



# Merchants Bridge Main Span and East Approach


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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
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# CONSTRUCTION HISTORY – MAIN SPAN



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# CONSTRUCTION HISTORY – EAST APPROACH

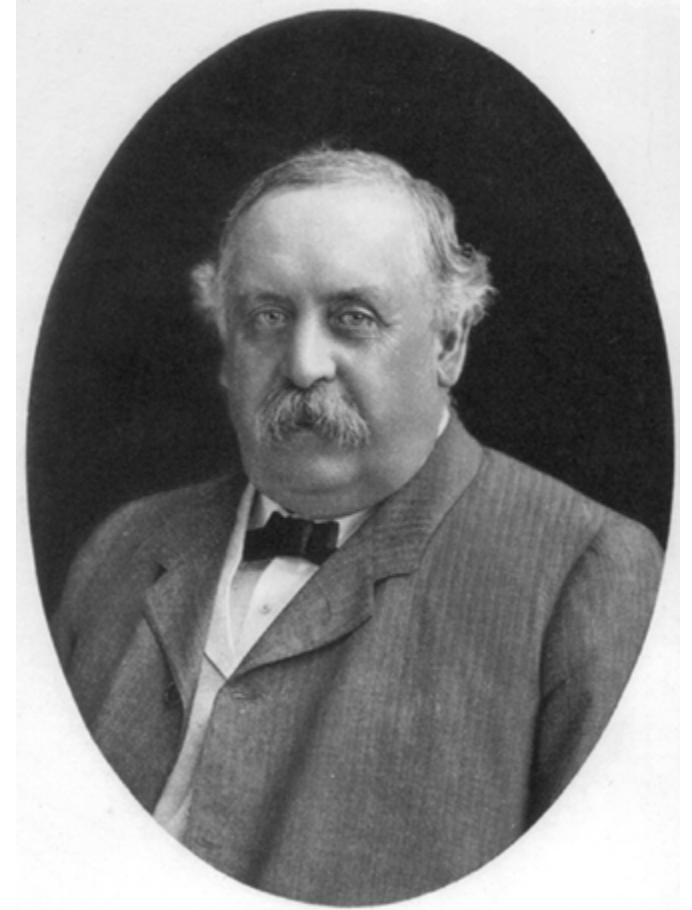


# CONSTRUCTION HISTORY — PNEUMATIC CAISSONS



# 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

- ▶ 3 Span Through Truss
- ▶ 4,340-ft Total Length: 518'-518'-518' Main Spans
- ▶ Deck plate Girder Approaches



# 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
  - ▶ Minimize maintenance
  - ▶ Minimize impacts to rail and maritime traffic during construction
  - ▶ Minimize risk due to vessel impact and seismic events
  - ▶ Inspection access
- 



# PROJECT TEAM

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




# PROJECT TIMELINE

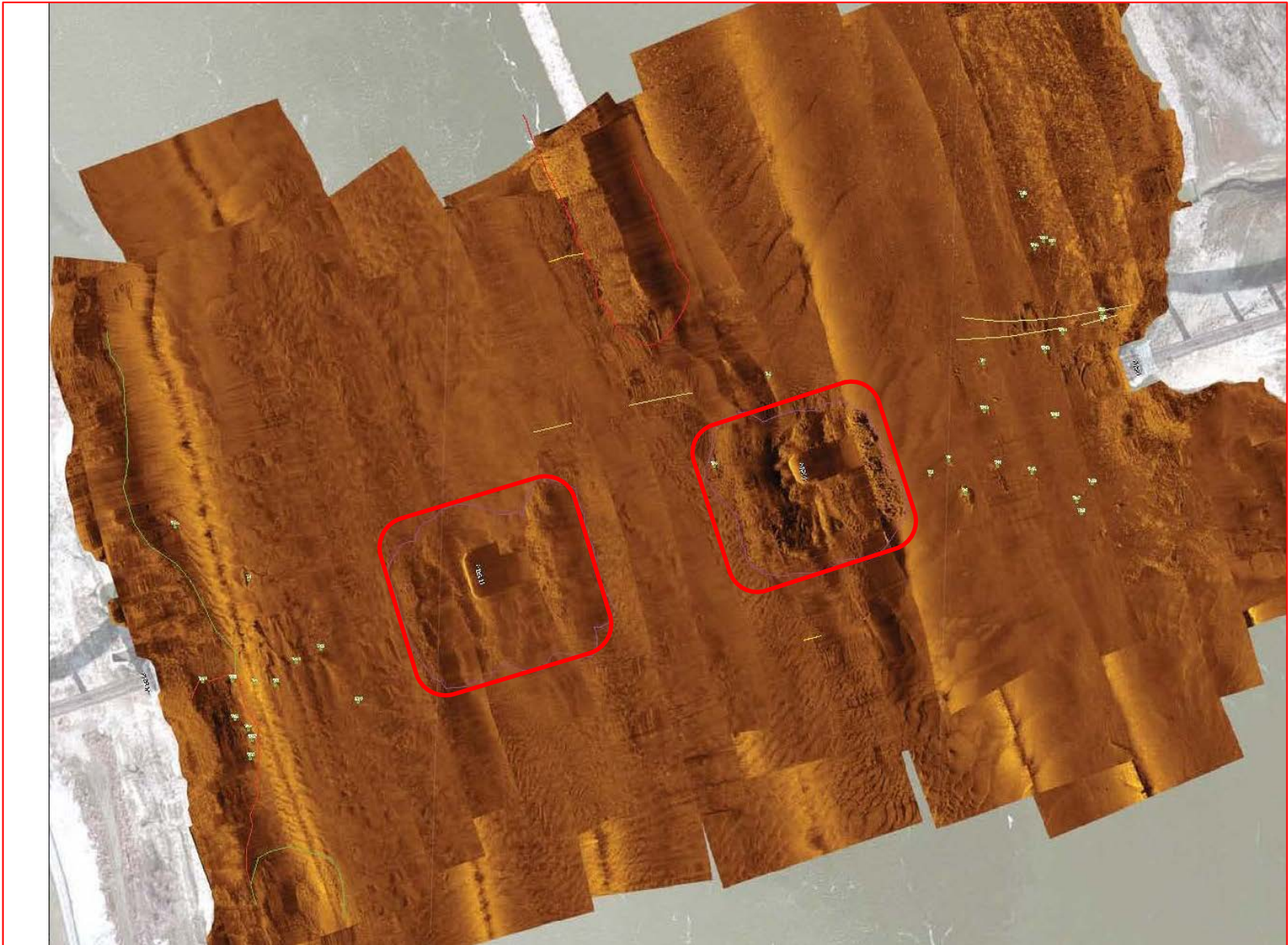
- ▶ West Approach Project Began 2014
  - ▶ Consultant selected for Main Span Design - May 2015
  - ▶ Study Phase Completed February 2016
  - ▶ Final Plans Completed August 2017
  - ▶ Contractor Selected March 2018
  - ▶ Construction projected completion 2021
    - \$75 Million grant application 2018
- 



# PHASE I BRIDGE STUDY

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


# PHASE I BRIDGE STUDY -BATHYMETRIC







# AGENCY COORDINATION

- ▶ Federal Railroad Association – Permitting agency
  - ▶ United States Coast Guard - navigation
  - ▶ Corps of Engineers
  - ▶ 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
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# UTILITY COORDINATION – AMEREN TOWER



# UTILITY COORDINATION – AMEREN TOWERS



# UTILITY COORDINATION – GAS REGULATOR





# 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



# DESIGN CHALLENGES – EAST APPROACH

## ► Embankment Widening



# DESIGN CHALLENGES – EAST APPROACH

- ▶ MSE Wall with Cellular Concrete Fill



# DESIGN CHALLENGES – EAST APPROACH

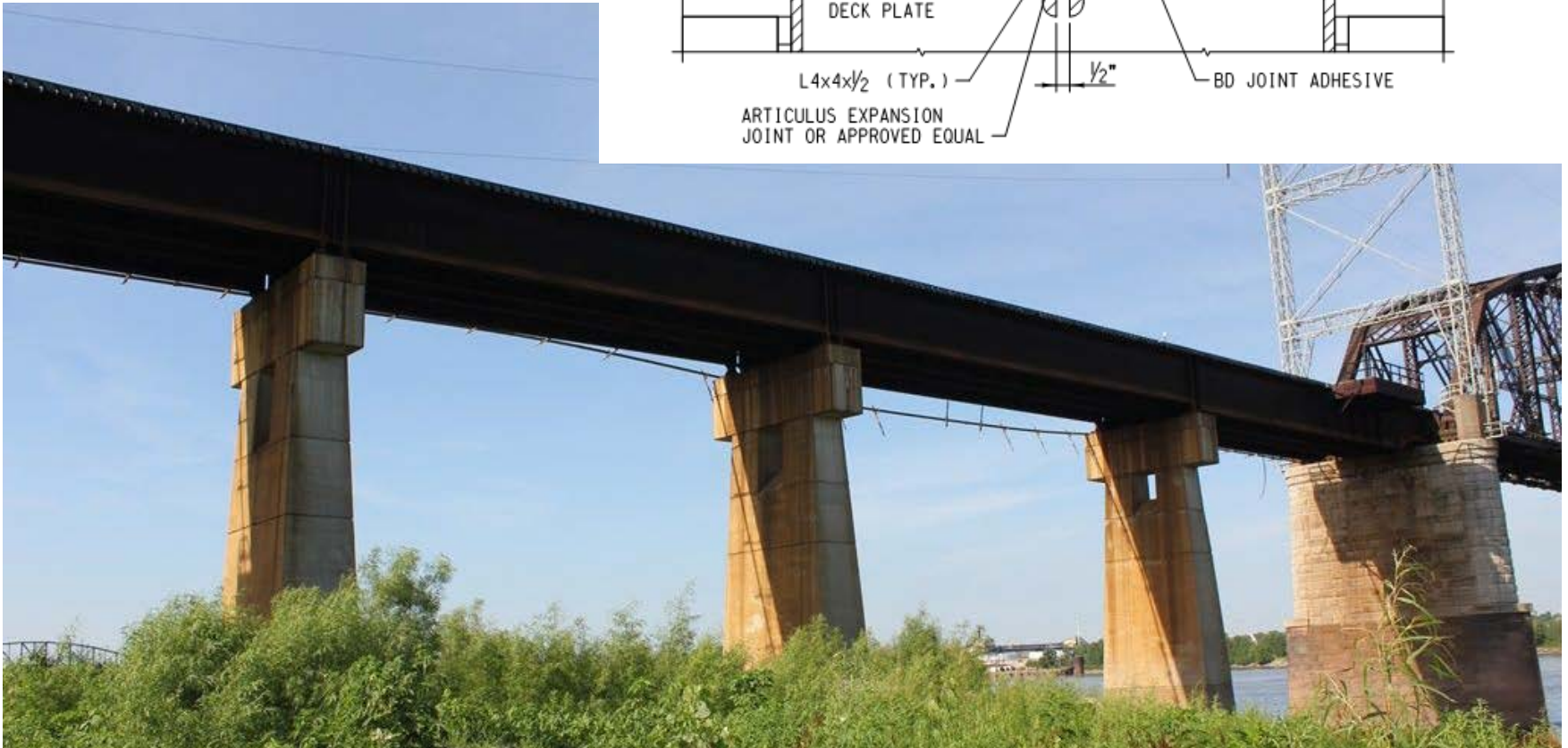
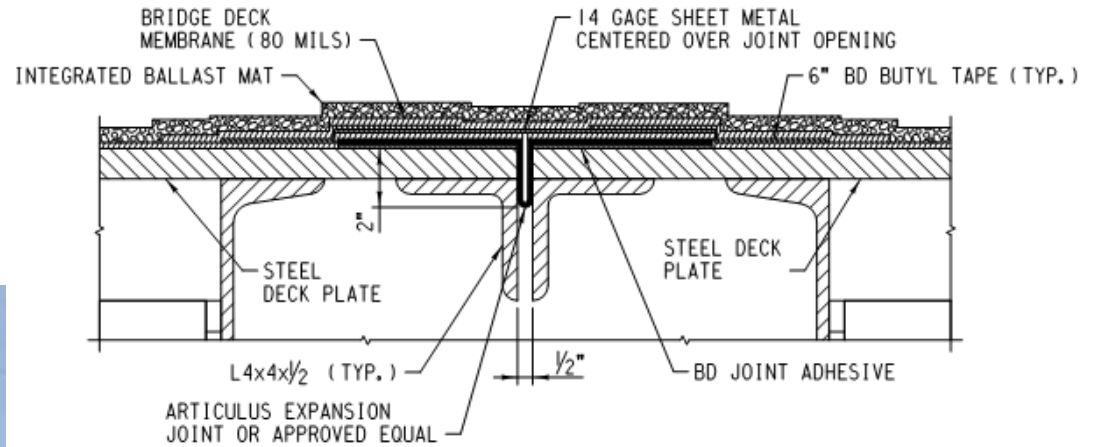
## ► CIP Culverts and Encasement Slab





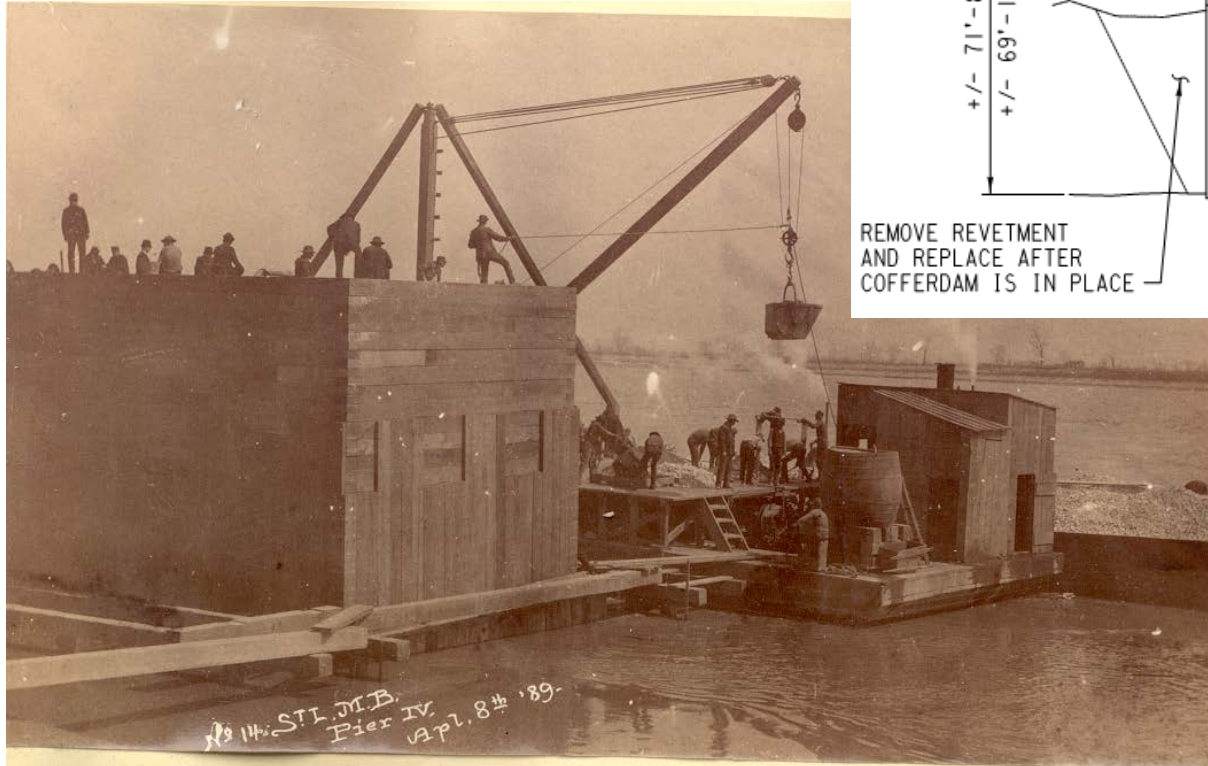
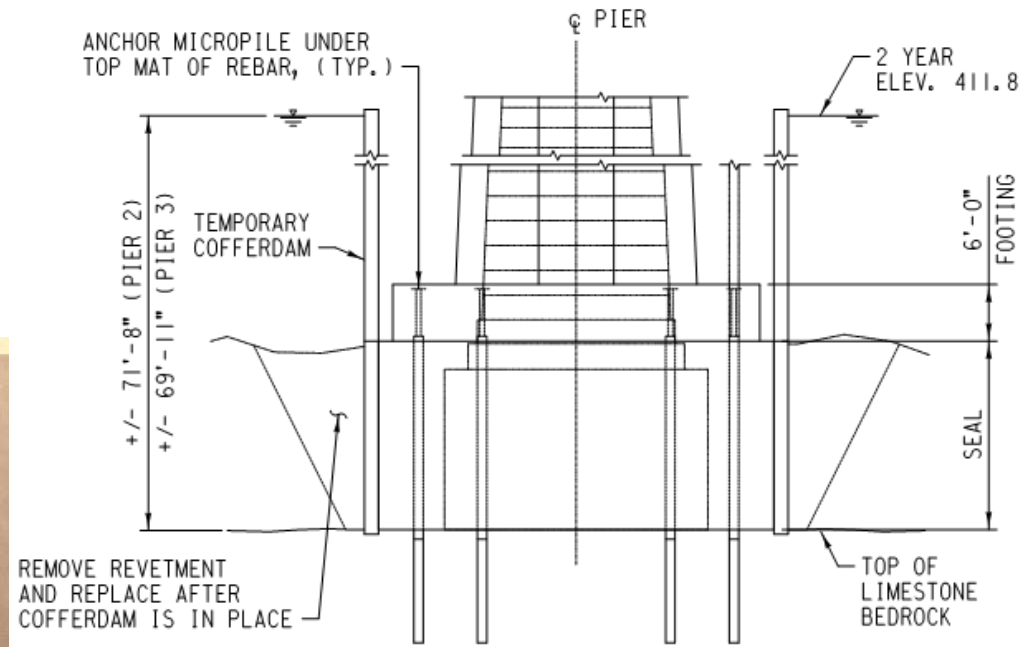
# DESIGN CHALLENGES – EAST APPROACH

## ► DPG Retrofit



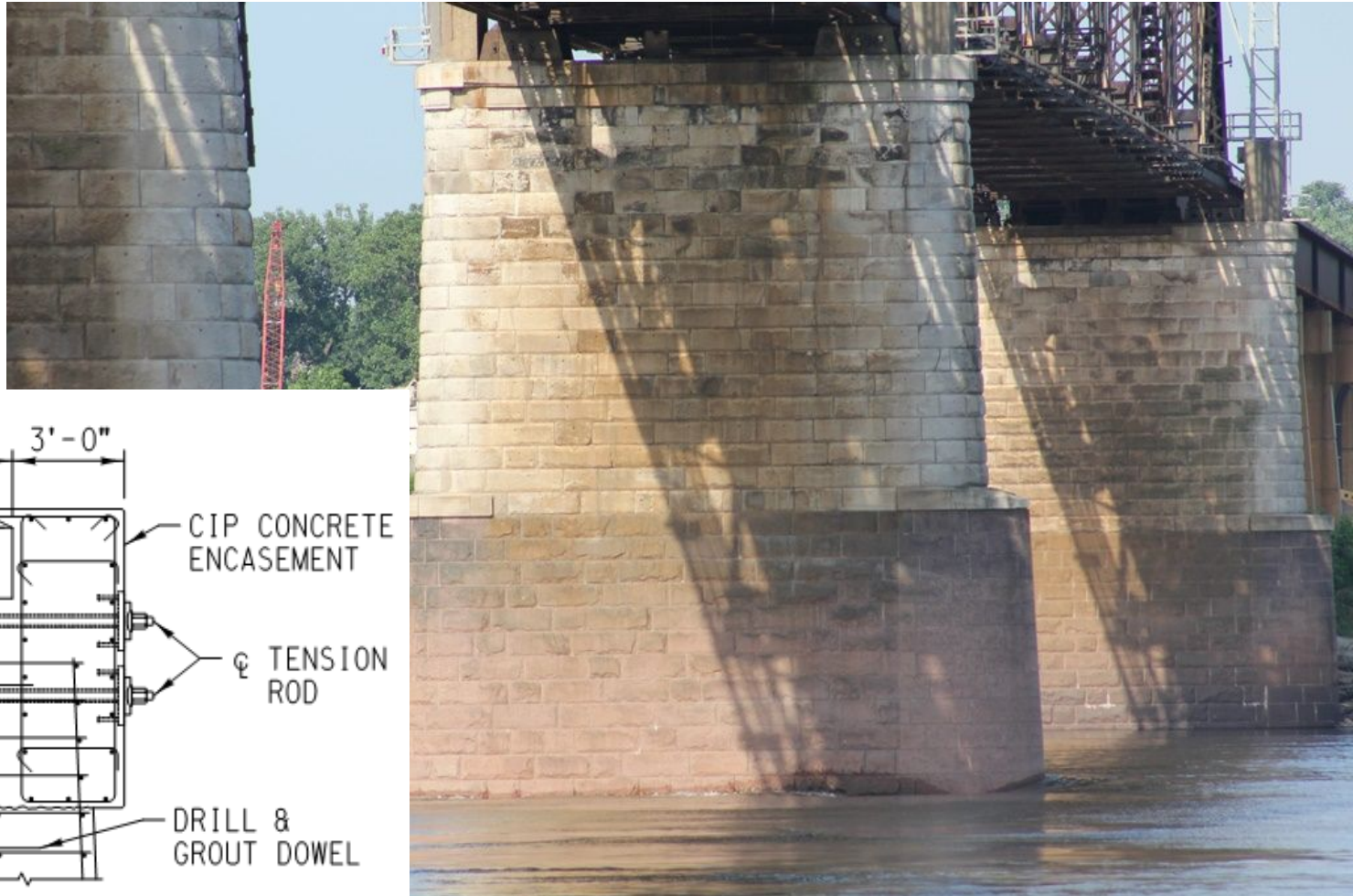
# DESIGN CHALLENGES – MAIN SPANS

## ► Pier Footings



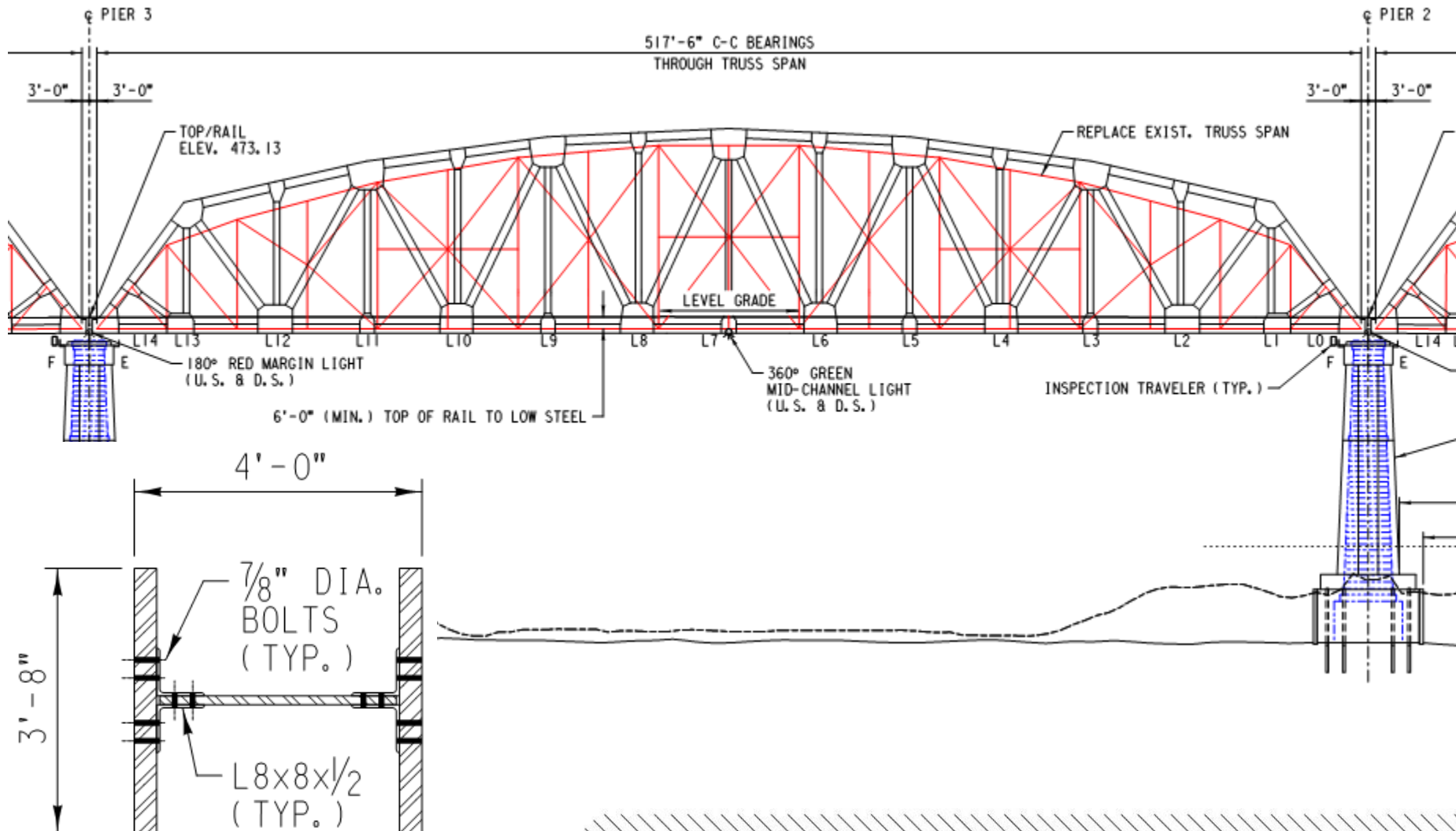
# DESIGN CHALLENGES – MAIN SPANS

## ► Pier Shaft & Cap Encasement



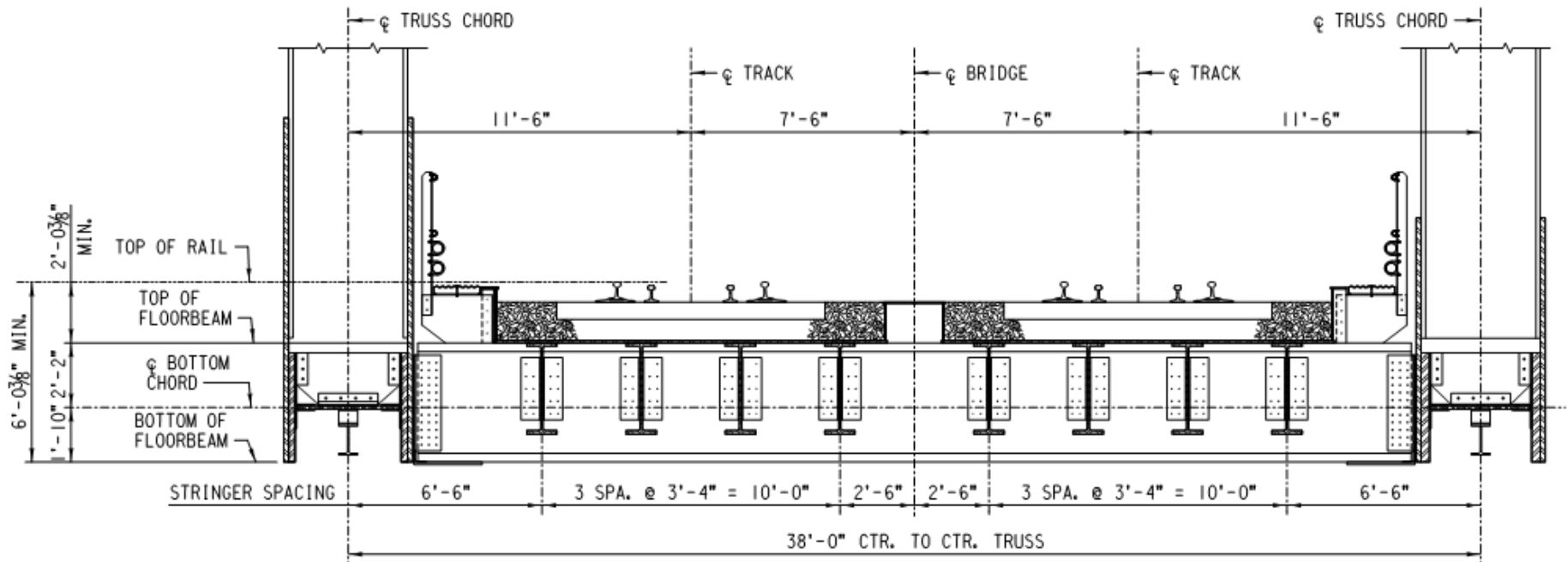
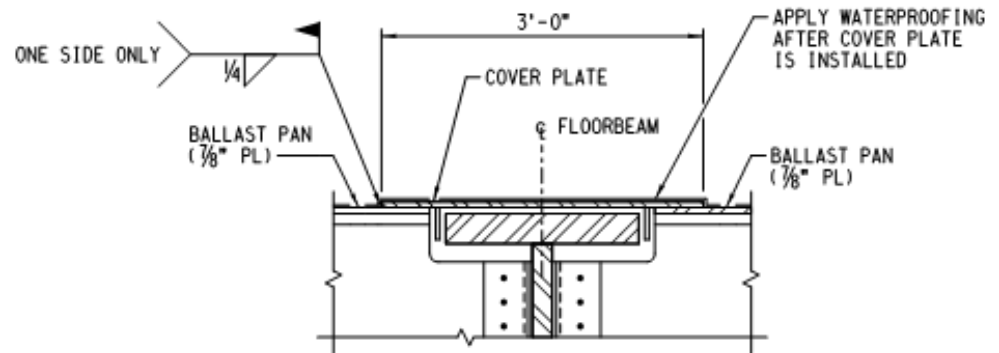
# DESIGN CHALLENGES – MAIN SPANS

## ▶ Truss Design



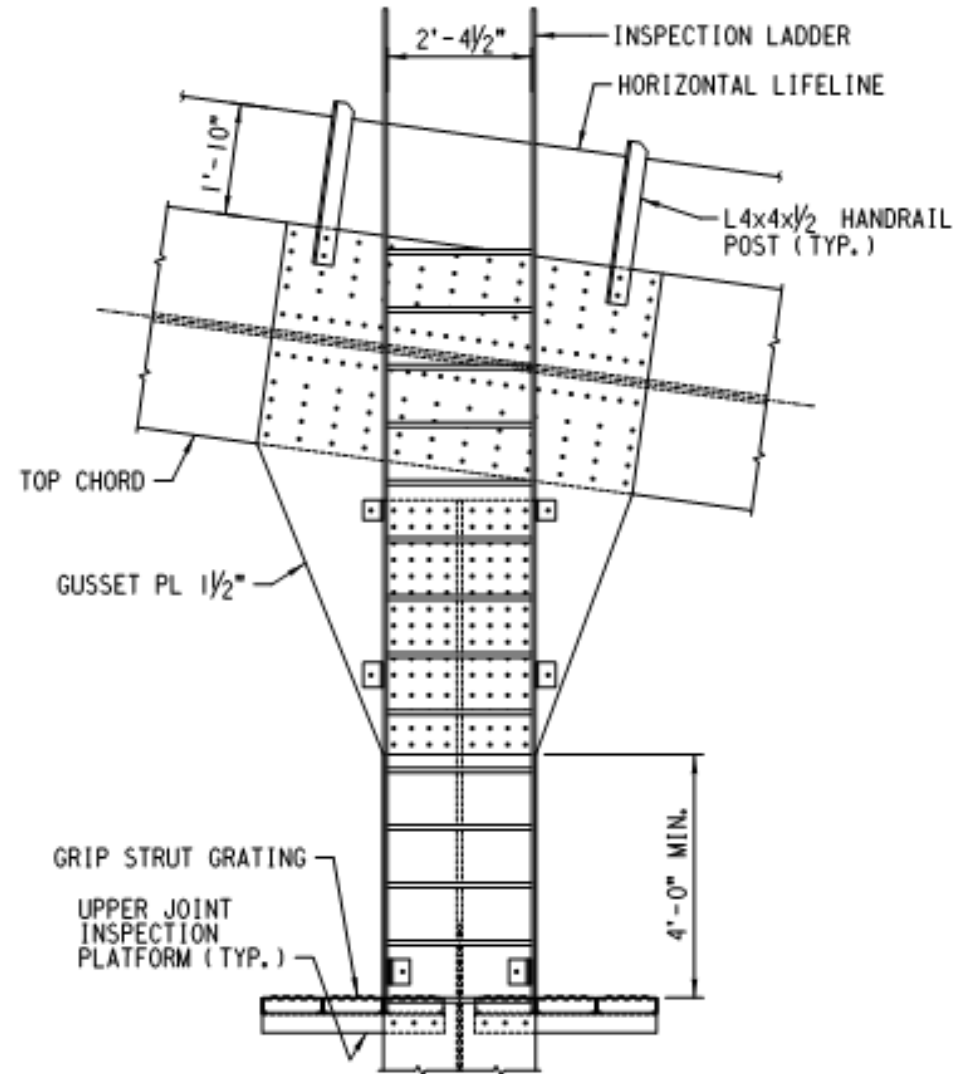
# DESIGN CHALLENGES – MAIN SPANS

## ▶ Truss Floor System

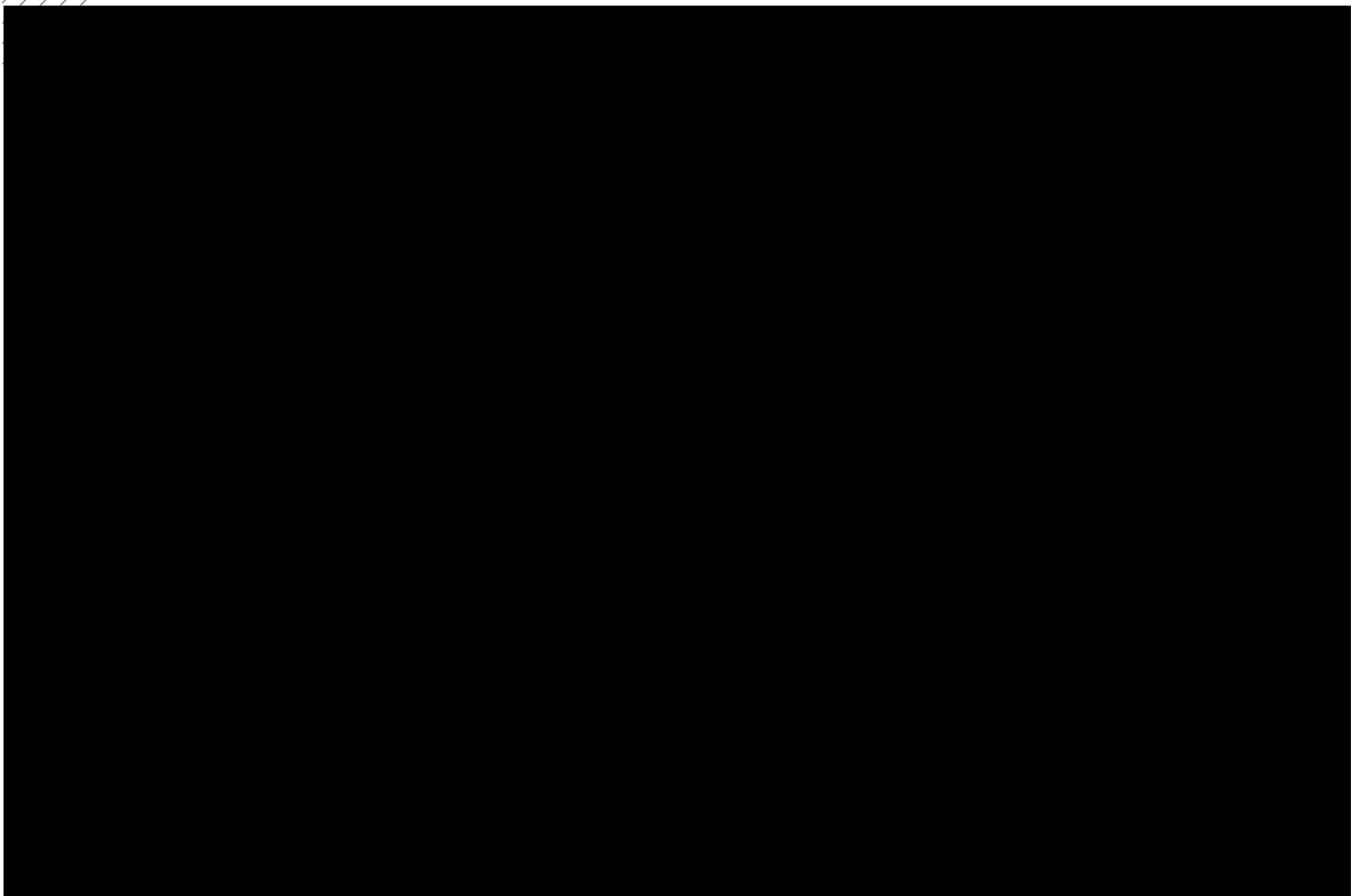


# INSPECTION ACCESS

- ▶ 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




# CONSTRUCTION SEQUENCE





# 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).*





# THE END

