

# US 190 MISSISSIPPI RIVER BRIDGE REPAIR, REHABILITATION, AND PAINTING



A COMBINED HIGHWAY/RAILROAD BRIDGE REHABILITATION

Durk Krone, P.E., TRC Engineers, Inc., Baton Rouge, LA



SESSION 3  
APRIL 17, 2019

# AGENDA

- DESIGN TEAM
- BRIDGE LOCATION, HISTORY, & SPECIFICS
- KEY REPAIR ITEMS
- IN-DEPTH LOOK AT COMPLEX REPAIRS:
  - RAILROAD STRINGER STIRRUP BEARINGS
  - TOWER LATERALS
  - ANCHOR BOLT REPAIRS
  - RIVET REMOVAL ISSUES
  - PEDESTAL FIBERWRAP
- QUESTIONS?

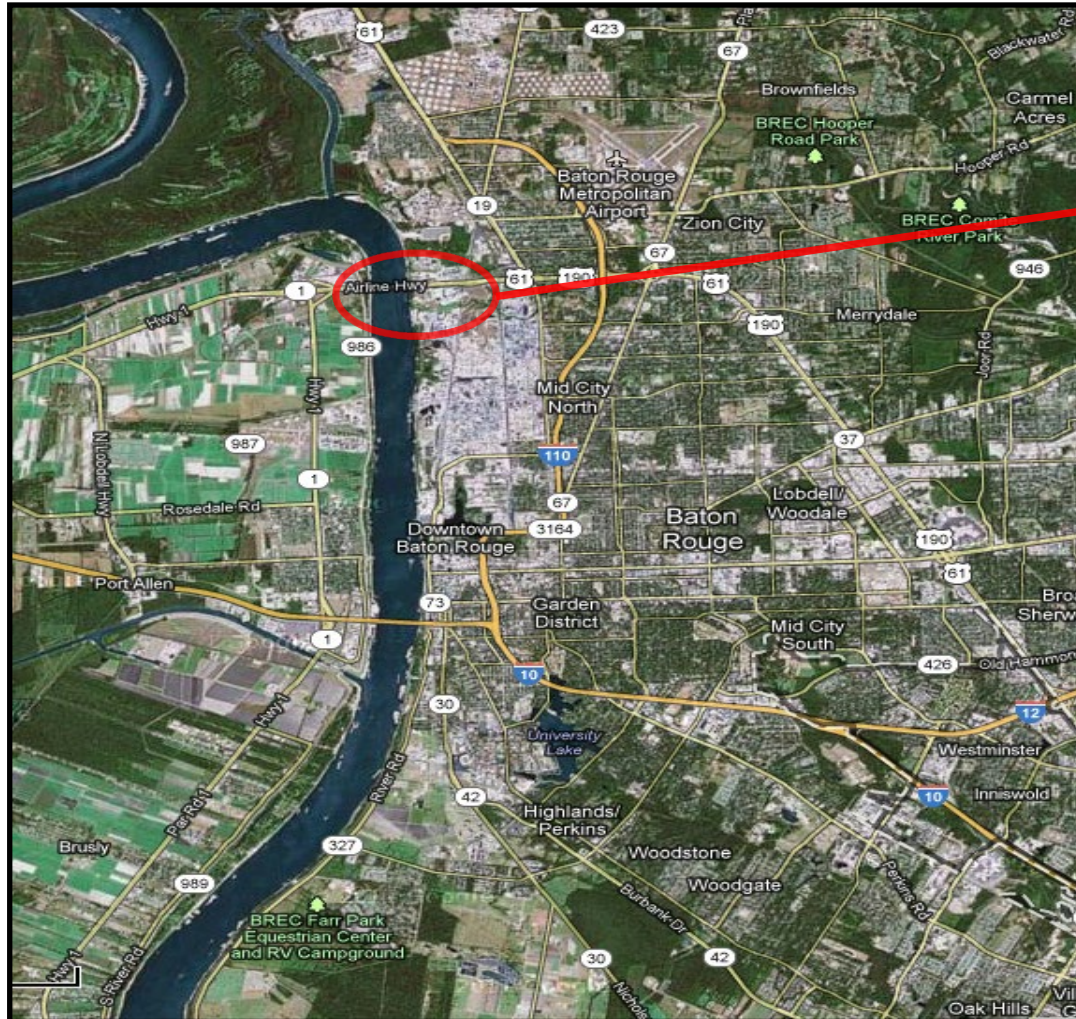


# DESIGN TEAM ORGANIZATION

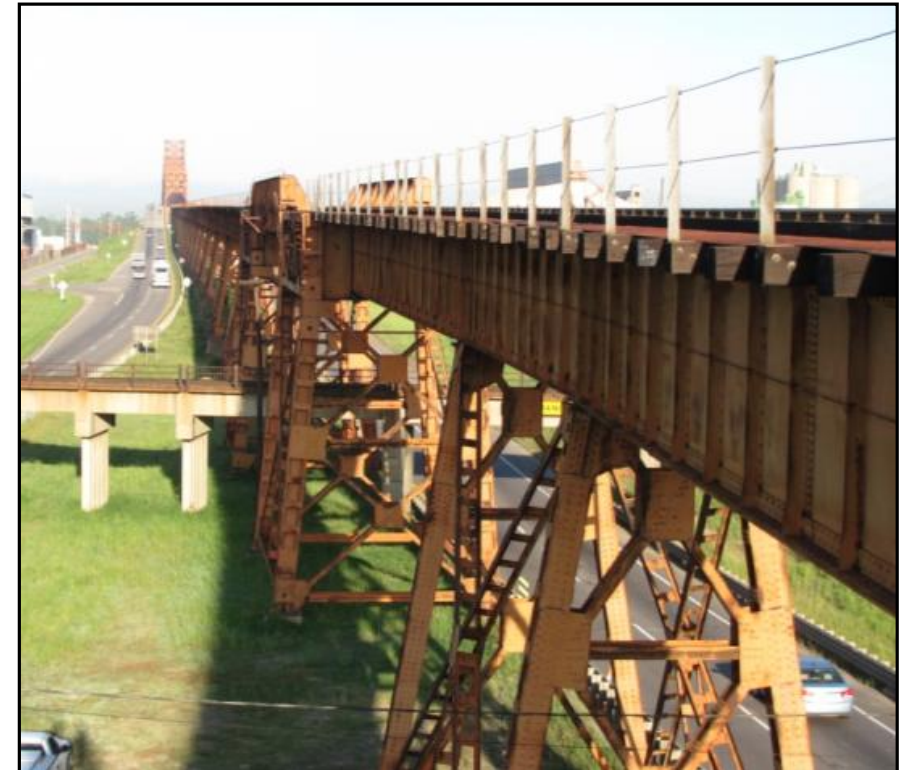


- LOUISIANA DOTD – BATON ROUGE, LA
  - CHRIS GUIDRY, P.E. – BRIDGE PROJECT MANAGER
- TRC ENGINEERS, INC.
  - DURK KRONE, P.E. – VICE PRESIDENT
  - JOHN DALLAS RICHARD, P.E. – PROJECT MANAGER
- KANSAS CITY SOUTHERN RAILWAY
  - SRIKANTH HONNUR, P.E.
- UNION PACIFIC RAILROAD
  - MICHAEL FREEMAN, P.E.
- GPI SOUTHEAST, INC.
  - FRANK REA – PROJECT MANAGER
- RAHMAN & ASSOCIATES
  - Rahman Bhatti, P.E. - President
- ENCON/CMS
  - Al Fletrich, P.E. - President

# BRIDGE LOCATION



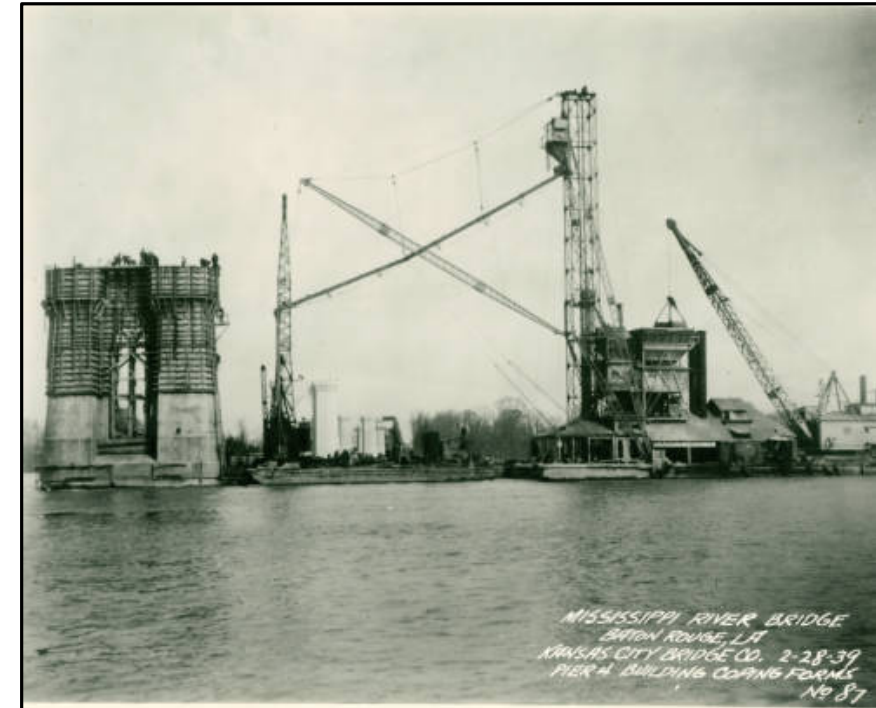
BATON ROUGE, LOUISIANA  
North Baton Rouge Industrial Area  
BETWEEN LA 1 AND US 61/I-110



# HISTORY OF REHABILITATION PROJECTS

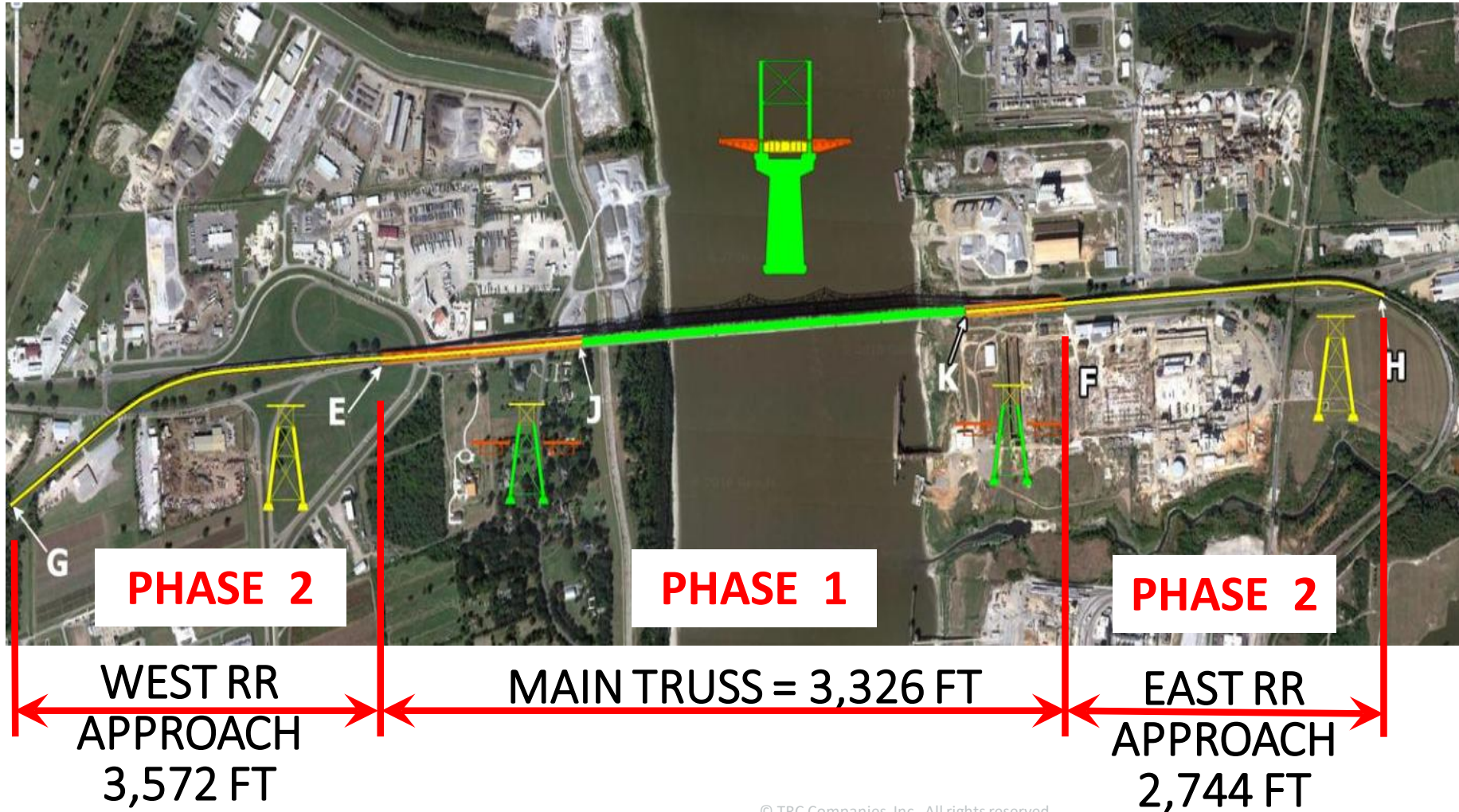


- Opened in August 1940
  - “Huey P. Long Bridge”
  - “Old Mississippi River Bridge”
- REHABILITATION PROJECTS
  - Painted in Mid-1960’s
  - Major Rehabilitation in 1980’s:
    - Roadway Widened from 19’-9” to 24’-0” in each direction
  - 2005 In-depth Inspection (TRC)
  - 2010-2017 Rehab Project (TRC)



# BRIDGE SPECIFICS

**1 RR MAIN LINE- 4 HWY LANES • STRUCTURE LENGTH = 12,213 LF**



# BRIDGE SPECIFICS

**HIGHWAY  
AND  
TRAIN  
TRAFFIC!**

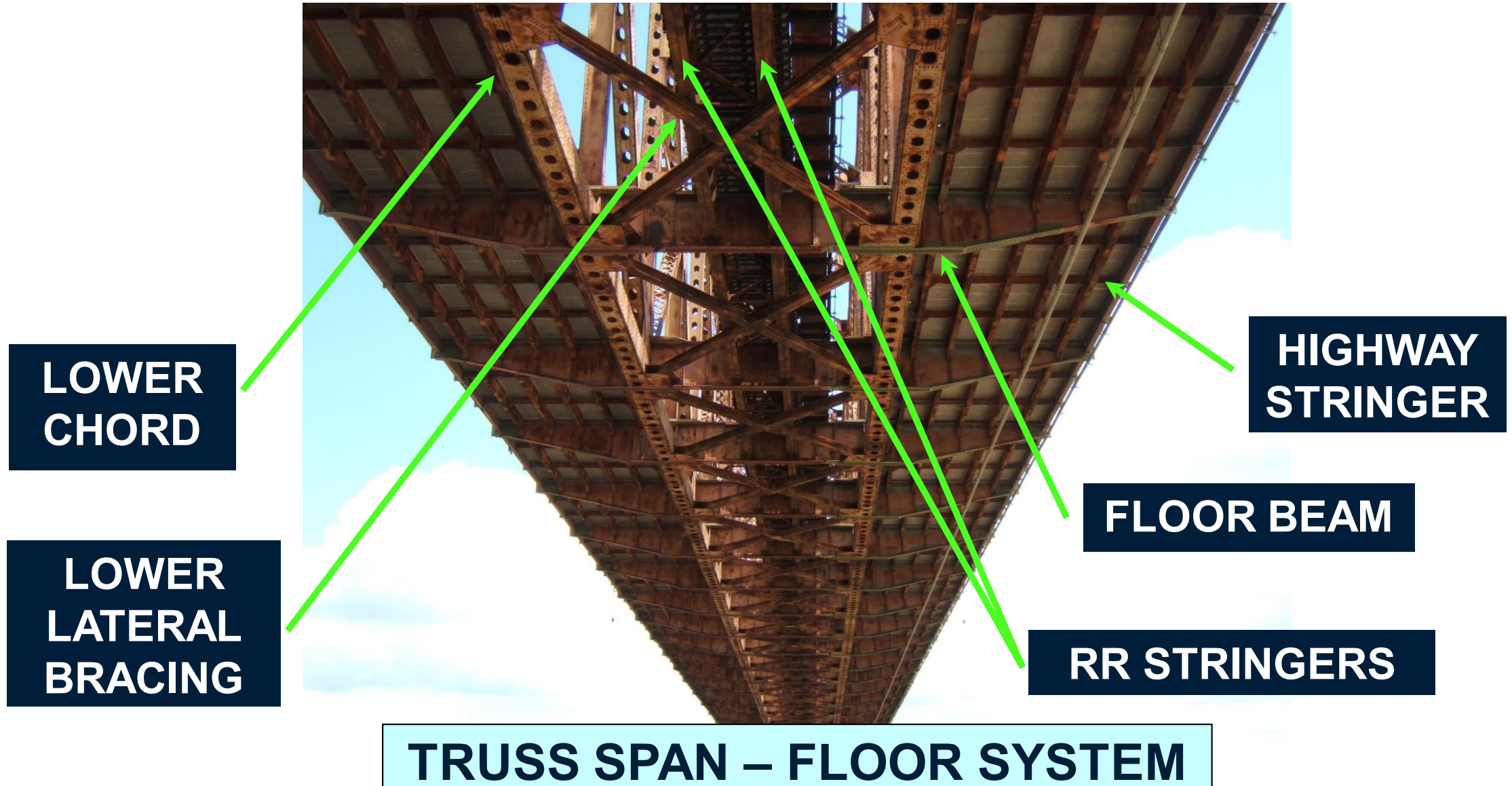


## UPPER CHORD PRIOR TO CLEANING AND PAINTING





# BRIDGE SPECIFICS



# BRIDGE SPECIFICS

**83 FOOT  
STEEL PLATE  
GIRDERS**

**43 FOOT  
STEEL PLATE  
GIRDERS  
BETWEEN  
BUILT-UP  
STEEL TOWER  
BENTS**



**RAILROAD APPROACH SPANS**

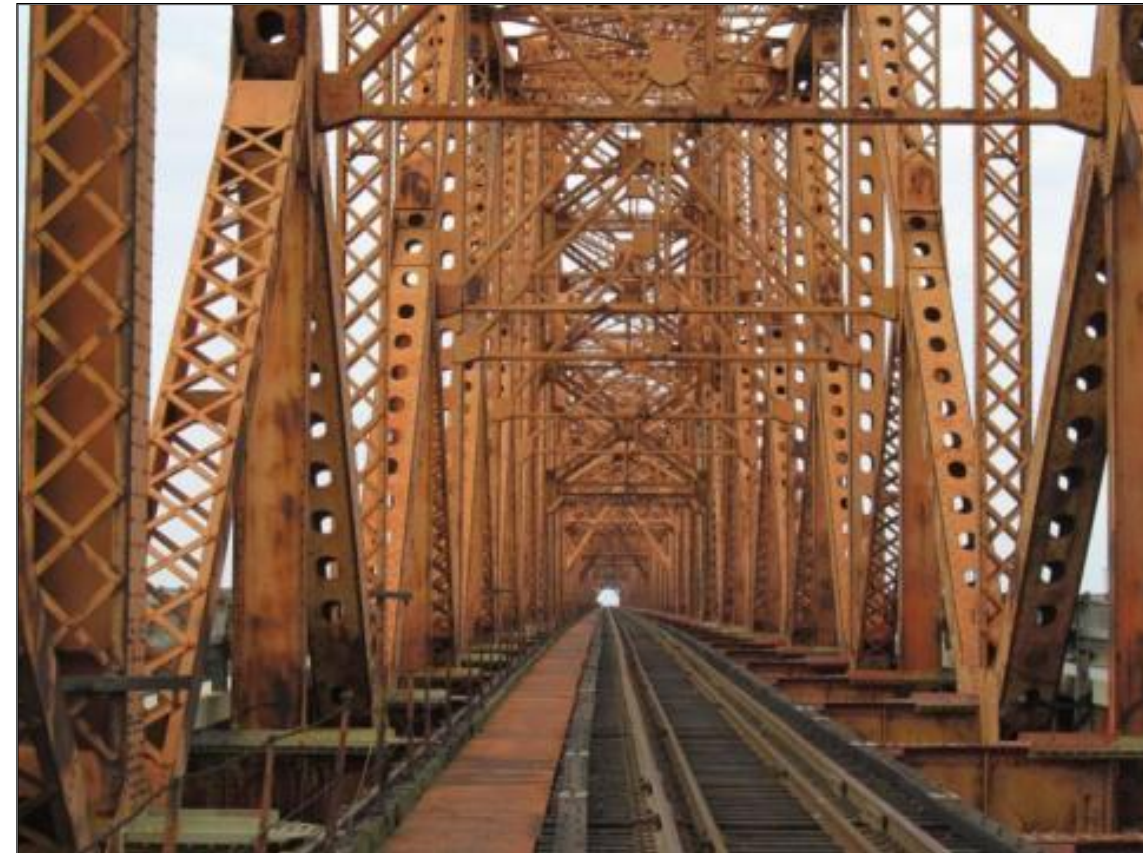
## COMBINED RAILROAD/HIGHWAY TOWER BENTS



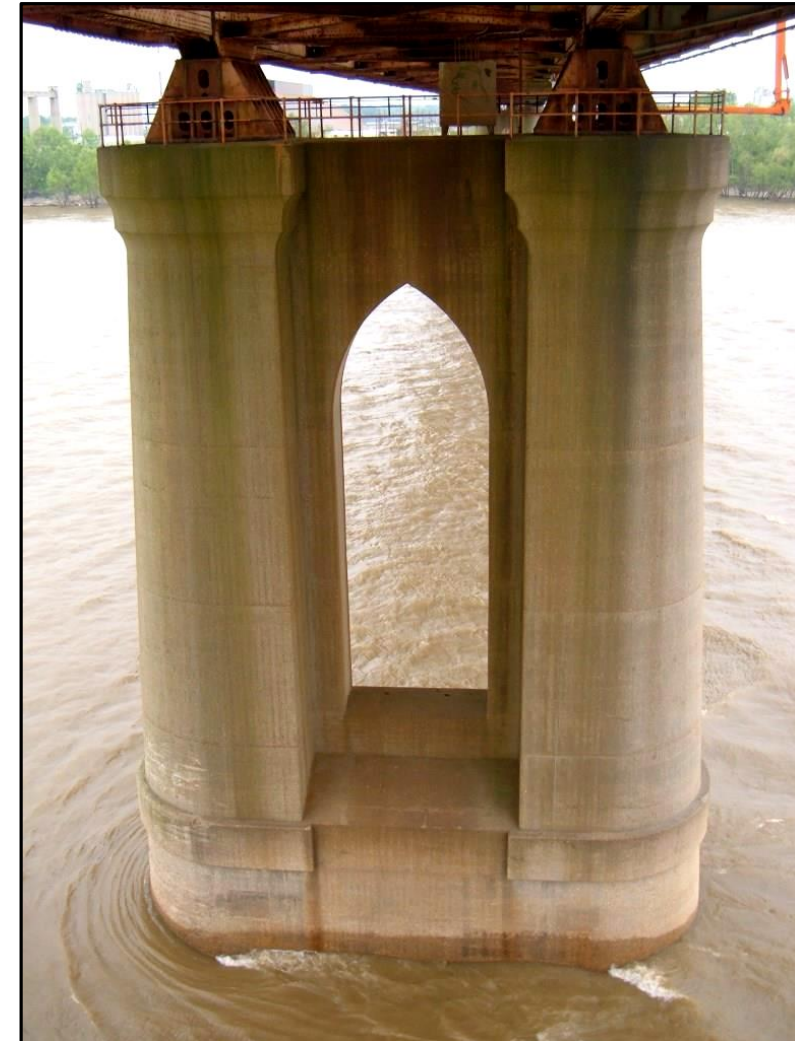
**RR/HWY APPROACH SPANS**

# KEY REPAIR ITEMS

- CLEANING, PAINTING & DISPOSAL
- SUPERSTRUCTURE REPAIR ITEMS
  - CHORD MEMBERS
  - BRACING MEMBERS
  - GUSSET PLATES
  - LATERAL BRACING
  - BEARING, BOLTS & RIVETS
  - STEEL RR GIRDER LATERAL BRACING



- **SUBSTRUCTURE REPAIR ITEMS**
  - **MAIN PIERS 1 & 6 HIGHWAY GIRDER PEDESTALS AND BEARINGS**
  - **STEEL APPROACH TOWERS**
  - **APPROACH TOWER ANCHOR BOLTS AND CONCRETE PEDESTALS**



# CRACKED HORIZONTAL GUSSET PLATES

**CENTER  
HORIZONTAL  
GUSSET  
PLATES OF  
TRUSS LOWER  
LATERALS  
WERE  
TYPICALLY  
CRACKED**



# TRUSS MEMBER DETERIORATION



**VERTICAL TRUSS MEMBERS**



# CRACKED GIRDER GUSSET PLATES





# REMOVING RIVETS IN CHORD MEMBERS



**DETERIORATION  
INSIDE LOWER  
CHORD**

**LIMITED ROOM  
FOR EQUIPMENT**

**LOWER CHORD  
INTERNAL  
MID-PLATE**



# PACK RUST IN BUILT-UP MEMBERS



# CLEANING, PAINTING, REPAIRS, & CONTAINMENT



- Total Surface Area  $\approx$  4,266,000 SF
- Cleaning to Include Vacuuming & Pressure Washing all Surfaces
- Pressure Wash and Solvent Clean to SSPC-SP1/SP12 NV2
- Abrasive Blast to SSPC-SP10
- Three Coat Organic Zinc Paint System
- Environmental Requirements
  - SSPC Guide 6, Level 1A Containment
  - Pre- and Post-Project Soil and Water Sampling
  - Air Quality Monitoring
  - Visible Emissions Assessment - EPA Method 22
  - Waste Management – SSPC Guide 7, 40 CFR  
(Collection, Storage, Transportation, Disposal)
- Red Lead in Existing Paint – Cleaning must be fully contained
- OSHA (29 CFR 1926.62, “Lead in Construction” PPE)
  - Respirators, Tyvex Suits, Fall Protection, Safety Glasses



## FULL CONTAINMENT FOR CLEANING AND PAINTING



## APPROACH CONTAINMENT



# BID OPENING – PHASE 1



- BID OPENING DATE – January 11, 2012 (Phase 1)  
November 13, 2013 (Phase 2)
- ENGINEER ESTIMATE = \$ 104,012,034 (Phase 1 + Phase 2)
- PHASE 1
  - HIGH BID = \$ 118,288,889
  - LOW BID = \$ 74,849,999
  - AWARDED TO – LIBERTY / ALPHA
- PHASE 2
  - HIGH BID = \$ 54,142,050
  - LOW BID = \$ 21,874,935
  - AWARDED TO – ABHE & SVOBODA, INC.
- TOTAL BID COST = \$ 96,724,934



## INSIDE THE CLEANING AND PAINTING CONTAINMENT FOR THE MAIN SPAN TRUSSES

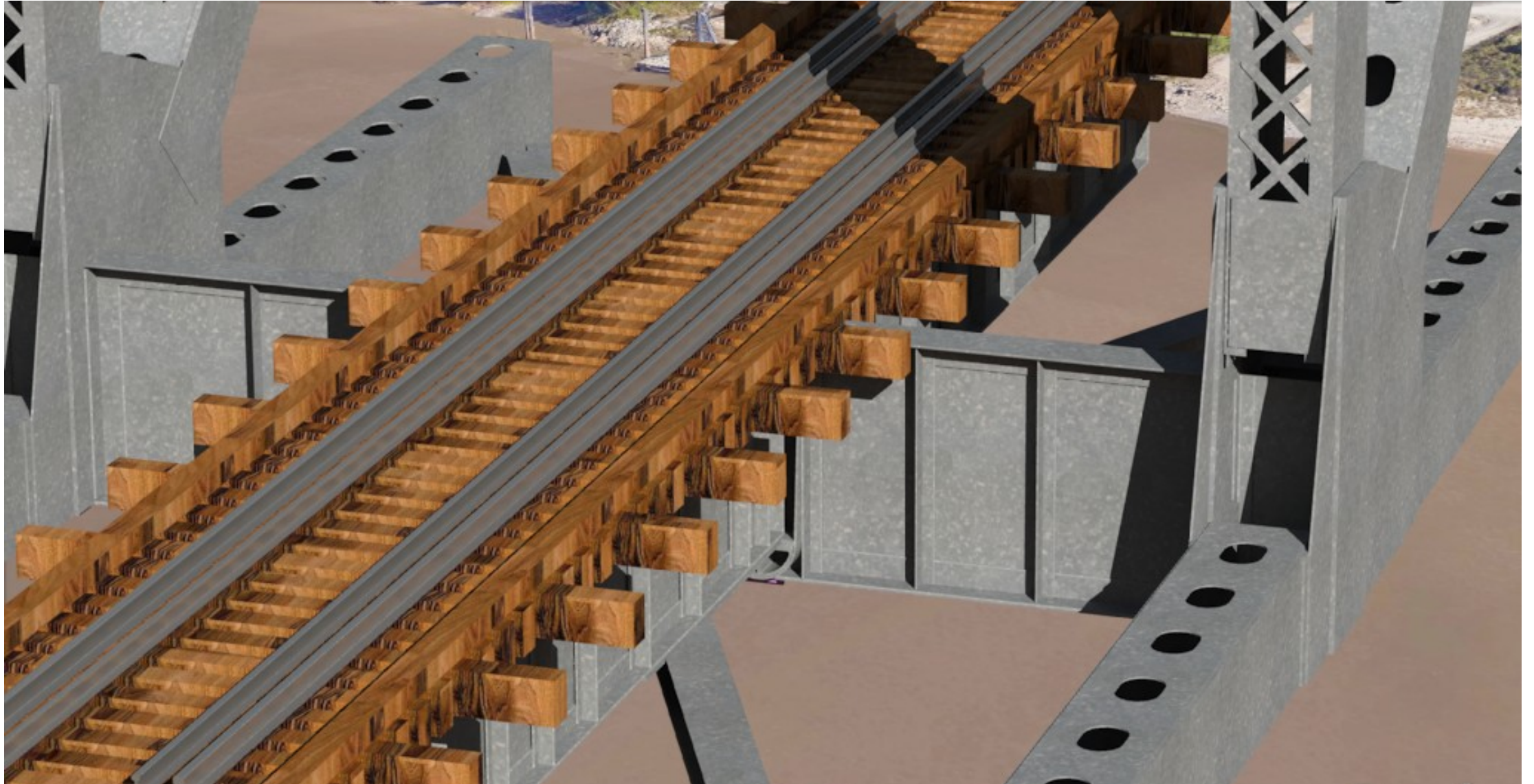


# CLEANING, PAINTING, REPAIRS, & CONTAINMENT

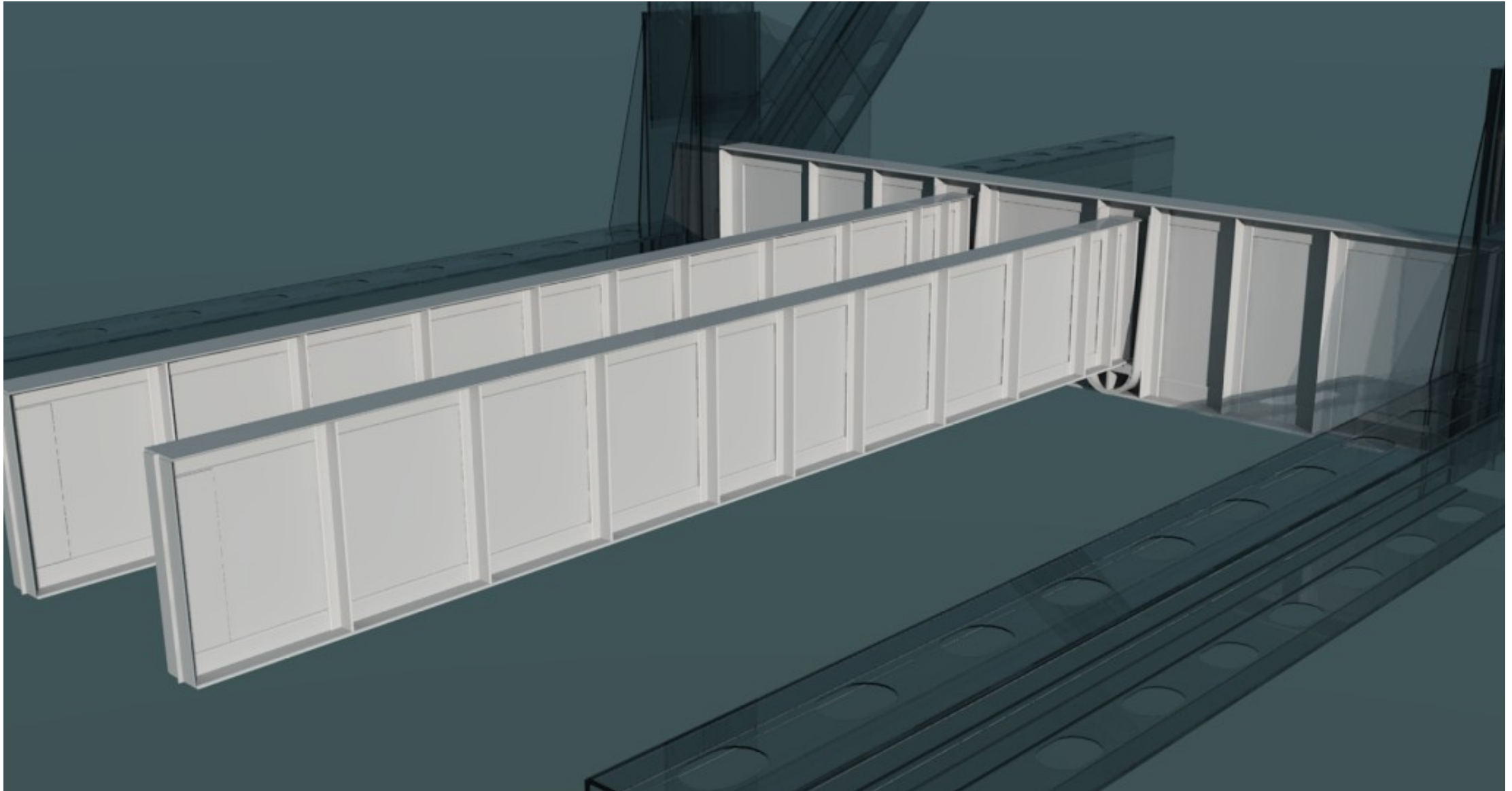




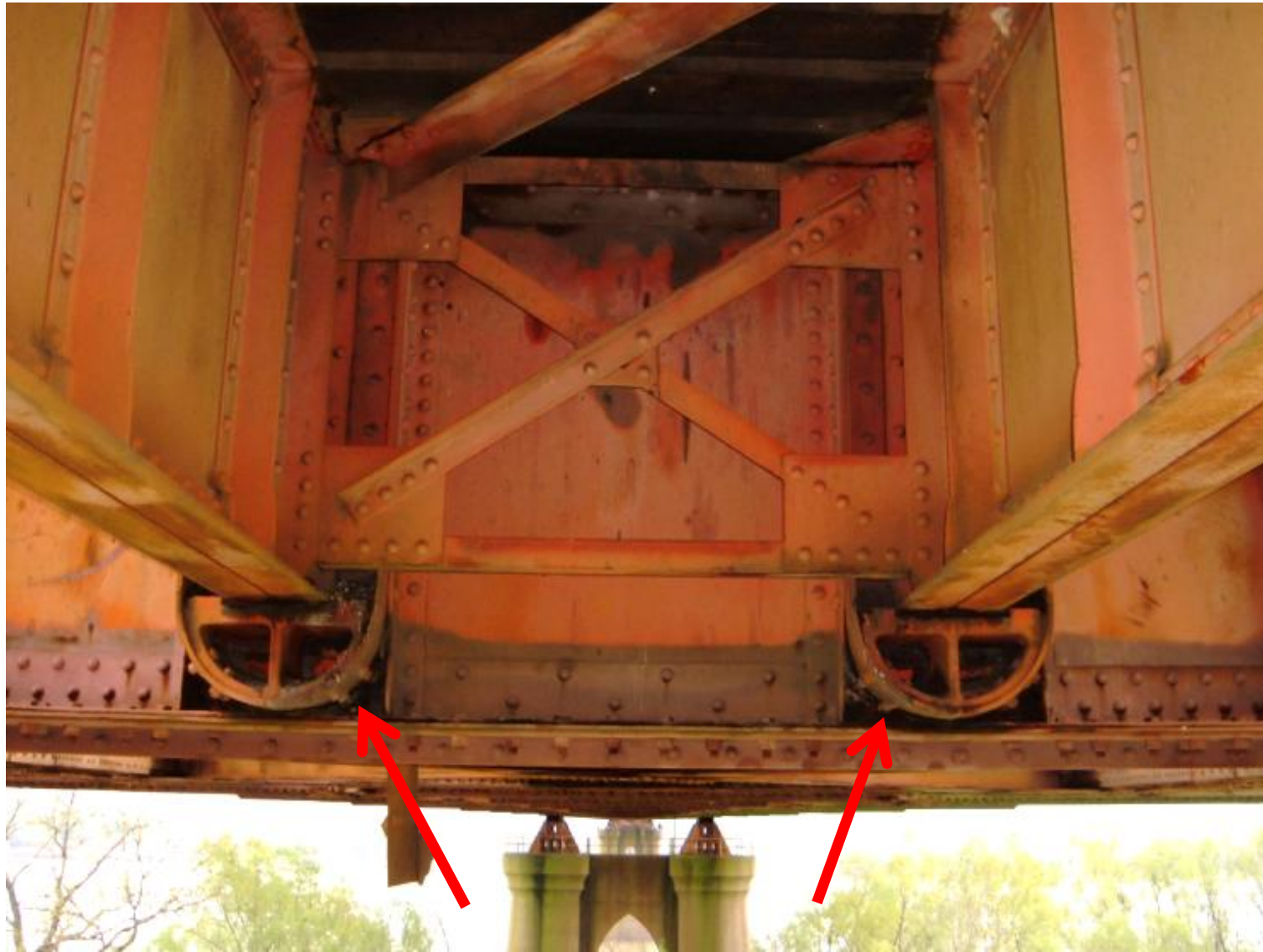
# RR STRINGER STIRRUP BEARING REPAIR



# RR STRINGER STIRRUP BEARING REPAIR



# RR STRINGER STIRRUP BEARING REPAIR



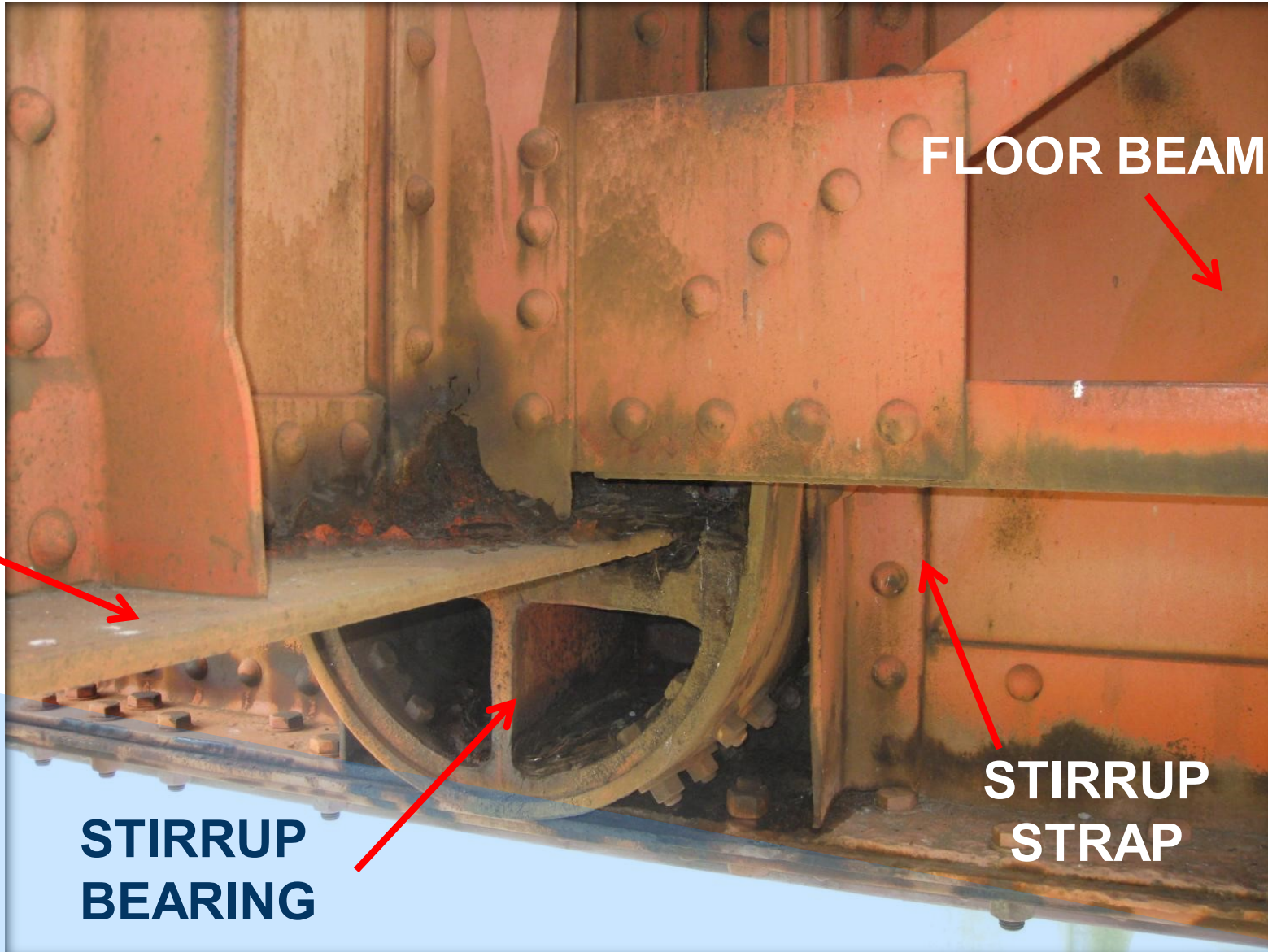
# RR STRINGER STIRRUP BEARING

**RAILROAD  
STRINGER**

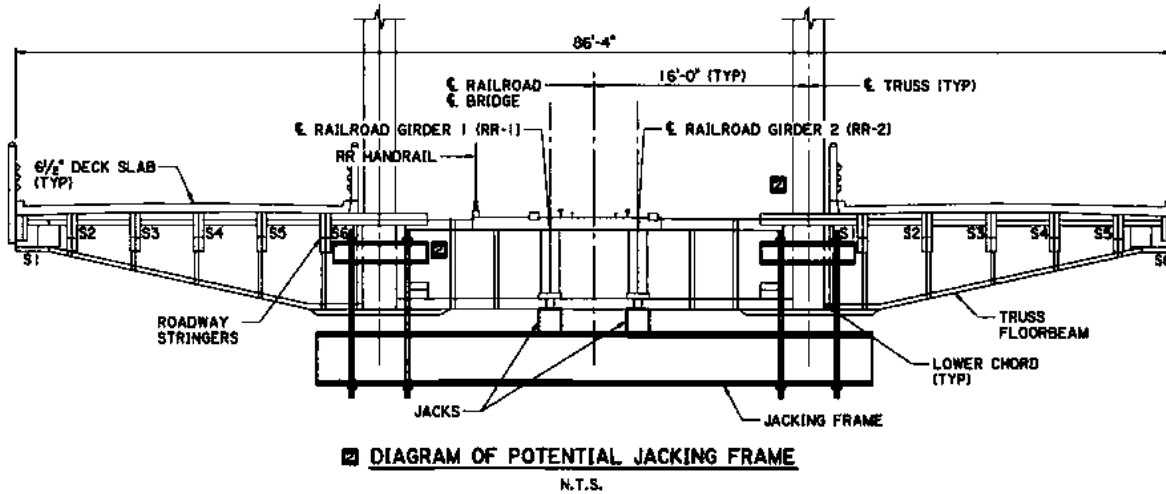
**FLOOR BEAM**

**STIRRUP  
BEARING**

**STIRRUP  
STRAP**



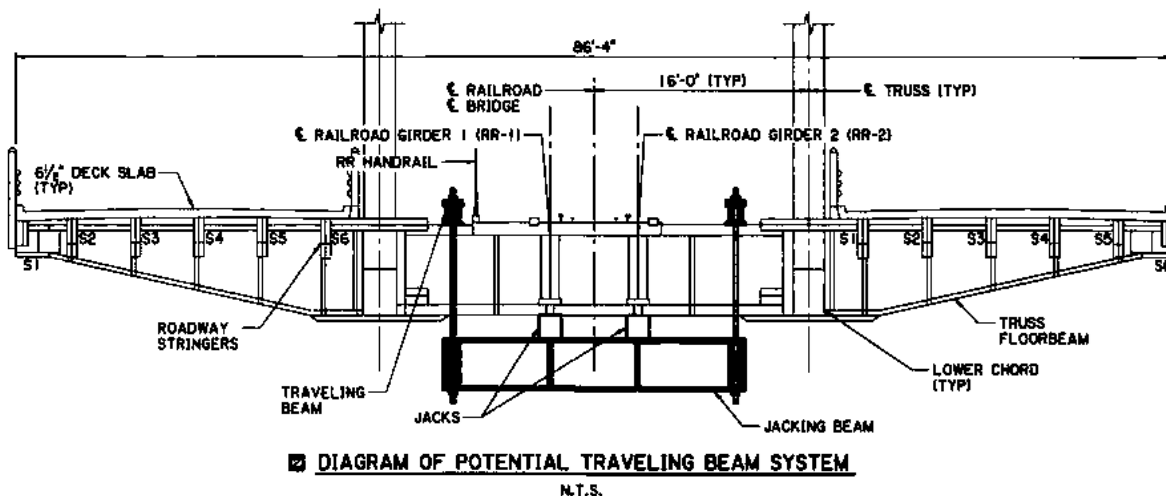
## JACKING FRAME SYSTEM FOR STIRRUP BEARING REPAIRS



**12 - 14 HOUR REPAIR WINDOW**

**COORDINATION REQUIRED**

- DESIGN TEAM
- DOTD
- RAILROADS
- CONTRACTOR

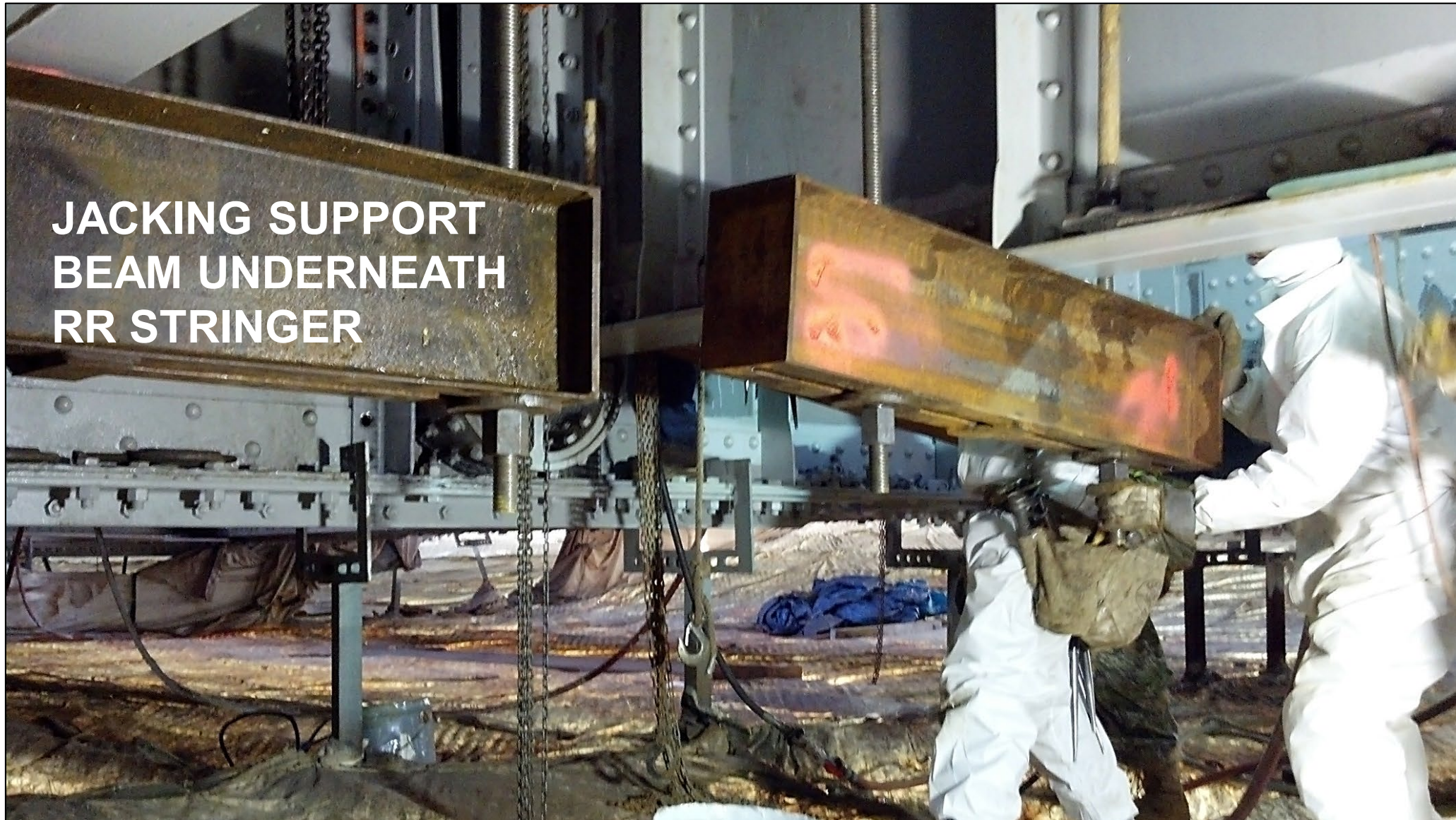


# RR STRINGER STIRRUP BEARING JACKING



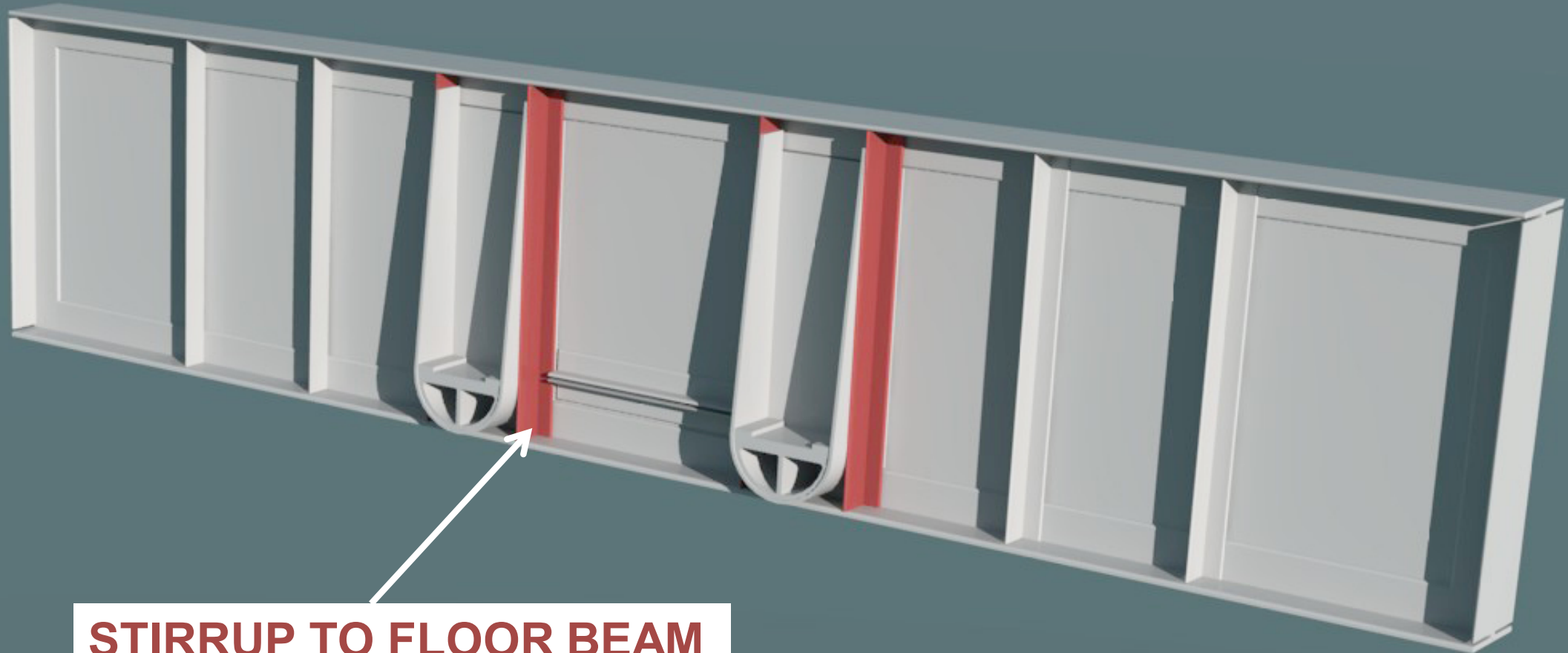
**PLACING JACKING  
SYSTEM TO JACK  
RR STRINGERS**

# RR STRINGER STIRRUP BEARING JACKING



**JACKING SUPPORT  
BEAM UNDERNEATH  
RR STRINGER**

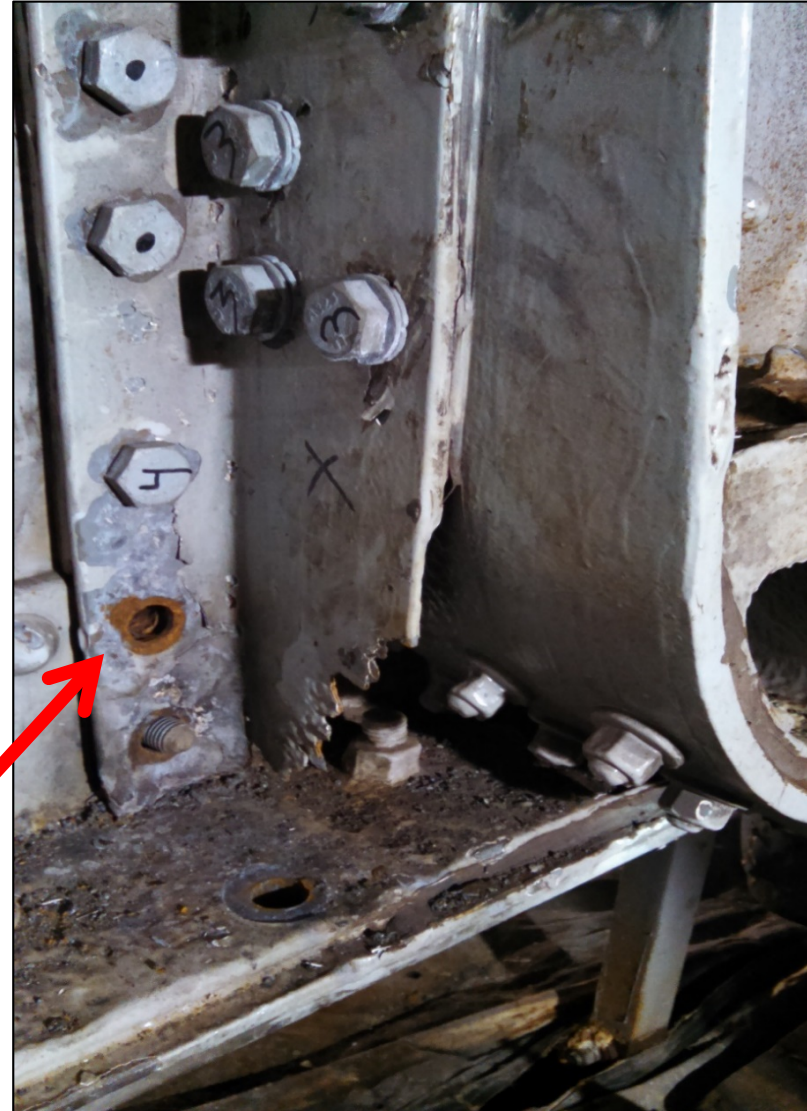
# RR STRINGER STIRRUP BEARING REPAIR



**STIRRUP TO FLOOR BEAM  
CONNECTION ANGLES**

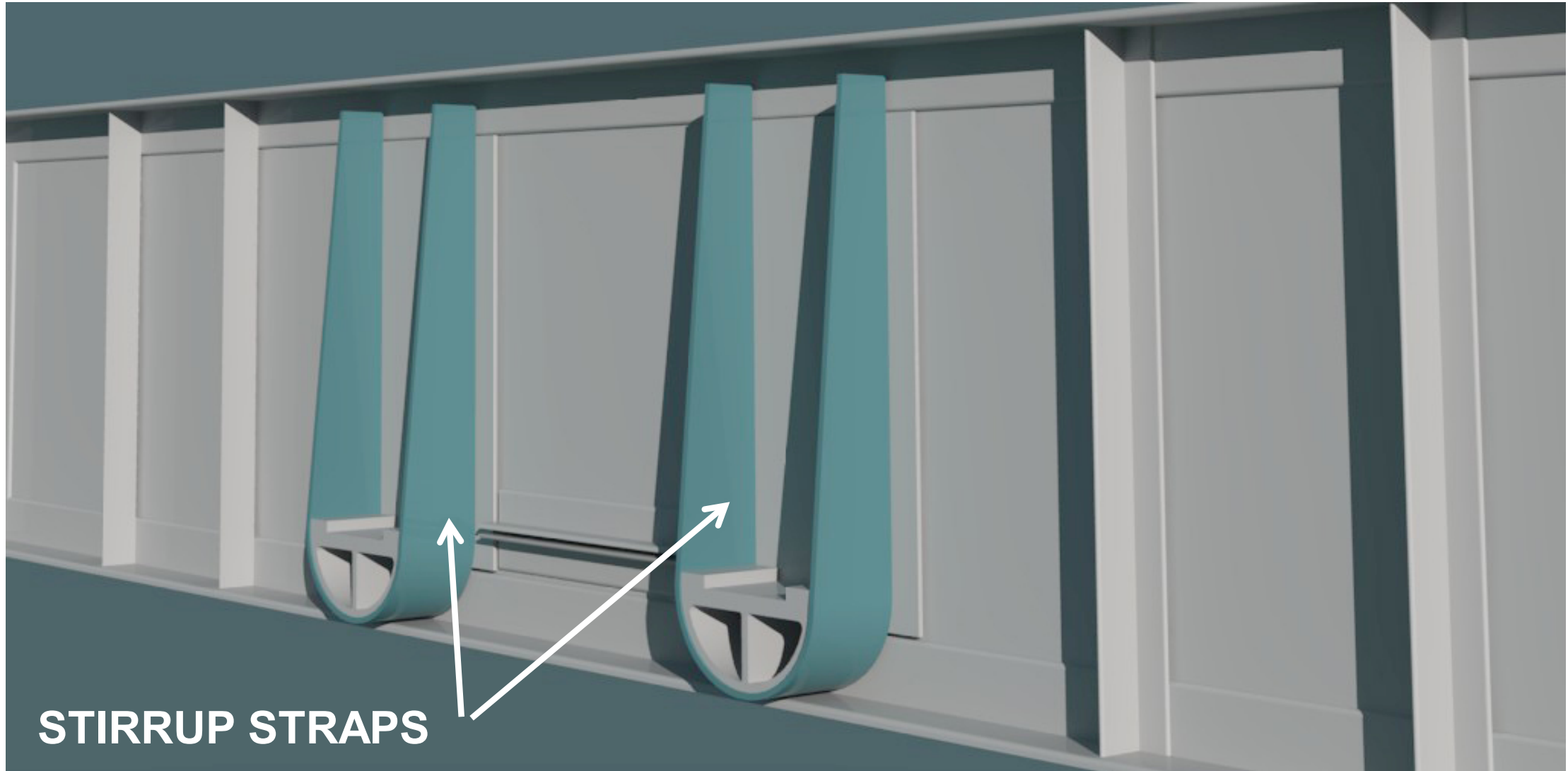


# RR STRINGER STIRRUP BEARING REPAIR



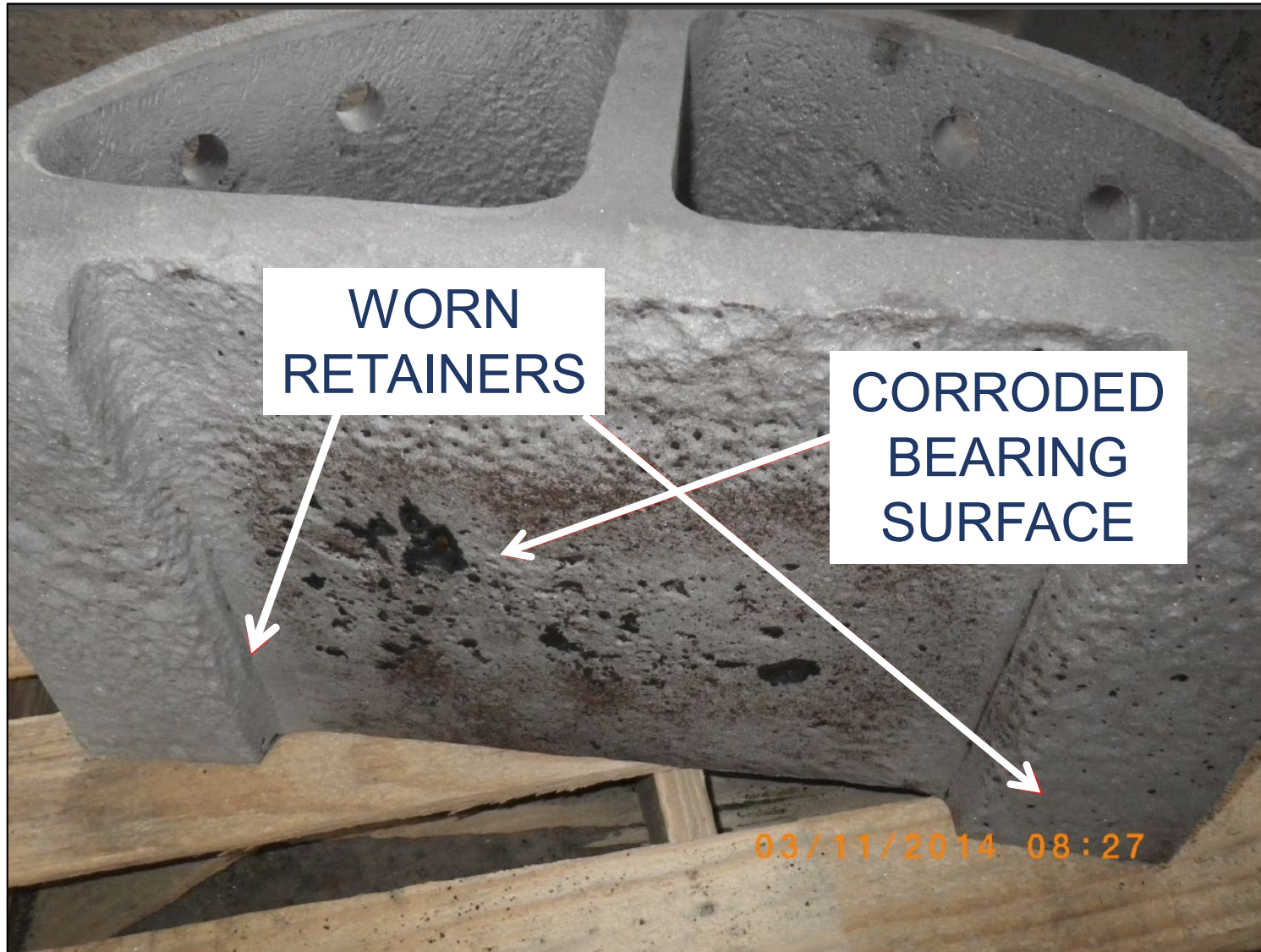
**DETERIORATED  
CONNECTION  
ANGLE**

# RR STRINGER STIRRUP BEARING REPAIR



**STIRRUP STRAPS**

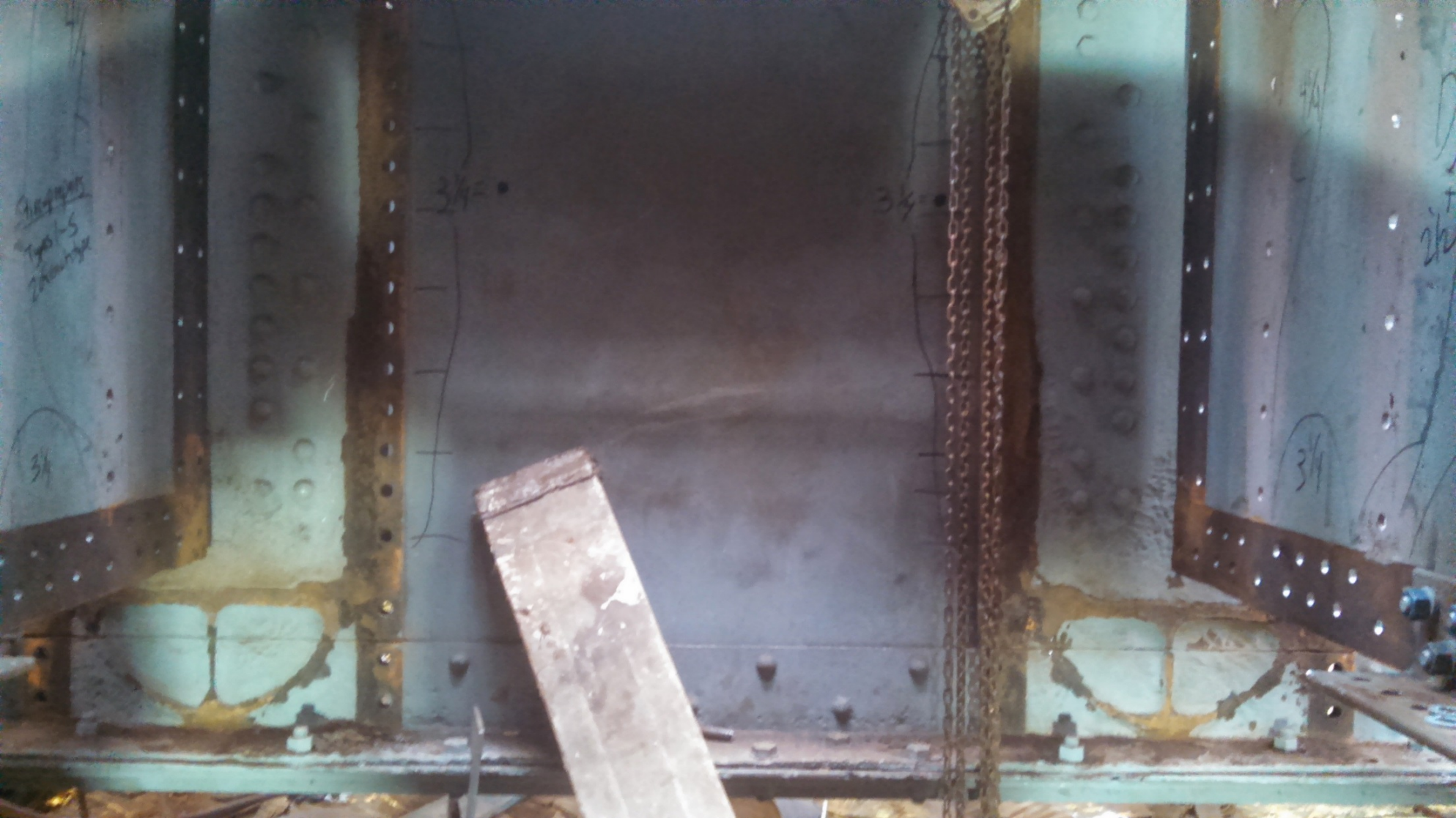
# SEMICIRCULAR BEARING CASTING



# STIRRUP BEARING REPAIR



# STIRRUP BEARING REPAIR



# STIRRUP BEARING REPAIR



# TOWER LATERALS

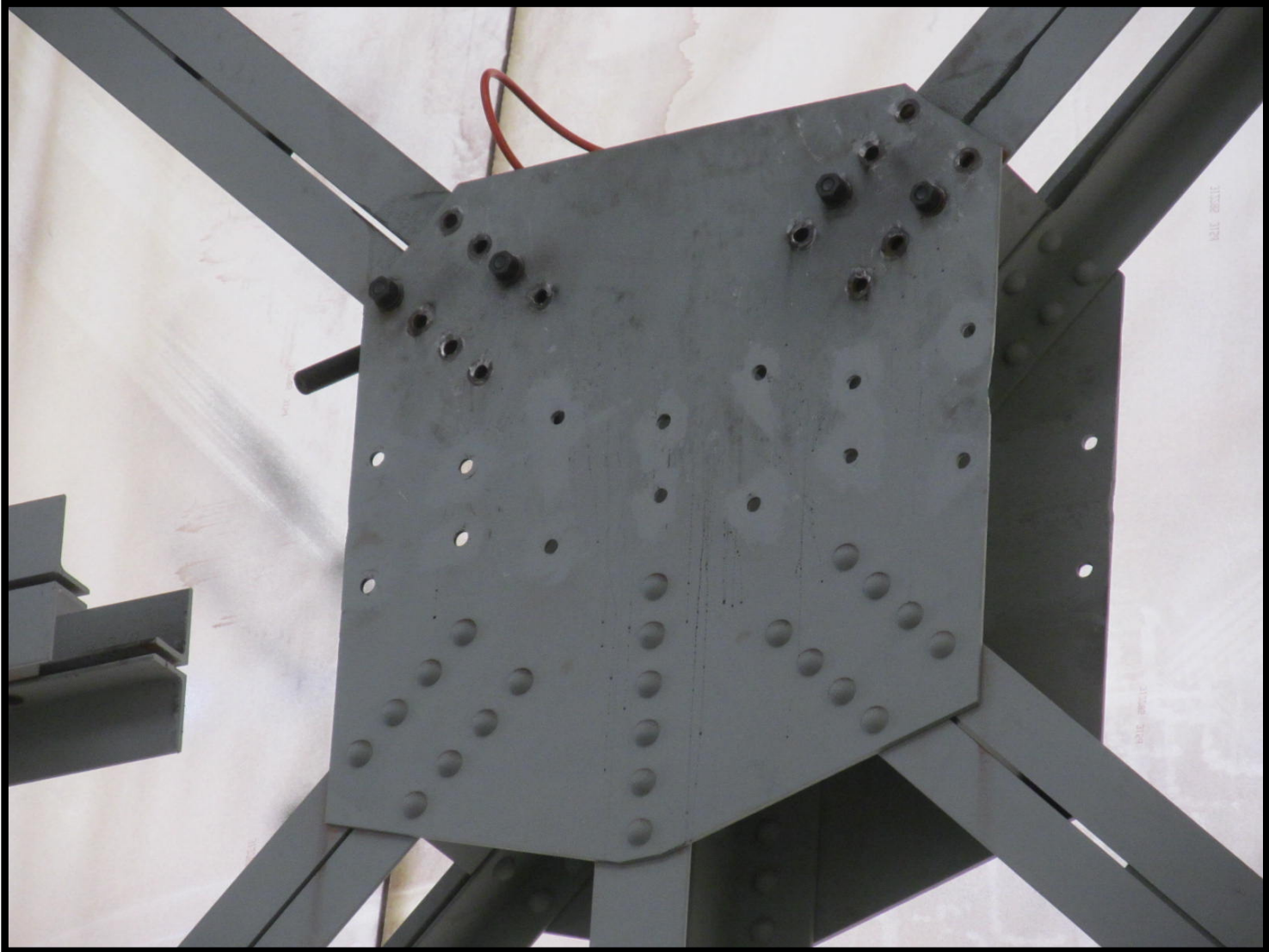


# TOWER LATERALS





# TOWER LATERALS



# TOWER LATERALS



# TOWER BASE AND PEDESTAL



# TOWER ANCHOR BOLTS



**OR  
WERE  
COMPLETELY  
ABSENT**



# ANCHOR BOLT REPAIR – TYPE I

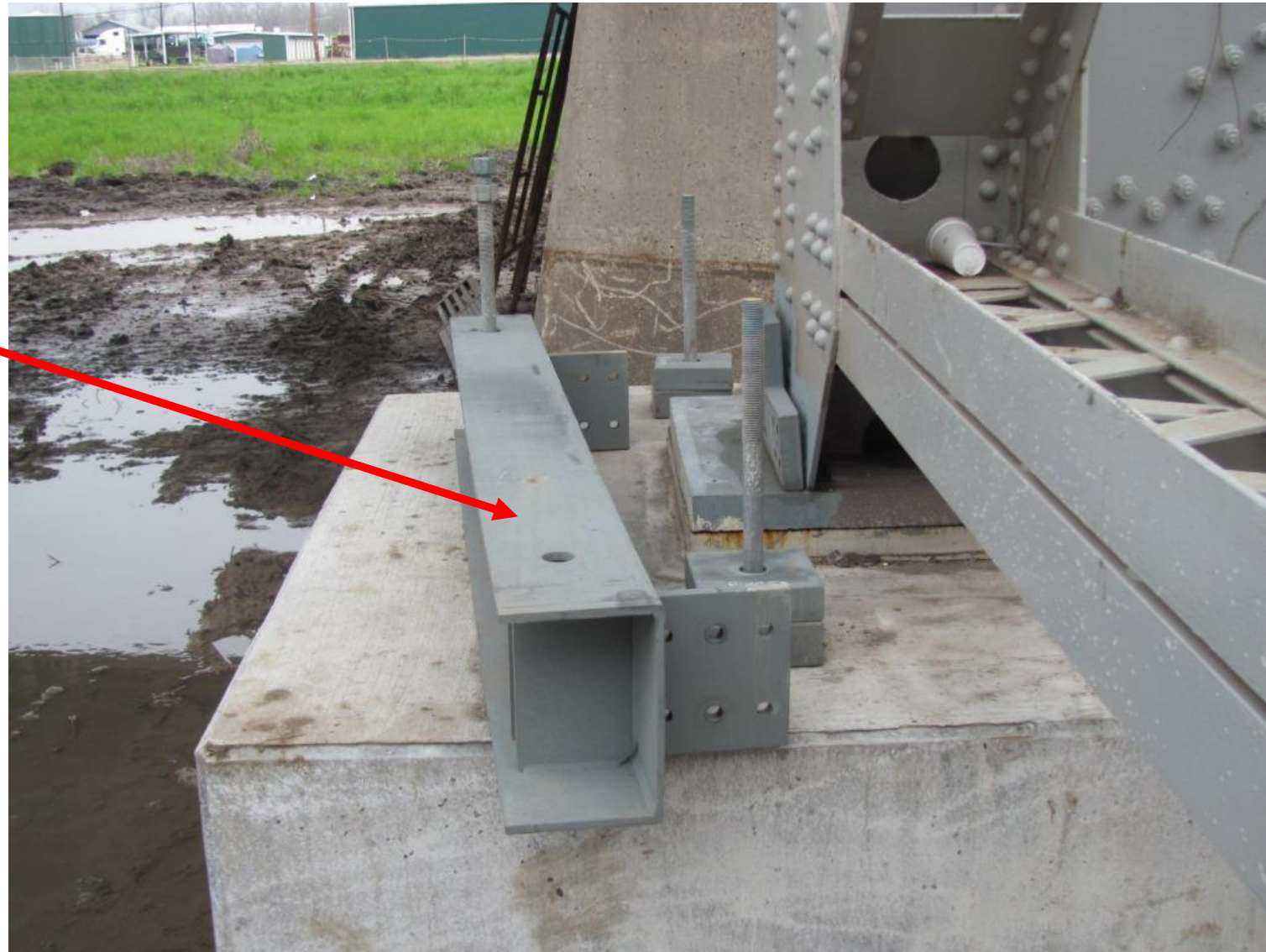
**NEW ANCHOR  
BOLTS IN NEW  
POSITIONS**

**NEW CONCRETE  
FOR WIDENED  
PEDESTAL**



# ANCHOR BOLT REPAIR – TYPE I

**STRUCTURAL  
BEAM**



# ANCHOR BOLT REPAIR – TYPE I

**COMPLETED  
REPAIR**

**STRUCTURAL  
FRAMING BEAM**



# ANCHOR BOLT REPAIR – TYPE II

**RAIL  
APPROACH  
(PHASE II)**

**PEDESTALS  
TOO CLOSE  
TO ROAD  
FOR  
EXCAVATION**





# ANCHOR BOLT REPAIR – TYPE II

**INSTALLATION  
OF NEW  
ANCHOR BOLT**

**CONCRETE  
REMOVED  
CAREFULLY  
BY LIGHT  
JACKHAMMER**



# ANCHOR BOLT REPAIR – TYPE II

## FORMWORK



# ANCHOR BOLT REPAIR – TYPE II

**COMPLETED  
REPAIR**

***ADDITIONAL  
AGGREGATE  
EXTENSION  
OF 3/8 PEA  
GRAVEL***

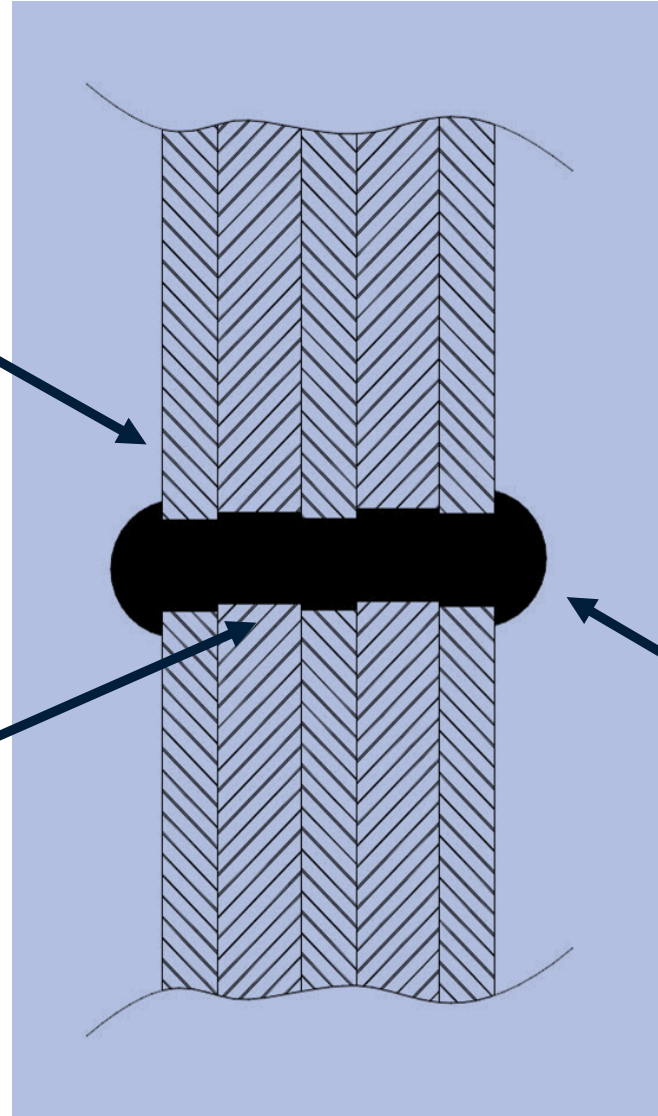


**CEMENT BASED, NON-SHRINK  
GROUT PATCHING MATERIAL  
FOR PRECAST /  
PRESTRESSED CONCRETE**

**HIGH EARLY STRENGTH  
REPAIR MATERIAL**

**MULTIPLE  
PLATE LAYERS**

**CAMMING  
EFFECT**



**RIVETS IN  
MULTIPLE  
PLATE LAYERS  
CAN BE  
DIFFICULT TO  
REMOVE!!!**

**RIVET**

# PEDESTAL REPAIRS AT PIERS 1 & 6

**HIGHWAY GIRDER  
PEDESTALS WERE  
WIDENED IN 1988  
AND HAD  
TYPICALLY  
CRACKED AT  
INTERFACE TO  
OLD CONCRETE**



# PEDESTAL REPAIRS AT PIERS 1 & 6



# PEDESTAL REPAIRS AT PIERS 1 & 6



# PEDESTAL REPAIRS AT PIERS 1 & 6



**GROUT  
INJECTION**

**CEMENTITIOUS GROUT**



# PEDESTAL REPAIRS AT PIERS 1 & 6



# PEDESTAL REPAIRS AT PIERS 1 & 6

**FIBERWRAP FIBER  
ORIENTATION  
WAS INCORRECTLY  
APPLIED BY  
CONTRACTOR AND  
FAILED!**



# PEDESTAL REPAIRS AT PIERS 1 & 6



# PEDESTAL REPAIRS AT PIERS 1 & 6

**RE-INSTALLED  
FIBERWRAP  
REPAIR**



# **Thank You**

Durk Krone, P.E.  
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