



Using Critical Thinking to Address Critical Findings on Local Agency Bridges

2019 Ohio Transportation Engineering Conference

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FHWA Metric #21 – Critical Findings

 U.S. Department of Transportation
Federal Highway Administration

NBIS Oversight Program

HIBS-30
NBIPOT

Metrics for the Oversight of the National Bridge Inspection Program



May 2017

[ToC](#)

- A procedure is established to assure that critical findings are addressed in a timely manner
- FHWA is periodically notified of the actions taken to resolve or monitor critical findings

What is a Critical Finding?

“Structural or safety related deficiency that may pose an immediate threat to the safety of the traveling public”

- **Damage or Loss**



What is a Critical Finding?

“Structural or safety related deficiency that may pose an immediate threat to the safety of the traveling public”

- Damage or Loss
- Scour



What is a Critical Finding?

“Structural or safety related deficiency that may pose an immediate threat to the safety of the traveling public”

- **Damage or Loss**
- **Scour**
- **Hazard to Public**



What is a Critical Finding?

“Structural or safety related deficiency that may pose an immediate threat to the safety of the traveling public”

- **Damage or Loss**
- **Scour**
- **Hazard to Public**
- **Missing or Incorrect Signs**

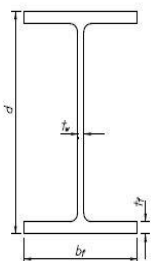


1600P

What is a Critical Finding?

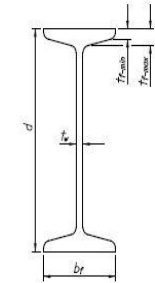
“Structural or safety related deficiency that may pose an immediate threat to the safety of the traveling public”

- Damage or Loss
- Scour
- Hazard to Public
- Missing or Incorrect Signs
- Load Rating



MEMBERS	SPAN	PHOTO	d	b _f	t _w	t _f				
Stringer Assume CB10x35	4 & 6		16"	6"	1/4"	1/2"				
Stringer Assume W10x45	5		16"	7"	3/8"	5/8"				
Beams Assume CB24.2x78	1-3 7-9		24"	9 7/8"	1/2"	11/16"				

NOTES:
Interior stringers crowned in spans 4, 5 and 6.



MEMBERS	SPAN	PHOTO	d	b _f	t _w	t _{f-min}	t _{f-max}			
End floor beam	5		28"	9 1/2"	.590	1/2"	3/4"			
End floor beam	4 & 6		23 1/2"	9 5/8"	.555	9/16"	3/4"			
Interior floor beams	4 & 6		28"	10"	3/4"	9/16"	1"			
Interior floor beams	5		27 1/2"	10"	5/8"	3/4"	1 1/8"			

NOTES:

Structure Rating Summary:	Loading		Gross Vehicle Weight (Tons)	Rating (Tons)			
	Inventory H20	20	20	3.9			
	Operating H20	20	20	12.6			
	Inventory HS20	36	36	4.7			
	Operating HS20	36	36	18.8			
	Inventory 3-3	40	40	6.3	0.16	L1L2 Spans 4 & 6	Tension
	Operating 3-3	40	40	25.4	0.64	L1L2 Spans 4 & 6	Tension
	Inventory NRL	40	40	4.8	0.12	L1L2 Spans 4 & 6	Tension
	Operating NRL	40	40	19.3	0.48	L1L2 Spans 4 & 6	Tension
	Inventory EV3	43	43	4.8	0.11	L1L2 Spans 4 & 6	Tension
	Operating EV3	43	43	17.6	0.41	Ext. Stringer Span 5	Shear at Support

Communication is Critical

- **Inform Bridge Owner Immediately**
 - **Phone call followed by letter (email and hard copy)**
 - **Having good prior relationship with bridge owner helps the process**
 - **We are here to help**

Critical Finding Process



- **Inform Bridge Owner Immediately**
- **What is the Finding**
 - **Need to know bridge owner's capabilities**
 - **Talking to another engineer is different than talking to a county commissioner**

Critical Finding Process

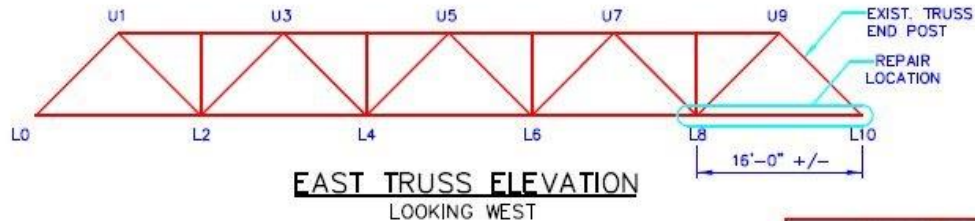


Inform Bridge Owner Immediately

- What is the finding
- Why is it a safety concern
- How to Fix the Critical Finding (Post, Repair, Close)
 - Provide repair sketches/details

Critical Finding Process

Repair Sketches/Details Over Photos

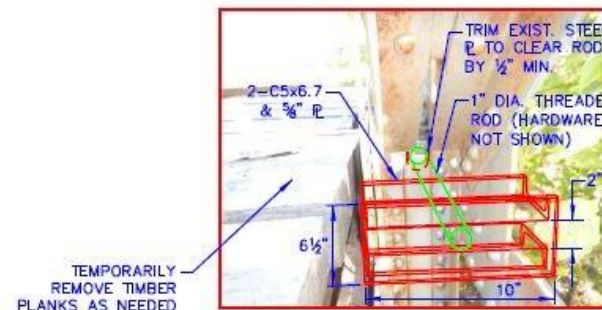


NOTES:

1. THREADED ROD SHALL BE 1" DIAMETER & HAVE MINIMUM 127.7ksi YIELD STRENGTH & 150ksi ULTIMATE STRENGTH AND SHALL CONFORM TO ASTM A722-07 & AASHTO M275 REQUIREMENTS.
2. THE THREADED ROD SHALL BE INSTALLED WITH HARDENED WASHERS AND TWO HEX NUTS AT EACH END & SHALL MEET THE ROD MANUFACTURER'S REQUIREMENTS.
3. THE THREADED ROD NUTS SHALL BE INSTALLED SNUG TIGHT.
4. ALL STRUCTURAL STEEL (CHANNELS, ANGLES & PLATES) SHALL BE 36ksi YIELD STRENGTH MINIMUM (ASTM A709) OR BETTER.
5. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWS D1.5 - BRIDGE WELDING CODE. ABRASIVELY CLEAN ALL WELDING SURFACES PRIOR TO WELDING.
6. FIELD VERIFY ALL DIMENSIONS PRIOR TO FABRICATION TO ASSURE PROPER FIT-UP.
7. AFTER INSTALLATION IS COMPLETE, PAINT ALL NEW AND AFFECTED EXISTING STEEL SURFACES WITH TWO COATS OF ZINC-BASED PAINT.



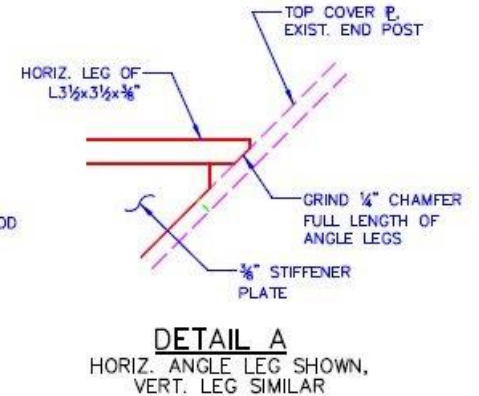
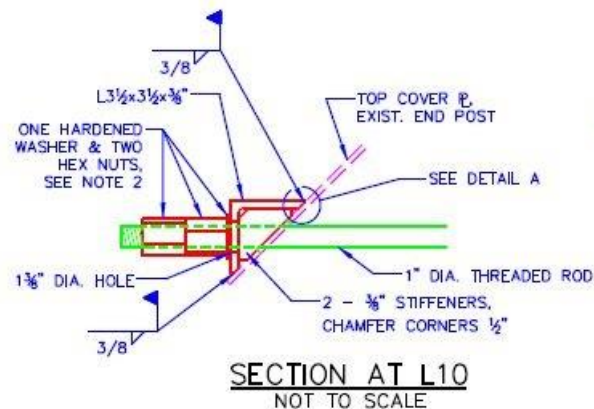
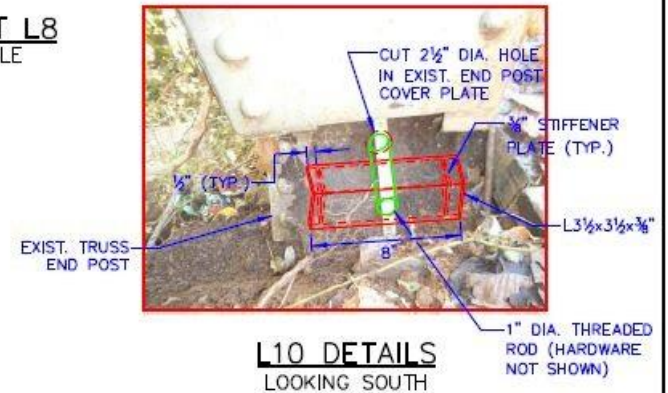
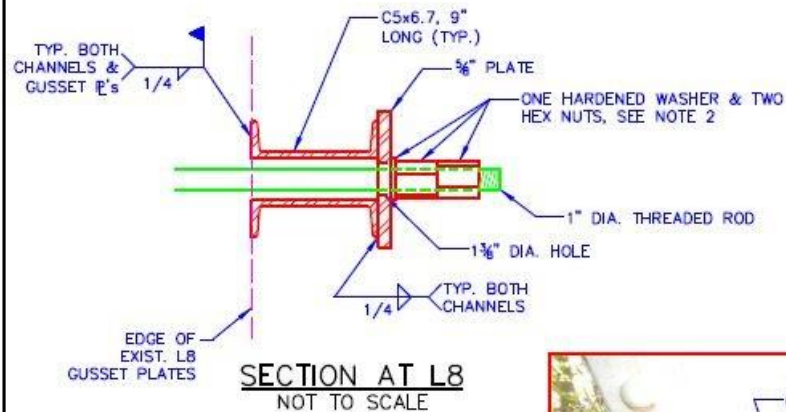
OVERALL REPAIR



L8 DETAILS
LOOKING NORTH

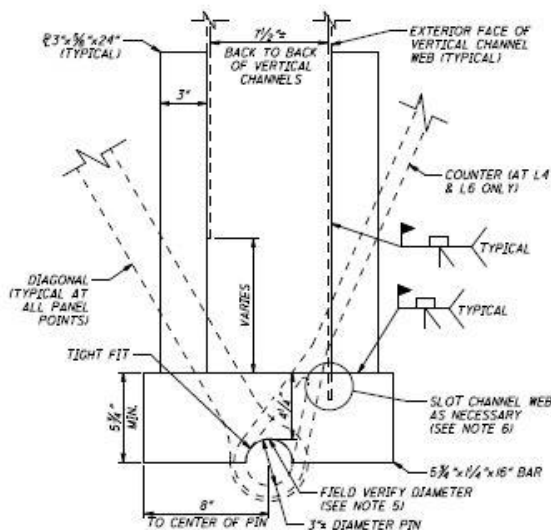
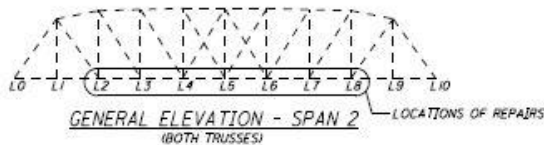
Critical Finding Process

Repair Sketches/Details Over Photos



Critical Finding Process

Repair Sketches/Details Over Photos

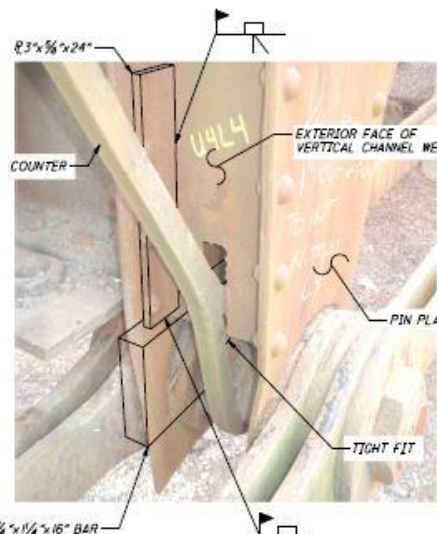


TYPICAL SECTION

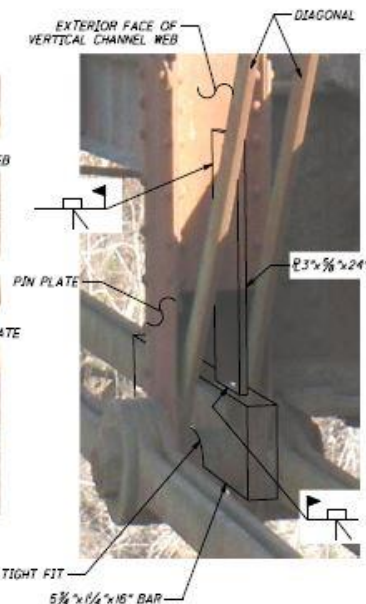
PIN NUT, LOWER CHORD, PIN PLATES AND CHANNEL FLANGES NOT SHOWN

NOTES:

- CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO FABRICATION OF STEEL MEMBERS.
- STEEL MEMBERS SHALL BE ASTM A572 (F_y = 50 ksi) AND COATED WITH A ZINC BASED PRIMER. CLEAN EXISTING STEEL SURFACES IN PREPARATION FOR WELDING WITH NEW STEEL MEMBERS.
- STEEL MEMBERS SHALL BE ADDED AT L2-L8 PANEL POINTS ON BOTH TRUSSES (14 LOCATIONS TOTAL, SEE ELEVATION).
- AT L4 AND L6 LOCATIONS, THE ASSEMBLY WILL BE OFFSET FROM THE CENTER OF THE VERTICAL DUE TO THE PRESENCE OF A COUNTER MEMBER. FIT THE ASSEMBLY BETWEEN THE COUNTER AND THE PIN PLATE AS SHOWN.
- EXIST. TRUSS PINS MAY HAVE A STEEL COLLAR AT SOME LOCATIONS. CONTRACTOR MAY REMOVE THE COLLARS BY NON-DESTRUCTIVE METHODS, MAKING SURE TO NOT DAMAGE THE PIN OR THE SURROUNDING MAIN MEMBERS. IF THE COLLAR CANNOT BE REMOVED, FABRICATE THE 5/8x1/4x16" BAR TO FIT AROUND THE COLLAR. BARS SHALL BE FABRICATED TO FORM A BEARING TIGHT FIT AROUND THE COLLAR OR PIN.
- SLOT THE VERTICAL CHANNEL WEB AS NECESSARY TO PLACE THE 5/8x1/4x16" BAR IN THE POSITION SHOWN, MAKING SURE TO NOT DAMAGE THE PIN OR THE SURROUNDING MAIN MEMBERS.
- REOPEN BRIDGE ONLY AFTER 3 TON LOAD POSTING SIGNS HAVE BEEN INSTALLED AT BOTH APPROACHES AND ALL REPAIR WORK IS COMPLETE IN ALL 3 SPANS.



ASSEMBLY LAYOUT AT L4 & L6



ASSEMBLY LAYOUT AT L2, L3, L5, L7, & L8

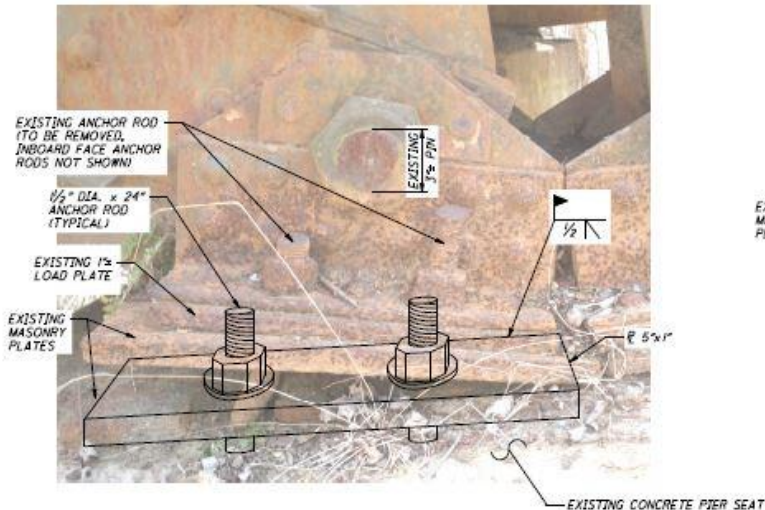


DESIGNED AP	DRAWN JMK	REVIEWED EMC	DATE 2/12
CHECKED JMK	REVISED	STRUCTURE FILE NUMBER	



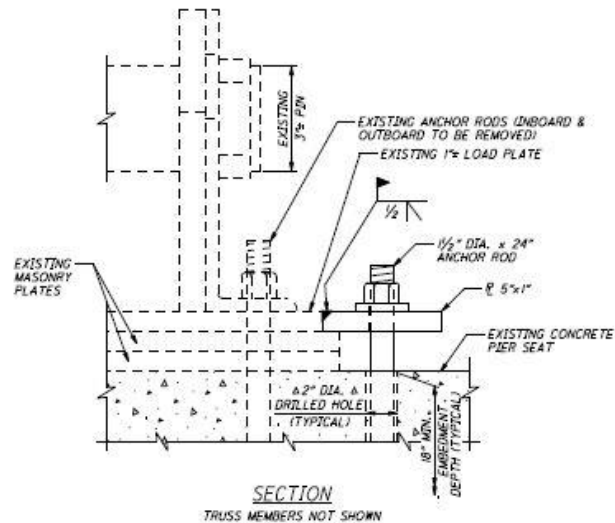
Critical Finding Process

Repair Sketches/Details Over Photos



LAYOUT

(PROPOSED PLATE SHOWN IN APPROXIMATE FINAL RE-POSITIONED TRUSS LOCATION)



SECTION

TRUSS MEMBERS NOT SHOWN

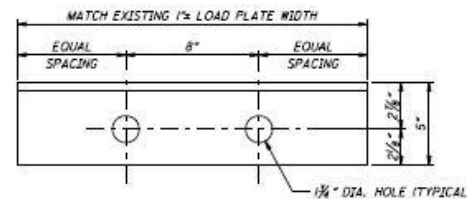


PLATE DETAIL

1" THICK
(2 PLATES TOTAL)

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO THE FABRICATION OF STEEL MEMBERS. PLATES AND ANCHOR BOLTS SHALL BE ADDED TO THE OUTBOARD FACE OF THE PIER BEARINGS OF THE EAST APPROACH TRUSS ONLY.
2. STEEL PLATE SHALL BE ASTM A572 (FY = 50 ksi) AND COATED WITH A ZINC BASED PRIMER. CLEAN EXISTING STEEL SURFACES IN PREPARATION FOR WELDING WITH NEW STEEL PLATE. ANCHOR RODS SHALL BE FURNISHED ACCORDING TO ASTM A307.
3. REMOVE/CUT ALL EXISTING ANCHOR RODS (INBOARD AND OUTBOARD) ABOVE THE PIER SEAT PRIOR TO POSITIONING THE TRUSS INTO ITS FINAL LOCATION.
4. USE THE NEW STEEL PLATE AS A TEMPLATE FOR DRILLING NEW ANCHOR ROD HOLES INTO THE EXISTING PIER. 2" DIA. HOLES SHALL BE 18" MINIMUM DEPTH AND FILLED WITH CEMENT GROUT.
5. PLACE WASHERS AND HAND-TIGHTEN NUTS ONTO ANCHOR RODS.



DESIGNED	DRAWN	REVIEWED	DATE
JMK	JMK	EMC	2/12
(CHECKED)	REVIEWED	STRUCTURE FILE NUMBER	
EMC			



Critical Finding Process

Inform Bridge Owner Immediately

- What is the finding
- Why is it a safety concern
- How to Fix the Critical Finding (Post, Repair, Close)
 - Provide repair sketches/details
 - Be available to answer questions

Critical Finding Process

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 - **DON'T ASSUME THEY KNOW**

DON'T ASSUME THEY KNOW



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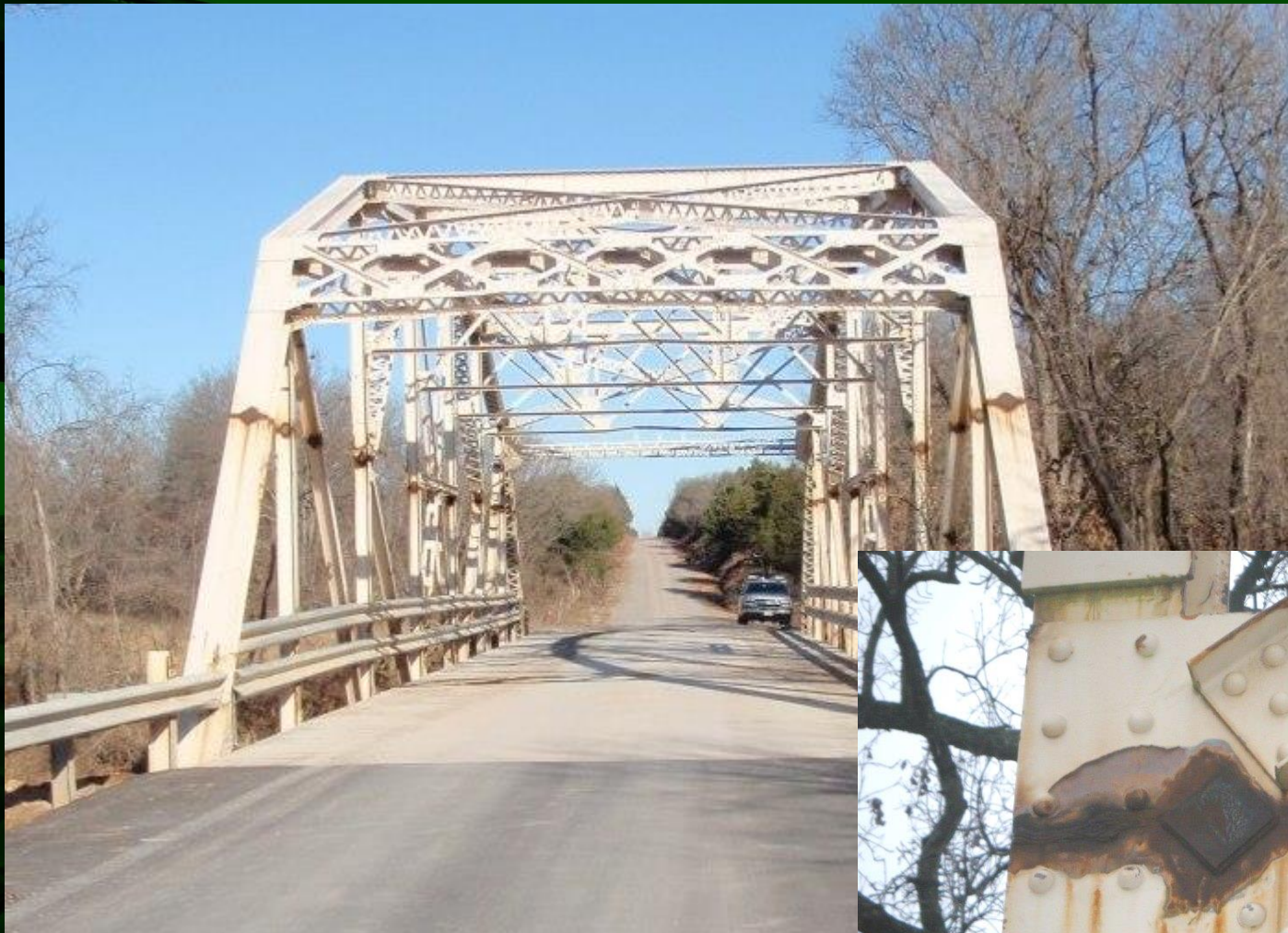
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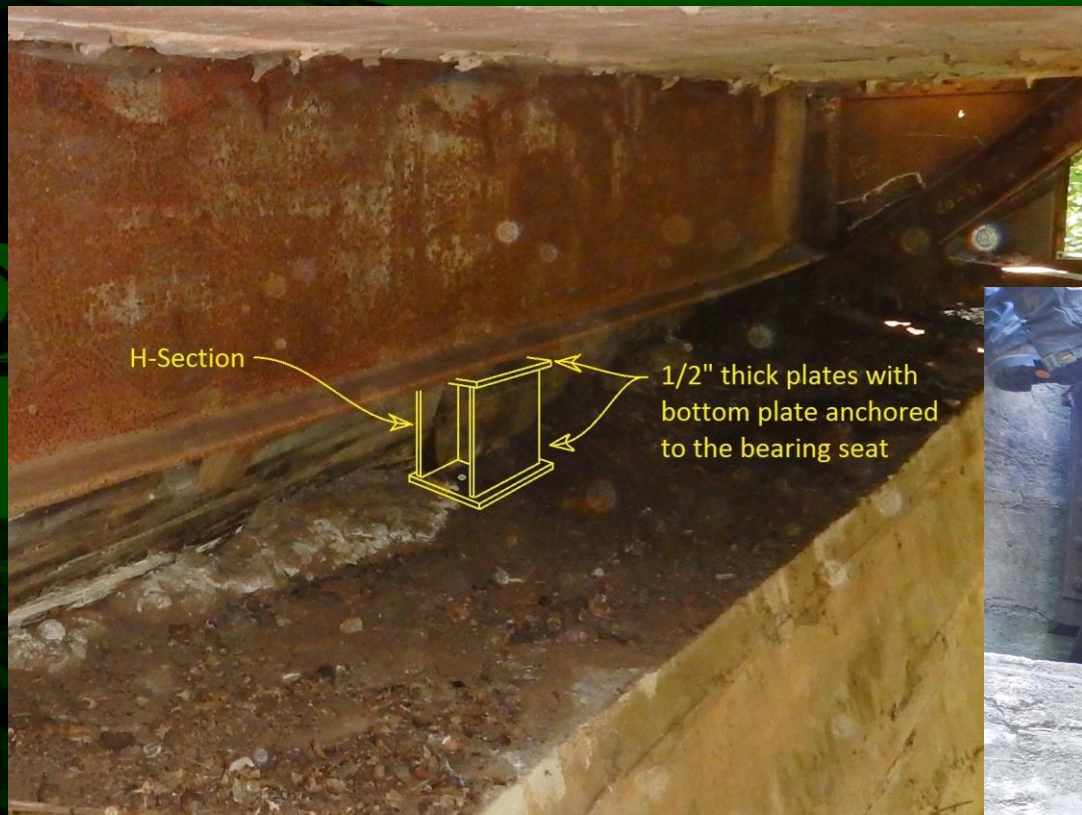
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Critical Finding Process

Inform Bridge Owner Immediately

- What is the Finding
- Why is it a Safety Concern
- How to Fix the Critical Finding (Post, Repair, Close)
- When do repairs have to be completed
 - Depends on agency's guidelines
 - 30 to 90 days common
 - Closure recommendation happens immediately

Critical Finding Process

Inform DOT

- Multiple people at DOT need to be informed
 - Central Office
 - District Office
- Update DOT database (element level database)
 - Make note in element and structure notes of Critical Finding
 - Change inspection frequency
 - Inspect repairs in 6 months

Keeping Track of the Process

We use a database based program

- Track progress
 - Letters and sketches sent
 - 14, 28, 60 and 90 day check-in
- Store correspondence
 - Notification/Closure/Resolved Letters
 - Repair sketches
 - Scour Plan of Action
 - Correspondence to/from bridge owner and DOT
- Email reminders for check-in due dates
- Over 140 Critical Findings since 2012

Keeping Track of the Process

Automated Critical Finding Tracking

Bridge	County	TL	CX Date	Division	Contract	Days	14D	28D	60D	90D	Resolved
(Touch to Review)	All	From:	9/19/2012	All	EC-1856 BN		(Check Up)	(Check Up)	(Letter)	(Close)	All
	All	To:	12/3/2018	All	All						All
03091	Delaware	DEP	9/26/2018	8	EC-1856 BN	68	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
01620	Creek	DEP	8/15/2018	8	EC-1856 BN	110	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
01400	Creek	DEP	8/8/2018	8	EC-1856 BN	117	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
01406	Creek	MAS	7/15/2018	8	EC-1856 BN	141	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
03016	Washington	DEP	6/15/2018	8	EC-1856 BN	171	X	X	X	<input type="checkbox"/>	X Resolved
04484	Osage	SMF	5/9/2018	8	EC-1856 BN	208	X	X	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
01877	Pawnee	DEP	4/16/2018	8	EC-1856 BN	231	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
01084	Creek	DEP	3/13/2018	8	EC-1856 BN	265	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
01619	Creek	DEP	3/13/2018	8	EC-1856 BN	265	X	X	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
01400	Creek	DEP	3/5/2018	8	EC-1856 BN	273	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
04953	Craig	EMC	1/8/2018	8	EC-1856 BN	329	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved
05015	Osage	DEP	9/11/2017	8	EC-1856 BN	448	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X Resolved

 = Within 14 Days
 = Beyond 14 Days
 = Beyond 28 Days
 = Beyond 60 Days
 = Beyond 90 Days

Keeping Track of the Process

Automated Critical Finding Tracking

Oklahoma_L

Trip County Load Rat. Bridge Inspection CX List Back

BURGESS & NIPLE
 Engineers ■ Architects ■ Planners

8/8/2018 01620 OS INS. **CX REVIEW**

Team Leader: Dale Poorman CX Date: 8/15/2018

General CX Inspection Comments CX Correspondence

Resolved Date Resolved:
▼ Mandatory Correspondence ▼

CX Comment	CX Status
Section loss to U2L2 and U6L6 of both trusses requiring strengthening. Spalling under retrofit plates supporting truss bearings at the east abutment.	2018/08/14 - Called Rick Rumsey, Sapulpa Asst. City Manager to discuss plans for bridge. Rumsey is OK with closure until repairs have been made. Sounds like city is wanting to close bridge and make into a park.
CX issued.	2018/08/15 - CX letter sent. Jeff Hunter is designated to work on the repair sketches. Not sure if repairs will be made to abutment at this time.
14 days	2018/08/29
28 days	2018/09/12
60 days	2018/10/14
90 days	2018/11/13
	2018/10/05 - CX repair detail sent.
	2018/10/24 - Talked to Rick Rumsey. Logos is doing the work. Wants me to stop by and meet him at the bridge when in town in November.
	2018/11/05 - SMF met with Rick Ramsey at bridge. Discovered west face of north L2 did not have welded angle. Instructed city to complete repair. East abutment repairs are complete.
	2018/11/06 - Letter stating that CX repairs unacceptable.
	2018/11/12 - Poorman inspected the additional repairs. Repairs comply with repair details. CX Resolved letter sent.

Keeping Track of the Process

Closing the Critical Finding Issue

- Visit bridge to review repair
 - Repair acceptable or unacceptable
- Send Critical Finding Resolved Letter
- Inform DOT of resolved Critical Finding
- Revise DOT database (element level database)
 - Change inspection frequency
 - Note Critical Findings have been resolved

Questions

