Uncoated Weathering Steel Components
July 19, 2023 FHWA Memorandum
Disclaimer

Non-Binding Contents

Except for the statutes and regulations cited, the contents of this presentation do not have the force and effect of law and are not meant to bind the States or the public in any way. This presentation is intended only to provide information regarding existing requirements under the law or agency policies.

Unless otherwise noted, images in this presentation are sourced from FHWA.
Fern Hollow Bridge Collapse

- January 28, 2022
- Pittsburgh, Pennsylvania
  - Forbes Avenue over Nine Mile Run in Frick Park
- 6 minor injuries
- 3-span rigid (K) frame 442’-8” in length
  - Constructed 1972-1973
- Fracture Critical (NSTM) Bridge
- Poor Condition (annual inspections)
- Posted at 26 tons
NTSB Recommendation to FHWA

Develop a risk-based, data-driven process and encourage its use by state Departments of Transportation, as well as highway-bridge-owning federal agencies and tribal governments, to help them identify, prioritize, and perform follow-up actions documented in inspections of bridges with uncoated weathering steel components. (H-23-13)
Fern Hollow Bridge Collapse

NTSB Interim Report (May 18, 2023) Findings

1. The legs of the Fern Hollow Bridge experienced significant deterioration and section loss that were documented in inspection reports. The deterioration and section loss resulted from the continual accumulation of water and debris, which prevented the development of the protective patina that would resist such corrosion on uncoated weathering steel.

2. The limited examinations of other Pennsylvania bridges revealed that the problem of incomplete maintenance—where maintenance was identified as needed in inspection reports but not completed—was not unique to the Fern Hollow Bridge.

3. Because of the potential for corrosion and deterioration associated with lack of proper maintenance, it is critical that bridge owners nationwide ensure that follow-up actions addressing the accumulation of water and debris on bridges with weathering steel components have been completed.

Report does not include a determination of probable cause.
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- [https://www.fhwa.dot.gov/bridge/inspection/Memo_July2023_UWS.cfm](https://www.fhwa.dot.gov/bridge/inspection/Memo_July2023_UWS.cfm)
- Background
  - Fern Hollow Bridge collapse
  - NTSB Interim report and recommendation
  - FHWA Technical Advisory 5140.22 (1989)
    - Application of UWS - Bridge location
    - Application of UWS - Design details
    - Inspection and maintenance
- Required actions for DOTs under 23 CFR 650.313 and 650.315
Risk Groups

Identify bridges with UWS components

Group 1
- UWS substructure or rigid frame with condition rating ≤ 4
- UWS NSTM with superstructure condition rating ≤ 4
- Bridge on NHS with UWS NBE in Condition State 4

Group 2
- All UWS bridges not in Group 1
Group 1 Bridges

- Report to FHWA Group 1 structure numbers
- For each bridge, review inspection and maintenance records
- Work items completed to address deficiencies?
Group 1 Bridges
- With Findings Addressed

- Work items completed to address deficiencies?
  - Yes: Review load rating
  - No: Update Load Rating

- Rating adequately considers documented deterioration and completed work?
  - Yes: Report date of work completion and most recent load rating
  - No: Next step
Group 1 Bridges
- Without Findings Addressed, AND
- With Sufficient Information to Support Load Rating

1. Work items completed to address deficiencies?
   - No
     - Sufficient documentation to support load rating?
       - Yes
         - Review load rating
       - No
         - Update Load Rating
     - No
       - Rating adequately considers documented deterioration?
         - Yes
           - Report date of deterioration documentation and load rating
         - No
           - Update Load Rating

U.S. Department of Transportation
Federal Highway Administration
Group 1 Bridges
- Without Findings Addressed, AND
- Without Sufficient Information to Support Load Rating

- Work items completed to address deficiencies? NO
  - Sufficient documentation to support load rating? NO
    - Special inspection to document deterioration
    - Update Load Rating
    - Report date of inspection and load rating
Group 2 Bridges

At the next scheduled inspection, confirm that preventative maintenance or preservation activities are communicated

Notify FHWA when complete for all Group 2 bridges
Key Dates and Reporting

• October 31, 2023
  • Report Group 1 NBI Structure Numbers to FHWA
  • Item 8 (Coding Guide), Item B.ID.01 (SNBI)

• December 31, 2024
  • Report the completion of follow-up actions for Group 1 bridges to FHWA
    • Date of work completion, OR
    • Date of deterioration documentation, OR
    • Date of special inspection, AND
    • Date of most recent load rating

• Report data to FHWA Division Office Bridge Engineer
UWS Data - NBI

- No NBI (Coding Guide) Item
- SNBI Item(s)
  - B.SP.07 – Span Protective System
  - B.SP.11 – Deck Protective System
  - B.SB.05 – Substructure Protective System
  - B.SB.07 – Foundation Protective System
UWS Data – Other Sources

• State BMS data items

• FHWA InfoBridge
  - Special Projects → UWS
  - Data source – 2014 LTBP Program Study¹
  - Survey, not inventory, data
  - Bridge numbers are linked in InfoBridge to current inventory data

¹ Performance of Uncoated Weathering Steel Highway Bridges Throughout the United States

Table version of the map: https://infobridge.fhwa.dot.gov/Data/SelectedBridges
InfoBridge  UWS Data – Current Condition

Table version of the map: https://infobridge.fhwa.dot.gov/Data/SelectedBridges
InfoBridge UWS Data – Poor Condition Bridges

Table version of the map: https://infobridge.fhwa.dot.gov/Data/SelectedBridges
Documenting Deterioration

• Cleaning (MBE Article 4.3.5.2)\(^1\)

*Steel components exhibiting impacted crevice corrosion (pack rust) or corrosive delamination require chipping with a hammer or other means to remove corrosion down to the base metal in order to measure the remaining section of sound metal.*

\(^1\) Incorporated by reference to 23 CFR part 650, subpart C per 23 CFR 650.317(a)

Source: FHWA
Steel Cleaning

Closed captioned video with narration available: Inspector removing debris and laminar rust from a floorbeam
Documenting Deterioration

• Section Loss Measurement and Evaluation (MBE Article 4.3.5.6.1)\(^1\)

*Inspect structural steel members for loss of section due to corrosion. Where a build-up of rust scale is present, a visual observation is usually not sufficient to evaluate section loss. Hand scrape areas of rust scale to base metal and measure the remaining section using calipers, ultrasonic thickness meters, or other appropriate method. Take sufficient measurements to allow the evaluation of the effect of the losses on member capacity.*

\(^1\) Incorporated by reference to 23 CFR part 650, subpart C per 23 CFR 650.317(a)