



TEXAS' TRUSS INVENTORY (PRIORITIZATION & PRESERVATION)

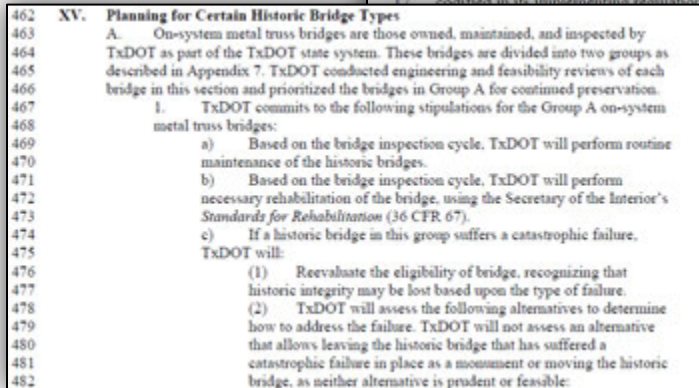
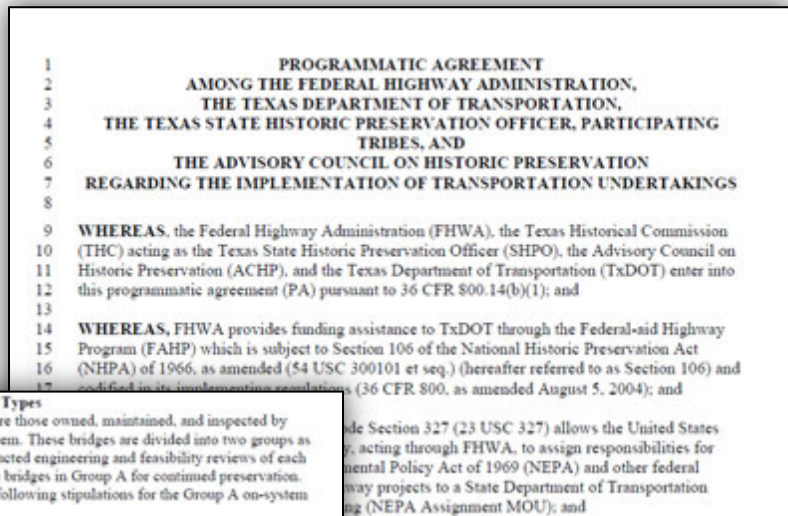
Jamie Griffin, P.E & Niyi Arowojolu, P.E.



April 25, 2025

Programmatic Agreements

- What is a Programmatic Agreement?
- How is the Programmatic Agreement valuable to preservation strategy
- How was TxDOT's Programmatic Agreement for on-system historic trusses developed?



What is a Programmatic Agreement?



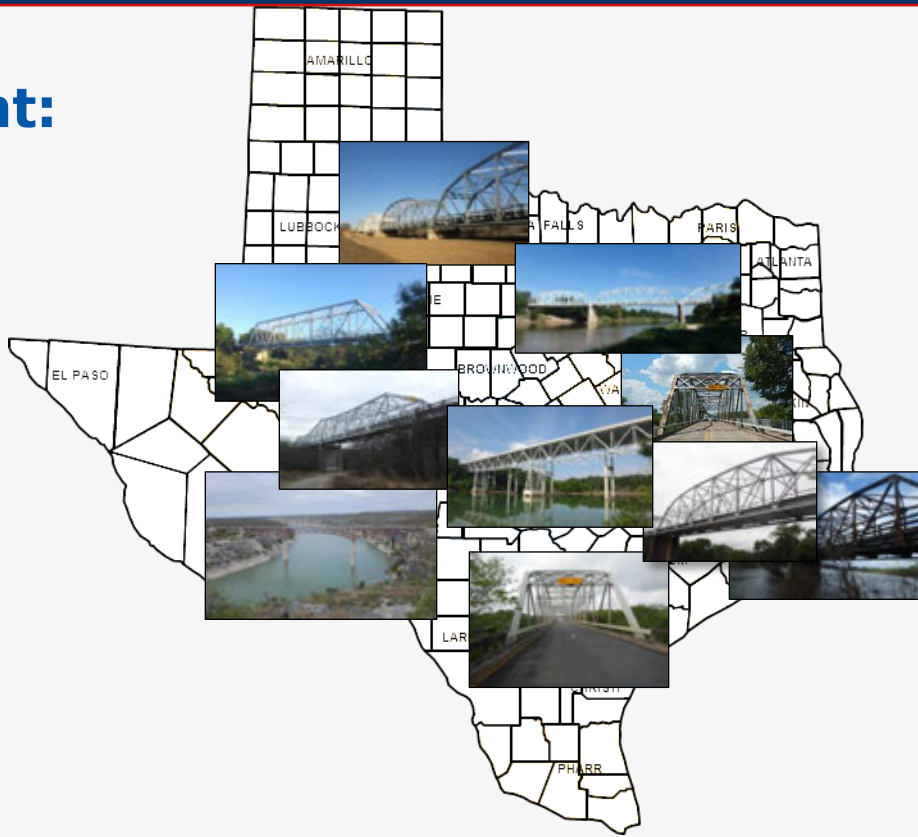
What is a Programmatic Agreement?

"Programmatic Agreements (PAs) are an effective tool for developing and documenting procedures and strategies for managing historic bridges. [They] outline the process for complying with federal regulations for cultural resources, including bridges, and that facilitate implementation of historic bridge programs."

-Mead and Hunt, "Historic Bridge Programmatic Agreements: Best Practices and Examples"

The Programmatic Agreement:

- Defines which historic on-system trusses will be rehabilitated and which will be scheduled for replacement when condition warrants
- Assists with project planning and asset management
- Provides a better understanding of the level of need versus the resources available
- Allows asset owners to focus resources on preservation



The Programmatic Agreement:

- Speeds up the project development and planning process
- Reduces time required for negotiations with Historic Commission and Historic Bridge Foundation
- Reduces risks and surprises related to negotiations during project development
- Helps projects let on time



CR 355 at San Gabriel River, BRY

A few things to note...

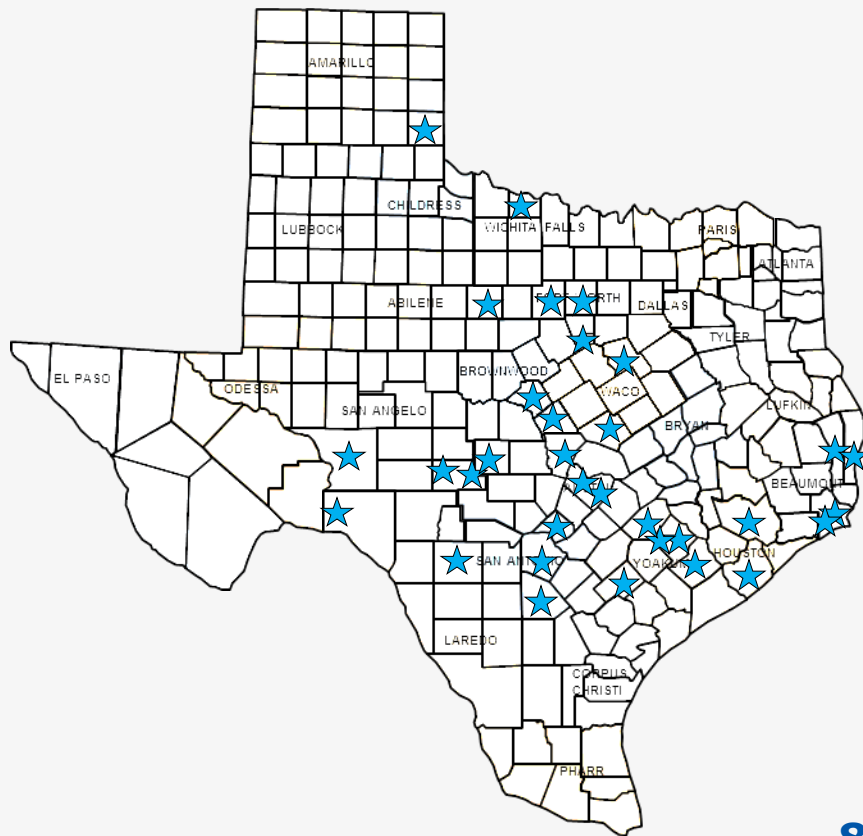
- The Section 106 process and individual 4(f)s are still required for each historic bridge when a project is planned
- Programmatic agreements can be renegotiated in extenuating circumstances, such as a catastrophic event



Business 59 at Colorado River, YKM

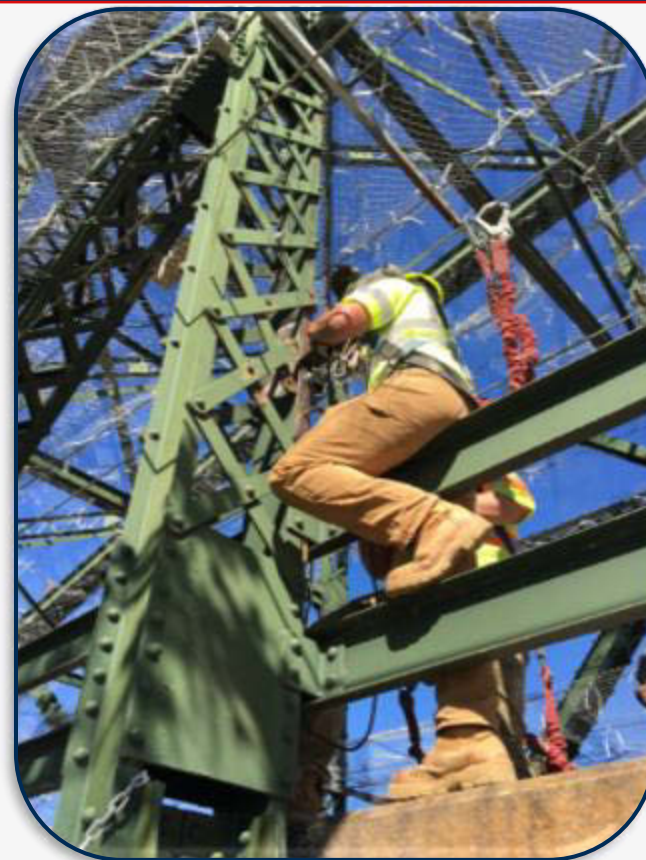
Truss Scoring Methodology

- The Environmental Division evaluated each bridge for historic significance, while the Bridge Division reviewed condition data to assess the need for repairs
- All trusses that received previous major rehabilitation work, or are programmed to receive a major rehabilitation, will continue to be maintained and rehabilitated as needed.
- The remaining bridges were ranked based on several factors, including
 - Current condition
 - Difficulty and extent of required repairs
 - Extents and severity of impact damage
- Based on these categories, each bridge received a weighted score that determined its position on the final list



Evaluation Criteria – Previous Rehabilitations

- These trusses tended to be in good condition, or a good candidate for rehabilitation
- This criteria tended to capture bridges with that are highly historically significant, or that have a high level of local interest



Evaluation Criteria – Condition

- Condition received the highest weight in the scoring criteria
- Condition ratings for superstructure and substructure were considered, along with load capacity and rehabilitation feasibility
- Deck condition was not considered since deck replacement is a part of a major rehabilitation



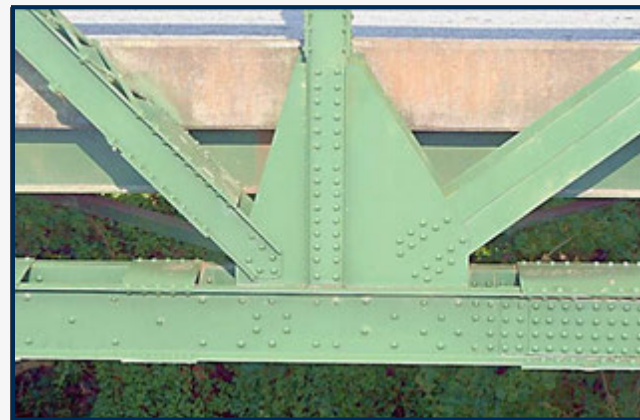
Evaluation Criteria – Rehabilitation Feasibility

- Rehabilitation feasibility was divided into two separate categories: floor systems and truss members
- Trusses with minimal repairs scored higher for rehabilitation feasibility
- Trusses with more extensive, but minor or easily repaired damage, scored higher than those with damage that is difficult to repair



Evaluation Criteria – Rehabilitation Feasibility

- Difficult to repair damage includes items such as gusset plates replacement, or damage that can only be repaired by providing an alternate load path during the replacement procedure
- Damage that cannot be corrected due to site conditions, such as stream migration, would also score lower for rehabilitation feasibility



Evaluation Criteria – Floor System

- Floor system members are generally easy to replace as connections are less complex and members can be removed with limited impact to the entire system
- Most truss floor systems will require replacement at some point due to design strength or corrosion along the top flange



Evaluation Criteria – Impact Damage

- Since most on-system trusses are through trusses, both horizontal and vertical clearance is limited
- Traffic needs may have changed from what the truss was originally designed to accommodate
- Widespread impact damage indicates that a truss may no longer be functional for the types of traffic it sees

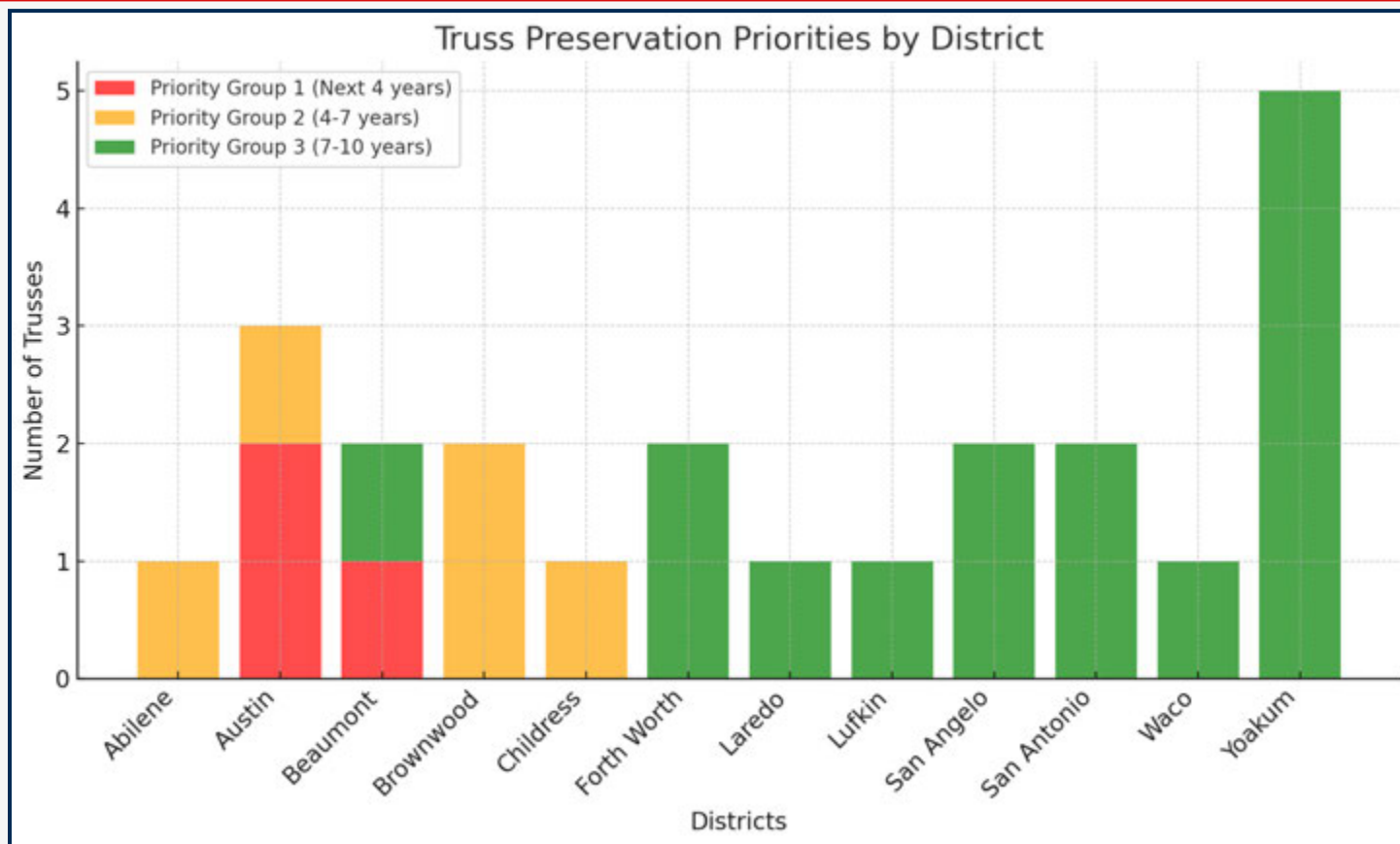


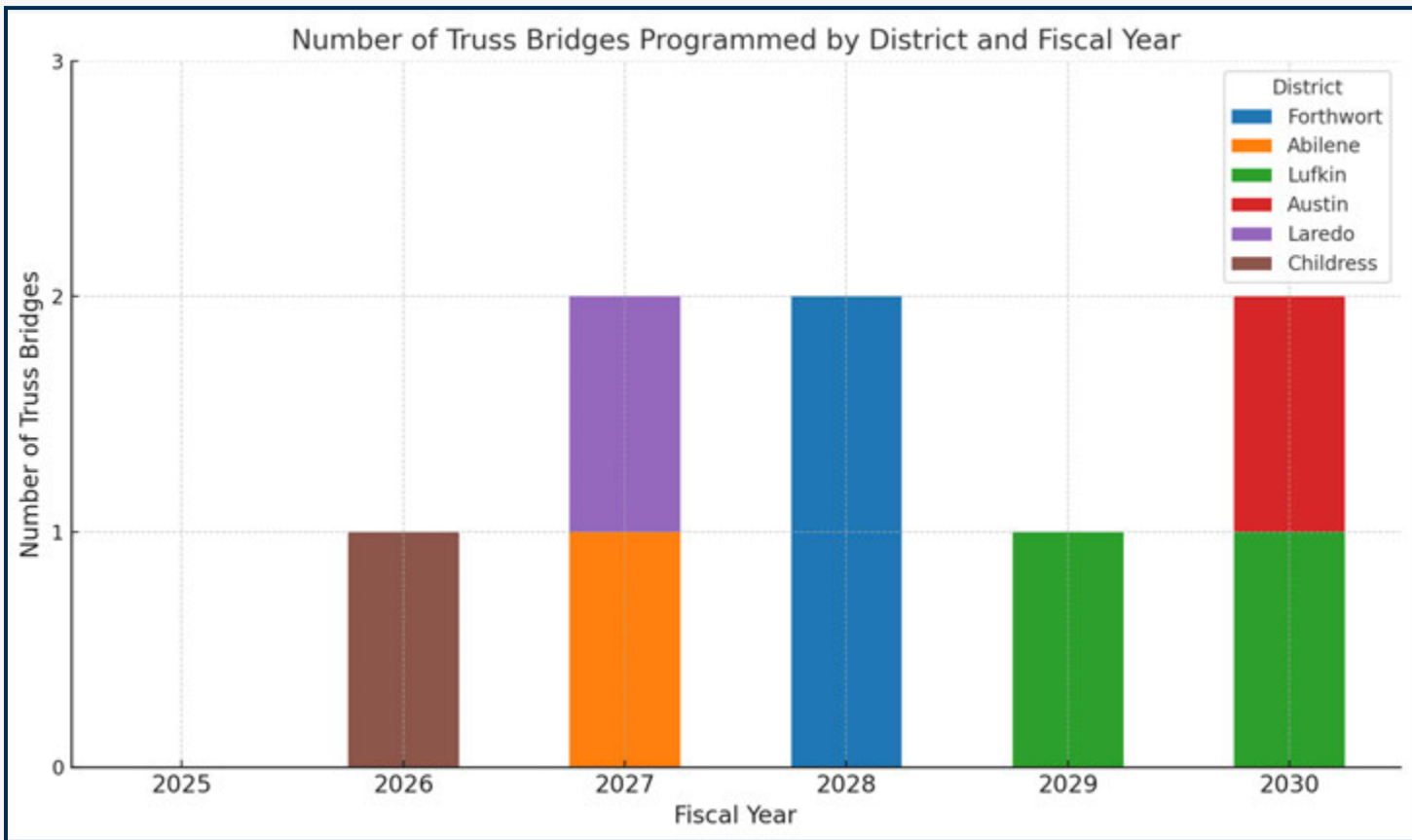
Final Notes

- The condition evaluation identified 24 of the remaining 34 on-system trusses that are recommended for continued maintenance and rehabilitation
- The list of trusses to maintain can be found in the Appendix 7 of the Programmatic Agreement
- Group A trusses will continue to be maintained and should be incorporated into District asset management plans
- Bridge Division Project Managers can work with Districts to program preservation projects based on budget and timing considerations



SH 203 at Salt Fork of Red River, CHS





Paint Failures



Upper Chord



Gusset Plate



Floor Beam



Diagonal

Corrosion



Severe corrosion on the Floor Beam around the Bearing



Severe corrosion on Gusset Plate around the Bearing



severe corrosion on lower chord batten plates



Corrosion with Section Loss in Floor Beam Web

Impact Damage, Deck and Substructure



Impact Damage on Truss Bracing



Poor Condition of Deck Riding Surface



severe corrosion on lower chord batten plates



Excessive rotation (21.5°) of Truss bearing due to shifted rocker

Preservation Process

- Reach out to your PMs to get the bridge programmed for the appropriate FY
- Consider using RMC for critical action within the programmed FY-(AUS US87 SB & SH71 WB Bridges)
- BRG DIV may help with rehab plans if the District will handle the balance of the PS&E
- If the District is unavailable for the balance PS&E, consider using District's Consultant Contract



Preservation & Rehabilitation Strategies- Painting

- System Type IIIA is recommended
- Completely remove the existing coating system before repainting

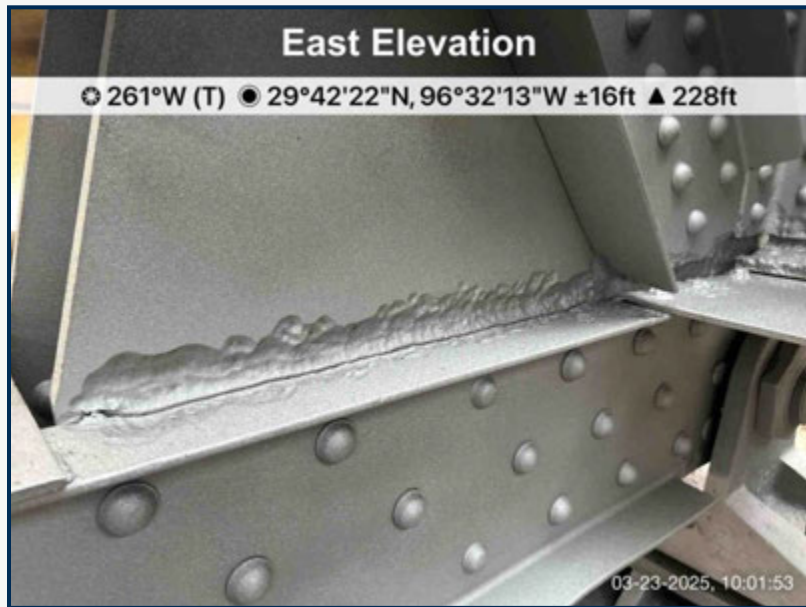
System Function	System	Primer	Intermediate	Topcoat	Notes
Overcoating	I-A	One-coat overcoat	N/A	N/A	
Overcoating	I-B	Penetrating epoxy sealer	Epoxy intermediate	Polyurethane	
Field Painting	II	OZ	N/A	Acrylic Latex	▪ Default system – non-coastal bridges
Field Painting	III-A	OZ	Epoxy intermediate	Polyurethane	▪ Coastal bridges ▪ Road salted bridges
Shop Painting	III-B	IOZ	Epoxy intermediate	Polyurethane	▪ Coastal bridges ▪ Road salted bridges
Shop Painting	IV	IOZ	N/A	Acrylic Latex	▪ Default system – non-coastal bridges

Preservation & Rehabilitation Strategies

- Gusset Plate: Consider Load rating and evaluate the condition of the bearing (if attached)



Up to 3/16" deep x 1" high x 30" long section loss to L0 inboard gusset plate along interface with a lower chord of the Truss (before blasting)



Corroded Gusset Plate Around Bridge Bearing (After shotblasting)

Preservation & Rehabilitation Strategies

- Corrosion (Gusset Plate): Case-by-case repair details- no one-size-fits-all solution

TECHBRIEF



Guidelines for Design and Rating of Gusset-Plate Connections for Steel Truss Bridges

FHWA Publication No.: FHWA-HRT-14-063
 FHWA Contact: Justin Ocel, HRDI-40, (202) 493-3080,
 justin.ocel@dot.gov

This document is a technical summary of the published National Cooperative Highway Research Program Web-Only Document 197, *Guidelines for the Load and Resistance Factor Design and Rating of Riveted, Bolted, and Welded Gusset-Plate Connections for Steel Bridges*, available through the Transportation Research Board at <http://www.trb.org/Main/Blurbs/168923.aspx>.

INTRODUCTION

On August 1, 2007, the I-35W bridge collapsed in Minneapolis, MN. The bridge was a three-span (255 by 456 by 255 ft), continuous subdivided Warren deck truss over the Mississippi River. The National Transportation Safety Board (NTSB) investigated the collapse, with technical assistance from the Federal Highway Administration (FHWA). NTSB determined that the collapse was due to undersized gusset plates at a particular node location on the main truss. The

<https://www.fhwa.dot.gov/publications/research/randt/evaluations/17039/002.cfm>



Project: BRD-COH CONFERENCE
 Task: Gusset Plate Load Rating
 Structure ID: XXXX12304

Page 1 of 8
 Made By: BRD
 Date: 4/9/2015
 Checked By:
 Date:

LB (Other Gusset)

GUSSET PLATE CONFIGURATION

Member Angles (Degrees) and Unsupported Edge Distances (in)

Member	Angle (deg)	Edge Dist (in)
1	90.00	90.00
2	0.00	0.00
3	0.00	0.00
4	47.25	47.25
5	90.00	90.00

S_{u1} in = 0.0 (not for load rating purpose)
 S_{u2} in = 0.0
 S_{u3} in = 25.8
 S_{u4} in = 20.0

General Notes

If the bottom chord is continuous, ignore all the following calculations and rating results for Member 1 and Member 2.

If analyzing a joint in the upper chord, rotate the joint 180 degrees so that the orientation matches that of the sketch provided above. Then, analyze as if a bottom chord with angle signs as described above.

Input positive angles for all members.

Should the joint not have all 4 members then enter 99 for all dimensions and 0.01 for all forces.

Units for length is in inches, and in degrees and kips in kips unless noted.

This spreadsheet follows published FHWA NHI-07-030 "Load Rating of Steel Bridges" and FHWA NHI-07-030 "Load Rating of Steel Bridges" Load Rating Guidance and Examples for Bolted and Riveted Gusset Plates in Truss Bridges using the LRFD Load Rating Design.

Dimensions/Material Properties

Gusset Thickness t_g	0.500 in
Ultimate Strength F_u	55.0 ksi
Yielding Strength F_y	33.0 ksi
Poisson's Ratio ν	0.3
Modulus of Elasticity E	29000 ksi
Effective Length Factor K	2.0

Conservatively consider away

Checklist

Checklist	Y/N	Y/N	Y/N	Y/N	Y/N
Checklist 1	Y	Y	Y	Y	Y
Checklist 2	Y	Y	Y	Y	Y
Checklist 3	Y	Y	Y	Y	Y
Checklist 4	Y	Y	Y	Y	Y
Checklist 5	Y	Y	Y	Y	Y

Design Example for Load Rating Gusset Plate

Preservation & Rehabilitation Strategies

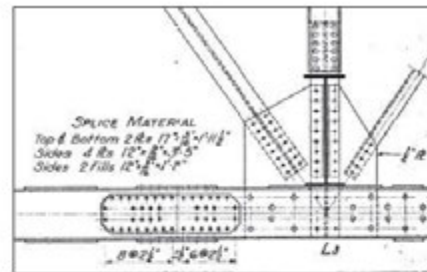
- Gusset Plate attached to Bearing: Consider replacing both the bearing and the Gusset Plate



SPAN 10 TRUSS #1 AT L0 ①

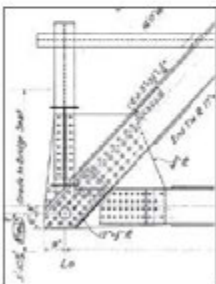


SPAN 10 TRUSS #1 AT L8 ①

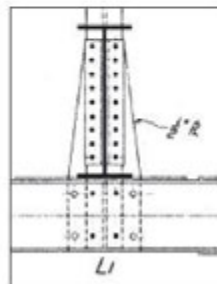


AS BUILT GUSSET PLATE
AT JOINT L3

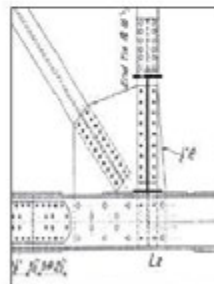
① Repairs in kind gusset plates found to have more than 20% section loss. See GUSSET REPLACEMENT table for minimum requirements based on PC inspection report.



AS BUILT GUSSET PLATE
AT JOINT L0



AS BUILT GUSSET PLATE
AT JOINT L1



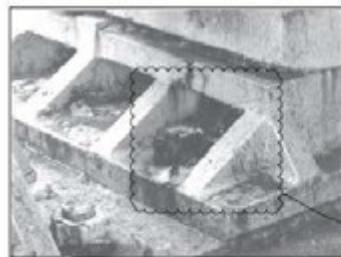
AS BUILT GUSSET PLATE
AT JOINT L2

GENERAL NOTES:
Replace existing corroded bolts, nuts and washers with ASTM F1554 Grade A325 bolts of the same diameter as the rivets.
Replace gusset plates in situ.
Determine the exact dimensions for the repair to the field prior to ordering materials.
Notify Engineer of Record of any more losses plates not addressed in the plans.
Prior to beginning work, submit a procedure for removing rivets and provide a demonstration of the method to the Engineer for approval.
Methods which can damage structural integrity will not be approved.
Photos shown are intended to provide a general view of existing conditions but may not be inclusive of all repair locations.

SHEET 3 OF 3

Preservation & Rehabilitation Strategies

- Some Bearings for Replacement



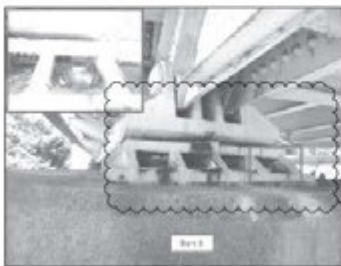
SPAN 7 NEAR TRUSS #1 AT LO (BENT 7)



SPAN 7 NEAR TRUSS #2 AT LO (BENT 8)



SPAN 8 NEAR TRUSS #1 AT LO (BENT 8)



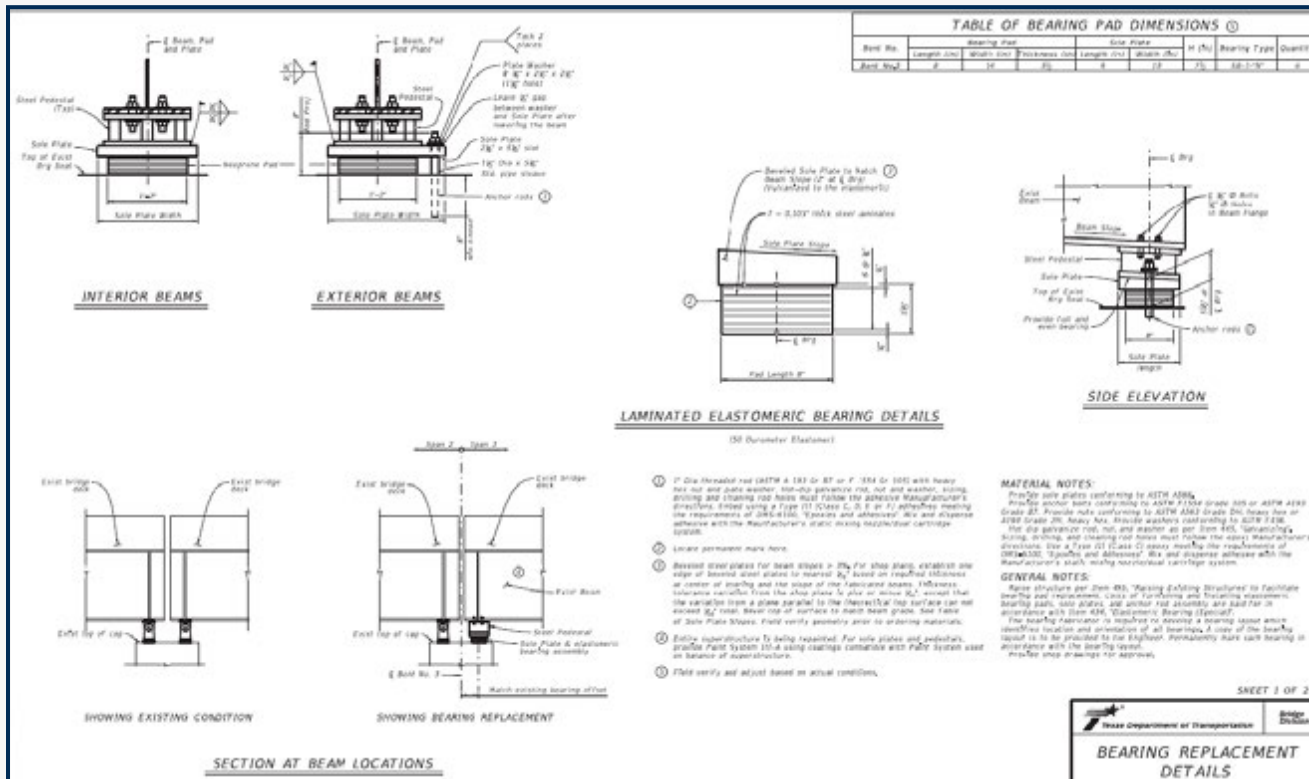
SPAN 8 NEAR TRUSS #2 AT LO (BENT 8)

GENERAL NOTES:

Use ASTM F3125 Grade A325 bolts for repairs at this location.
 Replace existing corroded bolts, nuts and washers with ASTM F3125 Grade A325 bolts of the same diameter.
 Determine the exact dimensions for the repair in the field prior to ordering materials.
 Notify Engineer of Record of any more corroded bolts not addressed in the plans.
 Weld threaded rod in accordance with Item 646, "Structural Steel Welding".
 Sandblast all bolts, nuts, and washers.
 Photos shown are intended to provide a general view of existing conditions but may not be inclusive of all repair locations.
 Remove paint and rust before repainting. Use system SS-4 paint system.

Preservation & Rehabilitation Strategies

- Bearing Replacement:
Item 434 & 495:
[https://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standards/bridge/WD-EBR\(S\)-24.pdf](https://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standards/bridge/WD-EBR(S)-24.pdf)

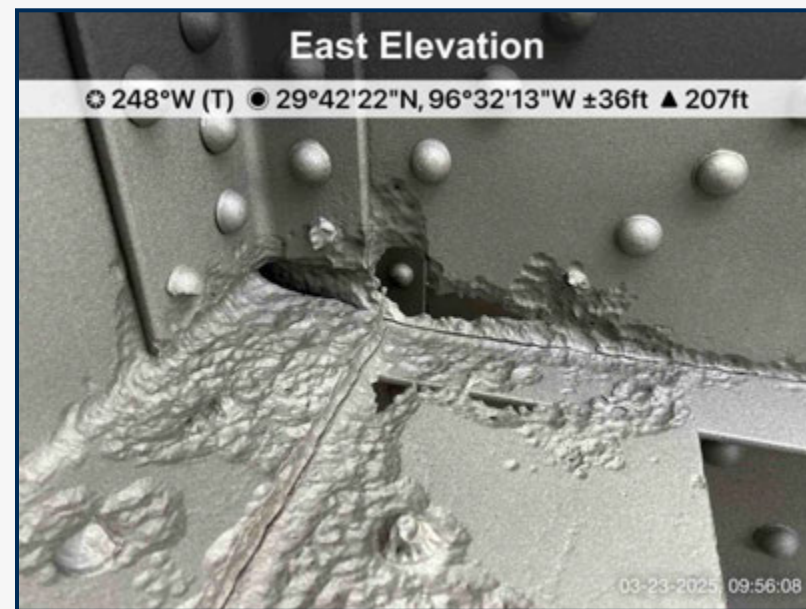


Preservation & Rehabilitation Strategies

- Corrosion: Case-by-case repair details- no one-size-fits-all solution



Before Shotblasting



After Shotblasting

Bridge Project Managers

Paul Rollins, P.E. – Section Director

Laura X. Garcia, P.E. – Group Leader

- Dallas

Jamie Griffin, P.E.

- Amarillo
- San Angelo
- Abilene
- Houston
- Brownwood

Andy Ding, P.E.

- Fort Worth
- Lubbock
- Yoakum
- El Paso

Dina Dewane, P.E.

- Wichita Falls
- Atlanta
- Beaumont
- Childress
- Laredo

Rachel Larcom, P.E.

- Paris
- Odessa
- Tyler
- Corpus Christi
- Bryan

Marie Fisk, P.E.

- Waco
- Lufkin
- Austin
- San Antonio
- Pharr



Thanks for your time. For questions, contact:
Jamie.Griffin@txdot.gov, Olaniyi.Arowojolu@txdot.gov