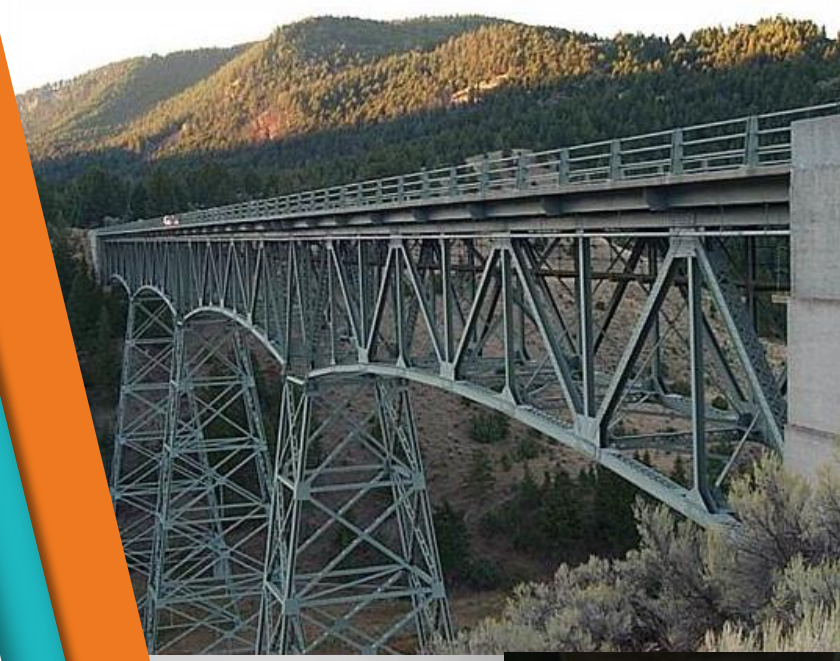
U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure



2023 Territorial Peer Exchange

Bridge Safety Discussion

Samantha Lubkin
Bert Buchanan

January 25, 2023

Disclaimer

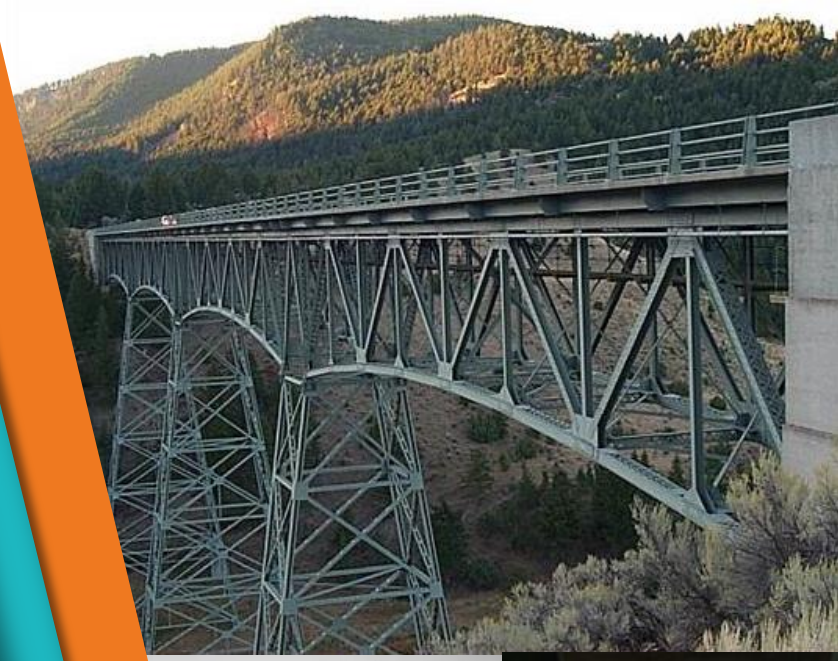
Except for any statutes or regulations cited, the contents of this presentation do not have the force and effect of law and are not meant to bind the public in any way. This presentation is intended only to provide clarity to the public regarding existing requirements under the law or agency policies. While this presentation contains nonbinding technical information, you must comply with the applicable statutes and regulations.

FHWA is the source for all images in this presentation.

Presentation Outline

- Bridge Inspection Basics
- Understanding Bridge Data and the Inspection Report
- When to Close a Bridge
- Load Rating and Posting

U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure



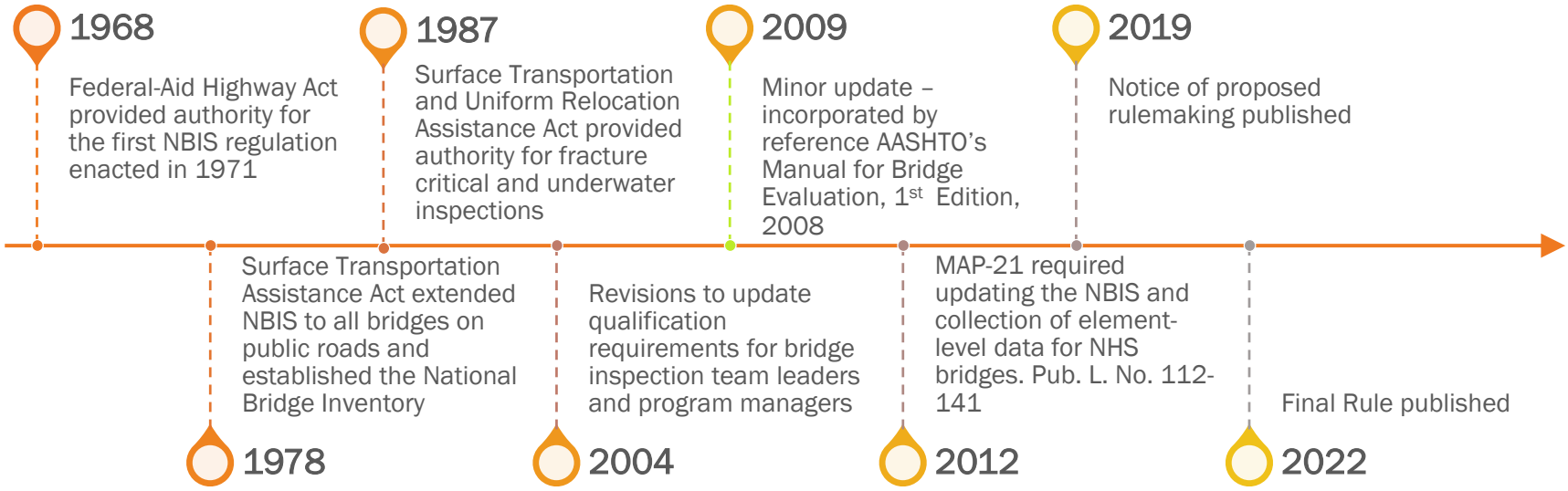
Overview of Bridge Inspection

The Basics

Bridge Inspection Basics

- Cyclical inspection of in-service bridges
- Documents changes in condition
- Identifies maintenance needs
- Provides info to manage program
- Ensures **safety** for the travelling public

Major Milestones of the NBIS



23 CFR 650 Subpart C
National Bridge Inspection Standards

- The NBIS defines the minimum requirements
  - Purpose
  - Applicability
  - Definitions
  - Bridge Inspection Organization Responsibilities
  - Qualifications of Personnel
  - Inspection Interval
  - Inspection Procedures
  - Inventory
  - Incorporation by Reference

Bridge Inspection Basics

National Bridge Inspection Standards - YouTube

https://www.fhwa.dot.gov/federal-aidessentials/

U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure

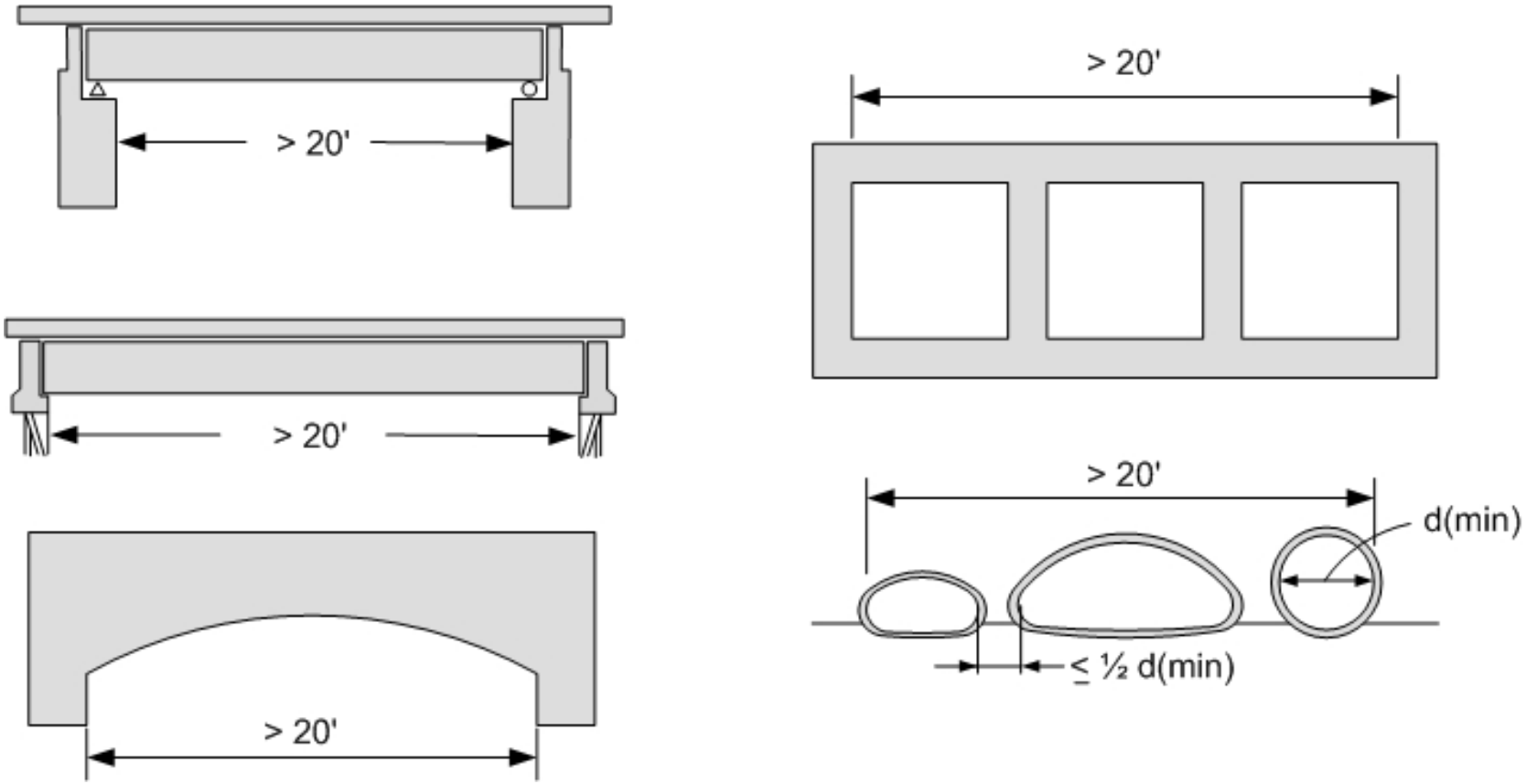
Inspection Reports

How to Read Them

Basic Bridge Terminology

- Bridge – A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it includes multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening (23 CFR 650.305).
- Must be on a public road with portions open to traffic (23 CFR 650.303).

Basic Bridge Terminology



U.S. Department of Transportation
Federal Highway Administration

Image from FHWA's *Bridge Inspector's Reference Manual*

Basic Bridge Terminology

CHAPTER 3: Basic Bridge Terminology
TOPIC 3.1: Basic Bridge Terminology

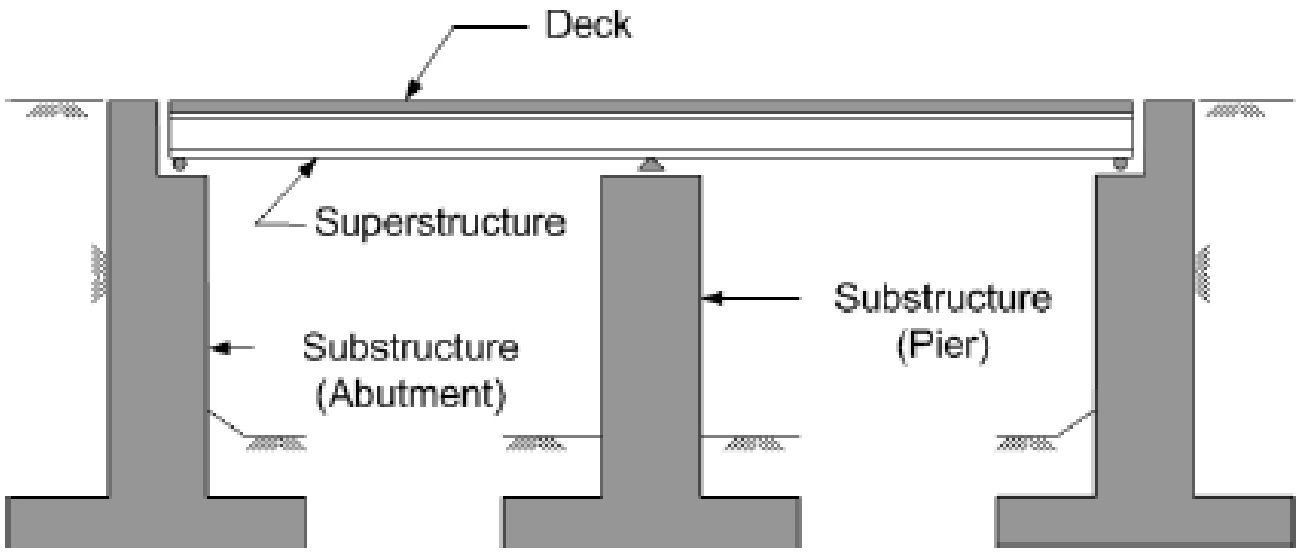


Figure 3.1.3 Major Bridge Components

Image from FHWA's *Bridge Inspector's Reference Manual*

Image from FHWA's *Specifications for the National Bridge Inventory*

Condition Codes – Component

Table 20. Codes and descriptions for component condition ratings.

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

Image from FHWA's *Specifications for the National Bridge Inventory*

Condition Codes – Scour

Code	Condition Description
N	Bridge does not cross over water.
9	No scour.
8	Insignificant scour.
7	Some minor scour.
6	Widespread minor or isolated moderate scour.
5	Moderate scour; strength and stability of the bridge are not affected.
4	Widespread moderate or isolated major scour; strength and/or stability of the bridge is affected.
3	Major scour; strength and/or stability of the bridge is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	Major scour; strength and/or stability of the bridge is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open.
1	Bridge is closed to traffic due to scour condition. Channel rehabilitation may return the bridge to service.
0	Bridge is closed due to scour condition, and is beyond corrective action. Bridge replacement is needed to restore service.

Condition Codes – Element

- AASHTO NBEs and BMEs have 4 defined condition states that address defect severity
- General condition state descriptions are:
  - CS 1 (Good)
  - CS 2 (Fair)
  - CS 3 (Poor)
  - CS 4 (Severe)
    - Load capacity implications
    - Structural review warranted

Bridge Inspection Reports

Thanks to:

- Puerto Rico Highways and Transportation Authority
- U.S. Virgin Islands Department of Public Works
- Guam Department of Public Works

U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure

When to Close a Bridge

Bridge Closures in the News

Structurally deficient Swan Lake Road bridge to close immediately

NEARLY NEW BRIDGE REMAINS SHUT DOWN IN KING COUNTY

Cobban Bridge closed to traffic

Banged-up Cherry Lane bridge to remain closed until the holidays

Marion's East Chilhowie Street bridge closed again for safety reasons

Closure of Kemp Bottom Road bridge is another example of infrastructure problem in state

Critical Findings

Critical finding. A structural or safety related deficiency that requires immediate action to ensure public safety.

– *23 CFR 650.305 Definitions*

Critical Findings

- The NBIS requires agencies to develop procedures to define and address critical findings – 23 CFR 650.313(q)(1)(i)

(q) *Critical findings.* (1) Document procedures to address critical findings in a timely manner. Procedures must:

(i) Define critical findings considering the location and the redundancy of the member affected and the extent and consequence of a deficiency. Deficiencies include, but are not limited to scour, damage, corrosion, section loss, settlement, cracking, deflection, distortion, delamination, loss of bearing, and any condition posing an imminent threat to public safety.

Critical Findings

- At a minimum, include findings which warrant any of the following:
  - Full or partial bridge closure
  - An NSTM in serious or worse condition (3 or less)
  - Any component in critical or worse condition (2 or less)
  - Channel or scour condition of critical or worse (2 or less)
  - Immediate load restriction, posting, or repair

– 23 CFR 650.313(q)(1)(i)

Critical Findings

- The NBIS requires agencies to notify FHWA of critical findings and provide updates until resolved
  – 23 CFR 650.313(q)(2)

(2) State transportation departments, Federal agencies, and Tribal governments must inform FHWA of all critical findings and actions taken, underway, or planned to resolve critical findings as follows:

(i) Notify FHWA within 24 hours of discovery of each critical finding on the National Highway System (NHS) as identified in paragraphs (q)(1)(i)(A) and (B) of this section;

(ii) Provide monthly, or as requested, a written status report for each critical finding as identified in paragraph (q)(1)(i) of this section until resolved.


BRIDGE
CLOSED
06/27/2017

U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure

Load Rating

... and When to Post

Load Rating

23 CFR 650 313(k)

- Rate each bridge as to its safe load capacity in accordance with the incorporated articles in Sections 6 and 8, AASHTO Manual (incorporated by reference, see §650.317).

SAFETY !!!

Load Rating

23 CFR 650 313(k)&(l)

- Each bridge must have a valid load rating.
- Re-evaluate and rate as loadings or conditions change at each inspection.
- Re-rate bridges anytime as deemed needed.
- Post or restrict a bridge in accordance with MBE or State law.

Load Rating

Bridge Load Rating and Posting - YouTube

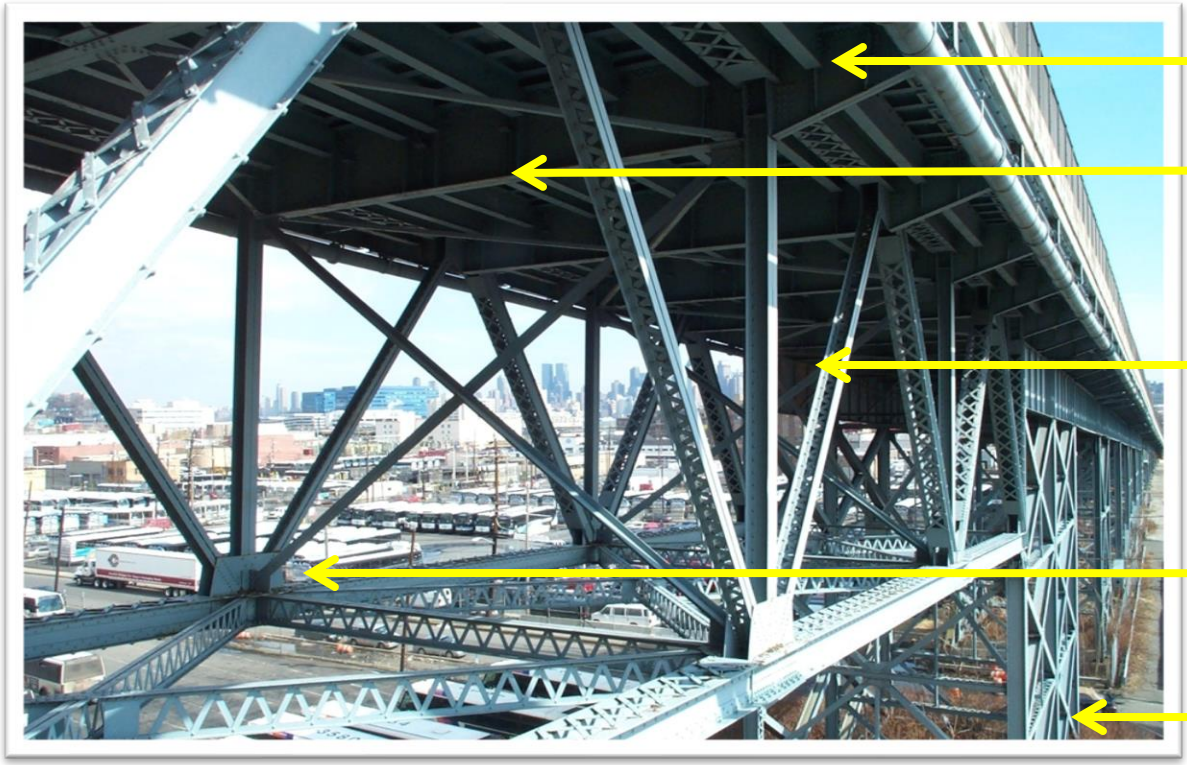
https://www.fhwa.dot.gov/federal-aidessentials/

Elements of a Bridge to be Load Rated

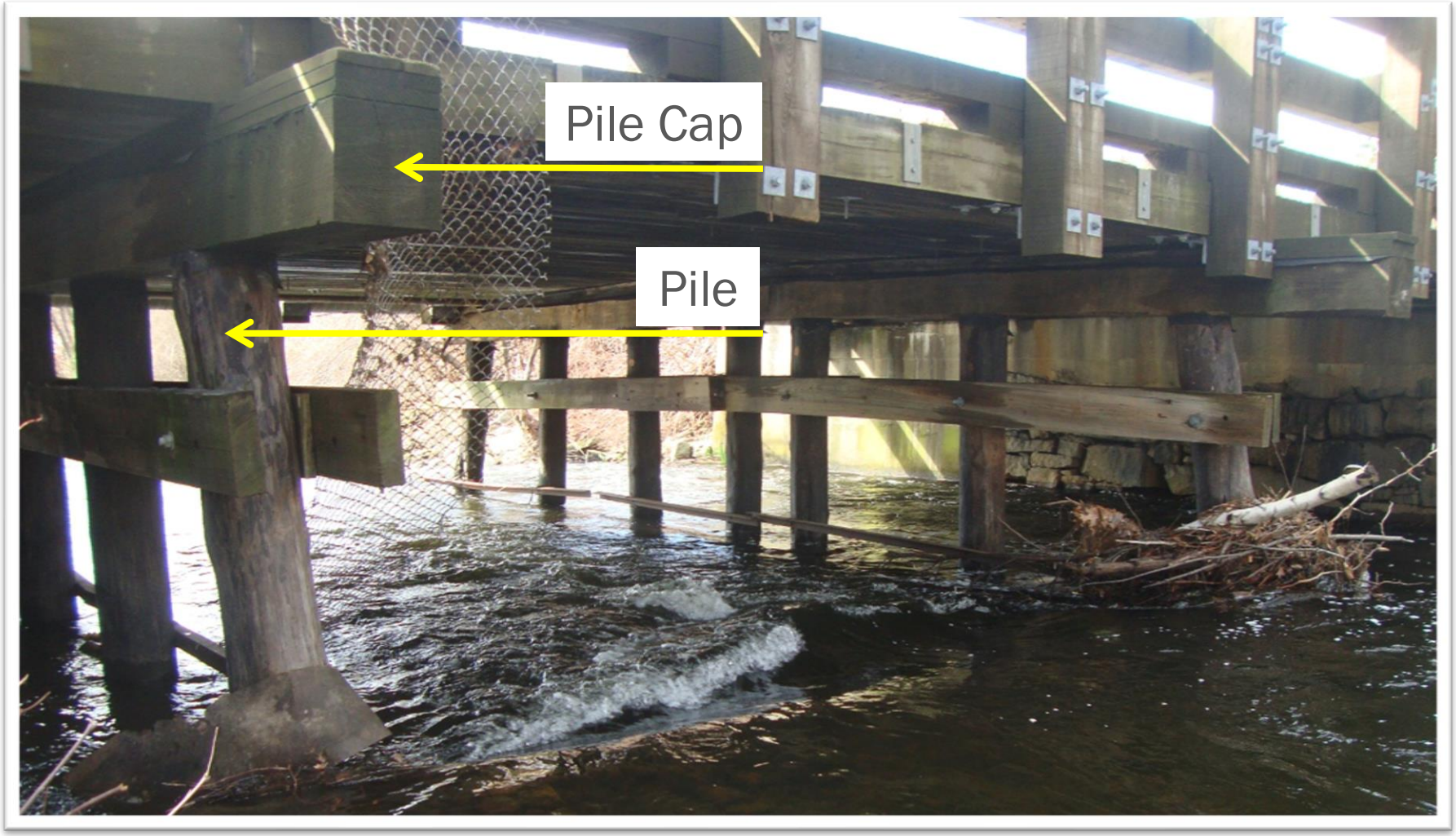
Typical Stringer Bridge

Elements of a Bridge to be Load Rated

Deck Truss Bridge



Elements of a Bridge to be Load Rated



U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure

Round Table Discussion

Round Table Discussion

Concerns heard from Territories:

- Not having the legal authority to act when something needs to be done
- Not having the structure/funding to address issues
- What does enforcement look like?

(Some) NHI Courses

- 130101 Introduction to Safety Inspection of In-Service Bridges – WEB-BASED (FREE)
- 130055 Safety Inspection of In-Service Bridges
- 130056 Safety Inspection of In-Service Bridges for Professional Engineers
- 130053 Bridge Inspection Refresher Training
- 130078 Fracture Critical Inspection Techniques for Steel Bridges
- 130091 Underwater Bridge Inspection
- 130091B Underwater Bridge Repair, Rehabilitation, and Countermeasures
- 135047 Stream Stability and Scour at Highway Bridges for Bridge Inspectors

Samantha Lubkin

Safety Inspection Team Leader

Office of Bridges and Structures

(202) 366-1575

samantha.lubkin@dot.gov

Bert Buchanan

Division Bridge Engineer

West Virginia Division Office

(304) 347-5932

bert.buchanan@dot.gov