Merchants Bridge
Main Span and East Approach

Allen Smith
Nick Staroski
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
CONSTRUCTION HISTORY – MAIN SPAN
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
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
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 1 BRIDGE STUDY

- Investigated two options
- H & H (no rise)
- Geotechnical investigation
- Utility Coordination
- Surveys
- Bathymetric Survey
PHASE 1 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
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
“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