



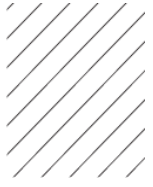
# Merchants Bridge Main Span and East Approach

Allen Smith

Nick Staroski



EXPERIENCE | Transportation



## HISTORY

- ▶ St Louis Merchants Exchange funded to compete with Eads Bridge
- ▶ Panic of 1893 resulted in St Louis Merchants Exchange giving up ownership
- ▶ TRRA took ownership 1890
- ▶ First Major rehabilitation occurred in 1902
- ▶ Second Major rehab occurred in 2004



# CONSTRUCTION HISTORY – MAIN SPAN



No. 87. St. L. M. B.  
Dec. 24-89

# CONSTRUCTION HISTORY – MAIN SPAN



# CONSTRUCTION HISTORY — PNEUMATIC CAISSONS



# CONSTRUCTION HISTORY – EAST APPROACH





## GEORGE MORISON

- ▶ Harvard Graduate. Lawyer and engineer
- ▶ Mentored by Octave Chanute
- ▶ Mentored Ralph Modjeski
- ▶ Designed multiple truss bridges over Mississippi, Ohio, and Missouri River
- ▶ Instrumental in the location of the Panama Canal



*Geo. S. Morison*



## BRIDGE OWNERSHIP HISTORY

- ▶ St Louis Merchants Exchange 1890-1893
- ▶ Terminal Railroad of St Louis 1893-present

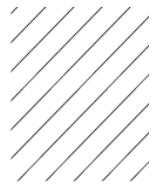




# BRIDGE DESCRIPTION

- ▶ 4,340-ft Total Length: 518'-518'-518' Main Spans





# BRIDGE DESCRIPTION

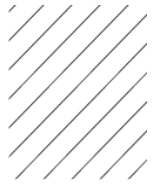
- ▶ Multi-beam Trestles Constructed 1902



# BRIDGE DESCRIPTION

- ▶ Deck Plate Girder Approaches Constructed 2004





# PROJECT GOALS

- ▶ Return service to both tracks across bridge at E80 loading
- ▶ 15-ft track centers (existing 12')
- ▶ Minimize maintenance (ballast deck)
- ▶ Minimize impacts to rail and maritime traffic during construction
- ▶ Improve vessel impact and seismic resistance
- ▶ Bridge inspection access



# PROJECT TEAM

- ▶ TranSystems Corporation- Prime
- ▶ Burns and McDonnell – Major Sub
- ▶ SCI Engineering - Geotechnical
- ▶ EDSI – Pick-up Survey
- ▶ Cardno/KCI – Utility Coordination

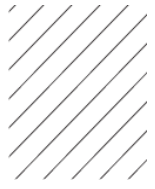
**Slide 13**

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**KS12**

**Add logos**

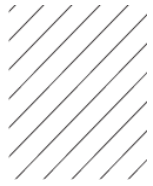
KC-Nick Staroski, 3/5/2018



## PROJECT TIMELINE

- ▶ West Approach Design Build Project 2014
- ▶ Design team selected for Main Span in May 2015
- ▶ Study Phase Completed February 2016
- ▶ Final Plans Completed October 2017
- ▶ Contractor Selected February 2018
- ▶ Construction Completed 2022



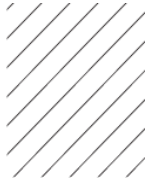


## PHASE I BRIDGE STUDY

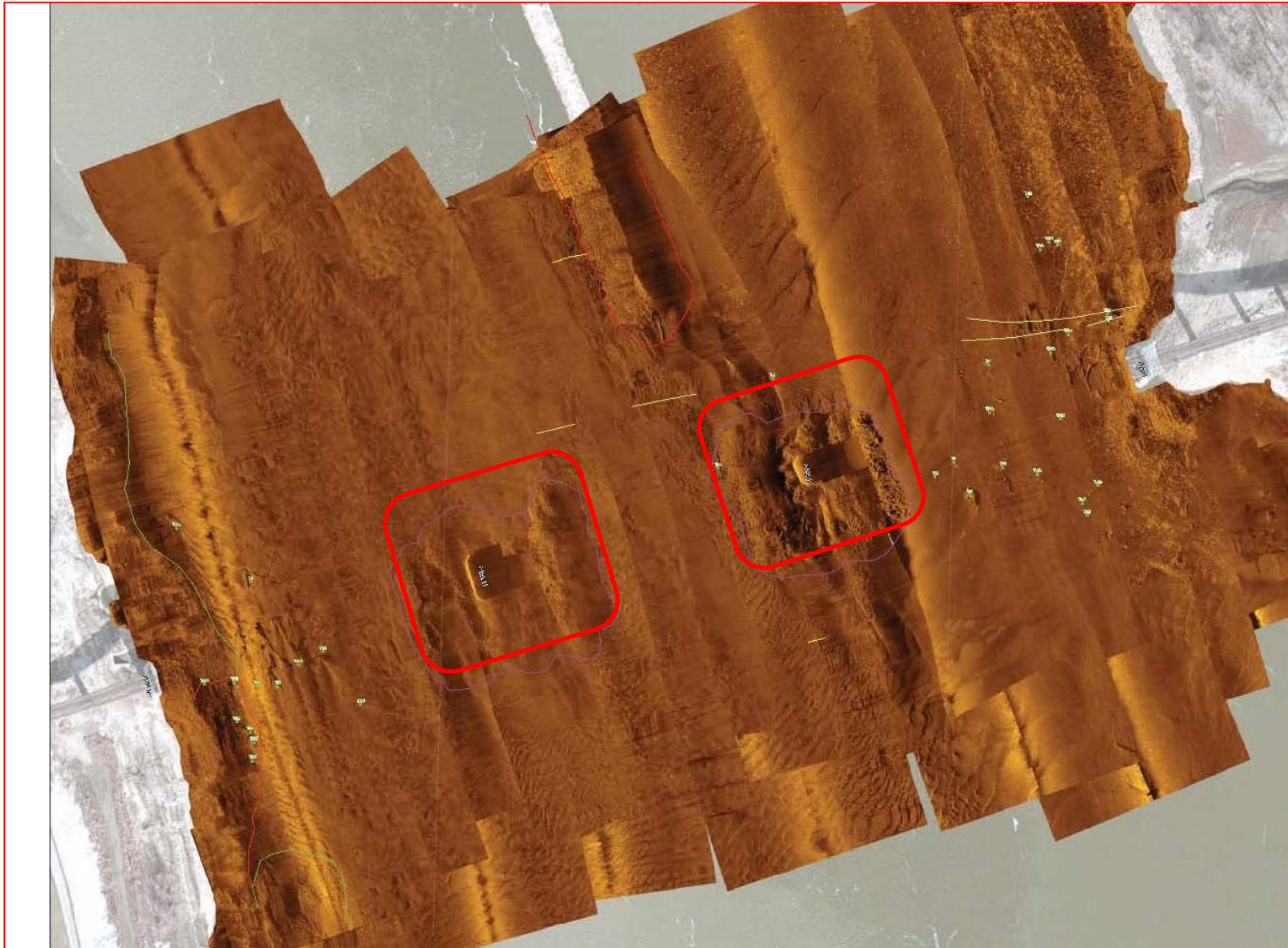
- ▶ Investigated two span arrangement options
- ▶ H & H (no rise)
- ▶ Geotechnical investigation
- ▶ Utility Coordination (YIKES!!)
- ▶ Surveys
- ▶ Bathymetric Survey








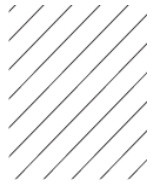
# PHASE I BRIDGE STUDY – BATHYMETRIC SURVEY





## AGENCY COORDINATION

- ▶ ~~Federal Railroad Association – Permitting agency~~
  - ▶ United States Coast Guard – navigation & permitting
  - ▶ Corps of Engineers – permitting and levees
  - ▶ City of St Louis – harbor, Missouri floodwall
  - ▶ Metropolitan Sewer District - outlet
  - ▶ Metro East Sanitary District – Illinois levee
  - ▶ Great Rivers Greenway- bike trail
  - ▶ Madison County Transit – bike trail
- 



# UTILITY COORDINATION – AMEREN TOWER



# UTILITY COORDINATION – AMEREN TOWERS



# UTILITY COORDINATION – GAS REGULATOR

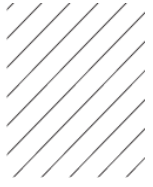


# UTILITY COORDINATION – MSD OUTFALL



# UTILITY COORDINATION – LEVEL 3

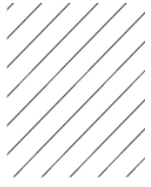




# UTILITY COORDINATION – ROGUE PIPE







# DESIGN CHALLENGES – STUDY PHASE

## ▶ “Preferred” vs. “Acceptable” Option

### – Preferred Design

- Replace west main span with three 174-ft DPG spans
- Replace center main span with two 260-ft truss spans
- Replace east main span with one 520-ft truss span

### – Acceptable Design

- Replace all three main spans with 520-ft truss spans

## ▶ Pier Strengthening Seismic Level 2 or Level 3

## ▶ Vessel Impact

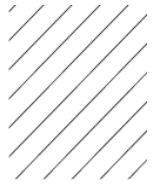
## ▶ Truss Span Configurations

## ▶ Ballast Deck vs Open Deck

## ▶ Cellular Fill & Box Culvert Sizes

## ▶ Seismic Isolation Bearings





# BRIDGE STUDY

## ► Preferred vs Acceptable



KS4

# DESIGN CHALLENGES – EAST APPROACH

## ► Embankment Widening



**Slide 26**

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**KS4**

**Add picture of east embankment**

KC-Nick Staroski, 3/2/2018

# DESIGN CHALLENGES – EAST APPROACH

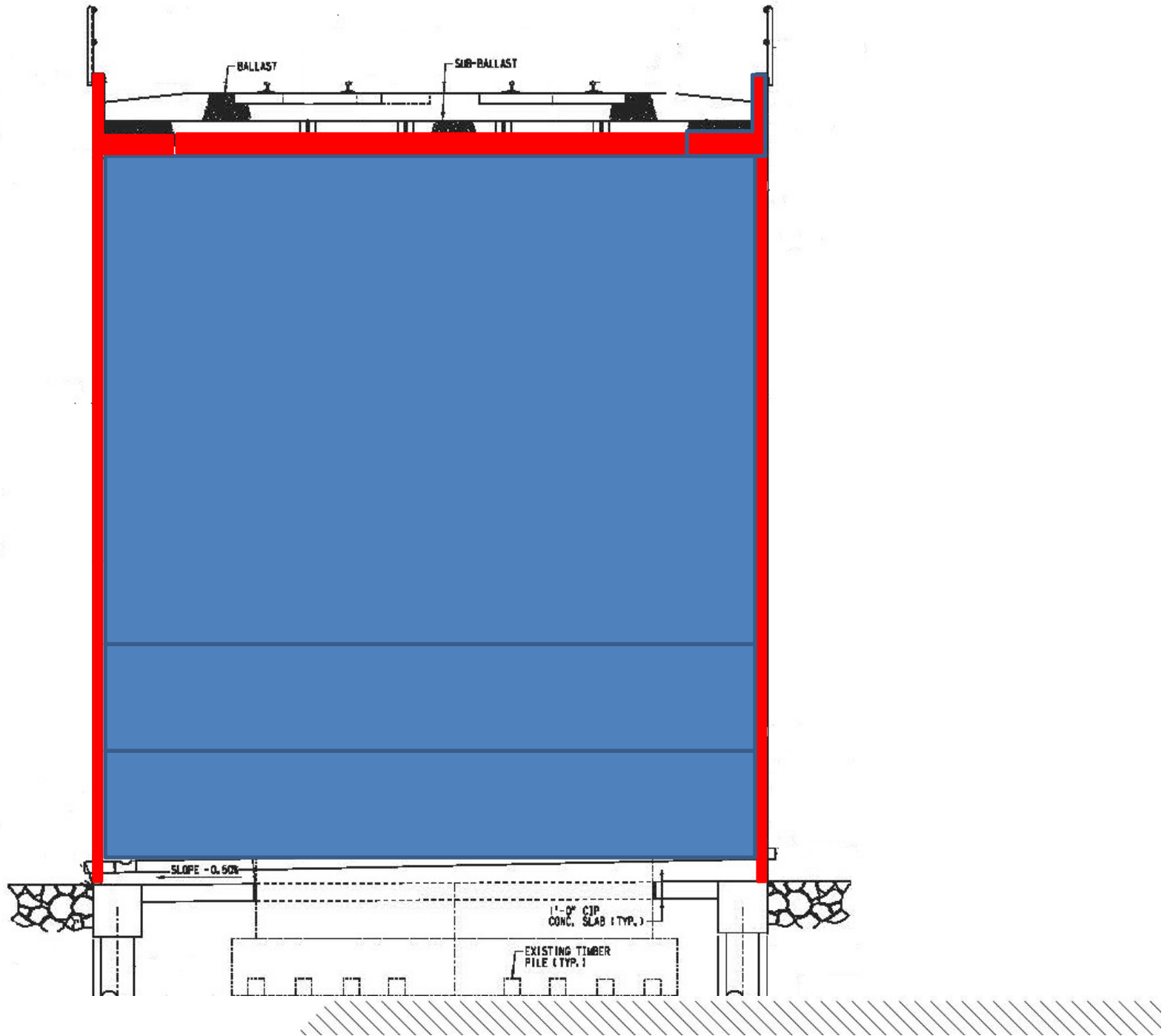
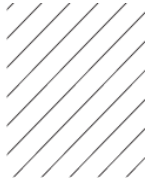
- ▶ MSE Wall with Cellular Concrete Fill



# DESIGN CHALLENGES – EAST APPROACH

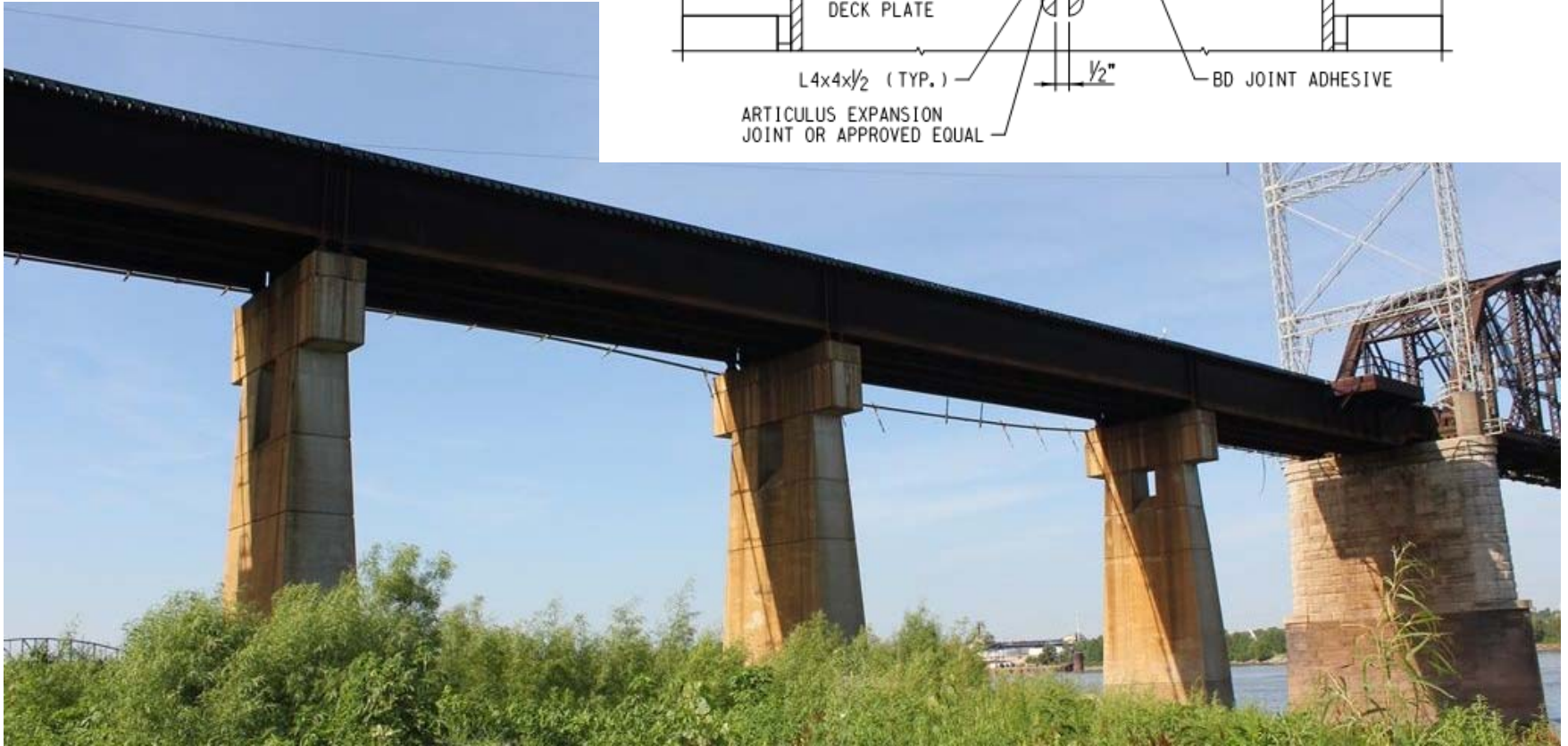
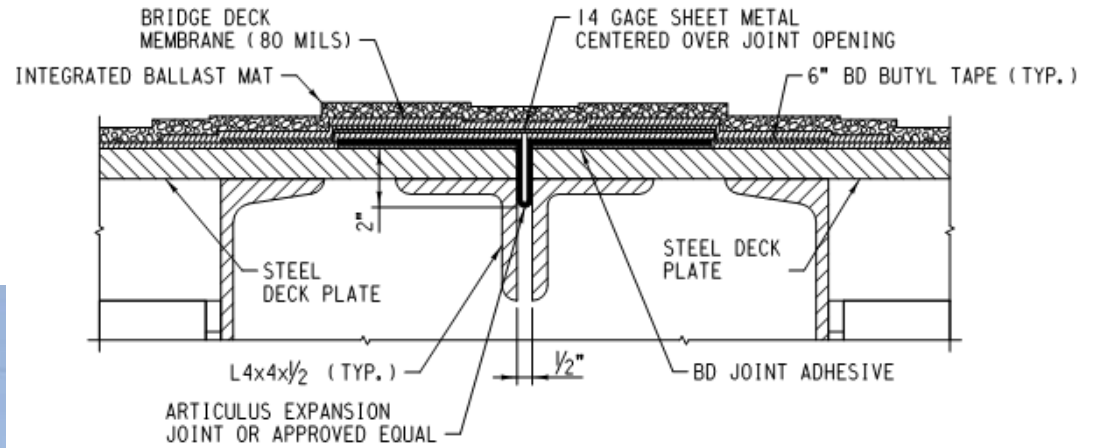
## ► CIP Culverts and Encasement Slab





# DESIGN CHALLENGES – EAST APPROACH

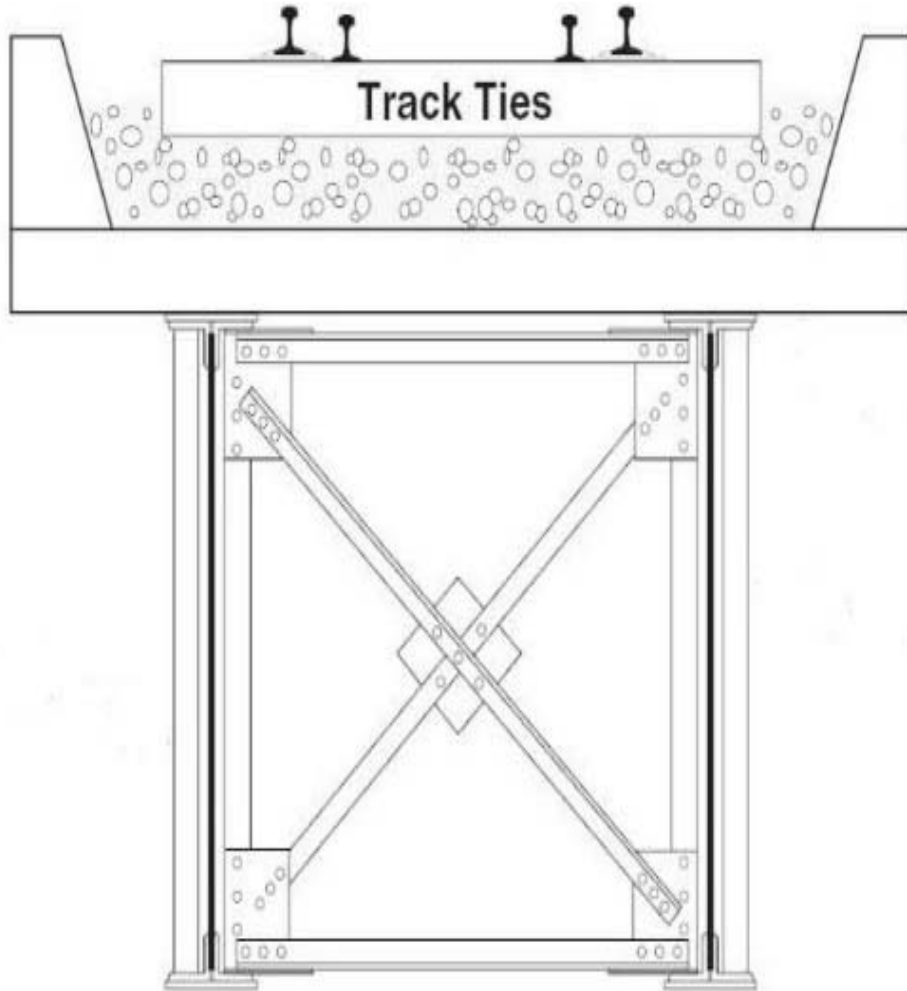
## ▶ DPG Retrofit



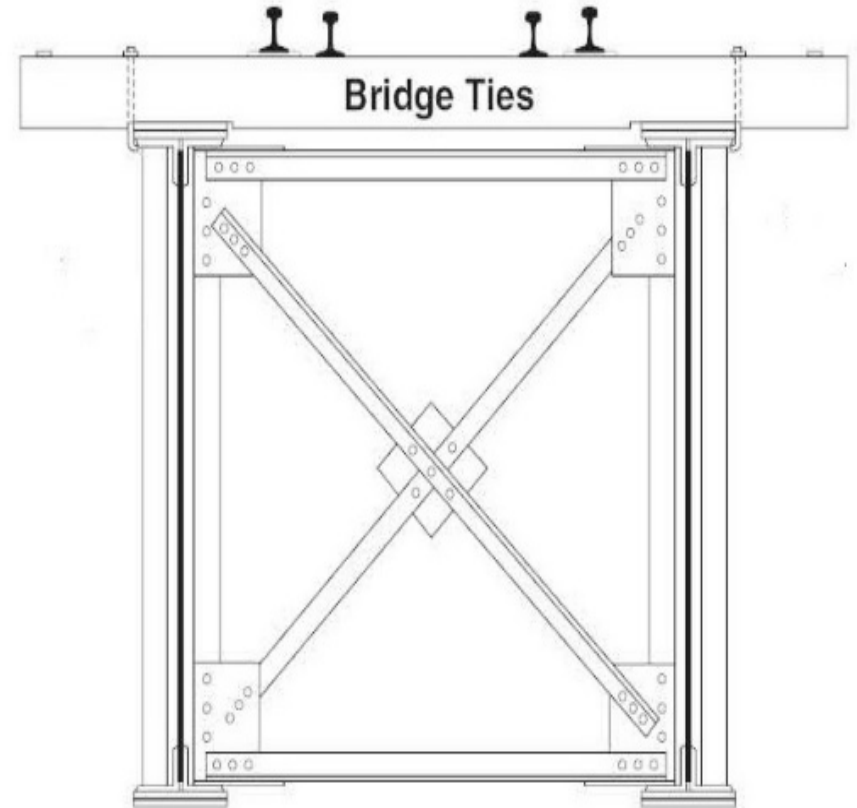


# DESIGN CHALLENGES – EAST APPROACH

## ► Open Deck vs Ballast Deck



**Ballast Deck**

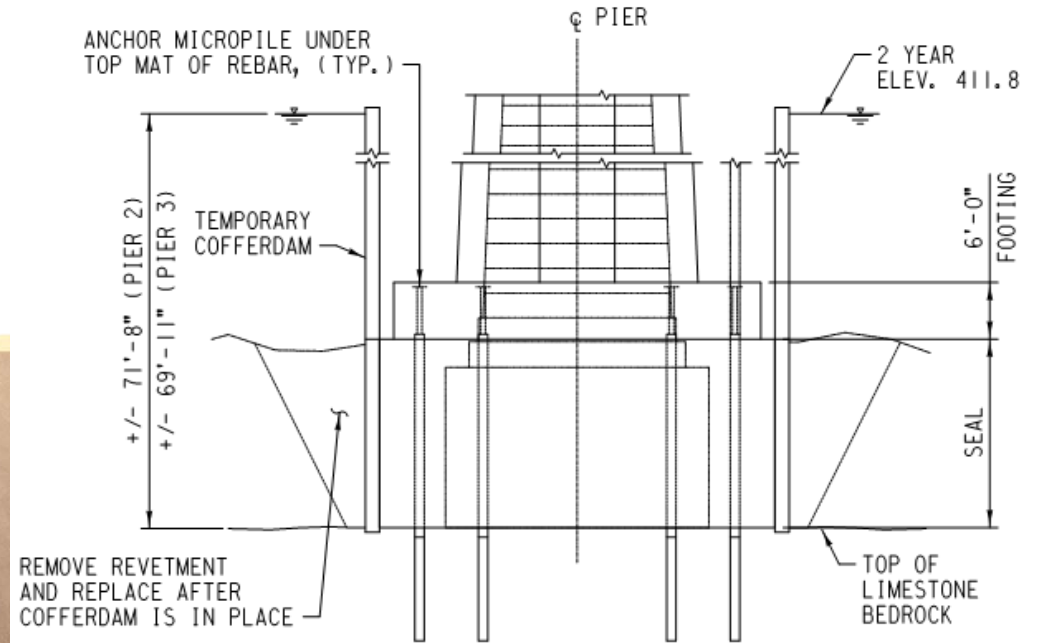
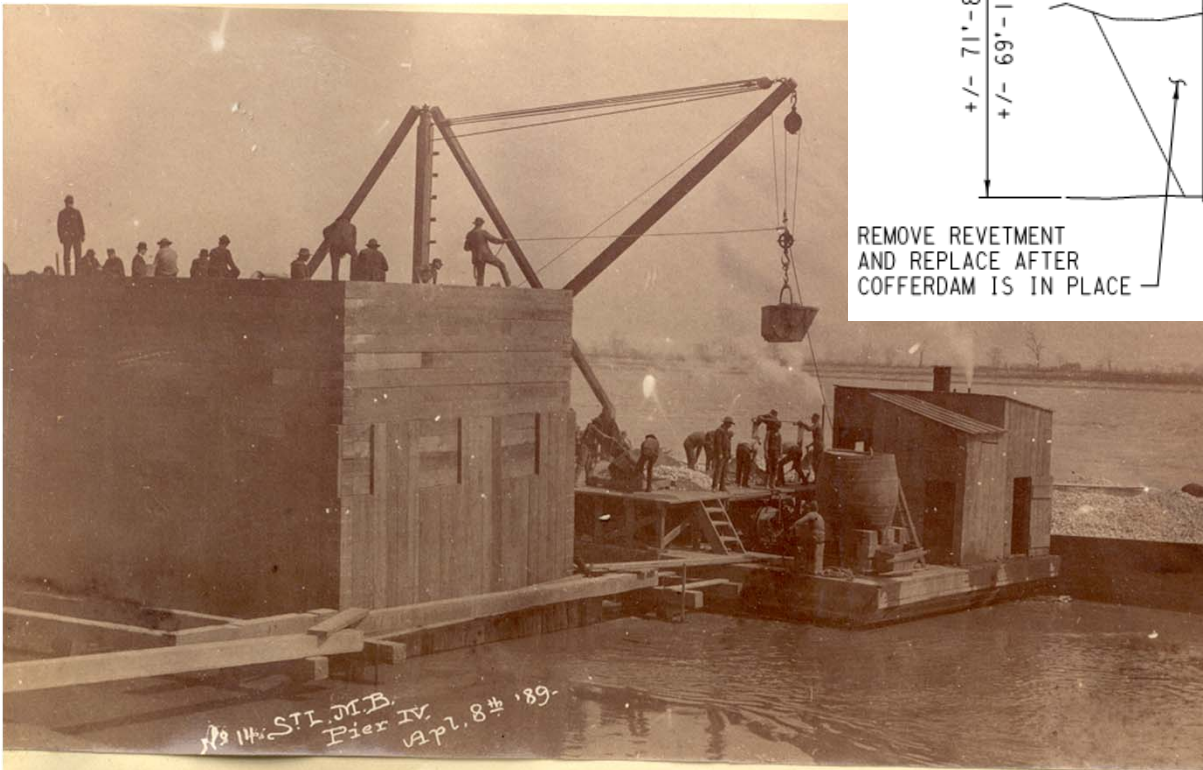


**Open Timber Deck**



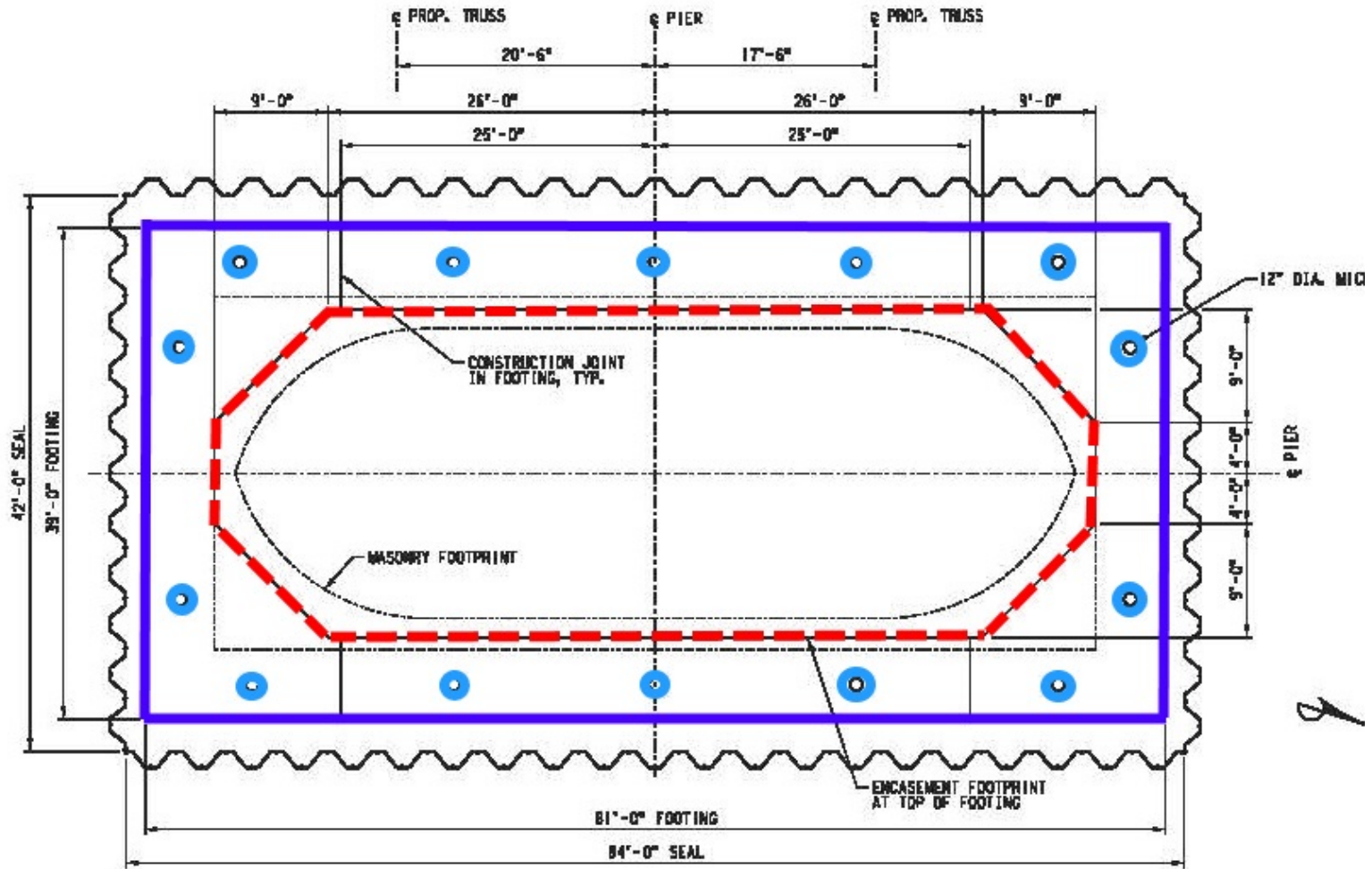
# DESIGN CHALLENGES – MAIN SPANS

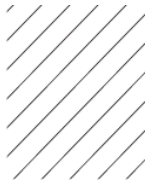
## ► Pier Footings



# DESIGN CHALLENGES – MAIN SPANS

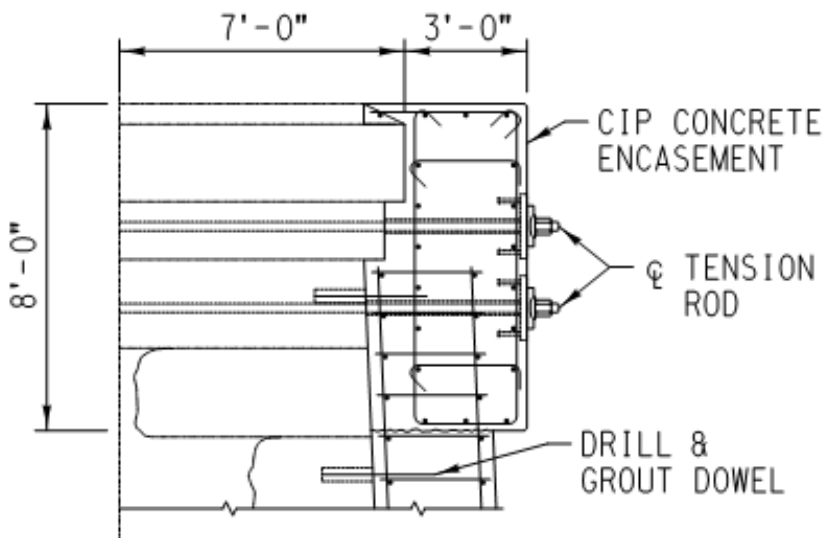
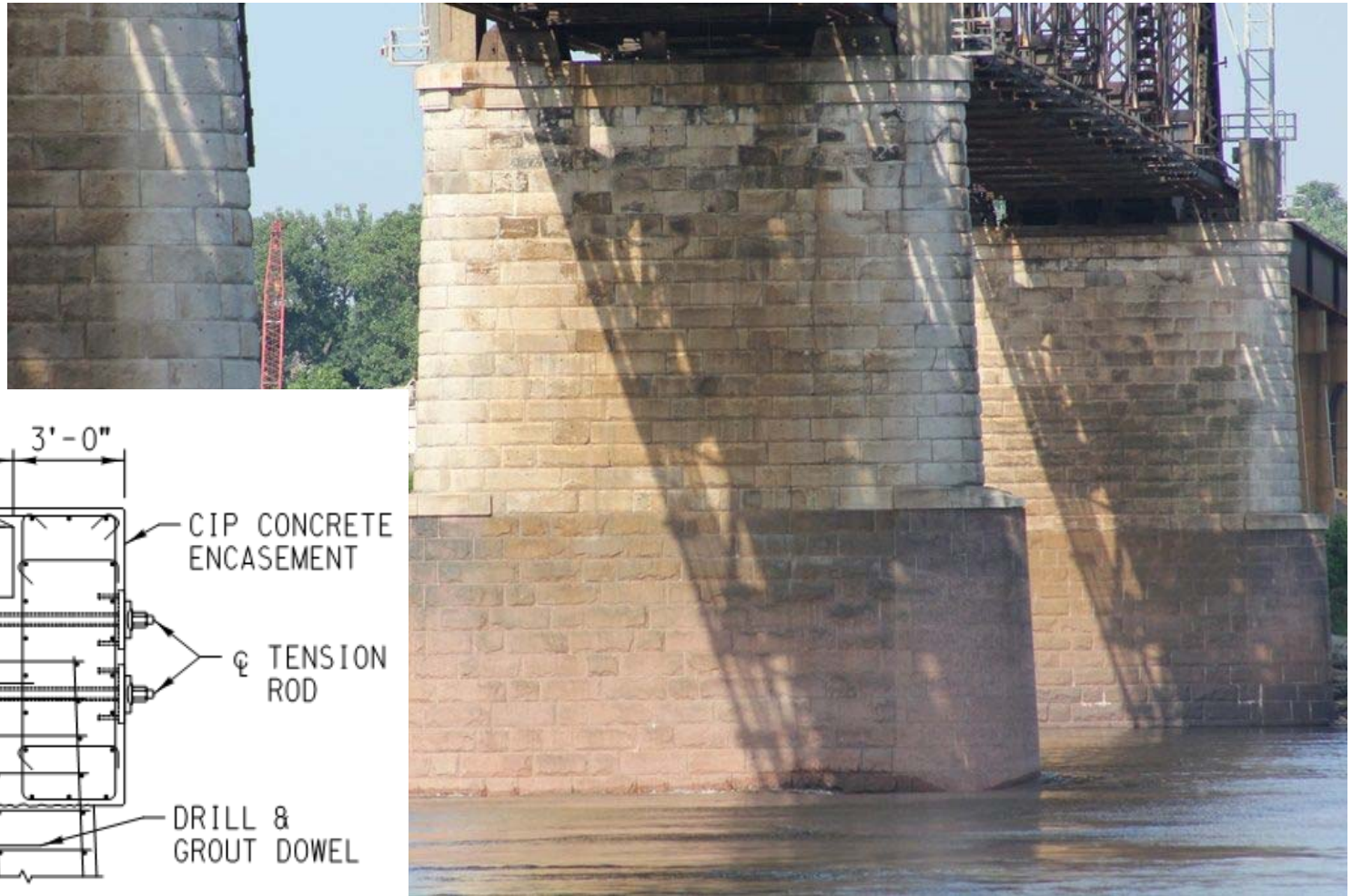
## ► Pier Footings





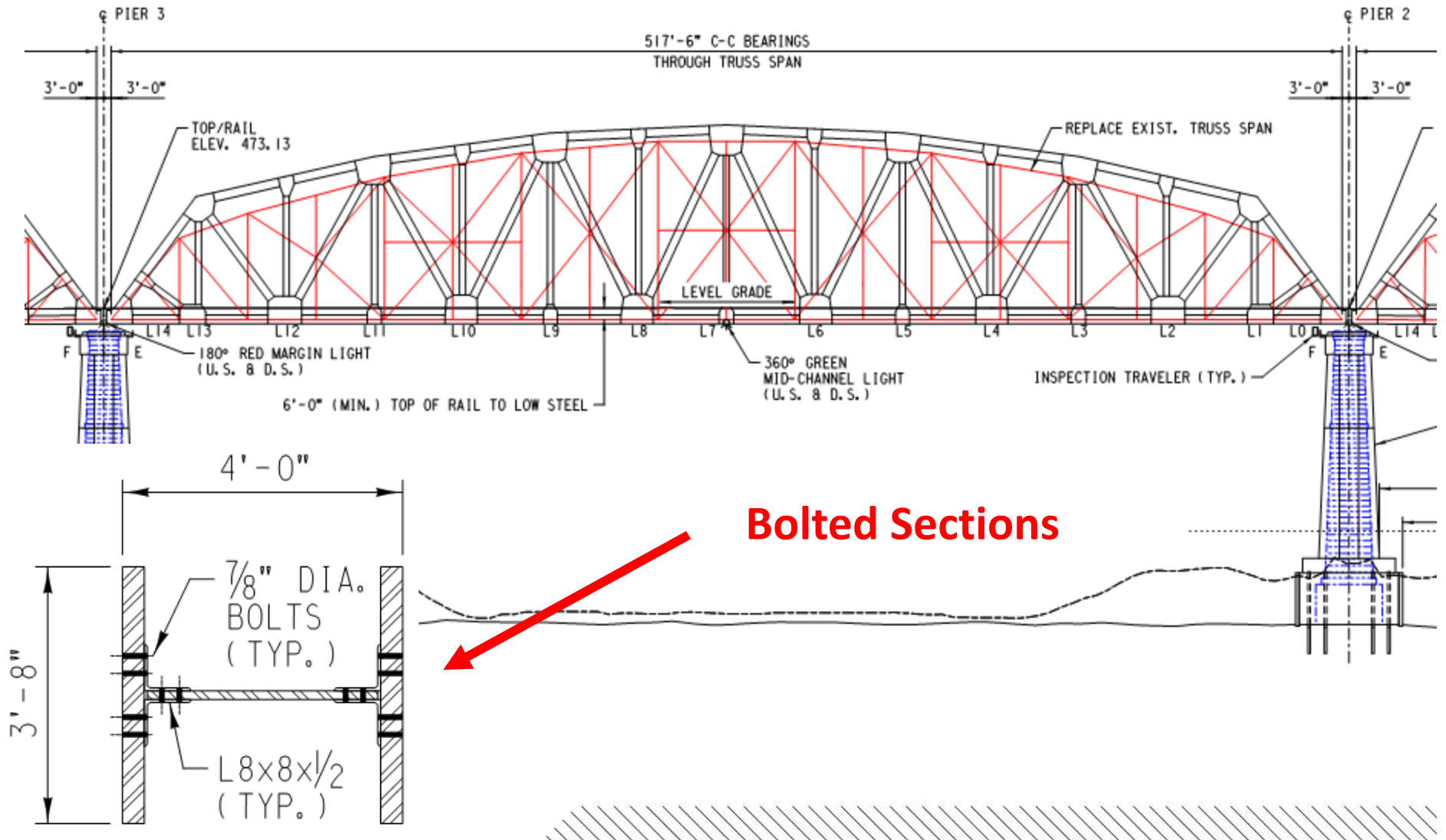
# DESIGN CHALLENGES – MAIN SPANS

## ► Pier Shaft & Cap Encasement



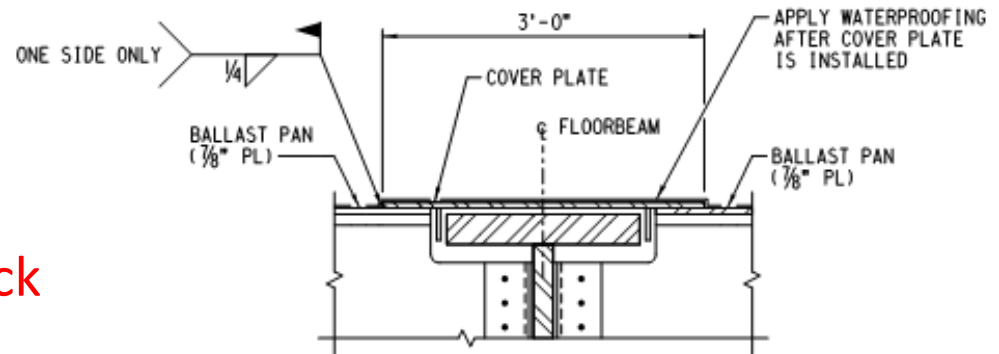
# DESIGN CHALLENGES – MAIN SPANS

## ▶ Truss Design

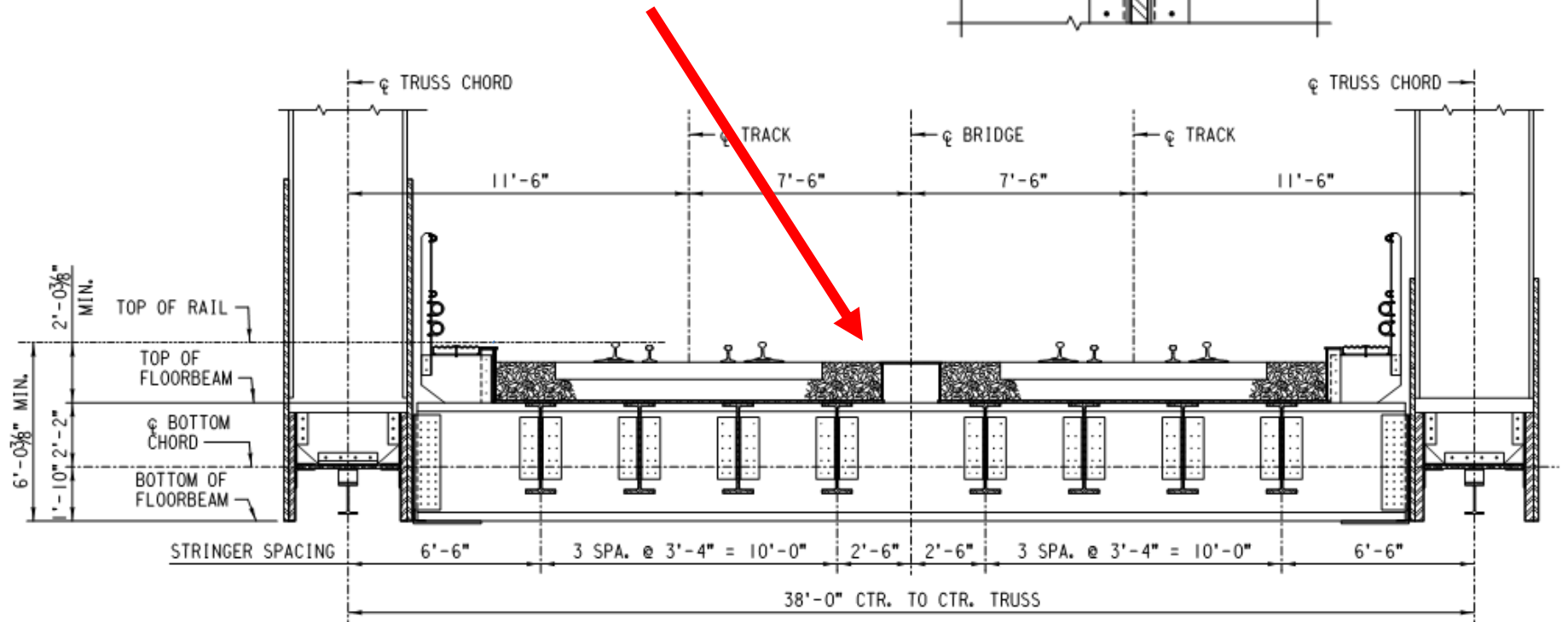


# DESIGN CHALLENGES – MAIN SPANS

## ▶ Truss Floor System

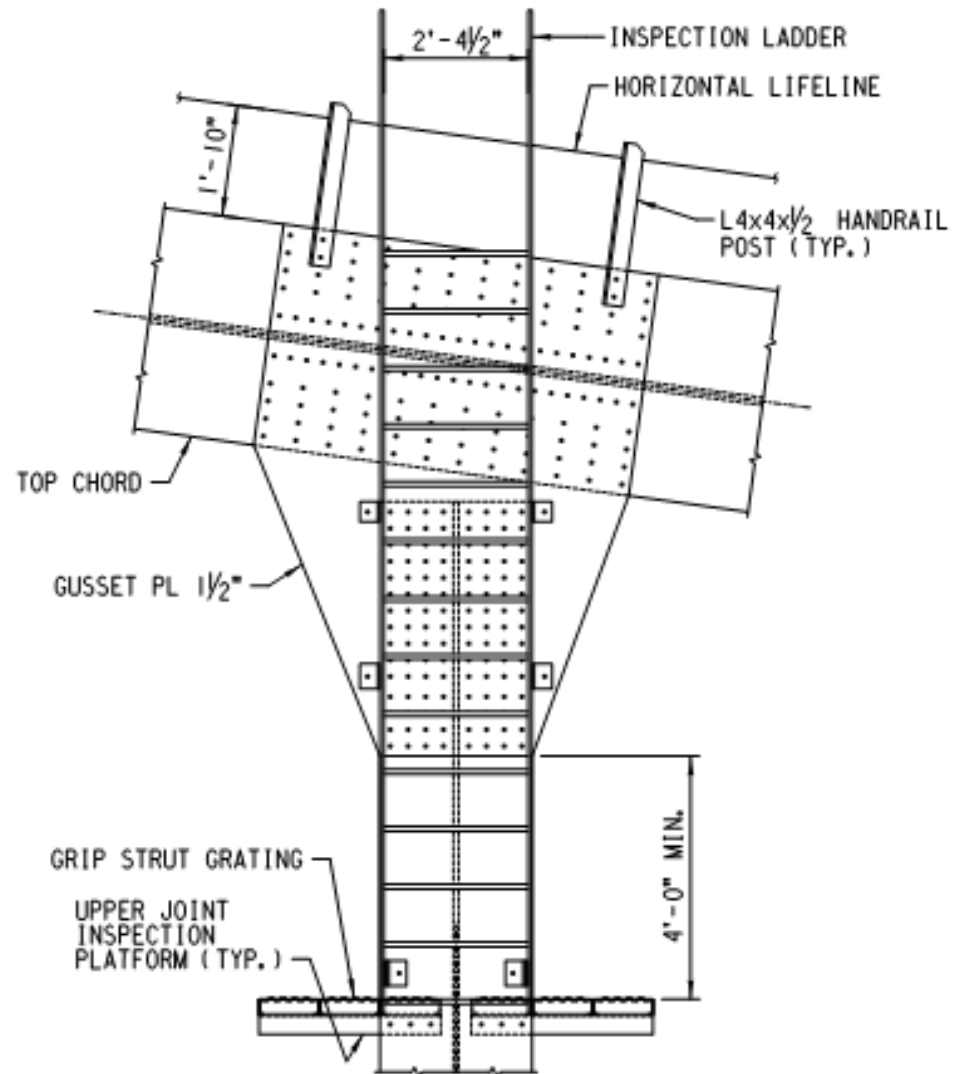


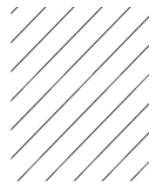
Ballast Deck



# INSPECTION ACCESS

- ▶ Truss Inspection Traveler
- ▶ End post ladder climbing safety system
- ▶ Top chord lifeline
- ▶ Top chord ladders at joints
- ▶ Access to pier tops from ends of each truss



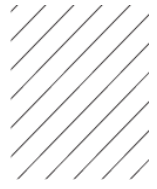


## PROJECT STATUS

- ▶ **Permits Pending**
- ▶ **Walsh team is mobilized**
- ▶ **Truss Fabrication has begun**
- ▶ **Completion 2022**



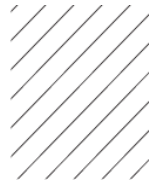




## PROJECT STATS

- ▶ **Engineer's Est. \$177 million**
- ▶ **Contractor's Bid \$172 million**
- ▶ **12,800 tons of truss steel**

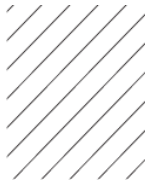




## FREIGHT PRIORITY #1 - ST LOUIS REGIONAL FREIGHTWAY

*“A new Merchants Bridge that can handle two modern freight trains at once could create more than \$456 million in economic activity over a 20-year period — nearly double the impact today,” Mike McCarthy, President (TRRA).*





**THANK YOU!!**

