Accelerated Design-Build
Replacement of SEPTA’s Crum Creek Viaduct

Jeffrey D. Knueppel, P.E.
General Manager

SEPTA

Robert L. Lund, Jr., P.E.
Assistant General Manager
EM&C
NEED TO QUICKLY REPLACE BRIDGE TO ENSURE RAIL SERVICE WILL REMAIN SAFE AND RELIABLE INTO THE FUTURE.

- Accelerated Project Delivery
- Balance Customer Needs versus Construction Efficiencies
- Obtain Long Service Life
- Maintain Safe Operations and Work Force Activities
Crum Creek
Viaduct Replacement Project

1854 Structure

1895 Structure

Completed Crum Creek Viaduct
Accelerated Project Delivery Method

- Design-Build Procurement
- Design to 30% Level
- Use of Stipends for Bidding
- Public Outreach
- Advance Permitting
History

• Original viaduct constructed in 1854
• Steel viaduct constructed in 1895, 17 spans, 915 feet long and 100 feet high.
• SEPTA acquired ownership from Conrail in 1982.
• 25 year life extension project performed in 1983.
• Serves the Media/Elwyn Regional Rail Line.
• Carries more than 320 passenger trains a week.
Project Schedule

- PA Act 89 passed – November 2013 (Funding for Project)
- Issued Step 1 of Procurement December 2013
- Five teams pre-qualified by SEPTA in August 2014.
- Three design-build bids were received on October 2014.
- Design/Build Contract Awarded December 2014
  - Walsh Construction Company with Figg Engineering
- Construction Began March 2015
- Viaduct went into Revenue Service September 5, 2016.
- All Work and Site Restoration Completed November 2016.
Permitting – By SEPTA

**NEPA/Historic Review**

- SHPO – Pennsylvania Historical and Museum Commission
- Mitigation Efforts – Survey and Document Historic Bridges on Line

**Waterway Permits**

- Joint Permit Application (JPA) – from USACOE and PADEP
- Assess impacts to water (streams and wetlands) due to project.
- Pennsylvania Natural Diversity Inventory (PNDI)

**Earth Disturbance Permit (NPDES)**

- Erosion and Sediment Control Plan (ESC) for all construction sequence
- Stormwater analysis (pre vs. post) for rate and volume
  - Land cover type effects run-off and DEP has requirements for retaining 2-year run-off on site
- Erosion and Sediment Control Plan (ESC) for all construction sequence
Public Outreach

- Community Meetings
- Stakeholder Meetings
- Web Site
- Live Web Cams
- Information Posters
Requirements

• Specified Acceptable Structure Type
  ▪ Steel Framing with Concrete Deck
  ▪ 100 Year Design Life

• Must Match Existing Track Alignment

• Designed to minimize effects on the existing structure while it remained in service. (Real-Time Monitoring)

• Must be in service by Labor Day 2016 (September 5, 2016).

• Designed to accommodate a TOTAL track outage time of 11 weeks
  ▪ Summer of 2016
  ▪ 9 weeks “owned: by Contractor for construction ($75k/day penalty)
  ▪ 2 weeks “owned” by SEPTA for Catenary, Signal Work and Testing
Real Estate Issues and Site Constraints

- Site on Swarthmore College Grounds and Within Arboretum.
- Limited Access - Site is landlocked by College and I-476.
- Access Road for Construction was integral to design process.
- Nearest public road is Rodgers Lane.
- College maintains nature trails and research projects throughout the area.
- Shallow Depth Sewer Line and Petroleum Pipe Lines along Access Route.
- Stream Crossing.
Real Time Structural Monitoring for Existing Bridge During Construction

- Structural Motion and Vibration Sensors were attached at key points to detect excessive structural motion or movement of elements.

- Inclinometers installed in critical slopes.

- Real time reporting to Contractor, Construction Manager and SEPTA Engineering.

- Remotely accessible cameras in addition to web cams.
Final Design

- 5-span continuous, composite, weathering steel girder bridge with four straddle piers each with a post-tensioned concrete pier cap.
- 735 Foot Long Bridge with 157 foot maximum span length.
- Foundations are 42” diameter drilled shafts, four per column.
- Bridge length was reduced by constructing high abutments and placing fill behind post and plank wingwalls at both ends.
- A precast concrete “tunnel” over the Leiper-Smedley trail paralleling I-476.
- Contractor chose straddle piers to allow for larger machinery outside of limits of existing bridge.
- Bearings are fixed “pot” bearings on the piers and seismic isolation bearings at the abutments.
To accomplish construction in 9 weeks:

• Build Substructure on each side of existing structure.

• Use Straddle Beams between columns, under existing structure.

• Erect Temporary Brackets.

• Precast Deck Sections.

• Erect new girders and deck ahead of outage on temp Brackets.

• During 9 week outage, perform lateral slide.
ABC Concept

Construction-Straddle Bents | Crum Creek Viaduct
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Lateral Slide Support System

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Pre-Cast Deck Installation | Crum Creek Viaduct
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Construction – Bridge Slide | Crum Creek Viaduct
Questions and Comments