



U.S. Department
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**Federal Highway
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National Bridge Preservation Conference 2024

Bridge Preservation Innovation for Infrastructure Resiliency
September 10, 2024

Disclaimer



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Unless otherwise noted, FHWA is the source for all images in this presentation.



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Agenda

- Overview of recent Bridge Investment Program changes
- FHWA Bridge Preservation Program
- Case Study: Fern Hollow Bridge Collapse



Bipartisan Infrastructure Law Bridge Investment Program



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Purpose	Improve bridge (and culvert) condition, safety, efficiency, and reliability
Funding	\$12.5 B (FY 22-26), \$2.5 B per Fiscal Year , including— <ul style="list-style-type: none">• \$3.3 B (FY 22-26) in Contract Authority from the Highway Trust Fund (HTF); and• \$9.2 B (FY 22-26) in advance appropriations from the General Fund (GF)
Eligible entities	<ul style="list-style-type: none">• State, MPO (w/ pop. >200K), Local government, Special purpose district/public authority with a transportation function, Federal land management agency, or Tribal government
Eligible projects	<ul style="list-style-type: none">• Project to replace, rehabilitate, PRESERVE, or protect one or more bridges on the NBI• Project to replace or rehabilitate culverts to improve flood control and improve habitat connectivity for aquatic species
Other key provisions	<ul style="list-style-type: none">• Large Bridge Projects (>\$100M) are eligible for up to 50% of project costs and have the option for multi-year funding agreements (minimum award of \$50M)• Bridge Projects (≤\$100M) are eligible for up to 80% of project costs (minimum award of \$2.5M)• Sets aside of \$20M per FY for Planning grants• Sets aside of \$40M per FY for Tribal transportation bridges



Review and Selection Process

- Application Intake and Eligibility Review – Large Bridge Projects
 - Applications submitted before the applicable application deadline will be considered for the identified funding cycle
 - August 1, 2024, for FY25 Funding Cycle
 - **August 1, 2025**, for FY26 Funding Cycle
- Application Intake and Eligibility Review – Bridge Projects
 - Applications submitted before the applicable application deadline will be considered for the identified funding cycle
 - **November 1, 2024**, for FY25 Funding Cycle
 - **November 1, 2025**, for FY26 Funding Cycle

BIP Large Bridge Projects Changes for FY2023 – FY2026

- Technical Review Process
 - All applicants will be notified of their preliminary **Merit Criteria rating, Economic Analysis Rating, Project Readiness Rating, and Overall Preliminary Rating** within 90 days of the closing date for the current funding cycle
 - Upon notification of their preliminary ratings, an applicant will be offered an opportunity to **submit an amended application or request a debrief**
 - An applicant has **14 days from notification or debrief to submit an amended application**
- Unfunded **eligible projects will automatically** be considered for future FY funding cycles

FY23/24 Large Bridge Projects



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Applications	FY22		FY23/24	
Received	40		36	
Not-Eligible	4		3	
Eligible	36		33	
Not Recommended	29		11	
Highly Recommended	3	7	12	22
Recommended	4	(19.4%)	10	(66.7%)



BIP Bridge Projects Changes for FY2023 – FY2026

- Technical Review Process
 - Only eligible applications that received **medium or higher rating for Merit Criteria** will be evaluated for Economic Analysis and the Project Readiness
 - Applicants will be notified of their preliminary ratings if their application received a medium or higher rating for Merit Criteria
 - Upon notification of their preliminary ratings, an applicant will be offered an opportunity to **submit an amended application or request a debrief**
 - An applicant has **14 days from notification or debrief to submit an amended application**
- Unfunded **Highly Recommended and Recommended** projects will **automatically** be considered for future FY funding cycle

BIP Information



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- Questions: BridgeInvestmentProgram@dot.gov
- Website: <https://www.fhwa.dot.gov/bridge/bip/index.cfm> (fhwa bip)
 - Application Templates
 - BCA Tool
 - Prerecorded overviews
 - Q&A
 - More...

FHWA Bridge Preservation Program

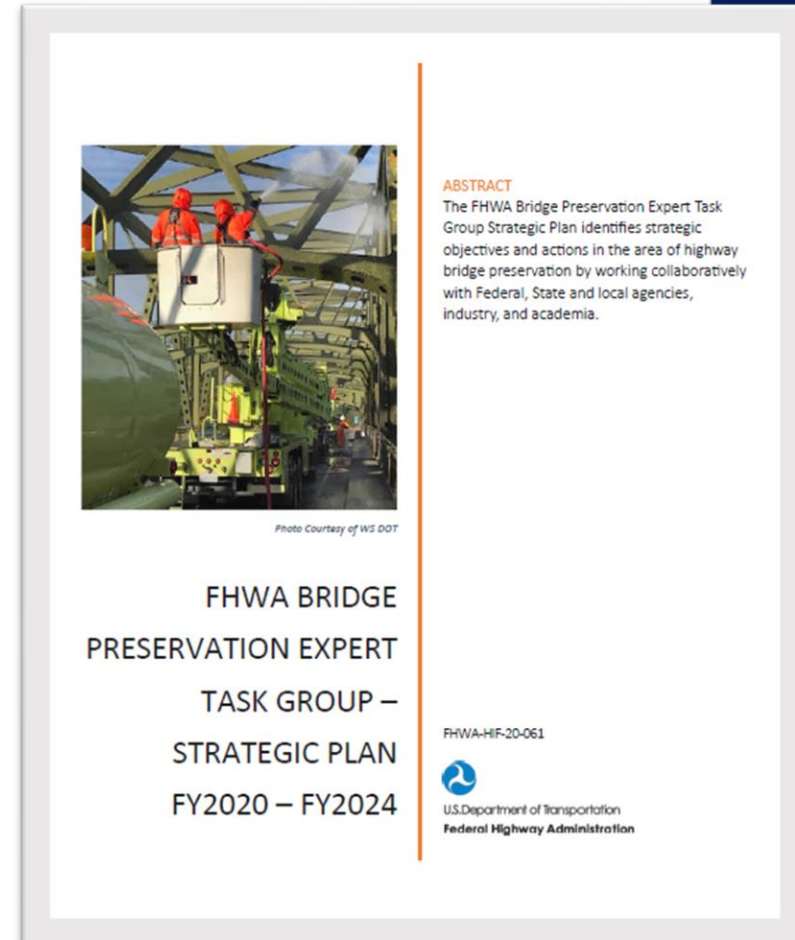


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Strategic Objectives

1. Share cost-effective bridge preservation strategies
2. Promote bridge preservation as a component of asset and performance management
3. Develop education materials on bridge preservation
4. Foster a collaborative environment that encourages innovation and adoption of new technologies for bridge preservation

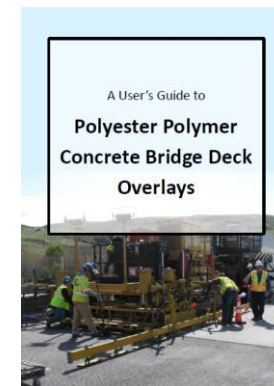
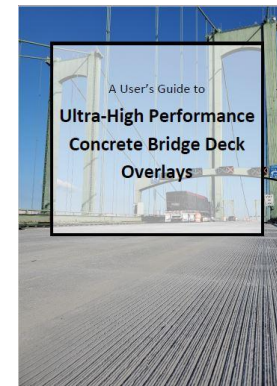
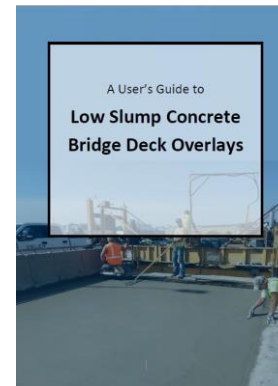
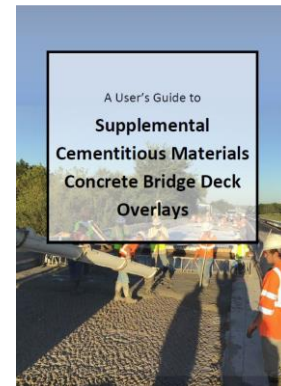
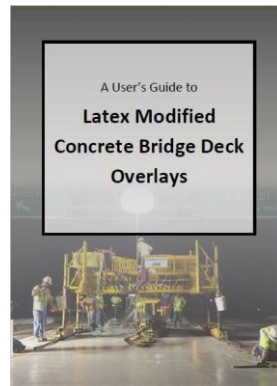
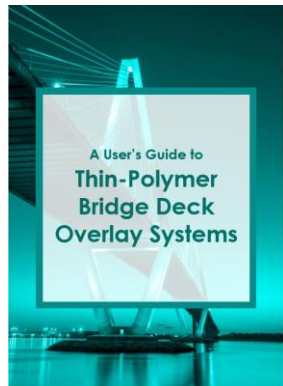
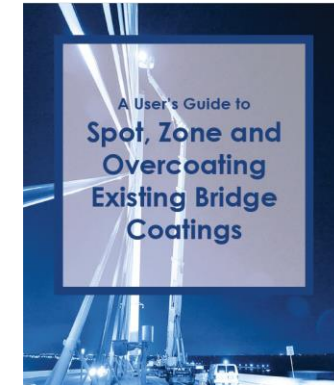
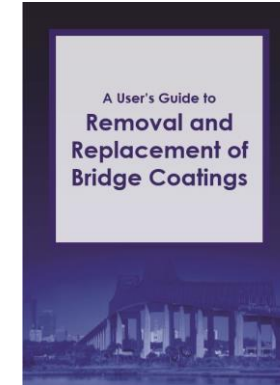
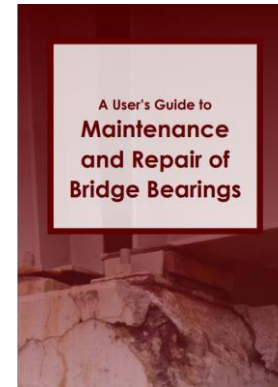
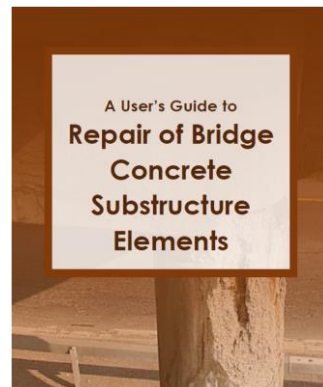
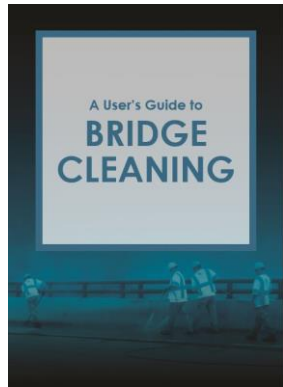
www.fhwa.dot.gov/bridge/preservation



ETG-Developed Pocket Guides (non-binding reference documents)



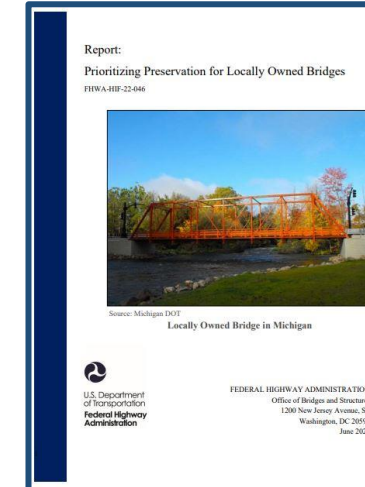
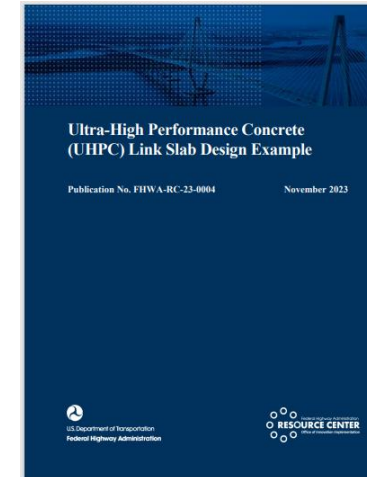
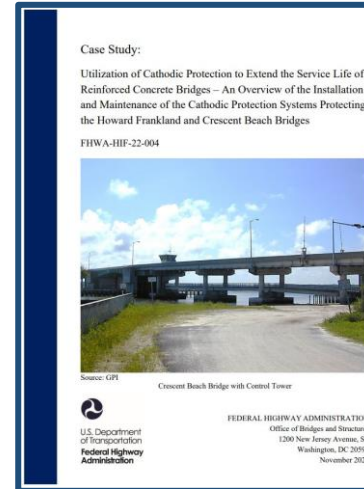
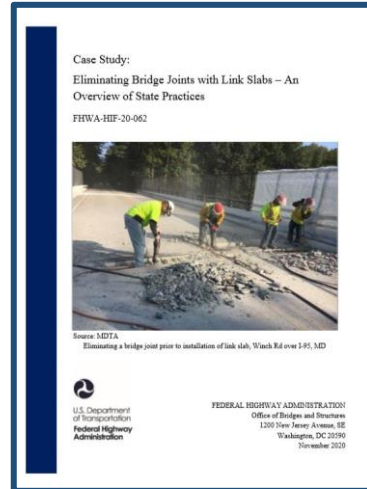
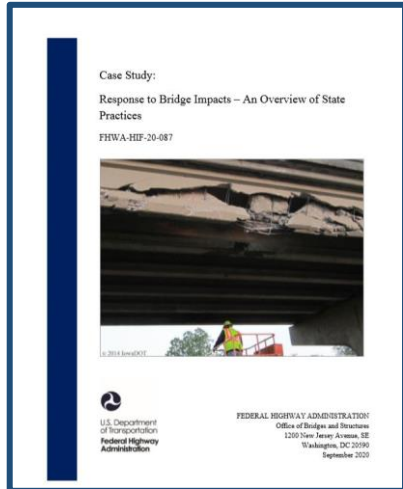
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FHWA Case Studies (non-binding reference documents)



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Source: FHWA

Case Studies:

- Response to Bridge Impacts
- Utilization of Cathodic Protection to Extend Service Life of Bridges
- Eliminating Bridge Joints with Link Slabs

Reports:

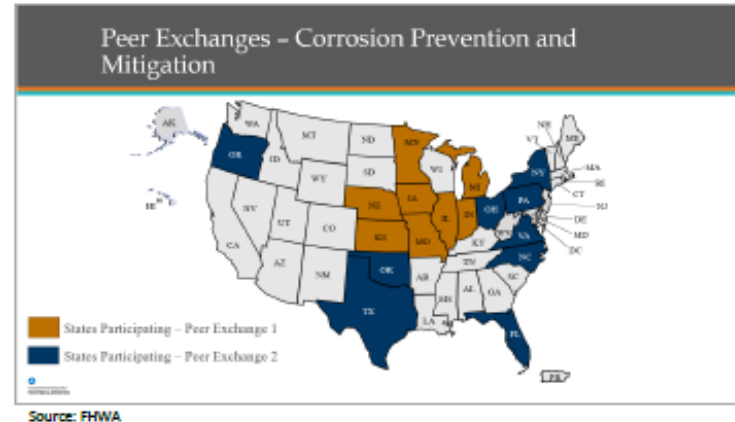
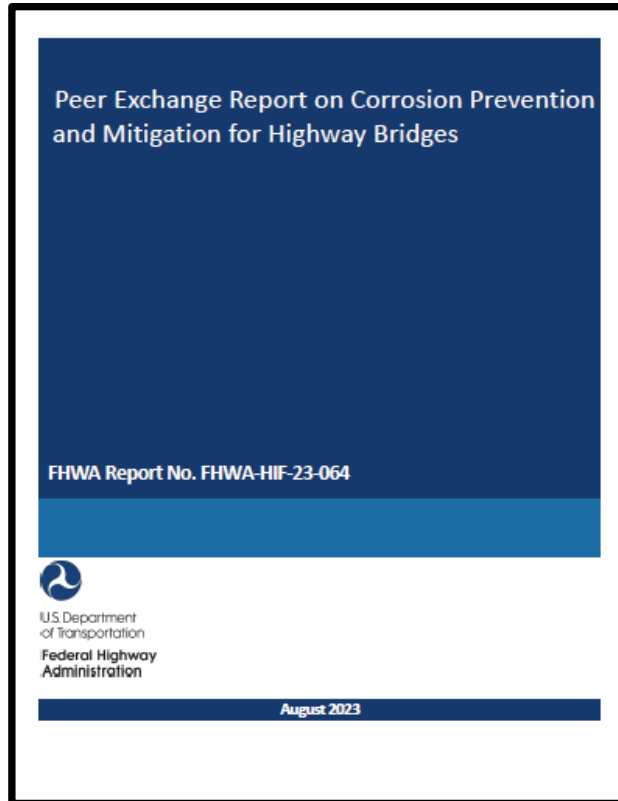
- UHPC Link Slab Design Example
- Prioritizing Preservation for Locally Owned Bridges

<https://www.fhwa.dot.gov/bridge/preservation/>

FHWA Case Studies (non-binding reference documents)



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Source: FHWA

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Bridges & Structures

Structures Geotech Hydraulics Safety Inspection **Management/Preservation**

Bridge Management Bridge Preservation Funding Programs National Bridge Inventory National Tunnel Inventory

Home / Programs / Bridges & Structures / Management and Preservation / Bridge Preservation

Bridge Preservation

Legislation

- [Fixing America's Surface Transportation \(FAST\) Act 2015](#) (12/4/15)
- [Moving Ahead for Progress in the 21st Century Act \(MAP-21\)](#) (07/06/2012)
- [23 USC 116 Maintenance](#)
- [23 USC 119 National Highway Performance Program \(NHPP\)](#)
- [23 USC 133 Surface Transportation Program \(STBGP\)](#)
- [23 USC 144 National Bridge and Tunnel Inventory and Inspection Standards \(NBTIIS\)](#)
- [United States Code](#)

Policy

- [Guidance on Highway Preservation And Maintenance](#) (02/25/2016)

Guidance

- [Ultra-High Performance Concrete \(UHPC\) Link Slab Design Example](#) (November 2023) **NEW!**
- [Peer Exchange Report on Corrosion Prevention and Mitigation for Highway Bridges](#) (August 2023) **NEW!**
- [Webinar: FHWA Service Life Design Reference Guide: How to Design Bridges that Last](#) (May 1, 2023)
Passcode: UNCE0%D6
- [Service Life Design Reference Guide](#) (November 2022)
- [Report: Prioritizing Preservation for Locally Owned Bridges](#) (June 2022)
- [Case Study: Utilization of Cathodic Protection to Extend the Service Life of Reinforced Concrete Bridges](#) (January 2022)
- [Case Study on Eliminating Bridge Joints with Link Slabs - An Overview of State Practices](#) (November 2020)
- [Case Study on Response to Bridge Impacts - An Overview of State Practices](#) (October 2020)
- [Bridge Preservation Video](#) (05/07/2019)
- [Report on Techniques for Bridge Strengthening](#) (April 2019)
- [Bridge Preservation Guide](#) (Spring 2018)

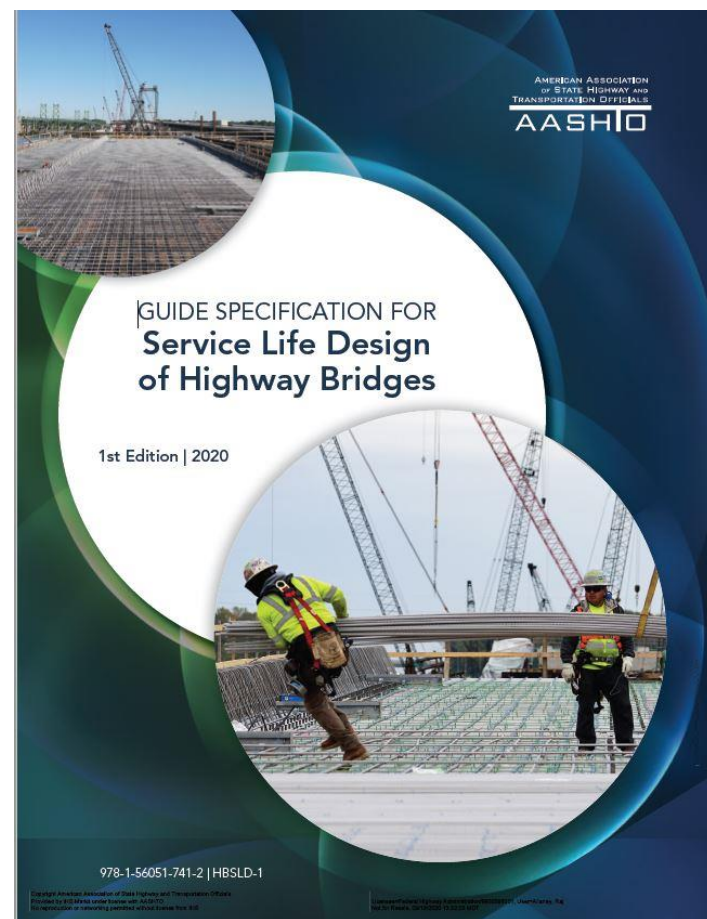
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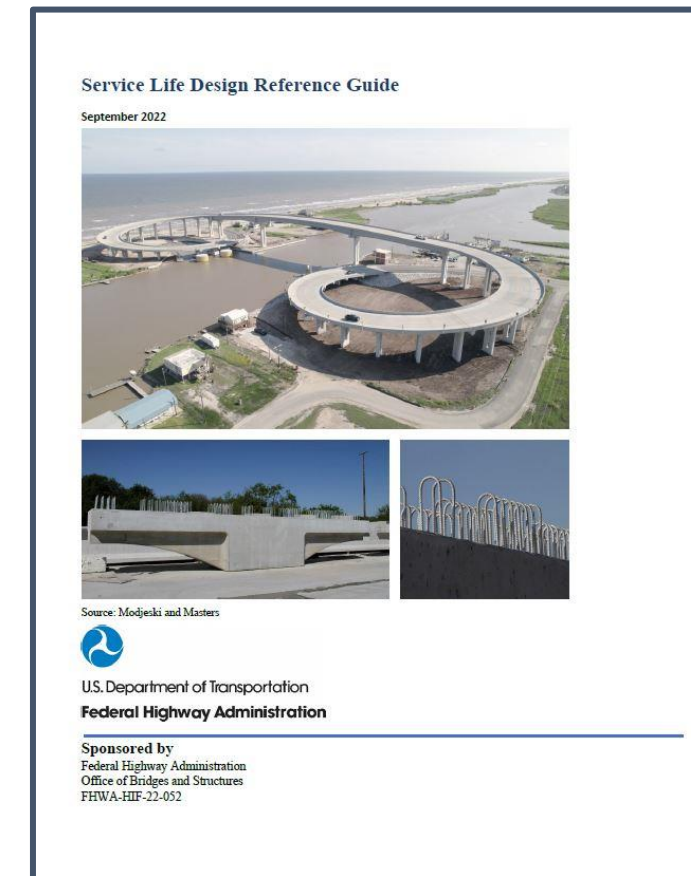
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Designing for Durability and Resilience

- AASHTO Guide Specification for Service Life Design of Highway Bridges – 1st Edition, 2020
- FHWA Service Life Design Reference Guide – September 2022



Source: AASHTO



Source: FHWA



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Fern Hollow Bridge Collapse

- January 28, 2022
- Forbes Avenue over Nine Mile Run in Frick Park
- 6 minor injuries
- 3-span rigid (K) frame of 497-foot in length
- Fracture Critical (NSTM) Bridge
- Poor Condition (annual inspections)
- Posted at 26 tons



NTSB Report and Docket

The main highway incident page and link to final report is at:

<https://www.nts.gov/investigations/Pages/HWY22MH003.aspx>

The docket is at:

<https://data.nts.gov/Docket/?NTSBNumber=HWY22MH003>

- “Forbes Avenue over Fern Hollow Bridge Collapse Investigation – Assessment of Bridge Inspection and Load Rating”
- “Materials Laboratory Factual Report 23-036,” Appendix A and Appendix B



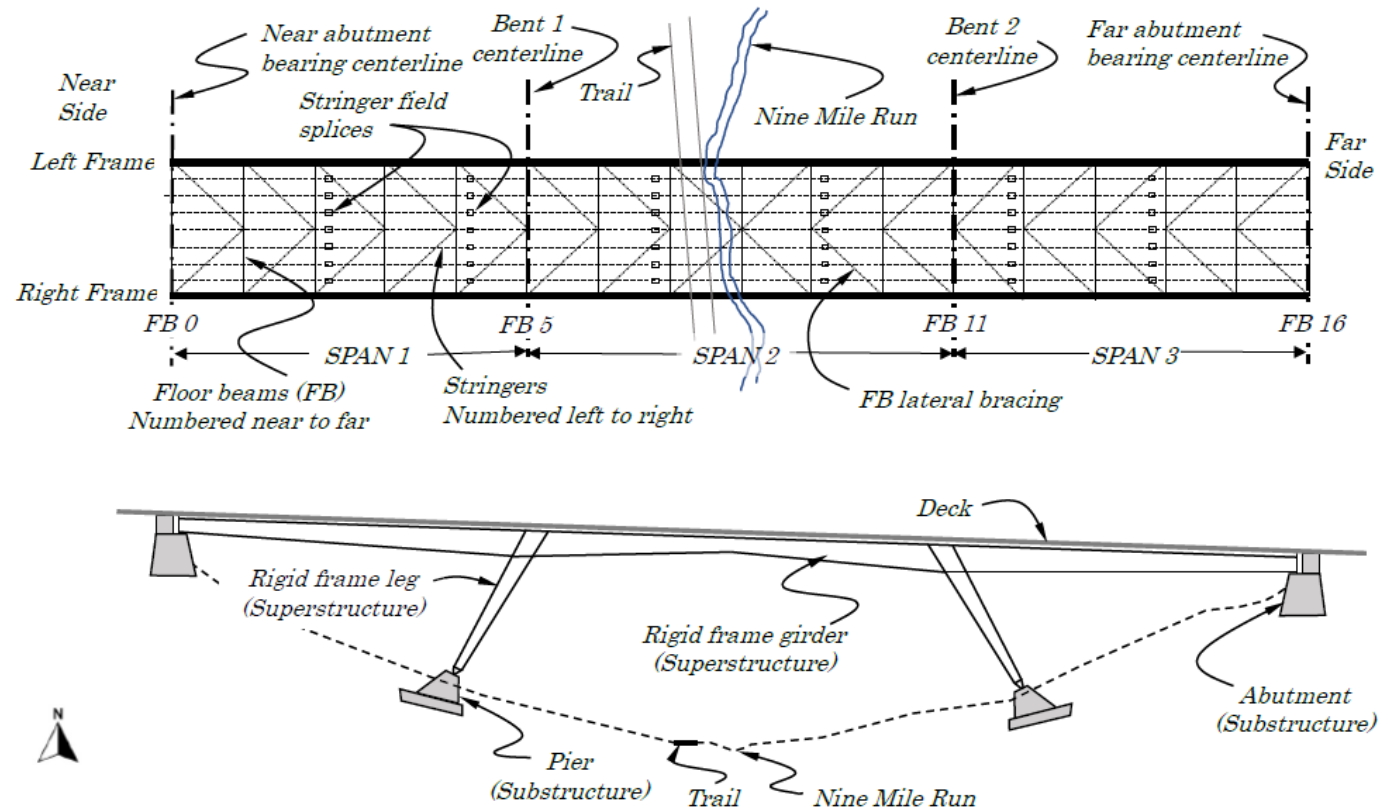
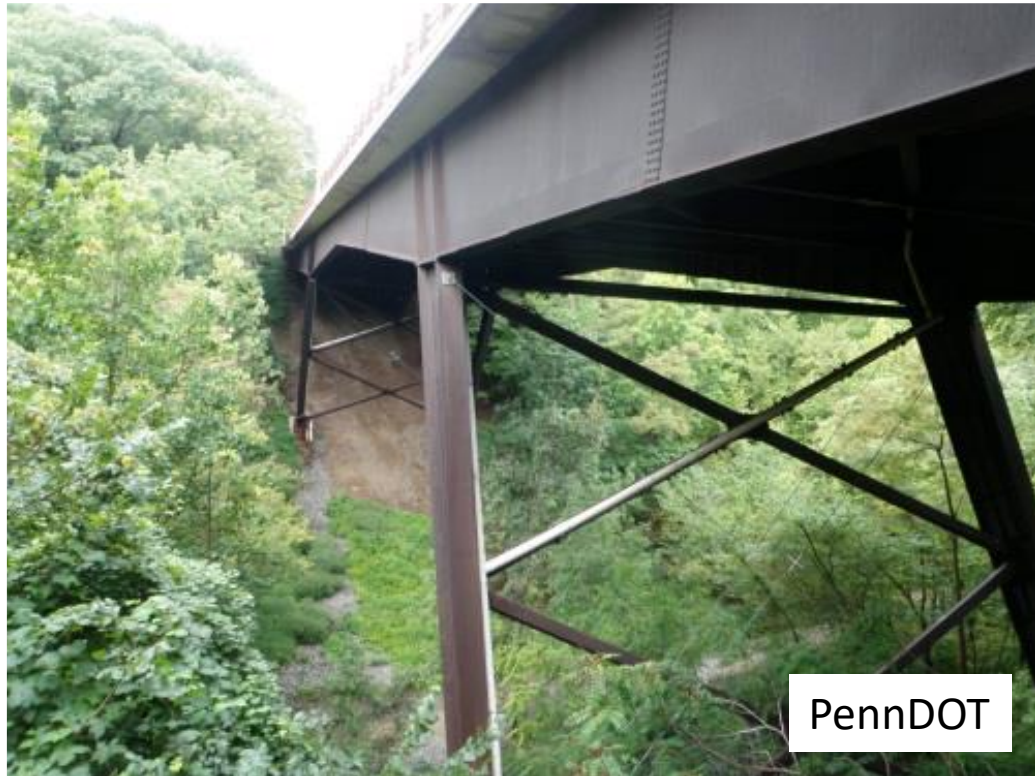
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Plan/Elevation



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Collapsed Bridge

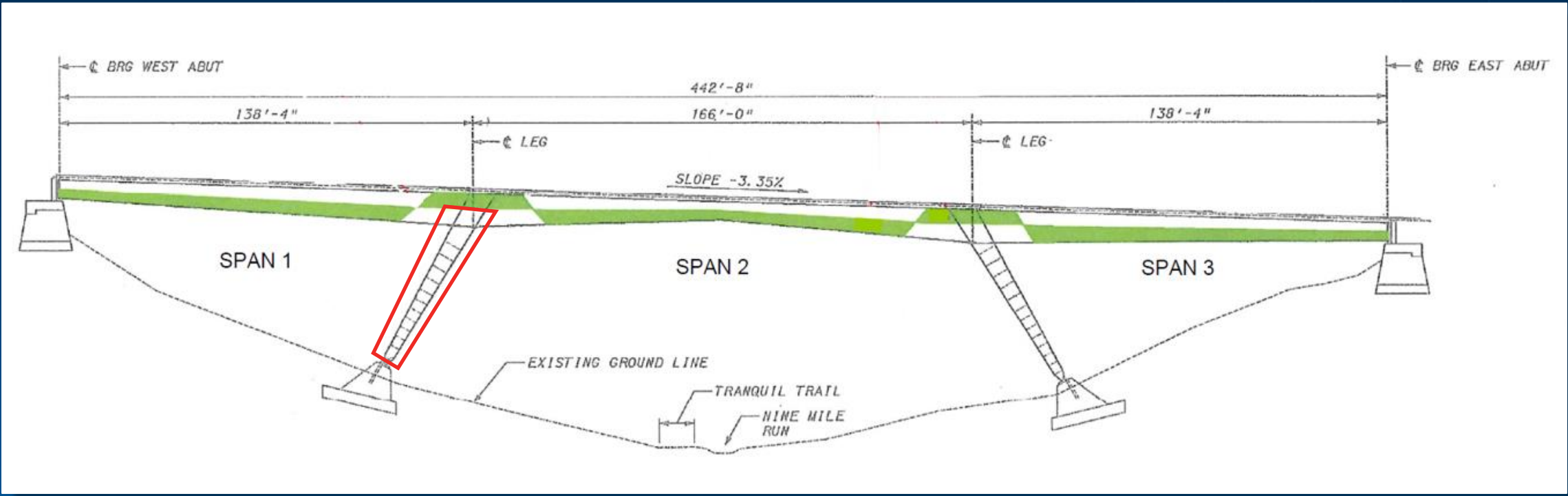


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NTSB

Rigid Steel Slant Legged Frame (K-Frame) Bridge





Paraphrased Probable Cause

Primary: the failure of the transverse tie plate on the southwest leg of the bridge, a fracture-critical member..., due to **corrosion** and section loss resulting from the...failure to act on repeated **maintenance and repair** recommendations from inspection reports.

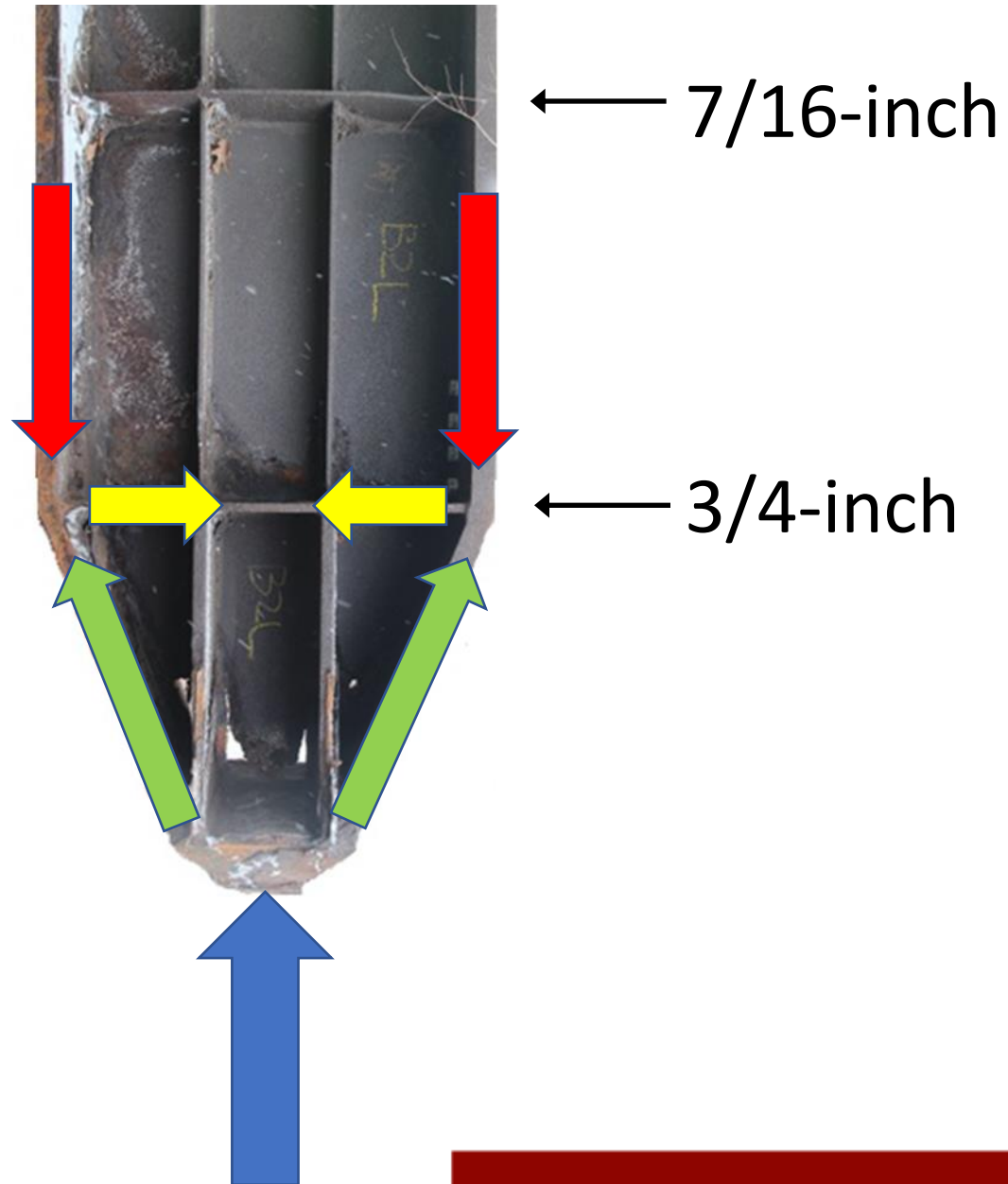
Contributory: the poor quality of **inspections**, the incomplete identification of the bridge's **fracture-critical members**..., and the incorrect **load rating** calculations for the bridge.

Tertiary: insufficient oversight by the...Department of Transportation of the City...bridge inspection program.

What We Found: *Corrosion and Cause of Collapse*

- The southwest leg failed because it had reduced capacity due to extensive corrosion and section loss
 - The collapse initiated at the corroded transverse tie plate
- The following were excluded as factors in the collapse:
 - Use of uncoated weathering steel
 - Materials fabrication
 - Weld quality
 - Bridge design

Shoe Statics



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Fern Hollow Bridge Inspections

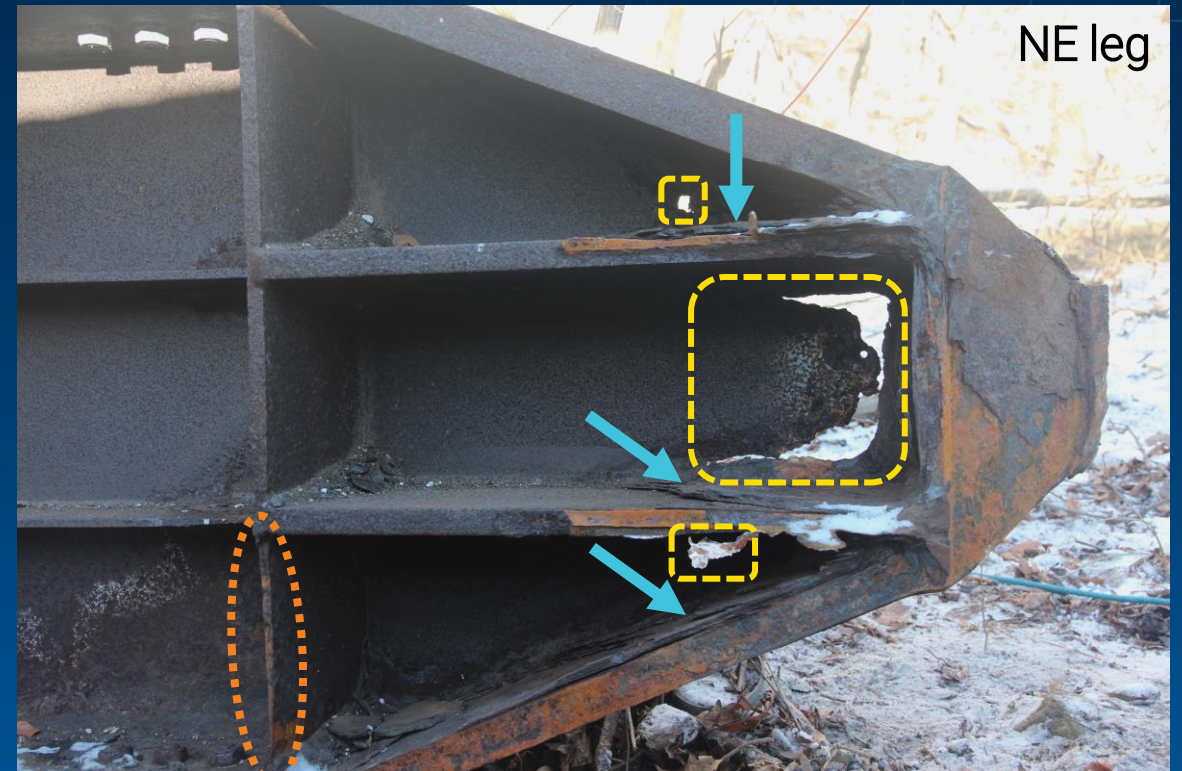
- City of Pittsburgh responsible for inspection and maintenance
- Subject to Routine and FCM inspections
- Interim FCM inspections required
 - Reduced load rating in 2014 – 26 tons
 - Poor condition rating
- Conducted by two or more certified bridge safety inspectors

Inspection Date	Inspection Type
September 2005	Routine & FCM
September 2007	Routine & FCM
September 2009	Routine & FCM
September 2011	Routine & FCM
September 2013	Routine & FCM
September 2014	Interim FCM
September 2015	Routine & FCM
September 2016	Interim FCM
September 2017	Routine & FCM
March 2018	Interim FCM
September 2018	Interim FCM
September 2019	Routine & FCM
September 2020	Interim FCM
September 2021	Routine & FCM

Corrosion – Leg Shoe



Corrosion product build-up



Holes

Transverse tie plate thinning

Stiffeners on Southwest Leg

2013



Source: 2013 inspection report

2021



Source: 2021 inspection report

Cross-Bracing

2005 (Southwest Leg)



Source: 2005 inspection report

2021 (Southeast Leg)



Source: 2021 inspection report

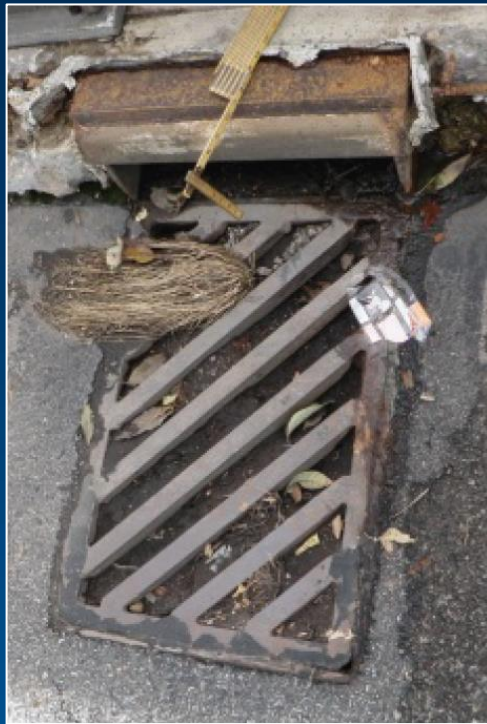
Clogged Drainage Inlets

2005



Source: 2005 inspection report

2011



Source: 2011 inspection report

2017



Source: 2017 inspection report

2021



Source: 2021 inspection report

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- Cyclical Maintenance Activity – cleaning/flushing of drainage systems
 - FHWA Bridge Preservation Guide
 - ETG Pocket Guide on Bridge Cleaning
 - AASHTO Guide to Bridge Preservation Actions

Challenges...

- Advancing NDE methods that provide actionable data
- New durable materials that extend service life
- Improved design methods
 - Service life design
 - Designing jointless bridges
 - Improved details that minimize maintenance needs



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