State of Good Repair: Infrastructure Management for Structure Inspections, Maintenance and Repairs

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Key Take-Aways

- Bridge the gap between FTA and FHWA regulations to help RTAs manage their structural inventory. FTA vs FHWA NBIS Training
- Help Rail Transit Agency (RTAs) develop infrastructure management systems to manage the structural inventory.
- During triennial audits, SSOAs will have consistent criteria to evaluate RTAs.

Workshop Goals

- We will discuss what RTAs are currently doing to keep their agency's structures in a State of Good Repair and bring to FTA's attention that FHWA bridge inspection regulations are for bridges that carry cars and trucks, not rail transit bridges that carry rail cars.
- Inform and encourage FTA to create structure inspection guidelines specific to rail transit structures to be applied consistently across all RTAs.
- Discuss options on how to bridge the gap between FTA/FHWA/FRA federal standards to help RTAs better manage their structural inventory database, inspections and repair/maintenance programs.
- Incorporate APTA guidelines (advisory not regulatory)

SSO Observations

- Structural integrity of rail transit bridges and structures is important to both the passengers riding the trains, as well as, the people below the bridge. Ensuring that these structures are being inspected, repaired/replaced and maintained is based on a consistent structural inspection and maintenance program.
- Apply system to maintain consistency across all rail transit agencies to assist SSOs in auditing these agencies with regard to federal regulations and best practices.
- Throughout all the expansions and improvements in bridge inspection programs and capabilities, one factor remains constant: the overriding importance of the inspector's ability to effectively inspect bridge components and materials and to make sound evaluations with accurate ratings. The validity of all analyses and decisions based on the inspection data is dependent on the quality and the reliability of the data collected in the field.

Transit Asset Management Plan

- **TAM PLAN PURPOSE**
- Comply with Federal TAM Plan Requirements - All Chapter 53 fund recipients and subrecipients of Federal Transit Administration (FTA) financial assistance that own, operate, or manage capital assets used for public transportation are required to have a TAM Plan in place by the deadline, October 1, 2018.
- Provide an overview of an RTA's transit asset inventory: facilities, equipment, rolling stock, and infrastructure.
- Develop a strategic and systematic process plan to prioritize and implement capital investments, maintenance and rehabilitation/replacement of assets that will achieve and sustain a desired state of good repair over the lifecycle of the assets
- Tie the TAM Plan into a State of Good Repair Infrastructure Program

APTA

- **APTA RT-FS-S-001-02 Rev 1: Rail Transit Fixed Structures Inspection**

- Purpose:
  - To provide guidance and standardize best practices for RTAs
  - Uses FHWA National Bridge Standards as a guideline
- References –
  - 23 CFR 650, Subpart C, National Highway Bridge Inspection Standards (FHWA)
  - 23 CFR 650, Subpart E, National Tunnel Inspection Standards (FHWA)
  - 29 CFR OSHA Standards
  - 29 CFR OSHA Standards, Subpart T
  - 49 CFR OSHA Part 237, Bridge Safety Standards
  - 49 CFR OSHA Part 659, Rail Fixed Guideway Systems, State Safety Oversight
  - FHWA
  - AASHTO Manual for Maintenance Inspection of Bridges & Manual for Bridge Evaluation
  - ANSI/AWS D1.1 & D1.5
  - AREMA Fatigue Standards, Manual for Railway Engineering Chapter 9, Part 1 Section 1.2 & 1.5
  - TCRP

APTA vs FHWA (NBIS BIRM)

- **APTA RT-FS-S-001-02 Rev 1: Structures Inspection Ratings**

NA	**Not Applicable**
9	**Excellent Condition**
8	**Very Good Condition -** No problems noted.
7	**Good Condition -** Some minor problems.
6	**Satisfactory Condition -** Structural elements show some minor deterioration.
5	**Fair Condition -** All primary structural elements are sound but may have minor section loss. Cracking, spalling or scour.
4	**Poor Condition -** Advanced section loss, deterioration, spalling or scour.
3	**Serious Condition -** Loss of section, deterioration, spalling, or scour may have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	**Critical Condition -** Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear
1	**"Imminent" Failure Condition -** Major deterioration or section loss present in critical structural components or
0	**Failed Condition -** Out of service - beyond corrective action.

- **FHWA: Structures Inspection Ratings**

The following general component condition rating guidelines (obtained from the 1995 edition of the *FHWA Coding Guide*) are to be used in the evaluation of the deck (Item 58), superstructure (Item 59), and substructure (Item 60):

Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted.
7	GOOD CONDITION - some minor problems.
6	SATISFACTORY CONDITION - structural elements show some minor deterioration.
5	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR CONDITION - advanced section loss, deterioration, spalling, or scour.
3	SERIOUS CONDITION - loss of section, deterioration, spalling, or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION - 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 bridge back in light service.
0	FAILED CONDITION - out of service; beyond corrective action.

APTA vs FHWA (BIRM) vs FRA

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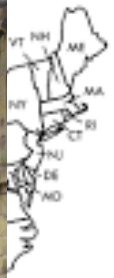
1	**"Imminent" Failure Condition** - Major deterioration or section loss present in critical structural components or
0	**Failed Condition** - Out of service - beyond corrective action.

- **FRA - 49 CFR Part 237 SubPart E: Bridge Inspection Procedures**

- Each bridge management program shall specify the procedure to be used for inspection of individual bridges or classes and types of bridges.
- The bridge inspection procedures shall be as specified by a railroad bridge engineer who is designated as responsible for the conduct and review of the inspections. The inspection procedures shall incorporate the methods, means of access, and level of detail to be recorded for the various components of that bridge or class of bridges.
- The bridge inspection procedures shall ensure that the level of detail and the inspection procedures are appropriate to: the configuration of the bridge; conditions found during previous inspections; the nature of the railroad traffic moved over the bridge (including equipment weights, train frequency and length, levels of passenger and hazardous materials traffic); and vulnerability of the bridge to damage.
- The bridge inspection procedures shall be designed to detect, report and protect deterioration and deficiencies before they present a hazard to safe train operation.

Metro's Structures Inspection Program

- Missouri and Illin
  - Joint State Safet
- Structures Invent
  - 68 Bridges – 57 I
  - 7 Tunnels – 5 < 3
  - 80 Culverts
  - 378 Retaining wa
  - 6 radio towers
  - 2 parking garage



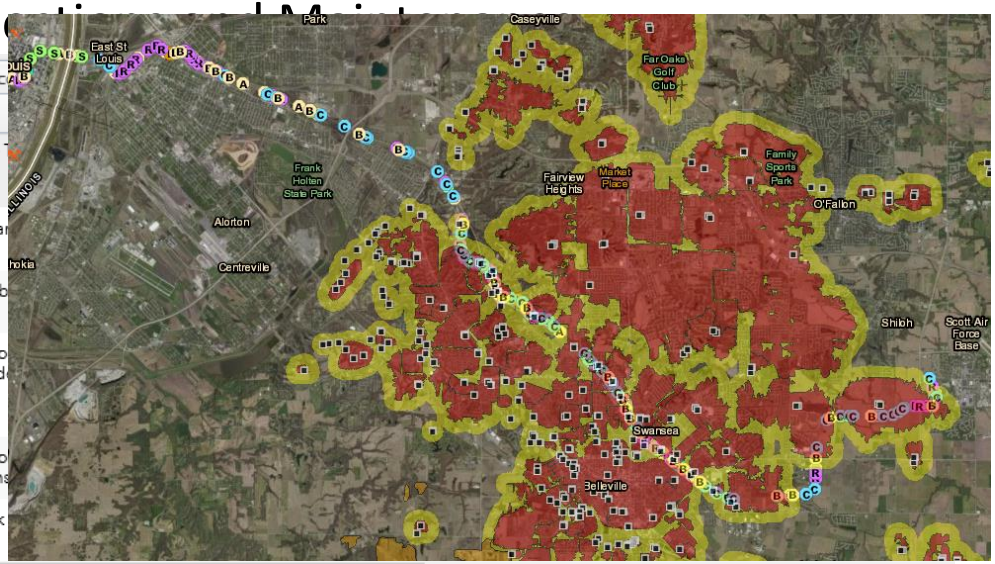
Metro's Structures Inspection Program

- Tools for Managing Inventory Insp[illegible]

Bridge | Culvert | RetainingWall | Retaining Wall Line | Slope | Station | Tunnel | Track Ac...

Options | Filter by map extent | Zoom to | Clear selection | Refresh

Asset ID	Asset Type	FTA-TAM Category	Mile Post	Structure Name	Feature Above	Feature Below	Structure T
ST-2606B	Bridge	Bridge Struc	26.06	Schoenberger Creek Bridge	METRO	Schoenberger Creek	PPC I-Bear
ST-1373B	Bridge	Bridge Struc	13.73	16th Street Bridge	16th Street	METRO	PPC Doub Girders
ST-2018B	Bridge	Bridge Struc	20.18	Alton and Southern RR Bridge	METRO	Alton & Southen Railroad and Service Road	Steel Thro Plate Girde
ST-1877B	Bridge	Bridge Struc	18.77	Southern RR Bridge	METRO	Southern Railroad	Steel Thro WF Beams
ST-1450B	Bridge	Bridge Struc	14.50	Spruce Street Bridge	Spruce Street	METRO	PPC Deck Beams



- Liquefaction & Mine Subsidence areas
- Track Access Points, Interlockings

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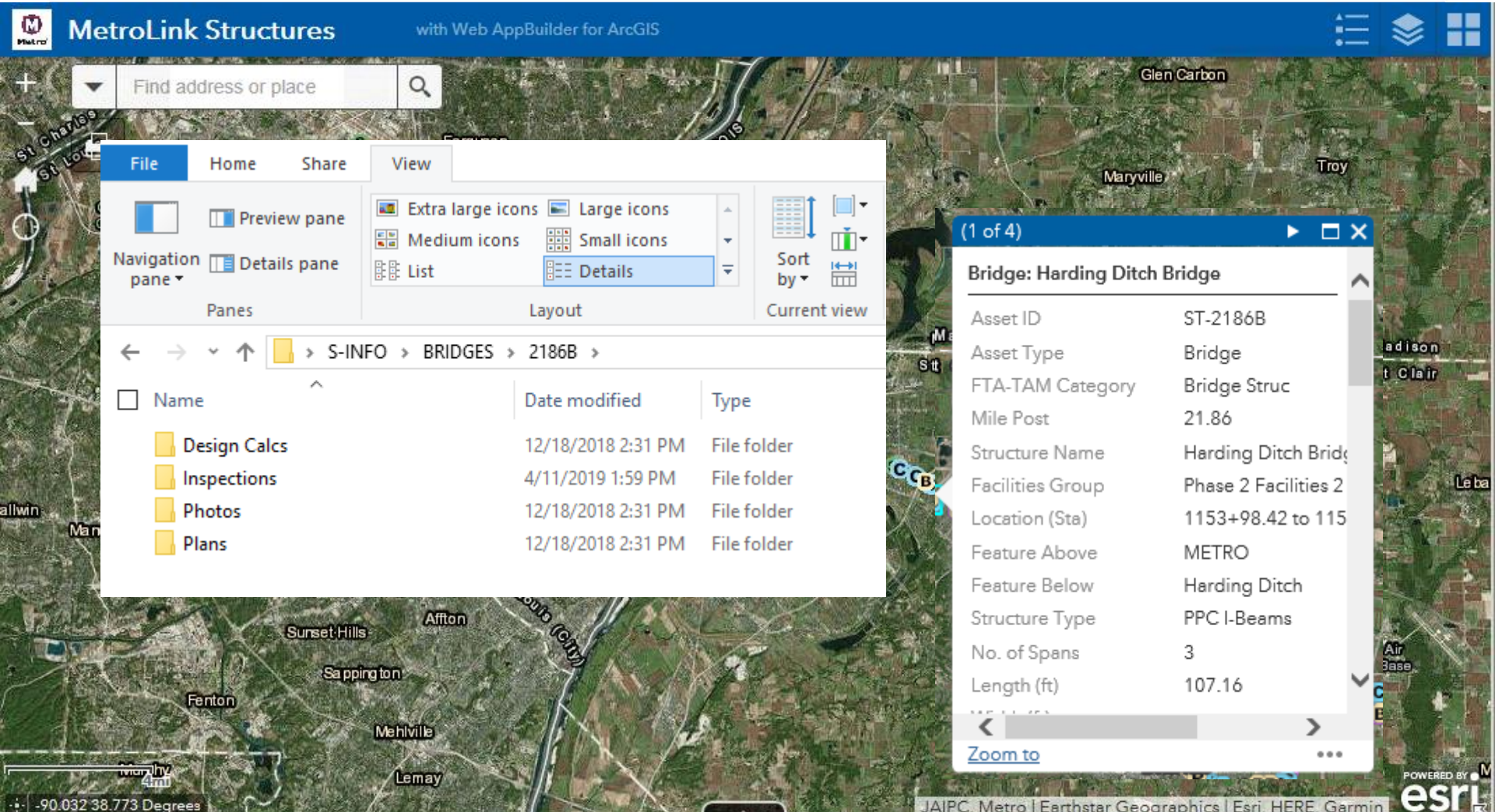
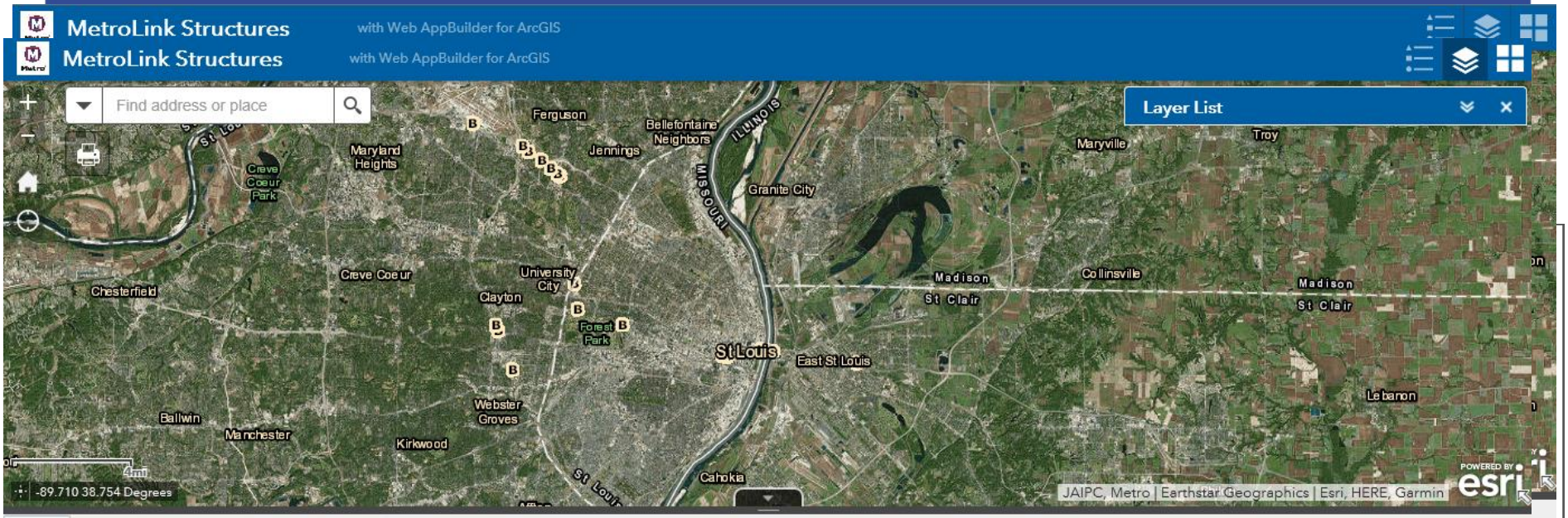

MetroLink Structures
with Web AppBuilder for ArcGIS
Find address or place
File
Home
Share
View
Navigation pane
Preview pane
Details pane
Panes
Extra large icons
Large icons
Medium icons
Small icons
List
Details
Layout
Sort by
Current view
S-INFO › BRIDGES › 2186B ›
Name
Date modified
Type
Design Calcs 12/18/2018 2:31 PM File folder
Inspections 4/11/2019 1:59 PM File folder
Photos 12/18/2018 2:31 PM File folder
Plans 12/18/2018 2:31 PM File folder
(1 of 4)
Bridge: Harding Ditch Bridge
Asset ID ST-2186B
Asset Type Bridge
FTA-TAM Category Bridge Struc
Mile Post 21.86
Structure Name Harding Ditch Brid
Facilities Group Phase 2 Facilities 2
Location (Sta) 1153+98.42 to 115
Feature Above METRO
Feature Below Harding Ditch
Structure Type PPC I-Beams
No. of Spans 3
Length (ft) 107.16
Zoom to
Glen Carbon
Maryville
Troy
Sunset Hills
Affton
Sappington
Fenton
Mehlville
Lemay
-90.032 38.773 Degrees
JAIPC, Metro | Earthstar Geographics | Esri, HERE, Garmin
POWERED BY esri

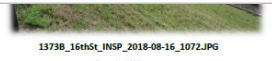


Bridges | Culverts | Retaining Walls | Stations | Tunnels

Options | Filter by map extent | Zoom to | Clear selection | Refresh

JAIPC No	RouteID	Mile Post	Mile Post Label	X Coordinate	Y Coordinate	General Structure Type	Facilities Group	Structure Name	Structure Type	Location (Sta)	Year Constructed	Feature Above	Fea
218	1	13.82	13.82	-90.203323	38.625879	Bridge	Phase I Facilities I	16th Street Bridge	PPC Double Tee Girders	4+23.99 to 5+49.99	1992	16th Street	ME

20 features 0 selected



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FHWA – NBIS Infrastructure Inspection Training

- The FHWA offers structure inspection training courses through the National Highway Institute (NHI):
- Engineering Concepts for Bridge Inspectors (NHI-130054- One-week) -presents engineering concepts, inspection procedures and information about bridges, for new inspectors with little or no practical bridge inspection experience.
- Introduction to Safety Inspection of In-Service Bridges (NHI-130101- web-based) - pre-requisite for NHI-130055 and presents engineering concepts, inspection procedures and information about bridges for new inspectors with little or no practical bridge inspection experience.
- Safety Inspection of In-Service Bridges (NHI-130055 - Two-weeks) for inspectors or engineers who perform or manage bridge inspections. Presents inspection applications and procedures, uniform coding and rating of bridge elements and components.
- Bridge Inspection Refresher Training (NHI-130053 - Three-days, every 5 years) a review of the National Bridge Inspection Standards (NBIS) Refresher after completing NHI-130055
- Underwater Bridge Inspection (NHI-130091 - four or five-days) - Course is required for all divers conducting underwater bridge inspections.

FHWA – NBIS Infrastructure Inspection Training

- Fracture Critical Inspection Techniques for Steel Bridges (NHI-130078 - Three and one-half days) provides inspection procedures and reporting of fracture critical members (FCM's) and fatigue/fracture identification in metal.
- Bridge Inspection Non-Destructive Evaluation Showcase (BINS) (NHI-130099 - One-day) bridge inspectors identify components of handheld NDE inspection tools and techniques, such as eddy current, ultrasonic and infrared thermography.
- Stream Stability and Scour at Highway Bridges (NHI-135046 -Three-days) - provides training in the prevention of hydraulic-related failures of highway bridges by identifying stream stability and scour problems at bridges. Scour at bridge piers and abutments will be estimated/calculated.
- Tunnel Safety Inspections (NHI-130110 - Five-days) - Course provides training on how to manage or execute a successful tunnel inspection based on the National Tunnel Inspection Standards (NTIS), Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual.
- Pontis Bridge Management (NHI-134056 Two and one-half days) - covers the management of the conditions of bridge infrastructure at the element level. Course provides training on developing a bridge preservation and assist in bridge rehabilitation projects.
- Inspection and Maintenance of Ancillary Highway Structures (NHI-130087 -Two-days) - provides training in the inspection and maintenance of ancillary structures, such as structural supports for highway signs, luminaries, and traffic signals.

FTA Next Steps

- Specific to structures, there is no federal regulatory policy that holds rail transit agencies in compliance (if RTAs are not on FRA Right-of-Way).
- Currently, RTAs use FHWA bridge inspection regulations and training classes to maintain structures in a State of Good Repair. FHWA bridge inspection regulations are for bridges that carry cars and trucks, not rail transit bridges that carry rail cars.
- Inform and encourage FTA to create structure inspection federal guidelines specific to rail transit structures consistently across all RTAs or formally adopt the FHWA bridge inspection training, methods and condition ratings as an FTA regulation.

MetroLink Structure Photos

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Thank You! Question & Answer

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