide the inspection report to the entity responsible for the bridge.
- The Statewide NBIS Program Manager (PM) will review the Agency PM's role in the failure to perform the inspection on time. If found to be uncooperative or to have inhibited the completion of the inspection, the Agency PM's certification will be revoked



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## General Policies and Requirements

### Critical Findings:

- Per the NBIS, a **Critical Finding** is a structural or safety related deficiency that may pose an imminent threat to the safety of the traveling public.
- The following findings *may* constitute a critical finding:
  - Lowering a Deck, Superstructure, Substructure or Culvert rating  $\leq 2$
  - Lowering a Channel & Channel Protection Condition rating  $\leq 2$
  - Lowering a Scour Critical Evaluation rating  $\leq 2$
  - Lowering a Fracture Critical (NSTM) rating  $\leq 3$
  - Full or partial closure of a bridge by owner or IDOT
  - Immediate load restrictions (by IDOT, IDOT must define)
  - Bridges requiring shoring to remain open
  - Any other situation the inspector considers a threat to the safety of the travelers

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## General Policies and Requirements

### Critical Finding Process:

1. On identifying an initial or more severe than previously reported Critical Finding – **immediately secure the bridge as necessary to protect the travelling public** (TL)
2. If the damage seriously reduces the structures load capacity, then **isolate the defect** from traffic by closing lanes or the entire structure if necessary (TL)
3. Report Critical Finding:
  - **Report immediately** to the Agency Designated NBIS Program Manager who **immediately** forwards it to the Statewide NBIS Program Manager (TL/PM)
  - **Provide sufficient, detailed information** to allow the Bureau of Bridges & Structures to make an initial determination of the severity of the finding (TL/PM)
4. If BB&S determines the deficiency qualifies, Form BBS-CF 1 Critical Finding Report must be completed and forwarded to the State Program Manager (PM)
  1. NHS structures must be reported to FHWA within 24 hrs
  2. Non-NHS structures reported to FHWA within 7 days
5. Critical Finding Report form recently updated on 5/16/2023.

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## General Policies and Requirements

### Bridge Files:

- A collection of information representing the history of a bridge
- Separate files are maintained for each structure
- A Bridge File Checklist, Form BBS BFC, must be maintained for each bridge and stored with the Bridge File
- It is not necessary to physically store all required items in the file, but the location of each must be referenced on the Checklist
- **Keep these up to date!** A lot of information is often missing.



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## General Policies and Requirements

### Bridge File Checklist BBS BFC :

- Master Structure Report
- Photographs
- Inspection and other Reports
- Channel Cross Sections & History
- Scour Analysis, Flood Data, Scour POA
- Correspondence - Rating, Posting, etc...
- Fracture Crit., Insp. Plans etc...
- Maintenance /Repair History
- Structure Plans
- Structure Design Calcs.
- Etc...

Required Items Per MBE	In Bridge File	Other Location	Not Applicable	Comments/Location Information
Structure Inventory and Appraisal Sheets (Master Structure Report)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
History of Structural Damage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Photographs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	located in computer bridge file under SN xxx-xxxx.
Chronological History of Inspection Reports - Original Signature Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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## General Policies and Requirements

### Quality Control: (Section 3.9.3 Structural Services Manual)

- **Bridge Inspection Refresher Training**
  - All PMs & TLs must receive refresher training every 60 months
  - IDOT Bridge Inspection Refresher Course – 18 hrs as of OCT 2022 (free)
  - FHWA-NHI-130053 Bridge Inspection Refresher Training – 18 hrs (\$925)
  - May take either course to meet IL refresher training requirement
- **Review of Bridge Inspectors, Reports & Procedures**
  - Every 24 months PMs must accompany their TLs on 3 inspections to observe and verify their performance is satisfactory
  - A PM who performs NBIS inspections must be field verified by another PM.
  - Document results on Form BBS 2790.

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## General Policies and Requirements

### Quality Assurance:

- **Bridge Management & Inspection Unit conducts yearly QA Reviews**
- **Department currently performs 19 QA reviews / year**
  - 2 - IDOT Districts
  - 17 – Local Public Agencies – Counties

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## General Policies and Requirements

### Quality Assurance:

#### Yearly QA Review – Common Findings

- **Documentation of deficiencies needs improvement**
  - Condition Ratings  $\leq 6$  require inspector comments, recommend comments for all ratings
  - List all notable deficiencies with Component, not just controlling case
  - Use SIP Manual condition descriptions in appraisal comments
  - Findings not related to General Condition Ratings for Items 58, 59, 60 & 62 need to be documented also – EX slopewall, joints, & bearings. Place notes in Remarks Field.
  - Take a few photos for each inspection

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## General Policies and Requirements

### Quality Assurance:

#### Yearly QA Review – Common Findings (cont'd)

- **Bridge Inventory Items miscoded**
  - Many items are miscoded
  - Separate class module will discuss these in detail
- **General Compliance +/- 1 with Ratings for:**
  - Deck (58), Super (59), Sub (60) & Culvert (60)
  - Channel Condition (61) & Waterway Adequacy (71)
  - Approach Roadway Alignment (72)
  - Some improvement needed
  - We will discuss all of these in detail in this refresher course

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## General Policies and Requirements

### General Requirements

- **Non-IDOT Entities responsible for a bridge on their right-of-way must report the bridge as part of the NBI**
  - Inspect in accordance with NBIS & IDOT Policy even if it carries traffic onto private roadways
  - Data reported to IDOT in the same time frames previously mentioned
- **Closed bridges that are still linked to a roadway must be inspected to verify proper closure.**
- **Closed bridges over roadways or navigable waterways must be inspected to verify proper closure and ensure safety of traffic beneath.**
- **Bridges closed for construction or under staged construction must be inspected prior to the due date of the required inspection.**
- **Detailed inspection requirements are defined in [Section 3 of the IDOT Structural Services Manual](#).**

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## General Policies and Requirements

### Local Issues - Scheduling Inspections

- **Local Agency Program Managers must track inspection schedules to ensure they are completed on time:**
  - Routine, Fracture Critical, Special, etc.
  - Allow time for Consultant contract to be approved by IDOT if needed
- **Schedule your inspections to be completed before their due dates!!**
- **SIMS County - <http://www.dot.il.gov/sims/sims.html>**
  - Data files – Forms and Reports
  - This will likely go away spring of 2025. Data will be available in another format. Working with IACE.
- **Local Agencies are responsible for inspecting their bridges per State Policy**

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## General Policies and Requirements

### Local Issues – ISIS/BIS Entry

- **Web-based data entry by locals for inspection ratings is currently being fielded (ISIS/BIS)**
  - System launched in 2019
  - All Districts and Counties are using the system
  - Currently working on getting all Municipalities online
  - Notify IDOT of personnel changes to maintain security of system
- **Get inspections entered into ISIS/BIS in a timely manner**
- **Ramifications for delinquent inspections**
  - LA pays for IDOT administered inspections (IDOT CL 2020-19)

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## General Policies and Requirements

### Local Issues - Record Retention Expectations:

- **Local Agencies must maintain bridge files for each of their structures – separate file for each bridge**
- **Files should include all information found on IDOT BBS-BFC (Bridge File Checklist)**
- **Keep pictures from each inspection cycle**

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## General Policies and Requirements

### Local Issues - Load Rating Procedures:

- The AASHTO Manual for Bridge Evaluation (MBE) defines procedures for calculating the load rating of structures
- Postings are typically based on the Operating Rating
- Posting is dependent on many factors to include; rating analysis method (ASD, LFD, LRFD), material type (concrete, steel, timber), and condition state
- By Illinois statutes, **only IDOT** can set the structure posting level
- Field posting must match the posting letter from IDOT

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## General Policies and Requirements

### Local Issues - Load Posting:

- Manual on Uniform Traffic Control Devices (MUTCD)
- 2021 Illinois Supplement to the National Manual on Uniform Traffic Control Devices
- Load posting signs shall be located between 50 feet and 300 feet in advance of the structure to which it applies
- Advance signs should be erected at junctions which permit the driver of affected vehicles to choose an alternate route
- Post bridges in a timely manner!
- Must be posted within 30 days of receiving notification from IDOT

BRIDGE WEIGHT LIMIT - TONS	
SINGLE VEHICLE	17
COMBINATIONS	
3 OR 4 AXLES	21
5 OR MORE	23

R12-I100

BRIDGE WEIGHT LIMIT - TONS	
SINGLE VEHICLE	16
COMBINATION VEHICLE	20

R12-I101

WEIGHT LIMIT 10 TONS
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R12-1

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## General Policies and Requirements

### Load Posting Requirements

- Flaws in improper signage can be subtle
- If you can't see it, it's not posted!



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## DISCUSSION

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# TYPES OF INSPECTIONS AND FORMS

3/7/2024 IL NBI Refresher Course 2024

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## Types of Inspections and Forms

### Types of Inspections:

- Initial Inspection
- Routine Inspection
  - In-Depth Inspection
  - Hands-On Inspection
- Underwater Inspection
- Fracture Critical Member Inspection (NSTM)
- Damage Inspection
- Load Rating Inspection
- Complex Bridge Inspection
- Element Level Inspection
- Special Inspection

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# Types of Inspections and Forms

## Inspection Form:

- Form: BBS RIR Routine Inspection Report
- Replaced Form BBS BIR in 6/2021
- Some fields added, removed & revised
- Pretty self explanatory. See NBI Subscription Service Announcement 2021.05

This is a thumbnail of the BBS RIR Routine Inspection Report form. It includes fields for Agency, District, State, and Agency Name. It also has sections for 'Inspection Details' and 'Inspection Results' with various checkboxes and input fields for different components like Deck Condition, Substructure Condition, and Culvert Condition.

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# Types of Inspections and Forms

## Inspection Form RIR: PG 1

This is a thumbnail of the BBS RIR Routine Inspection Report form, Page 1. It includes fields for Agency, District, State, and Agency Name. It also has sections for 'Inspection Details' and 'Inspection Results' with various checkboxes and input fields for different components like Deck Condition, Substructure Condition, and Culvert Condition. It also includes a 'References' section and 'Additional Inventory Data'.

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# Types of Inspections and Forms

## Inspection Form RIR: PG 2

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# Types of Inspections and Forms

## Initial Inspection:

- The 1<sup>st</sup> inspection of a new or newly rehabilitated bridge to provide data to set baseline conditions.
- Inspection Interval: **All structures must be inspected & entered in ISIS within 90 days of opening to traffic** (may be reduced)
- Form: BBS RIR Routine Inspection Report

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## Types of Inspections and Forms

### Routine Inspection:

- A regularly scheduled inspection to determine the physical and functional condition, identify changes from previous inspections and ensure the structure satisfies service requirements.
- Most common type of inspection
- Conducted on a 48, 24 or 12-month interval (see Structural Services Manual 3.4)
- Form: BBS RIR Routine Insp. Report

The image shows a screenshot of the 'Routine Inspection Report' form from the BBS Department of Transportation. The form includes sections for 'Project Information', 'Inspection Information', and 'Inspection Results'. The 'Inspection Results' section contains a table with columns for 'Inspection Item', 'Inspection Date', 'Inspection Status', and 'Inspection Notes'. The form is titled 'Page 1 of 1' and includes a footer with the BBS logo and contact information.

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## Types of Inspections and Forms

### Routine Inspection: (In-Depth Procedures)

- Completed in place of the standard Routine Inspection. Same process but **pay closer attention to potential trouble areas**
  - Every 4 yrs. for 12 month interval inspections
  - Every 6 yrs. for 24 month interval inspections
  - Every 8 yrs. for 48 month interval inspections
- Typical areas of concern: under expansion joints, web stiffeners, X-frame and lateral bracing connections, vaulted abutments, etc...
- Form: BBS RIR Routine Insp. Report
- Check the box on the 1<sup>st</sup> page to indicate you completed an in-depth inspection

The image shows a screenshot of the 'Routine Inspection Report' form from the BBS Department of Transportation. The form includes sections for 'Project Information', 'Inspection Information', and 'Inspection Results'. The 'Inspection Results' section contains a table with columns for 'Inspection Item', 'Inspection Date', 'Inspection Status', and 'Inspection Notes'. The form is titled 'Page 1 of 1' and includes a footer with the BBS logo and contact information.

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## Types of Inspections and Forms

### Underwater Inspection:

- Inspection of the underwater portion of a substructure and surrounding channel that cannot be inspected visually at low water by wading & probing, generally requiring other techniques or diving.
- A 60-month inspection interval can be used for structures meeting the criteria specified in Section 3.3.4 of the Structural Services Manual provided they do not fall into any of the Special Inspection categories and are not subject to additional requirements of scour critical POA
- Channel cross sections must be prepared
- Form BBS BIR-UW1

The image shows a form titled 'Underwater Inspection Report' from the New York State Department of Transportation. The form is divided into several sections: 'Project Information', 'Structure Information', 'Inspection Information', and 'Inspection Results'. It includes fields for project name, location, structure type, and inspection details. There is also a table at the bottom for recording inspection results.

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## Types of Inspections and Forms

### Channel Cross Section Requirements:

- Required for all Bridges & Culverts over waterways:
  - Take at the up/downstream fascia's for comparison to original baseline
  - They are taken at an interval not to exceed the In-Depth Routine Inspection Interval unless required more frequently by the Scour POA
  - Channel Cross Section intervals 48/72/96 months
  - See NBI Subscription Service Announcement 20190717 for additional guidance and examples
- Results should be plotted/compared to previous findings

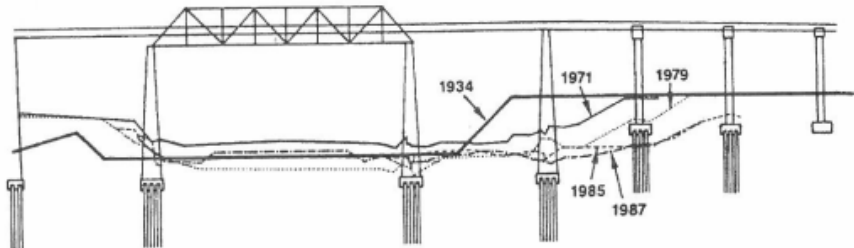
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## Types of Inspections and Forms

### Channel Cross Section Requirements:

*“Top FHWA finding for corrective action”*



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## Types of Inspections and Forms

### Channel Cross Section Requirements:

#### Example Potential Equipment for Measurements

- Range pole
- Weighted measuring tape
- Laser measuring tape
- Hip/chest waders
- Boat
- Sonar
- Paper & pen for documenting results

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## Types of Inspections and Forms

### Channel Cross Section Requirements – Bridge: Must be taken along the up and downstream fascias.

1. Take measurements from datum reference line on bridge that is not likely to move over time (top of parapet/rail, top/bottom of deck, top of sub cap...)
2. Plot all channel cross sections oriented looking downstream.
3. Label substructure units per existing plans.
4. Must measure at all substructure units. Abutments at exposed face, Piers at CL.
5. Should take additional measurements at regular longitudinal intervals at predetermined points.
6. Must measure at beginning and end of slope, edges and low points of scour holes, edge of water, low stream elevation, any other location with substantial change in elevation.
7. Should take measurements at the ends and mid point of significant flat areas.

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## Types of Inspections and Forms

### Channel Cross Section Requirements – Bridge: Must be taken along the up and downstream fascias. (cont'd)

8. Take Vertical measurements to nearest ½ foot other than scour holes should be measured to nearest tenth of a foot.
9. Take Horizontal measurements to nearest foot.
10. Debris piles – measure edges and top to document loss of hydraulic opening.
11. For dual bridges with little difference in elevation the measurements for one fascia can be used for both.
12. Take additional cross sections around sub units with significant changes.
13. Graph the results using a format such as an Excel spreadsheet. Additional data can easily be added for future periods.

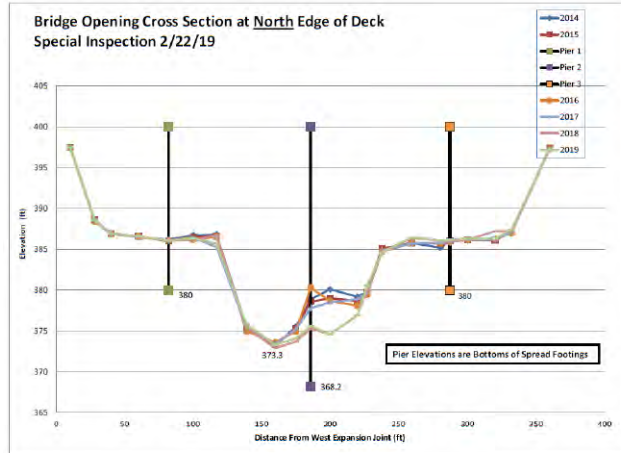
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# Types of Inspections and Forms

## Channel Cross Section Requirements - Example Bridge Sketch



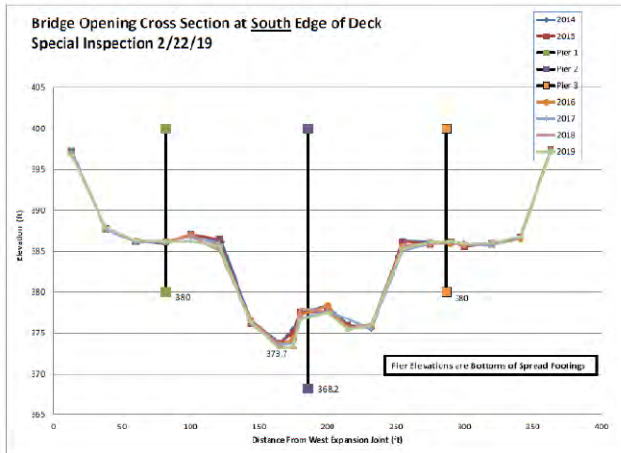
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# Types of Inspections and Forms

## Channel Cross Section Requirements - Example Bridge Sketch



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## Types of Inspections and Forms

### Channel Cross Section Requirements – Culvert: Must be taken along the up and downstream fascias.

1. Take measurements from datum reference line on culvert that is not likely to move over time (headwalls, bottom of top slab...)
2. Plot all channel cross sections oriented looking downstream.
3. Label culvert barrels consistently.
4. Must measure vertically at inside face of all exterior and interior walls.
5. Should take additional measurements at regular longitudinal intervals at predetermined points.
6. Must measure at beginning and end of slope, edges and low points of scour holes, edge of water, low stream elevation, any other location with substantial change in elevation.
7. Should take measurements at the ends and mid point of significant flat areas.

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## Types of Inspections and Forms

### Channel Cross Section Requirements – Culvert: Must be taken along the up and downstream fascias. (cont'd)

8. Take Vertical measurements to nearest ½ foot other than scour holes should be measured to nearest tenth of a foot.
9. Take Horizontal measurements to nearest foot.
10. Debris piles – measure edges and top to document loss of hydraulic opening.
11. Take additional cross sections around sub units with significant changes from original construction or previous inspection.
12. Culverts with aprons – vertical measurements should be taken at the end with the top of apron used as the datum point.
13. Graph the results using a format such as an Excel spreadsheet. Additional data can easily be added for future periods.

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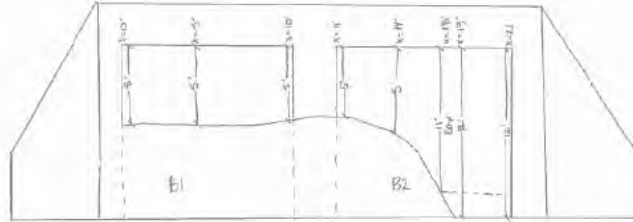
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# Types of Inspections and Forms

## Channel Cross Section Requirements - Example Culvert Sketch

Outlet Cross Section:



Note: Barrel height is 12 ft  
 Reference Datum is bottom of culvert ceiling  
 Barrel 1 is about halfway filled with silt Barrel 2 also has silt build up but not as severe.

Figure 11- Example of a Stream Cross Sections at Culverts without Aprons

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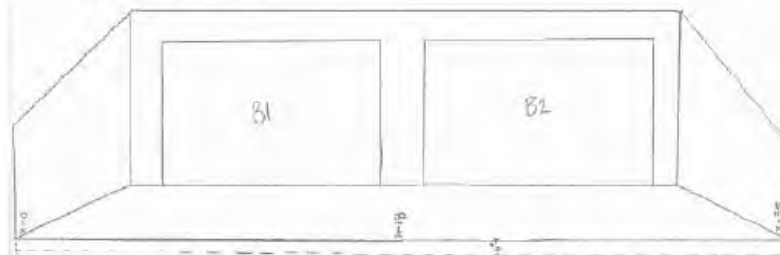
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# Types of Inspections and Forms

## Channel Cross Section Requirements - Example Culvert Sketch

Outlet Cross Section:



Note: Reference Datum is top of the toe of the apron. The stream cross section vertical dimensions are of feet from  $x=0$  to  $x=35$ . (Stream bed is level with apron)

Figure 12- Example of a Stream Cross Sections at Culverts with Aprons

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## Types of Inspections and Forms

### Fracture Critical or Non-Redundant Steel Tension Member (FCM or NSTM) Inspection

- Hands-on, arms-length inspections of FCM/NSTM members
- Inspection interval:
  - 90-days, and again within 24-months from the date of opening to traffic for new or rehabilitated bridges with FCM/NSTM members.
  - 12-months for bridges with a FC Appraisal Rating (ISIS Item 93A1) coded "4" or less.
  - 24-months for bridges other than those included in the previously described categories for FCM/NSTM inspection intervals.
- Form BBS BIR-FC1

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## Types of Inspections and Forms

### Fracture Critical Member Insp. Plan:

- Inspection records must identify the location (by sketch) and a description of all FCM/NSTM
- Inspection frequency must be identified
- Procedures for inspection of FCM/NSTM must be identified
- See Example in Structural Services Manual

The form is titled 'Fracture Critical Inspection Report' and is issued by the Illinois Department of Transportation. It contains several sections:
 

- Project Information:** Fields for Project Name, Location, and other project details.
- Inspector's Approval:** A section for the inspector to provide their name, title, and signature.
- Inspection Tasks:** A table with columns for 'Inspection Task Location', 'Signature', and 'Date'. It lists various inspection tasks such as 'Visual Inspection of Steel Members', 'Visual Inspection of Welds', etc.
- Legend:** A section defining various codes and symbols used in the inspection process.
- Other Inspected Components:** A section for listing additional components inspected during the process.

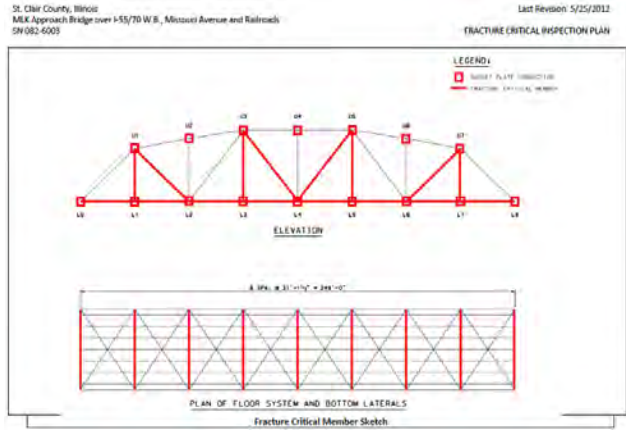
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# Types of Inspections and Forms

## Fracture Critical Member Inspection: Location Sketch of FCM/NSTM



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# Types of Inspections and Forms

## Fracture Critical Member Inspection: Form BBS BIR-FC2: Fracture Critical Member Inventory Report (Identifies type, location & number of FCM/NSTM on bridge)

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## Types of Inspections and Forms

### Fracture Critical Member Inspection:

- Form BBS 2760: Preliminary Pin and Link Inspection Journal
- Form BBS 2780: Supplemental Pin / Link Inspection Journal

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## Types of Inspections and Forms

### Damage Inspection:

- An unscheduled inspection used to assess a bridge for sudden change in structural capacity or stability
- Completed by District staff, BB&S staff or a licensed structural engineer who is a IDOT certified NBIS team leader or program manager
- Determines the need for emergency load restrictions/closure and the effort necessary for repair
- No official inspection form



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## Types of Inspections and Forms

### Load Rating Inspection:

- A scheduled inspection used to collect detailed information required to complete a load rating analysis
- Required when:
  - Super, Sub or Culvert rating  $\leq 4$
  - Deck ratings  $\leq 3$
  - If these ratings fall lower a new Load Rating inspection is required
- No official inspection form



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## Types of Inspections and Forms

### Complex Inspection:

- An In-Depth inspection requiring Hands-On inspection procedures
- Covers: suspension, cable-stayed and movable bridges
- Requires: experienced inspection team, extensive coord., traffic control, access equipment, extensive inspection equipment and documentation
- Inspection forms as required by the particular structure.



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## Types of Inspections and Forms

### Special Inspection:

- Used to monitor a known deficiency or condition that must be looked at more often than Routine, Underwater or FC inspection intervals
- Inspection interval varies depending on deficiency severity, often 1-12 months
- Emphasis on detailed measurements and photographs to monitor change over time
- At times used to defer load restrictions or closure
- Form BBS SI-1 Special Inspection Report (updated 5/16/2023)

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## Types of Inspections and Forms

### Hands On Inspection:

- An inspection within arms length of a bridge component
- May use visual techniques and be supplemented by non-destructive testing
- This is a method of inspection used within other inspection types
  - Fracture Critical Inspections
  - Load Rating Inspections
  - Damage documentation on other inspection types, etc...



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## Types of Inspections and Forms

### Form BBS-RIR: (Routine Insp Report)

- All notable deficiencies must be documented even if not related to items 58/59/60/62
- All ratings  $\leq 6$  must have comments on page 1 under "Inspectors Appraisals" justifying rating!!!
- Comments must specifically identify criteria met in SIP Manual that required the  $\leq 6$  rating

Inspector's Appraisals		
	Prev	Next
58 - Deck Condition:	<input type="text"/>	<input type="text"/>
59 - Superstructure Condition:	<input type="text"/>	<input type="text"/>
60 - Substructure Condition:	<input type="text"/>	<input type="text"/>
62 - Culvert Condition:	<input type="text"/>	<input type="text"/>
61 - Channel Condition:	<input type="text"/>	<input type="text"/>
71 - Waterway Adequacy:	<input type="text"/>	<input type="text"/>
72 - Approach Rdwy Align:	<input type="text"/>	<input type="text"/>
111 - Pier Navig Protection:	<input type="text"/>	<input type="text"/>

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## Types of Inspections and Forms

### Form BBS-RIR: (Routine Insp Report) Documentation Requirements

- Quality and descriptive comments must be recorded for condition ratings
- Place concise comments in the section adjacent to each condition rating item
- Other notable deficiencies (ex. slopewall problems, railing issues, etc.) should be recorded in the Inspection Remarks field (Item 90B)
- When the number of deficiencies makes it not practical to document each individually, use words such as "scattered", "moderate", "extensive" or other phrases to capture global conditions
- Use inspection drawings/sketches along with comments on the Routine Inspection Form and photos taken in the field. This is particularly helpful on steel bridges with multiple members having varying degrees of section loss.
- When abbreviating, use abbreviations common to the field of bridge engineering

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## Types of Inspections and Forms

### **Form BBS-RIR: (Routine Insp Report) Documentation Requirements**

- Photos are an important part of bridge inspection documentation and are used to identify and document the general condition and problem areas. At a **minimum take the following photos:**
  - Top view of the roadway across the bridge
  - Side elevation view of the bridge
  - An under view of the main or typical span superstructure
  - Condition ratings ≤ “4” must be documented with photos showing the damaged area
  - **Extra Credit** – a few additional photos showing the general condition of the major structure components are helpful
- Refer to IDOT NBI Subscription Service Announcement 2021.04 for additional documentation details and for examples

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## Types of Inspections and Forms

### **Form BBS-RIR: (Routine Insp Report)**

- Insp. Team Leader & the Agency Program Manager **must sign and date form on page 2**
- The Agency PM may be a consultant if officially designated in writing
- Bridge Information System (BIS) workflow – NBIS TL submits insp form (serves as electronic signature/date) and the NBIS PM approves (serves as electronic signature/date – hard copy forms no longer required)

	Signature	Date
Inspection Team Leader:		
Agency Program Manager:		

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The image shows a rectangular frame with a black border. Inside the frame, there is a horizontal bar with a gold-colored segment on the left and a dark red segment on the right. The word "Discussion" is written in white text on the dark red segment. Below the bar, the rest of the frame is filled with horizontal grey lines. In the bottom-left corner of the frame, the date "3/7/2024" is printed in small black text.

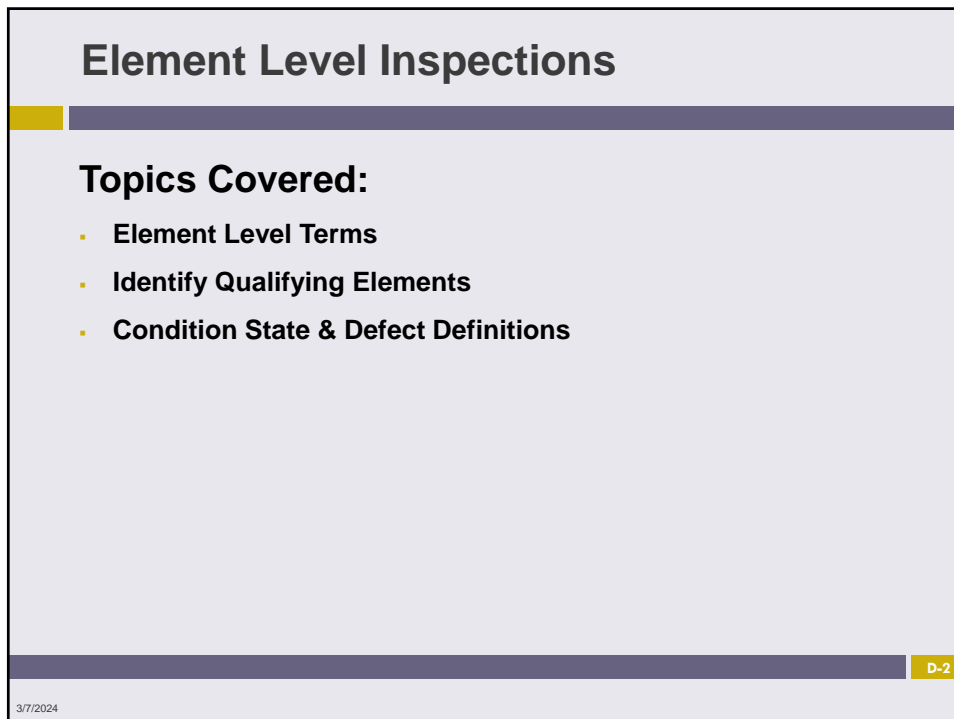
37



**ELEMENT LEVEL INSPECTIONS**

3/7/2024 IL NBI Refresher Course 2024

1



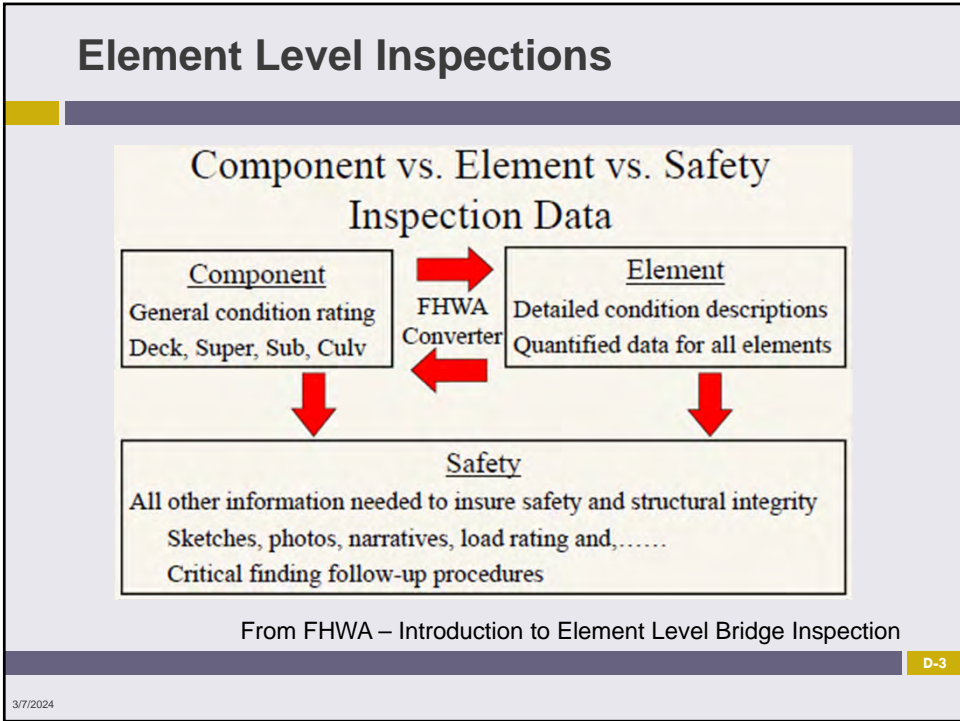
**Element Level Inspections**

**Topics Covered:**

- Element Level Terms
- Identify Qualifying Elements
- Condition State & Defect Definitions

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2



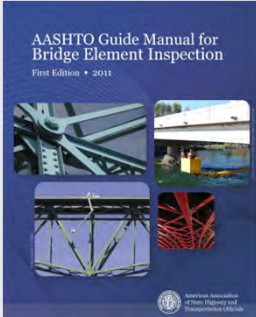
3

## Element Level Inspections

**Element Level Terms:**

**There are 3 types of elements**

- **They come from the AASHTO Manual for Bridge Element Inspection**
  - National Bridge Elements
  - Bridge Management Elements
  - Agency Developed Elements
- **We will cover each briefly**



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## Element Level Inspections

### Element Level Terms:

#### Each Element has:

- **Detailed Description**
  - Classification (description)
  - Unit of measure (length, SF, each...)
  - Quantity (calculated per element)
- **Condition state definitions**
- **Element commentary**

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## Element Level Inspections

### Element Level Terms:

#### Elements – National Bridge Elements – NBEs

- **Primary structural elements of bridges required to determine the overall condition & safety of the primary load carrying members**
- **Designed to remain consistent for agencies nationwide (owning agencies can't change them)**
- **FHWA collect data for NBEs**

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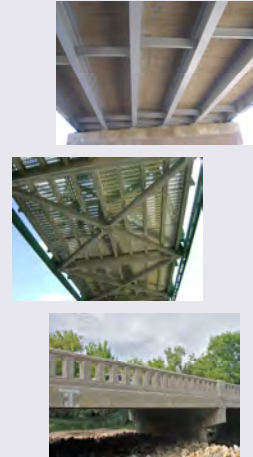
6



# Element Level Inspections

## Element Level Terms: National Bridge Elements – NBEs

Decks / Slabs (NBEs)		
El. No.	Element Name	Units
12	Reinforced Concrete Deck	AREA (sq. ft.)
13	Prestressed Concrete Deck	AREA (sq. ft.)
15	Prestressed Concrete Top Flange	AREA (sq. ft.)
16	Reinforced Concrete Top Flange	AREA (sq. ft.)
28	Steel Deck with Open Grid	AREA (sq. ft.)
29	Steel Deck with Concrete Filled Grid	AREA (sq. ft.)
30	Steel Deck Corrugated/Orthotropic/Etc.	AREA (sq. ft.)
31	Timber Deck	AREA (sq. ft.)
38	Reinforced Concrete Slab	AREA (sq. ft.)
54	Timber Slab	AREA (sq. ft.)
60	Other Deck	AREA (sq. ft.)
65	Other Slab	AREA (sq. ft.)



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# Element Level Inspections

## Element Level Terms: National Bridge Elements – NBEs

Superstructures (NBEs)		
El. No.	Element Name	Units
102	Steel Closed Web/Box Girder	LENGTH (ft.)
104	Prestressed Concrete Closed Web/Box Girder	LENGTH (ft.)
105	Reinforced Concrete Closed Web/Box Girder	LENGTH (ft.)
106	Other Closed Web/Box Girder	LENGTH (ft.)
107	Steel Open Girder/Beam	LENGTH (ft.)
109	Prestressed Concrete Open Girder/Beam	LENGTH (ft.)
110	Reinforced Concrete Open Girder/Beam	LENGTH (ft.)
111	Timber Open Girder/Beam	LENGTH (ft.)
112	Other Open Girder/Beam	LENGTH (ft.)
113	Steel Stringer	LENGTH (ft.)
115	Prestressed Concrete Stringer	LENGTH (ft.)
116	Reinforced Concrete Stringer	LENGTH (ft.)
117	Timber Stringer	LENGTH (ft.)
118	Other Stringer	LENGTH (ft.)
120	Steel Truss	LENGTH (ft.)
135	Timber Truss	LENGTH (ft.)
136	Other Truss	LENGTH (ft.)
141	Steel Arch	LENGTH (ft.)
142	Other Arch	LENGTH (ft.)
143	Prestressed Concrete Arch	LENGTH (ft.)
144	Reinforced Concrete Arch	LENGTH (ft.)
145	Masonry Arch	LENGTH (ft.)
146	Timber Arch	LENGTH (ft.)
147	Steel Main Cables	LENGTH (ft.)
148	Secondary Steel Cables	EACH
149	Other Secondary Cable	EACH
152	Steel Floor Beam	LENGTH (ft.)
154	Prestressed Concrete Floor Beam	LENGTH (ft.)
155	Reinforced Concrete Floor Beam	LENGTH (ft.)
156	Timber Floor Beam	LENGTH (ft.)
157	Other Floor Beam	LENGTH (ft.)
161	Steel Pin and Pin and Hanger Assembly or both	EACH
162	Steel Gusset Plate	EACH



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# Element Level Inspections

## Element Level Terms: National Bridge Elements – NBEs

Substructures (NBEs)		
El. No.	Element Name	Units
202	Steel Column	EACH
203	Other Column	EACH
204	Prestressed Concrete Column	EACH
205	Reinforced Concrete Column	EACH
206	Timber Column	EACH
207	Steel Tower	LENGTH (ft.)
208	Timber Trestle	LENGTH (ft.)
210	Reinforced Concrete Pier Wall	LENGTH (ft.)
211	Other Pier Wall	LENGTH (ft.)
212	Timber Pier Wall	LENGTH (ft.)
213	Masonry Pier Wall	LENGTH (ft.)
215	Reinforced Concrete Abutment	LENGTH (ft.)
216	Timber Abutment	LENGTH (ft.)
217	Masonry Abutment	LENGTH (ft.)
218	Other Abutments	LENGTH (ft.)
219	Steel Abutment	LENGTH (ft.)
220	Reinforced Concrete Pile Cap/Footing	LENGTH (ft.)
225	Steel Pile	EACH
226	Prestressed Concrete Pile	EACH
227	Reinforced Concrete Pile	EACH
228	Timber Pile	EACH
229	Other Pile	EACH
231	Steel Pier Cap	LENGTH (ft.)
233	Prestressed Concrete Pier Cap	LENGTH (ft.)
234	Reinforced Concrete Pier Cap	LENGTH (ft.)
235	Timber Pier Cap	LENGTH (ft.)
236	Other Pier Cap	LENGTH (ft.)



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# Element Level Inspections

## Element Level Terms: National Bridge Elements – NBEs

Culverts (NBEs)		
El. No.	Element Name	Units
240	Steel Culvert	LENGTH (ft.)
241	Reinforced Concrete Culvert	LENGTH (ft.)
242	Timber Culvert	LENGTH (ft.)
243	Other Culvert	LENGTH (ft.)
244	Masonry Culvert	LENGTH (ft.)
245	Prestressed Concrete Culvert	LENGTH (ft.)



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## Element Level Inspections

### Element Level Terms: National Bridge Elements – NBEs

Bearings (NBEs)		
El. No.	Element Name	Units
310	Elastomeric Bearing	EACH
311	Movable Bearing	EACH
312	Enclosed/Concealed Bearing	EACH
313	Fixed Bearing	EACH
314	Pot Bearing	EACH
315	Disk Bearing	EACH
316	Other Bearing	EACH



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## Element Level Inspections

### Element Level Terms: National Bridge Elements – NBEs

Bridge Railings (NBEs)		
El. No.	Element Name	Units
330	Metal Bridge Railing	LENGTH (ft.)
331	Reinforced Concrete Bridge Railing	LENGTH (ft.)
332	Timber Bridge Railing	LENGTH (ft.)
333	Other Bridge Railing	LENGTH (ft.)
334	Masonry Bridge Railing	LENGTH (ft.)



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## Element Level Inspections

### Element Level Terms:

#### Elements – Bridge Management Elements – BMEs

- Elements including joints, approach slabs, wearing surface & protective systems
- These elements are typically managed by owning agencies using their Bridge Management Systems
- FHWA collects data for BMEs for joints, wearing surfaces and protective coatings

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## Element Level Inspections

### Element Level Terms: Bridge Management Elements – BMEs

Joints (BMEs)		
El. No.	Element Name	Units
300	Strip Seal Expansion Joint	LENGTH (ft.)
301	Pourable Joint Seal	LENGTH (ft.)
302	Compression Joint Seal	LENGTH (ft.)
303	Assembly Joint with Seal	LENGTH (ft.)
304	Open Expansion Joint	LENGTH (ft.)
305	Assembly Joint without Seal	LENGTH (ft.)
306	Other Joint	LENGTH (ft.)



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## Element Level Inspections

### Element Level Terms: Bridge Management Elements – BMEs

Approach Slabs (BMEs)		
El. No.	Element Name	Units
320	Prestressed Concrete Approach Slab	AREA (sq. ft.)
321	Reinforced Concrete Approach Slab	AREA (sq. ft.)



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## Element Level Inspections

### Element Level Terms: Bridge Management Elements – BMEs

Wearing Surface and Protective Systems (BMEs)		
El. No.	Element Name	Units
510	Wearing Surfaces	AREA (sq. ft.)
515	Steel Protective Coating	AREA (sq. ft.)
520	Concrete Reinforcing Steel Protective System	AREA (sq. ft.)
521	Concrete Protective Coating	AREA (sq. ft.)



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## Element Level Inspections

### Element Level Terms:

#### Elements – Agency Developed Elements – ADEs

- ADEs can be sub elements of NBEs or BMEs an agency wants to track more closely
- May be an independent agency defined element without ties to the AASHTO developed elements
- See IDOT Bridge Element Inspection Manual

D-17

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## Element Level Inspections

### Element Level Terms: Condition State and Defects

AASHTO NBEs and BMEs have 4 defined Condition States that address the severity of deterioration/damage

#### General Condition State descriptions:

- CS 1 – Good Condition
- CS 2 – Fair Condition
- CS 3 – Poor Condition
- CS 4 – Severe Condition (load capacity implications)

Element quantities are distributed to one or more of these condition states depending on the condition of the element

D-18

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## Element Level Inspections

### Element Level Terms: Condition State and Defects

#### EXAMPLE

Example data collected by agency using ADE-NBE

Element	Total Qty	Units	CS 1 Qty	CS 2 Qty	CS 3 Qty	CS 4 Qty
107 - Steel Open Girder/Beam	800	ft.	400	400	0	0
807 - Steel Open Girder/Beam, Ends	200	ft.	0	160	40	0

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## Element Level Inspections

### REFERENCES:

AASHTO Manual for Bridge Element Inspection

IDOT Bridge Element Inspection Manual

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DISCUSSION

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# PERSONNEL QUALIFICATIONS & DUTIES

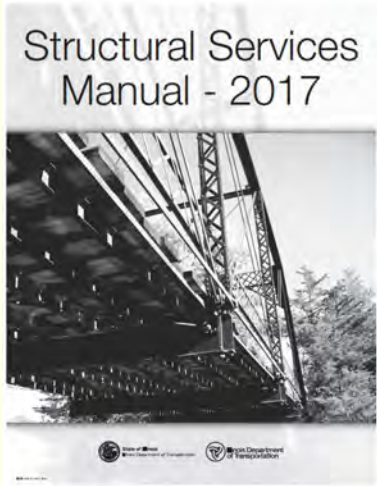
3/7/2024 IL NBI Refresher Course 2024

1

## Personnel Qualifications & Duties

**General:**

- Chapter 3.9 of the IDOT Structural Services Manual – “Quality Control and Quality Assurance”
- Provides policy guidance for bridge inspectors in IL.
- Provides detailed requirements for bridge inspection personnel qualification
- FHWA guidelines available in NBIS



3/7/2024 C-2

2

## Personnel Qualifications & Duties

### Bridge Inspector Qualification Training:

- Federal regulations require all personnel, including registered/licensed professional or structural engineers, managing bridge inspection programs or directing inspections in the field, to have successfully completed an FHWA approved bridge inspection training course.
  - NHI course "Safety Inspection of In-Service Bridges" (FHWA-NHI-130055), 2 weeks for all non-licensed engineers
  - NHI course "Safety Inspection of In-Service Bridges For Professional Engineers" (FHWA-NHI-130056), 1 week for all licensed professional/structural engineers
  - Both classes have prerequisite training requirements required before taking
- Team Leaders & Program Managers previously "grandfathered in" from requiring one of these courses must now take one of these courses per the FHWA to be qualified as a TL or PM.

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C-3

3

## Personnel Qualifications & Duties

### Bridge Inspector Qualification Training Definitions:

- **Bridge Inspection Experience**: Active participation in bridge inspections in accordance with the NBIS, in either a field inspection, supervisory, or management role. A combination of bridge design, bridge maintenance, bridge construction and bridge inspection experience, with the predominate amount in bridge inspection, is acceptable.
- **Desired Minimum Bridge Inspection Experience Level**: The predominate amount, or more than 50%, should come from NBIS bridge safety inspection experience. Other experience in bridge design, maintenance, or construction may be used to provide the additional required experience.
- **Engineering Personnel** are individuals who have received a bachelor's degree or higher in engineering from a program accredited by ABET but are not licensed in Illinois as Professional Engineers.

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C-4

4

## Personnel Qualifications & Duties

### **Bridge Inspector Team Leader Qualification Requirements (IL):**

- Structural & Professional Engineers as Team Leaders:
  - Successfully complete either **FHWA-NHI-130055** or **FHWA-NHI-130056**
  - Have 6 months of bridge inspection experience (active participation in inspections)
- Engineering Personnel as Team Leaders:
  - Successfully complete **FHWA-NHI-130055**
  - Personnel with EIT (Type 1) – 2 yrs bridge related experience & 12 mo NBIS inspection experience
  - Personnel without EIT (Type 2) – 4 yrs bridge related experience & 24 mo NBIS inspection experience
- Complete and submit IDOT Form BBS 2620 “Team Leader Qualifications” to be considered for IDOT qualification as a Team Leader

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3/7/2024

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## Personnel Qualifications & Duties

### **Bridge Inspector Team Leader Qualification Requirements (IL):**

- Technical Personnel as Team Leaders:
  - Successfully complete **FHWA-NHI-130055**
  - Personnel who have an associate’s degree in engineering or engineering technology from a college or university accredited by ABET, 4 yrs bridge related experience & 24 mo NBIS inspection experience
  - Personnel who have not received education/training resulting in a bachelor’s degree in engineering, an associate’s degree related to engineering, 5 yrs bridge related experience & 30 mo NBIS inspection experience
- Complete and submit IDOT Form BBS 2620 “Team Leader Qualifications” to be considered for IDOT qualification as a Team Leader

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## Personnel Qualifications & Duties

### **Bridge Program Manager Qualification Requirements (IL):**

- Successfully complete either **FHWA-NHI-130055** or **FHWA-NHI-130056**
- Be licensed as a Professional or Structural Engineer & have 6 months of bridge inspection experience (active participation in inspections) (**as of JUL 2023, new PMs only**)
- **Or** have 10 yrs of Routine Inspection Experience
- Complete and submit IDOT Form BBS 2610 "Program Manager Qualifications" to be considered for IDOT qualification as a Program Manager



C-7

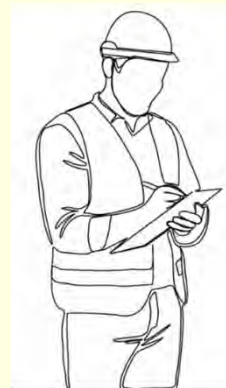
3/7/2024

7

## Personnel Qualifications & Duties

### **Element Level Inspector Qualification Requirements (IL):**

- Program Managers
  - Meet the qualification requirements for Program Manager
  - Successfully complete the IDOT Bridge Element Inspection Class
- Team Leaders
  - Meet the qualification requirements for Team Leader
  - Successfully complete the IDOT Bridge Element Inspection Class



C-8

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8

## Personnel Qualifications & Duties

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**Fracture Critical or NSTM Inspector Qualification Requirements (IL):**

- Program Managers
  - Meet the qualification requirements for Program Manager
  - Successfully complete the **FHWA NHI 130078** “Fracture Critical Inspection Techniques for Steel Bridges” 3.5 day class
- Team Leaders
  - Meet the qualification requirements for Team Leader
  - Successfully complete the **FHWA NHI 130078** “Fracture Critical Inspection Techniques for Steel Bridges” 3.5 day class
- This training requirement must be met for all PMs and TLs completing Fracture Critical NBIS inspections by **1/1/2024**

C-9

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9

## Personnel Qualifications & Duties

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**Underwater Inspector Qualification Requirements (IL):**

- Team Leaders & Dive Team Members
  - Successfully complete the **FHWA NHI 130091** “Underwater Bridge Inspection” class.
  - Divers must meet this requirement by **June 6, 2024** in IL.



C-10

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## Personnel Qualifications & Duties

### **Bridge Inspector Team Leader Duties:**

- Ensure inspections are completing in according with NBIS
- Ensure bridge files are maintained in accordance with IDOT policy
- Ensure structures are secured for the safety of the traveling public in a timely manner following a new or more serious Critical Finding
- Assists program managers in oversight of all NBIS activities



C-11

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## Personnel Qualifications & Duties

### **Bridge Program Manager Duties:**

- Manages the NBIS activities for all staff & structures under their jurisdiction
- Ensure inspections are completed on time
- Ensure inspectors are completing inspections in according with NBIS
- Ensure structures are posted/emergency repairs in a timely manner
- Ensure bridge files are maintained in accordance with policy
- Perform QC/QA on inspection staff
- Assists higher level state program managers in oversight of all NBIS activities

C-12

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## Personnel Qualifications & Duties

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**Bridge Inspector QA/QC Requirements (IL):**

- Program Managers must conduct in-depth reviews of field procedures of all Team Leaders functioning under their supervision to ensure that inspections are being performed correctly.
- Every 24 months Program Managers should accompany each Team Leader to observe the performance of NBIS bridge inspections on at least 3 structures over the course of a 30 day period. Program Managers are required to complete IDOT Form BBS 2790, "Bridge Inspection Procedures Review" for each Team Leader as documentation.
- Choose inspections of different structure types and include a Fracture Critical Member Inspection if relevant.
- Program managers must also be reviewed/documentated over this same period of time and number of inspections by another PM.

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# DISCUSSION

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C-14

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## DECK CONDITION

3/7/2024

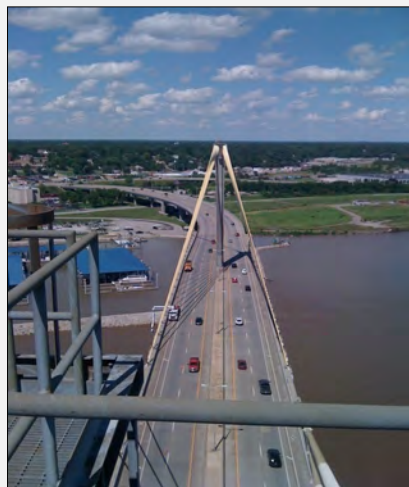
IL NBI Refresher Course 2024

1

### Item 58 – Deck Condition

#### Deck

- Component of the bridge to which the live load is directly applied and provides a riding surface for traffic
- Can be concrete, steel or timber (all covered in SIP)
- This module will focus primarily on concrete deck inspection



G-2

3/7/2024

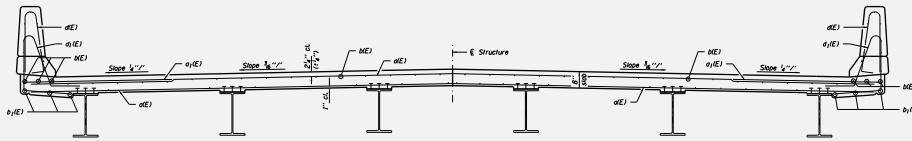
2



## Item 58 – Deck Condition

### Concrete Deck on Stringers

- May be cast in place or precast
- Primary reinforcement typically perpendicular to stringers
- Typically 6 1/2" - 9" thick



G-3

3/7/2024

3

## Item 58 – Deck Condition

### Concrete Deck on Stringers

- The condition evaluation should be primarily based on the condition of the bottom of the deck.
- The condition of the wearing surface, parapets, railings, median, sidewalks, drains, light standards and joints may be recorded on the inspection form, but their conditions should not be considered in the deck condition rating.
- On bridges where the deck is integral with the superstructure, the superstructure rating may be affected by the deck rating. However, the deck rating will not be affected by the superstructure rating except for slab & PPC deck beam bridges.



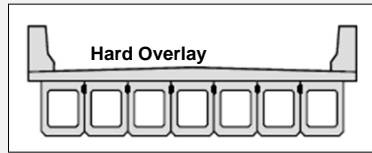
G-4

3/7/2024

4

## Item 58 – Deck Condition

- **PPC Deck Beam (with no or flexible wearing surface (WS))**  
For deck beam bridges, the deck condition rating shall be rated the same as the Superstructure (Item 59) using the Superstructure criteria
- **PPC Deck Beam (w/rigid WS)**
  - 4" (min.) reinforced concrete overlay
  - The overlay is rated as the Deck (Item 58) and may have a different rating than the Superstructure



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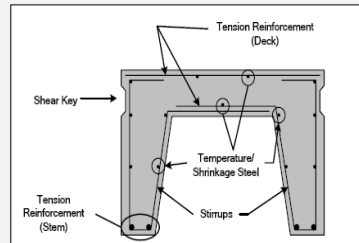
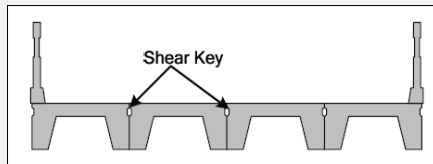
G-5

5

## Item 58 – Deck Condition

### PC Channel Beams

- Found on spans up to 50 feet
- Generally precast
- Mildly reinforced deck cast monolithically with two stems
- Top section of the beam is rated as the deck - do not include stem condition



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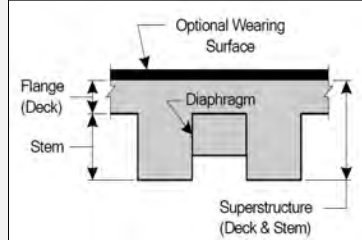
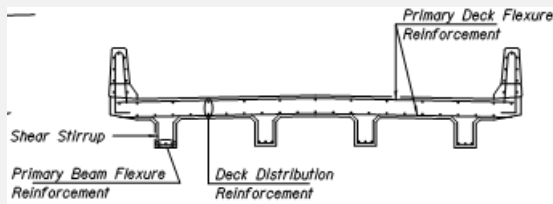
G-6

6

## Item 58 – Deck Condition

### T-Beams

- Built during the 1930's - 1950's
- Generally cast-in-place monolithic concrete deck and stem forming a letter "T"
- Top section of the beam is rated as the deck - do not include stem condition



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7

## Item 58 – Deck Condition

Code	Description
N	Not Applicable

Concrete Culverts, 3-Sided Precast Concrete & Metal Pipes/Arches are coded "N-Not Applicable" for Deck



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8

## Item 108 - Wearing Surface / Protective System

- **Total Deck vs. Deck Structure Thickness**
- **Item 108A-C:**
  - **108A – Type of Wearing Surface**
  - **108B – Type of Membrane**
  - **108C – Deck Protection**

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## Item 108 - Wearing Surface / Protective System

Code	Item 108A – Type of Wearing Surface: Description
A	Bare Deck - No Overlay
B	Additional Concrete Overlay - not a special mix
C	Latex Modified Concrete Overlay
D	Low Slump Concrete Overlay
E	Plasticized Dense Concrete Overlay
F	Micro Silica Concrete Overlay
G	Bituminous Overlay
H	Asbestos Asphalt Overlay
I	Asphalt Block
J	Timber or Timber Runners
K	Gravel - Macadam (Oil & Chip)
L	Other
M	Epoxy Overlay
P	Grating
Q	High Reactivity Metakaolin Concrete
R	Additional Concrete Overlay - Reinforced
S	Ground Granulated Blast-Furnace Slag Concrete Overlay
T	Fly Ash Concrete Overlay
N	Not Applicable (applies only to structures with no deck)

G-10

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## Item 108 - Wearing Surface / Protective System

### Item 108B - Type of Membrane

Code	Description
A	Waterproofing Membrane System
B	Other Preformed Fabric System
C	Epoxy
D	Unknown
E	Other
F	None
G	Waterproofing Membrane for Railroad Structures (Section 580)
H	Asbestos Waterproofing Membrane System
I	Spray Applied Waterproofing Membrane
J	Sheet Waterproofing Membrane
N	Not Applicable (applies only to structures with no deck)

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## Item 108 - Wearing Surface / Protective System

### Item 108C – Deck Protection

Code	Description
A	Epoxy Coated Reinforcing
B	Galvanized Reinforcing
C	Other Coated Reinforcing
D	Cathodic Protection
F	Polymer Impregnated Concrete
G	Internally Sealed Concrete
H	Unknown
I	Other
J	None
N	Not Applicable (applies only to structures with no deck)

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12

### Item 58 – Deck Condition – Key Indicators

Code	Description
8	VERY GOOD. Transverse <b>cracks</b> < 0.06” at > 15’ intervals may be present but no spalling, scaling, pop-outs or delamination.
7	GOOD. Some transverse <b>cracks</b> < 0.06” at > 5’ intervals over the majority of the deck, light <b>scaling</b> (less than 1/4” depth) or pop-outs may be present, no spalling.
6	SATISFACTORY. <ul style="list-style-type: none"> <li>• Transverse <b>cracks</b> &lt; 0.06” at &lt; 5’ or &gt; 0.06” at &gt; 5’ intervals over a majority of the deck,</li> <li>• isolated longitudinal <b>cracks</b>, <b>spalls</b> and <b>delaminations</b> may be present on up to 5% of the deck riding surface or soffit area,</li> <li>• up to 10% of the deck soffit may be <b>spalled</b>, <b>delaminated</b>, and <b>map cracked</b>.</li> </ul>
5	FAIR. <ul style="list-style-type: none"> <li>• Transverse <b>cracks</b> &gt; 0.06” at &lt; 5’ intervals with or without leaching in the majority of the deck,</li> <li>• longitudinal <b>cracks</b> &lt; 0.06” in majority of deck,</li> <li>• <b>spalls</b> and <b>delaminations</b> may be present on up to 10% of the deck surface or soffit area,</li> <li>• up to 25% of the deck surface or soffit may be <b>spalled</b>, <b>delaminated</b> and <b>map cracked</b>,</li> <li>• up to 10% <b>loss of primary reinforcement</b> in any <b>6’ bay length</b>.</li> </ul>

- **Key Indicators**
  - Cracks
  - Scaling
  - Spalls/Delams
  - Section Loss
- **Note differences between ratings**
- **Review all descriptions before deciding on a rating**

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### Item 58 – Deck Condition – Key Indicators

Code	Description
4	POOR. <ul style="list-style-type: none"> <li>• Longitudinal <b>cracks</b> &gt; 0.06” in majority of deck,</li> <li>• <b>spalls</b> and <b>delaminations</b> may be present on up to 25% of the deck surface or soffit area,</li> <li>• up to 50% of the deck surface or soffit may be <b>spalled</b>, <b>delaminated</b> and <b>map cracked</b>,</li> <li>• up to 30% <b>loss of primary reinforcement</b> in any <b>6’ bay length</b>.</li> </ul>
3	SERIOUS. Condition is similar to the description for a condition rating of “4”, though <b>more extensive</b> full depth failures are evident to the point that wheel loads may need restricted or temporary measures implemented.
2	CRITICAL. <b>Full depth failures</b> needing patching over much of the deck on a regular basis which requires special inspections to keep the bridge open, possibly with reduced load limits, temporary measures may be needed to allow continued use of the structure. The Bureau of Bridges and Structures shall be notified immediately.

- **Key Indicators**
  - Cracks
  - Scaling
  - Spalls/Delams
  - Section Loss
- **Decks must be inspected from both the top and bottom when possible**

G-14

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## Item 58 – Deck Condition

### Define what is meant by a 6' bay length and the % section loss in reinforcement?

- A 6' bay length is a 6' wide section of deck oriented perpendicular to the direction of the primary reinforcement
- The section loss in the reinforcement is measured as the % section loss over the full 6' width of the section, not the loss in individual bars

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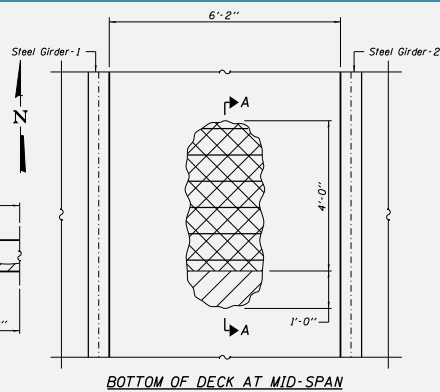
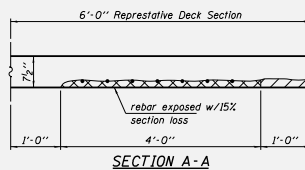
## Item 58 – Deck Condition

### Concrete Deck on Girders: (Example)

**DAMAGE SKETCH**  
 Inspected by M.D.C.  
 Date: 11/14/2011  
 S.N. 001-0002  
 IL-1000 over Main St.  
 Bottom of Deck  
 Between Girder #1 & 2

**LEGEND**

- Delamination (D)
- Spalls (S)
- Crack - Hairline unless noted otherwise
- Leaching Cracks (L)



- INSPECTION NOTES**
1. 23% of the deck surface is delaminated or spalled.
  2. 16% of the deck soffit is delaminated or spalled.
  3. Leaching Map cracks are present over 10% of the deck soffit.
  4. The largest area of deck damage is detailed above.
  5. Note the rebar measurements have previously been taken and converted to X SL for the purpose of this problem.

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## Item 58 – Deck Condition

### Concrete Deck on Girders: (Example)

- Based on information from the Damage Sketch, we need to investigate damage to three elements of the deck:
  - Concrete Deterioration on the Deck Surface
  - Concrete Deterioration on the Deck Soffit
  - Longitudinal Reinforcement SL at Section A-A

#### Calculate the Concrete Deterioration to the Deck Surface:

- The “Inspection Notes” on the sketch indicate 23% of the deck surface was delaminated or spalled.

#### Calculate the Concrete Deterioration to the Deck Soffit:

- The “Inspection Notes” on the sketch indicate 16% of the deck soffit was delaminated or spalled and 10% of the soffit has leaching map cracks,  $16 + 10 = 26\%$

G-17

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## Item 58 – Deck Condition

### Concrete Deck on Girders: (Example)

#### Calculate the Section Loss (SL) in the Rebar at Section A-A:

- The SL in the flexure reinforcement is calculated for the primary rebars running longitudinally from beam to beam (perpendicular to beams).
- For concrete deck and slab structures, a 6' wide (bay length) representative section will be analyzed. The section reviewed should be perpendicular to the direction of the primary reinforcement and at the most heavily deteriorated location, Section A-A in this case.
- The 6' wide section represents the area a wheel load would be roughly distributed over on the deck or slab.

G-18

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## Item 58 – Deck Condition

### Concrete Deck on Girders: (Example)

- Determine the SL % over the 6' wide (bay length) section:
  - The inspector has determined the exposed rebars have 15% SL (by unseen calculation) over the 4.0' of spalled area of deck.
  - 1.0' of the deck adjacent to the spall is delaminated and is assumed to be in similar condition to the spalled area.
  - An additional 1.0' of undamaged deck must be included to reach the 6' width required for the calculation.
- From the above discussion a 4' + 1' = 5' section of the deck will be considered as having 15% SL. The remaining 1' undamaged section will be considered as having 0% SL.

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G-19

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## Item 58 – Deck Condition

### Concrete Deck on Girders: (Example)

- $\%SL = [(original\ area - current\ area) / original\ area] \times 100\%$
- $\%SL = \{[(6' \times 100\%) - (5' \times 85\% + 1' \times 100\%)] / (6' \times 100\%)\} \times 100$   
 $= [(600 - 525) / 600] \times 100$   
 $= \underline{12.5\% \text{ steel SL}}$  for the rebar over the 6' width (bay length)
- Deck Deterioration Summary for Example:
  - Concrete Deterioration to the Deck Surface = 23%
  - Concrete Deterioration to the Deck Soffit = 26%
  - Longitudinal Rebar SL over 6' Section = 12.5%

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G-20

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## Item 58 – Deck Condition

### Concrete Deck on Girders: (Example)

- Determine the correct NBI condition rating for the deck based on the Damage Sketch and the calculated results using the IDOT SIP Manual. Refer to Item # 58, Deck Condition – Concrete Bridge Decks.
- Using 23% delaminated & spalled area on the deck surface you get a rating of “4” for damage  $\leq$  25% of the deck surface area.
- Using 26.0% delaminated, spalled or map cracked area on the deck soffit, you get a rating of “4” for damage  $\leq$  50% of soffit delaminations, spalls and map cracks.
- Using SL of 12.5% on the primary rebar over the 6’ representative width (bay length) in the deck you get a rating of “4” for steel SL  $>$  10% and  $\leq$  30% in the primary reinforcement.

G-21

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## Item 58 – Deck Condition

### Concrete Deck on Girders: (Example)

- Use the lowest of the three ratings as the controlling rating for the deck. In this case all three ratings are the same.
- The deck NBI condition rating should be a “4”, POOR, based on all locations checked.

G-22


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### Item 58 – Deck Condition

**New Deck**

No problems noted



New Deck – Allowed first inspection only

G-23


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### Item 58 – Deck Condition

**Very Good Condition**

0.05” transverse cracks at 30’ intervals



VERY GOOD. Transverse **cracks** < 0.06” at > 15’ intervals may be present but no spalling, scaling, pop-outs or delamination.

G-24

3/7/2024

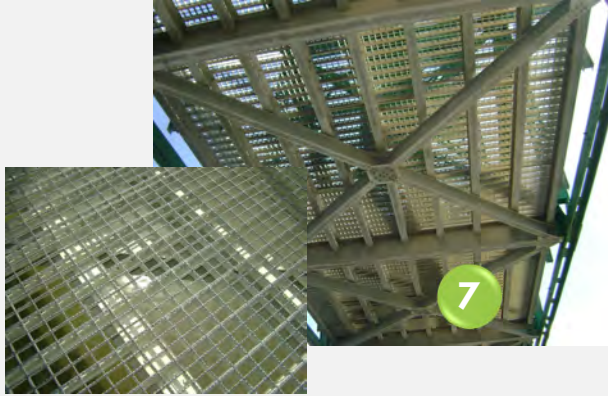
24

## Item 58 – Deck Condition

**Good Condition**

### Steel Grid Deck

Minor rusting at edges of grid  
No cracked welds noted



GOOD. Sound connections with **minor rusting**, **no cracked welds**.

G-25

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25

## Item 58 – Deck Condition

**Good Condition**

0.05” transverse cracks at 6’ intervals



GOOD. Some transverse **cracks** < 0.06” at > 5’ intervals over the majority of the deck, **light scaling** (less than 1/4” depth) or pop-outs may be present, no spalling.

G-26


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## Item 58 – Deck Condition

**Good Condition**

0.05" transverse cracks at 7'-6" intervals



GOOD. Some transverse **cracks** < 0.06" at > 5' intervals over the majority of the deck, **light scaling** (less than 1/4" depth) or pop-outs may be present, no spalling.


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G-27

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## Item 58 – Deck Condition

**Good Condition**

- RC Slab Bridge
- 0.03" longitudinal cracks at 8' intervals
- Spans longitudinally, not transversely
- **Item 58 incorrect!!**
- Rate Deck same as the Super **based on Item 59**



- **Use Item-59 (Reinforced Concrete Superstructure) not Item-58**
- GOOD. Isolated non-structural cracks up to 0.03", minor pop-outs or spalls without exposed primary reinforcing steel, stirrups may be exposed in a few locations.

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G-28

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## Item 58 – Deck Condition

### Satisfactory Condition

- 0.05” transverse cracks at 3’ intervals
- Spalls and delamination on 4% of deck surface



SATISFACTORY. **Transverse cracks** < 0.06” at < 5’ or > 0.06” at > 5’ intervals over a majority of the deck, isolated longitudinal cracks, **spalls and delaminations** may be present on up to 5% of the deck riding surface or soffit area, up to 10% of the deck soffit may be spalled, delaminated, and map cracked.

G-29

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## Item 58 – Deck Condition

### Satisfactory Condition

- 0.07” transverse cracks at 10’ intervals
- Spalls and delamination on 4% of deck surface
- Spalls & delaminations are the primary difference between “7” and “6” ratings



SATISFACTORY. **Transverse cracks** < 0.06” at < 5’ or > 0.06” at > 5’ intervals over a majority of the deck, isolated longitudinal cracks, **spalls and delaminations** may be present on up to 5% of the deck riding surface or soffit area, up to 10% of the deck soffit may be spalled, delaminated, and map cracked.

G-30

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## Item 58 – Deck Condition

### Satisfactory Condition

#### Timber Deck

- Minor # of planks rotted and need replaced
- Numerous small wet areas



- **SATISFACTORY.** A **minor number of rotted or crushed planks in need of replacement**, many planks cracked or split, many loose planks, fire damage limited to surface scorching with insignificant section loss, **some wet areas** noted.

G-31

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## Item 58 – Deck Condition

### Fair Condition

- 0.05" transverse cracks at 4' intervals
- 0.03" longitudinal cracks present
- Spalls and delamination present on 8% of concrete deck surface
- Do not use condition of overlay for Deck rating



- **FAIR.** **Transverse cracks** > 0.06" at < 5' intervals with or without leaching in the majority of the deck, **longitudinal cracks** < 0.06" in majority of deck, **spalls and delaminations** may be present on up to 10% of the deck surface or soffit area, up to 25% of the deck surface or soffit may be spalled, delaminated and map cracked, up to 10% loss of primary reinforcement in any 6' bay length.

G-32

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## Item 58 – Deck Condition

### Fair Condition

- Transverse and longitudinal cracks < 0.06" present over most of the deck
- Minor spalls, delamination, and map cracking present on 20% of deck soffit
- 8% of deck soffit is spalled & delaminated
- Larger areas of longitudinal cracks are the primary difference between "6" and "5" ratings



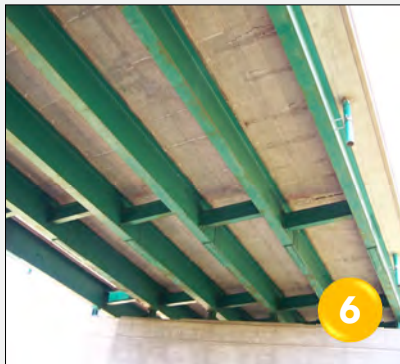
**FAIR.** Transverse cracks > 0.06" at < 5' intervals with or without leaching in the majority of the deck, longitudinal cracks < 0.06" in majority of deck, spalls and delaminations may be present on up to 10% of the deck surface or soffit area, up to 25% of the deck surface or soffit may be spalled, delaminated and map cracked, up to 10% loss of primary reinforcement in any 6' bay length.

G-33

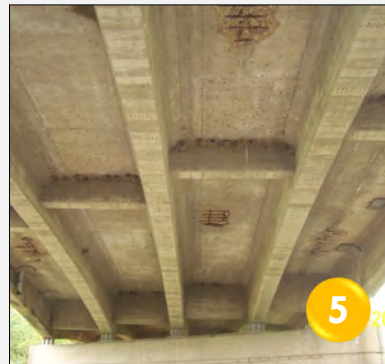
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## Item 58 – Deck Condition



**Satisfactory:** 0.03" transverse cracks at 3' intervals. Minor spalls, delamination, and map cracking present for less than 10% of deck



**Fair:** 0.03" transverse cracks at 4' intervals. 0.05" longitudinal cracks present with delams, spalls & map cracking over 15% of the deck soffit

G-34

3/7/2024

34



## Item 58 – Deck Condition

### Poor Condition

- 0.03” transverse cracks at 3’ intervals
- Spalls & delaminations present on 23% of the deck surface and longitudinal cracks over the majority of the deck



POOR. Longitudinal cracks > 0.06” in majority of deck, spalls and delaminations may be present on up to 25% of the deck surface or soffit area, up to 50% of the deck surface or soffit may be spalled, delaminated and map cracked, up to 30% loss of primary reinforcement in any 6’ bay length.

G-35

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## Item 58 – Deck Condition

### Poor Condition

- Spalls, delamination, and map cracks present on 35% of the deck soffit
- 20% loss of primary reinforcement in the outside bay



POOR. Longitudinal cracks > 0.06” in majority of deck, spalls and delaminations may be present on up to 25% of the deck surface or soffit area, up to 50% of the deck surface or soffit may be spalled, delaminated and map cracked, up to 30% loss of primary reinforcement in any 6’ bay length.

G-36

3/7/2024

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## Item 58 – Deck Condition

### Poor Condition

- Transverse and longitudinal cracks with leaching are present
- Spalls, delaminations, and map cracking present on 40% of deck soffit
- 22% of deck soffit is spalled and delaminated



**POOR.** Longitudinal cracks > 0.06" in majority of deck, spalls and delaminations may be present on up to 25% of the deck surface or soffit area, up to 50% of the deck surface or soffit may be spalled, delaminated and map cracked, up to 30% loss of primary reinforcement in any 6' bay length.

G-37

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## Item 58 – Deck Condition

### Serious Condition

- Spalls, delaminations, and cracks present on 54% of the deck soffit
- Bituminous patches present on 51% of the deck surface



**SERIOUS.** Condition is similar to the description for a condition rating of "4", though more extensive full depth failures are evident to the point that wheel loads may need restricted or temporary measures implemented.

G-38

3/7/2024

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## Item 58 – Deck Condition

### Serious Condition

- Spalls, delaminations, and cracking are present on 53% of the deck soffit
- 45% loss of reinforcement present in the wheel line



**SERIOUS.** Condition is **similar to** the description for a condition rating of “4”, though **more extensive** full depth failures are evident to the point that wheel loads may need restricted or temporary measures implemented.

G-39

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39

## Item 58 – Deck Condition

### Critical Condition

- 3' long full-depth deck failure present
- Map cracking is present throughout the deck



**CRITICAL.** **Full depth failures** needing patching over much of the deck on a regular basis which requires special inspections to keep the bridge open, possibly with reduced load limits, **temporary measures may be needed to allow continued use of the structure.** The Bureau of Bridges and Structures shall be notified immediately.

G-40

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## Item 58 – Deck Condition

### Critical Condition

- 4' long full-depth deck failure present
- Map cracking is present throughout the deck



**CRITICAL.** Full depth failures needing patching over much of the deck on a regular basis which requires special inspections to keep the bridge open, possibly with reduced load limits, temporary measures may be needed to allow continued use of the structure. The Bureau of Bridges and Structures shall be notified immediately.

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## Item 58 – Deck Condition

### Major Learning Points for Deck Condition Rating:

- Document crack size, spacing and orientation
- Document area of spalls, delaminations and map cracking
- Document % SL on reinforcement in 6' width (bay length)
- Refer to SIP Manual to select correct rating

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# TRAFFIC SAFETY FEATURES

3/7/2024 IL NBI Refresher Course 2024

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## Traffic Safety Features - Item 36

**IDOT ISIS Manual Item 36:**

- **Item 36A Bridge Railings**
- **Item 36B-D Approach Railing Appraisal**
  - 36B – Transitions
  - 36C – Approach Guardrail
  - 36D – Approach Guardrail Ends

3/7/2024 D-2

2

## Traffic Safety Features - Item 36

### Item 36A Bridge Railings:

- The bridge rail is to be evaluated for its adequacy in relation to current safety standards for the highway facility carried by the structure.
- Railings should be capable of retaining and smoothly redirecting an errant vehicle. Bridge railings that have been successfully crash tested for the highway being served are considered adequate.
- The standards for crash testing are published in the National Cooperative Highway Research Program (NCHRP) Report 350 published by the Transportation Research Board (TRB)
- Crash Tested Rails are required for all bridges on NHS routes. They are also required on non-NHS routes except in the following cases:
  - Current ADT < 1,000
  - Bridges in urban areas with posted speed limit < 40 mph and the roadway cross section is a curb and gutter or having a non-mountable curb between the roadway and bridge rail.

D-3

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3

## Traffic Safety Features - Item 36

### Item 36A Bridge Railings (con't):

- When a crash tested rail is not required, it must meet the design requirements of the current AASHTO Standard Specifications for Highway Bridges. All current IDOT standard bridge railings meet this criteria.
- The criteria for appraising a crash tested rail with regard to the speed limit of the roadway is:

Crash Testing Criteria	
Crash Testing Level	Maximum Speed
TL1	30 mph
TL2	40 mph
TL3 – TL6	65 mph

- When appraising bridge rails use the following codes:

Code	Description
N	Not applicable or safety feature not required
1	No bridge railing
2	Bridge railing does not meet currently acceptable standards
3	Bridge railing meets currently acceptable standards

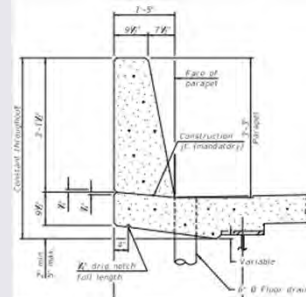
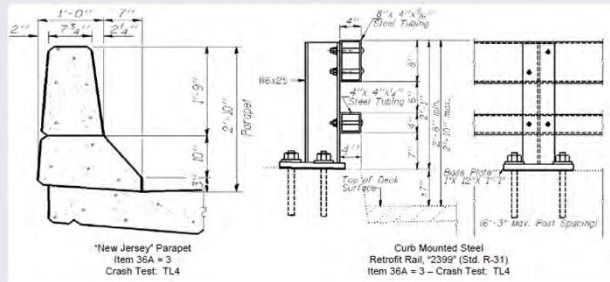
D-4

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4

# Traffic Safety Features - Item 36

## Item 36A Bridge Railings Examples – Crash Tested TL4:



The IDOT ISIS Manual needs to be updated regarding rail types, crash testing and coding.

New Constant Slope Parapet

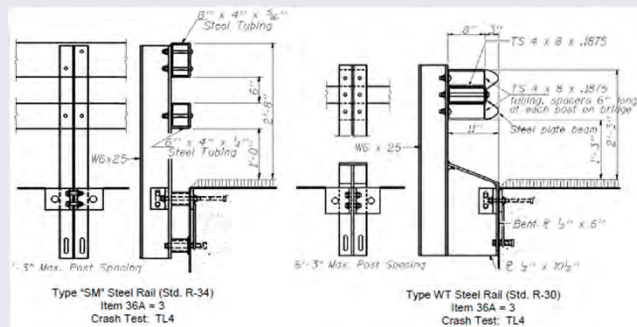
D-5

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# Traffic Safety Features - Item 36

## Item 36A Bridge Railings Examples – Crash Tested TL4:



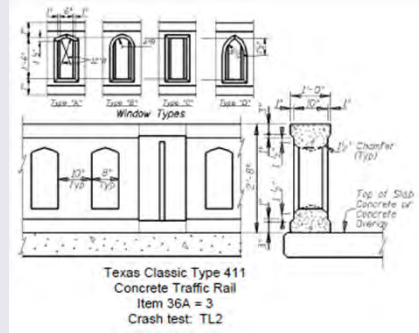
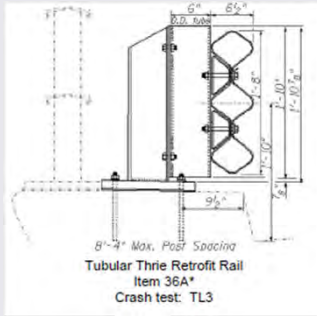
D-6

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## Traffic Safety Features - Item 36

### Item 36A Bridge Railings Examples – Crash Tested TL3 or 2:



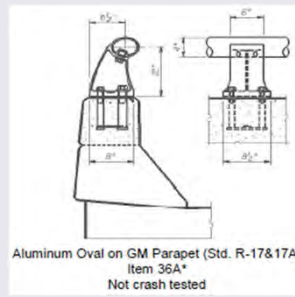
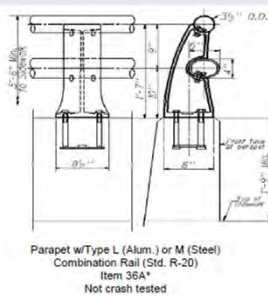
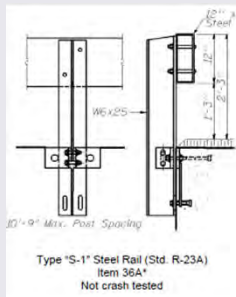
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## Traffic Safety Features - Item 36

### Item 36A Bridge Railings Examples – Not Crash Tested:



NOTE: \* Code Item 36A as "2" for bridges where current design specifications require a crash tested rail. Code as "3" when crash tested Rail is not required. (See "Item Description")

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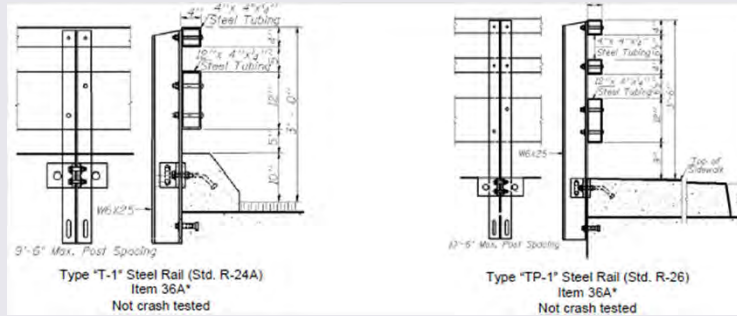
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# Traffic Safety Features - Item 36

## Item 36A Bridge Railings Examples – Not Crash Tested:



NOTE: \* Code Item 36A as "2" for bridges where current design specifications require a crash tested rail. Code as "3" when crash tested Rail is not required. (See "Item Description")

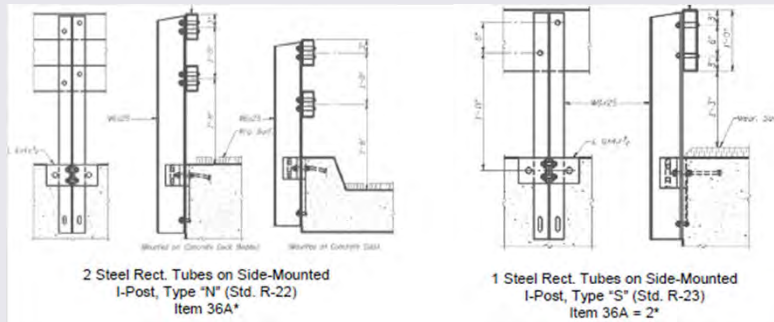
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# Traffic Safety Features - Item 36

## Item 36A Bridge Railings Examples – Not Crash Tested:



NOTE: \* Code Item 36A as "2" for bridges where current design specifications require a crash tested rail. Code as "3" when crash tested Rail is not required. (See "Item Description")

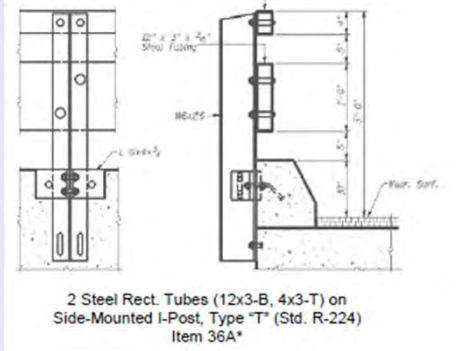
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# Traffic Safety Features - Item 36

## Item 36A Bridge Railings Examples – Not Crash Tested:



NOTE: \* Code Item 36A as "2" for bridges where current design specifications require a crash tested rail. Code as "3" when crash tested Rail is not required. (See "Item Description")

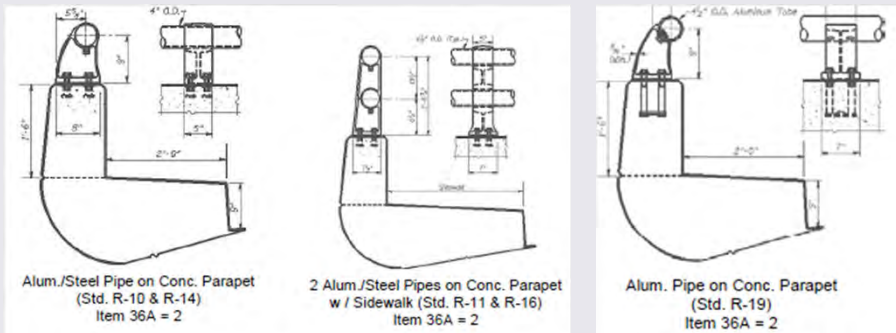
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# Traffic Safety Features - Item 36

## Item 36A Bridge Railings Examples – Not Crash Tested:



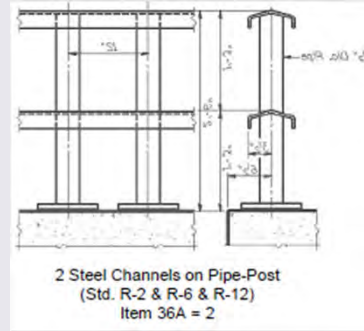
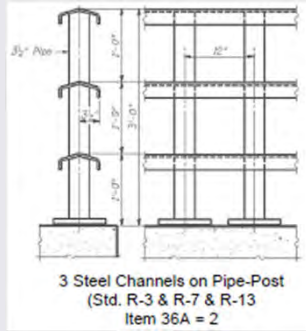
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## Traffic Safety Features - Item 36

### Item 36A Bridge Railings Examples – Not Crash Tested:



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## Traffic Safety Features - Item 36

### Item 36B Guard Rail Transitions:

- The bridge approach guardrail is to be evaluated for its ability to safely redirect errant vehicles.
- The transition from approach guardrail to bridge railing requires the approach guardrail be firmly attached to the bridge railing.
- It also requires the approach guardrail be gradually stiffened as it comes closer to the bridge rail. The ends of curbs and safety walks need to be gradually tapered out or shielded if present.
- When appraising this item use the following codes:

Code	Description
N	Not applicable or safety feature not required
1	No guardrail
2	Guardrail does not meet currently acceptable IDOT standards
3	Guardrail meets currently acceptable IDOT standards

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## Traffic Safety Features - Item 36

### Item 36B Transitions:

- Transition from approach guardrail to bridge railing is firmly attached to the bridge railing
- Approach guardrail is gradually stiffened as it comes closer to the bridge rail. The ends of curbs and safety walks are gradually tapered out or shielded.



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## Traffic Safety Features - Item 36

### Item 36C Approach Guardrail:

- The structural adequacy and compatibility of approach guardrail with transition designs should be evaluated.
- An approach guardrail with adequate length and structural qualities to shield motorists from the hazards at the bridge site must be present if needed
- In addition to being capable of safely redirecting an impacting vehicle, the approach guardrail must also facilitate a transition to the bridge railing that will not cause snagging or pocketing of an impacting vehicle
- When appraising this item use the following codes:

Code	Description
N	Not applicable or safety feature not required
1	No guardrail
2	Guardrail does not meet currently acceptable IDOT standards
3	Guardrail meets currently acceptable IDOT standards

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## Traffic Safety Features - Item 36

### Item 36C Approach Guardrail:

- Approach guardrail with adequate length and structural qualities to shield motorists from the hazards at the bridge
- Capable of safely redirecting an impacting vehicle, the approach guardrail also facilitates a transition to the bridge railing that will not cause snagging



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## Traffic Safety Features - Item 36

### Item 36D Approach Guardrail Ends:

- The ends of approach guardrails to bridges should be flared, buried, made breakaway or shielded
- Collision damage or deterioration of the elements are not considered when coding items 36B-D
- Acceptable guardrail design details and criteria are available at:
  - IDOT Highway Standards Manual
  - AASHTO Guide for Selecting, Locating and Designing Traffic Barriers
  - AASHTO Roadside Design Guide
- When appraising this item use the following codes:

Code	Description
N	Not applicable or safety feature not required
1	No guardrail
2	Guardrail does not meet currently acceptable IDOT standards
3	Guardrail meets currently acceptable IDOT standards

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## Traffic Safety Features - Item 36

### Item 36D Approach Guardrail Ends:

- The ends of approach guardrails to bridges are flared, buried, made breakaway or shielded



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## DISCUSSION

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