ABC Training
FHWA
12/19/2017
Pittsburgh,Pa

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Talking Points:

- ABC History/ Policy in Pennsylvania
- Summary of ABC Bridges done recently and in the near future
- ABC highlights (when to use ABC, detour, RULD's, prefab elements, connections)
- 5 projects (built in 30 days or less)
- Shaler St project using an SPMT

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ABC History in Pennsylvania

- Incentives/ disincentives/ RULD's (Road USER Liquidated Damages)
- 1980’s precast decks
- 1990’s Inverset (steel I beams with precast concrete deck)
- 2000’s precast abutment systems, p/s beams, pier caps, SMPT move in District 6,Philadelphia railroad bridge over SR 376
- 2012 – 2014 full pre fab/ precast elements built in thirty days or less
- P3 (Public-Private Partnership Project)

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ABC

- Pennsylvania has no ABC policy
- We started out using incentives/ disincentives/ RULD's
- Bridges getting done fast but we paid extra dollars and contractors weren’t always getting done early (asking for and getting extensions) so we are doing more end date contracts. We still use A + Bx bidding, lane rental with incentives/ disincentives with limited delay penalties and overall project penalty.
- We also have to put a ceiling on total incentive you pay out (Ft. Pitt Blvd) $23,000,000 estimate/ $34,000,000 actual bid
- We still do Non-ABC, Non prefab/ precast end date contracts – in district 11-0 we have done 8 bridges in 28 to 60 days
- RULD's can’t be too high SR288, Main Street in Wampum, PA (7 days) 36000/ day RULD's Contractor $324,000 to do a temporary run around – we said no

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1980’s

- Precast deck panels were used with post tension in one direction and keyways
- Once in use, water was getting into the joints between panels corroding/ deteriorating keyways/ post tensioning after only **10 years** causing deck panels to move under traffic
- As a result we had to place 5” overlays over top of the deck panels to stop the movement

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1990’s

- Inverset (steel I beams with precast deck material), 2 projects in District 11-0, Pittsburgh
- Silicon joint used between modules still holding up well, considering placed between 1992 through 1997

2000’s

- Precast abutments stem on cast in place– footing (experimental job in 11-0 Millers Run road at Koppers Plant)
- Precast beams CIP deck
- Millers Run Road Bridge is working well

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2012 to 2014

- If we have 8 to 9 mile detours on a project – looking to do ABC
- GRS Abutments
- Precast/ prefab element **all** elements

2015-2017

- Super replacements on existing abutments as long as substructure shows no signs of distress and newer superstructure within 110% of existing super (SR 30 over Bessemer Ave., Allegheny County in – 1 weekend)
- FHWA $400,000 grant to use an SPMT. SPMT project Shaler Street over West End Bypass in Pittsburgh– build as much as possible before demo including abutments, piers, caps, bearings. Build super nearby replace 2 spans over 2 weekends

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GRS Abutments

SR 2011 Potter County built in 2 months by contractor

SR 318 Mercer County built in 2 months by department forces

GRS Abutments

SR 3071 Allegheny County built in 8 months by department forces

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GRS Abutments

First abutment completion date: 10/7/2011

Start date 10/5/2011

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GRS Abutments

Second Abutment Completion Date:10/11/2011
Two Abutments – 8 Days

Timber Super Being placed

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P3 (Public-Private Partnership Project)

- Pre-cast substructure
- Next ‘D’ Beam with full deck
- Folded Plate girder

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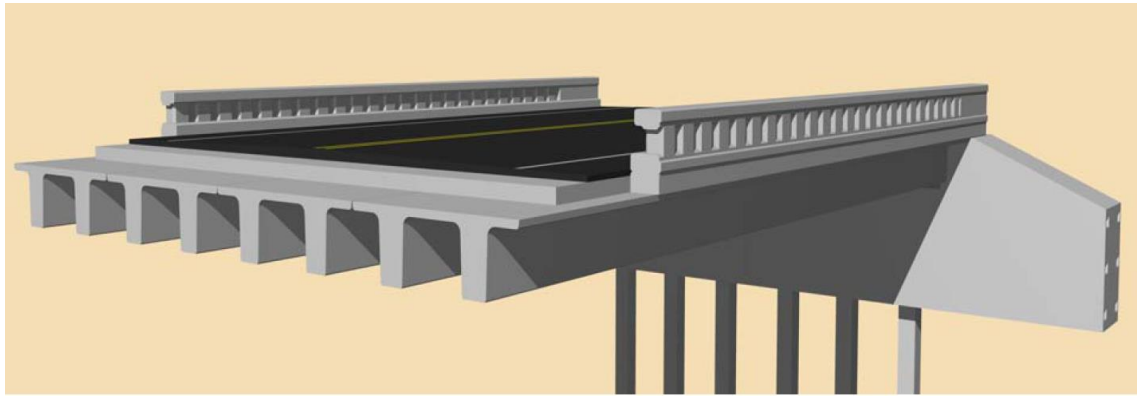
Next Beam



Folded Plate Girder

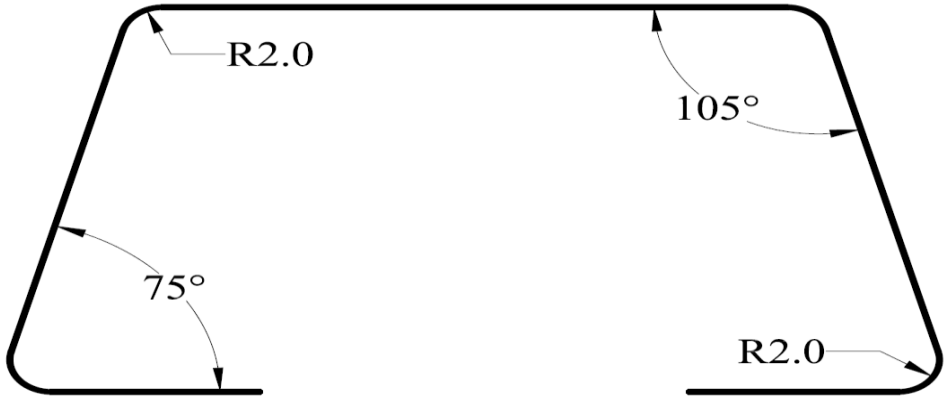


Fig. 1 Typical cross section for the Folded Plate Bridge System. Dimensions vary based on span length.

Integral Abutment ABC Bridge District 11-0 (Western PA)

Wampum Run Bridge
Lawrence Co SR 288-L10
7 Days Construction

78 ft. Span
35’-3” Width

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Integral Abutment ABC Bridge

- Project Let 4/10/2014.
- Low Bid $1,685,859 – High Bid $2,638,695 ($200,000 extra for ABC – 1 beam line & UHPC joint)
- A + Bx Bidding Used
- $36,00/day Incentive/Decentive
- Existing Bridge – concrete arch restricted to one lane with a 12 mile detour when the bridge is closed.
- Pre-Cast Fabrication of Pile Caps, Three (3) Two-Beam Deck Modules, Wing Walls & Approach Slabs
- Pick weights kept to 118,000 using light weight concrete and steel I beams
- Constructed from 8/18/14 through 8/24/14.
- Goal was to construct in 17 days. Contractor bid 9 days. Actually finished in 7 days.

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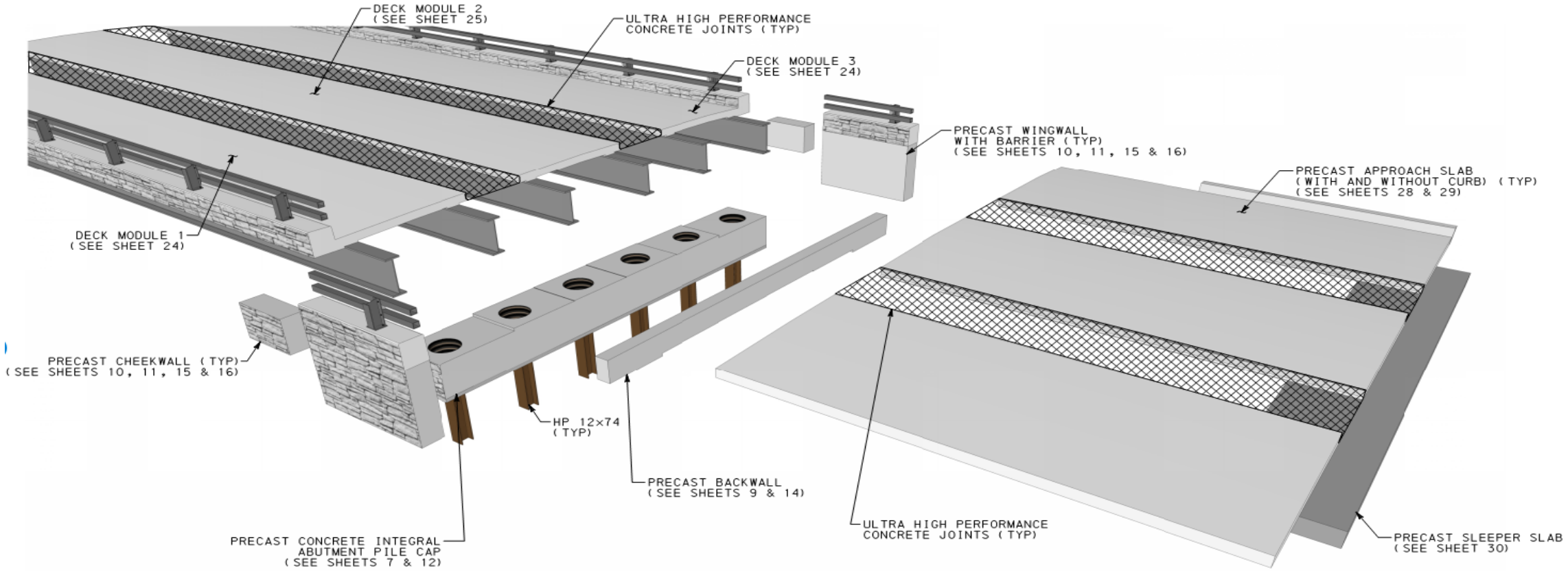
SR 288-L10 Wampum Precast Components



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SR 288-L10 Wampum Existing Bridge

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SR 288-L10 Wampum Time Line – 7 Day Closure

- Day 1 - Demo
- Day 2 - Replacement of remaining integral abutment piles
- Day 3 - Placement of abutment cap, cheekwalls and wings
- Day 4 - Place 2 beam deck modules
- Day 5 - Placement of sleeper slabs, approach slabs and leveling approach slabs
- Day 6 - Pour UHPC Joints
- Day 7 - Attach guiderail and pave approaches
- Days 8 & 9 (30 days later) - Place epoxy overlay and finish staining barrier

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SR 288-L10 Wampum Piles for Integral Abutment Cap Placement

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SR 288-L10 Wampum Precast Pile Cap

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SR 288-L10 Wampum 550 Ton Crane

Used to set beam/ deck modules and abutment 2 cap

Took 3 shifts to set up 550 ton crane with a 220 ton crane
Came in on 9 trucks

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SR 288-L10 Wampum Beam-Deck Modules

Beam-Deck Modules were Set in 3 Hours

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SR 288-L10 Wampum Approach Slabs

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SR 288-L10 Day 6 Saturday 8/23/2014 UHPC Joints Continued

UHPC Concrete

Add Mixtures and Ice

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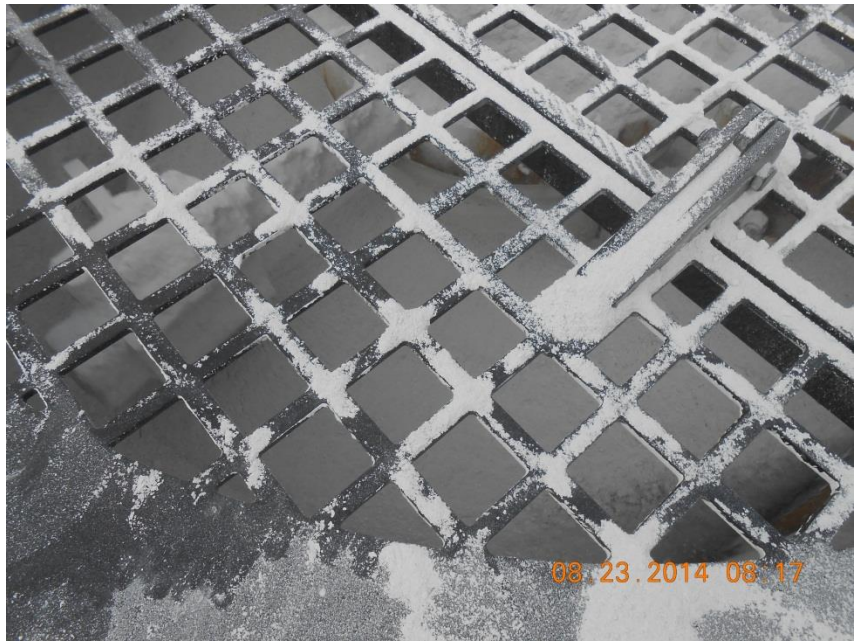
SR 288-L10 Day 6 Saturday 8/23/2014 UHPC Joints Continued

Ice

Mixer



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SR 288-L10 Day 6 Saturday 8/23/2014

Segregation Check

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SR 288-L10 Day 6 Saturday 8/23/2014

Temperature Check

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SR 288-L10 Wampum | Completed Structure

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SR 4009 - Babcock Boulevard late summer 2017

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SR 4009 – Babcock Boulevard Deck Removal

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Babcock Boulevard - Demolition

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Babcock Boulevard – Preparing the Abutments

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Babcock Boulevard – Precast Abutment Caps

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Babcock Boulevard – Abutments Capped

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Babcock Boulevard – Lifting Superstructure Section

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Babcock Boulevard – Placement of First Section

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Babcock Boulevard – Superstructure In-Place

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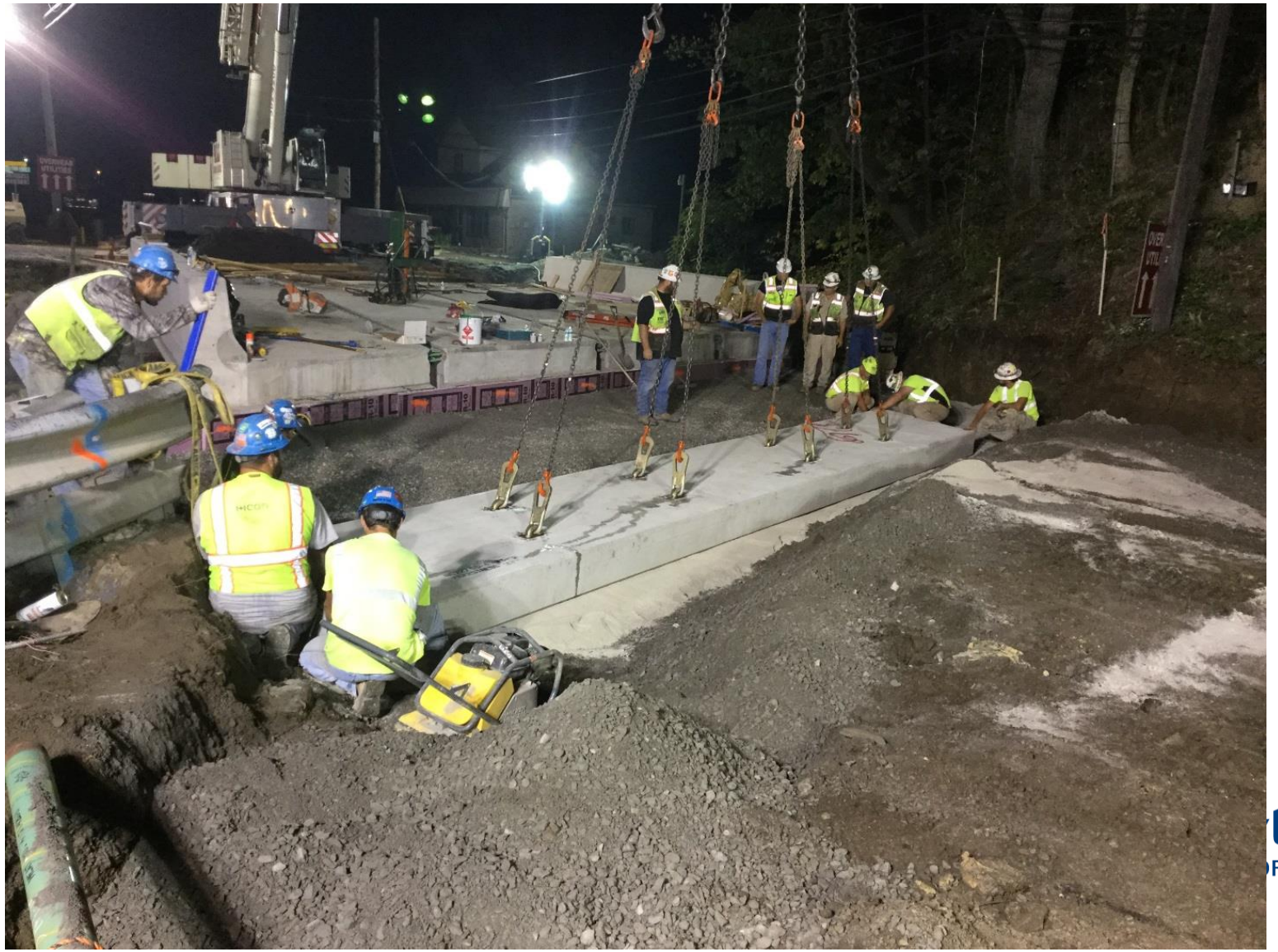
Babcock Boulevard – Approach Slab Prep Work



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Babcock Boulevard – Approach Slab Prep Work

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Babcock Boulevard

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SR 2014 Lawrence County

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SR 2014 Lawrence County Summer 2017

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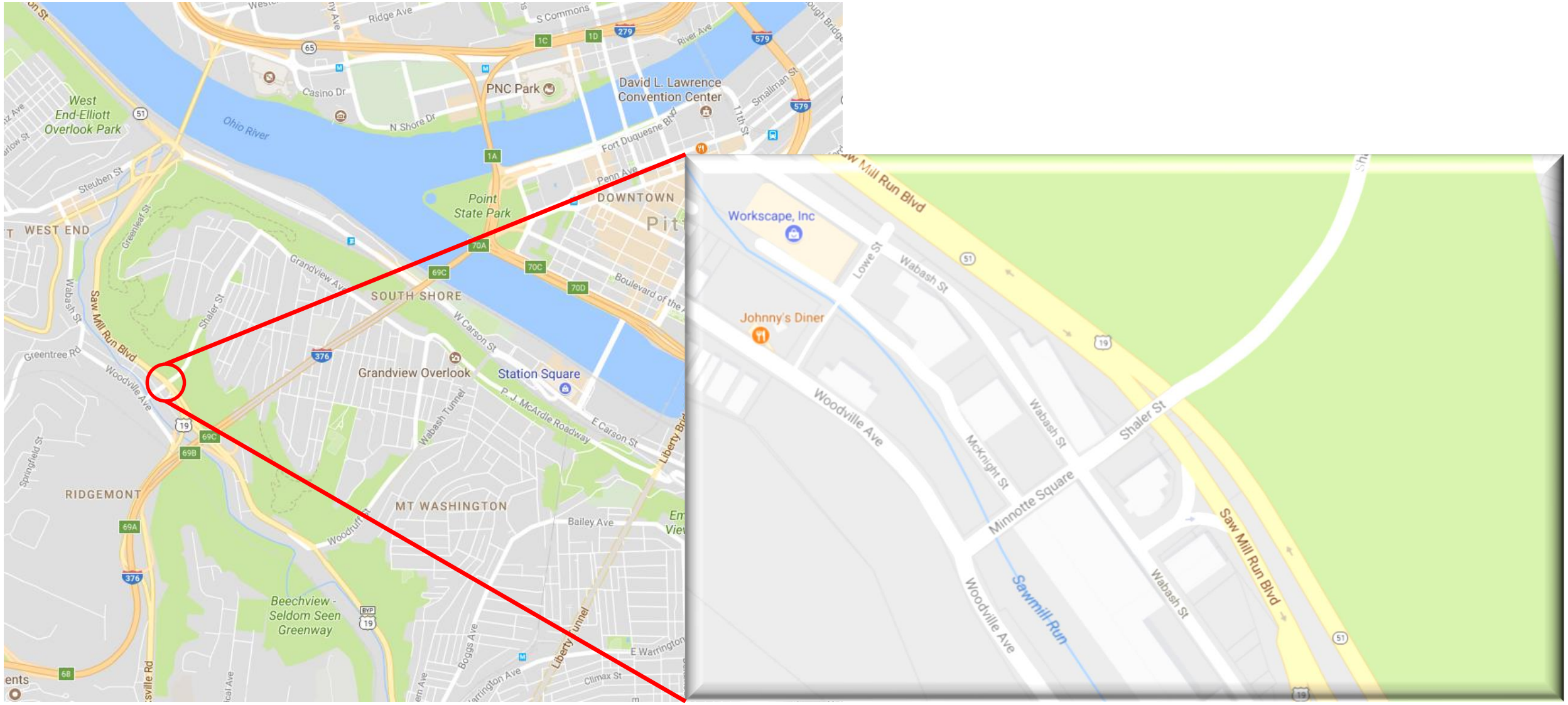
SR 3110 Shaler St SPMT move



SR 3110 Shaler St SPMT move

PA 581 10TH Street Rapid Bridge Replacement

Accelerated Bridge Construction of PA581 10th Street Bridge.

Structure replaced in 2 weekends and two weekends to install a latex overlay

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Design Concept

- Utilize Existing Substructure
- Use Steel Beams
- Availability of Pre-casting Area in the Bridge
- Selection of Closure Pour Material
- Protection of Closure Joints
- Maintenance and Protection of Traffic

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Design Build

- Innovation/Flexibility
- Full Responsibility
- Engineering and Construction Management System (ECMS): 89177
- Design Cost:
  - Bridge- $210,000
  - Maintenance and Protection of Traffic (M & P) - $50,000
- Construction:
  - Bridge- $2,600,000
  - M & P-$125,000
- Construction: 2015

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Cost Differential

- Conventional construction: ~ $150-$200/SF
- $1.5-$2.0M for bridge superstructure
- Accelerated Construction: $2.6M
- Differential: $600K (premium)
- Maintenance and Protection of traffic cost

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Detour PA581 East to I83 South

SR 0581WB - ADT: 42,544, ADTT: 3,829

SR 0581EB - ADT: 45,235, ADTT: 4,071

SR 0083NB - ADT: 51,000, ADTT: 5,100

SR 0083SB - ADT: 61,000, ADTT: 6,100

Summary of Picks- New Superstructure

Stage	Assembly	Assembly Weight (lbs.)	Rigging Weight (lbs.)	Total Pick Weight (lbs.)
1	1	224,130	14,602	238,732
1	2	190,197	14,602	204,799
1	3	190,626	14,602	205,228
1	4	263,580	14,602	278,182
2	1	227,803	14,602	242,405
2	2	199,642	14,602	214,244
2	3	249,650	14,602	264,252

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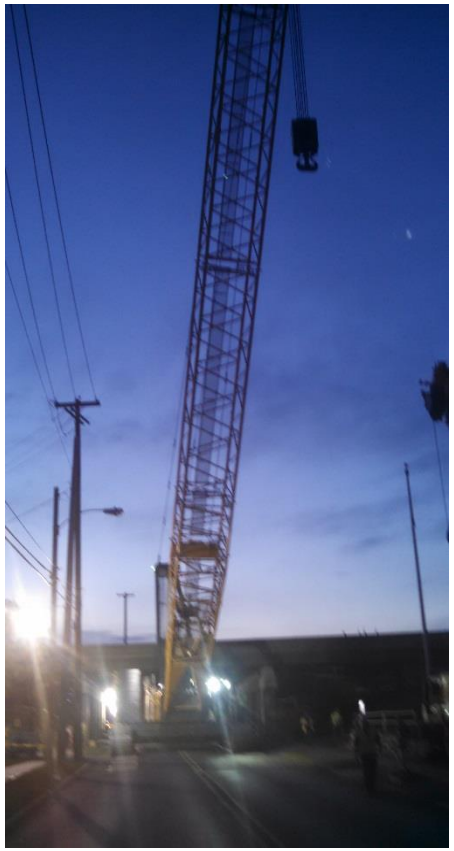
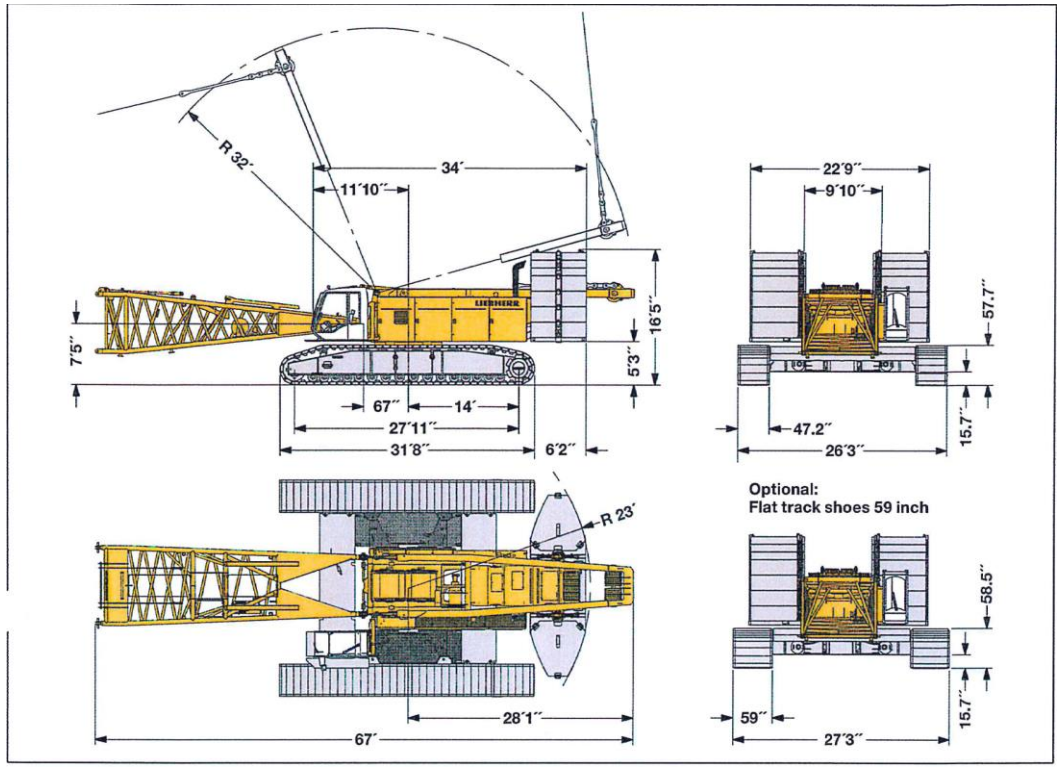
Crane Selection

- Liebherr LR 1300 SX Crawler, 273,400 lb. cwt., 125,700 lb. carbody cwt., and 144 ft. boom
- Liebherr LTM 1400-7.1 Hydraulic Truck, 264,600 lb. cwt.,118 ft. boom



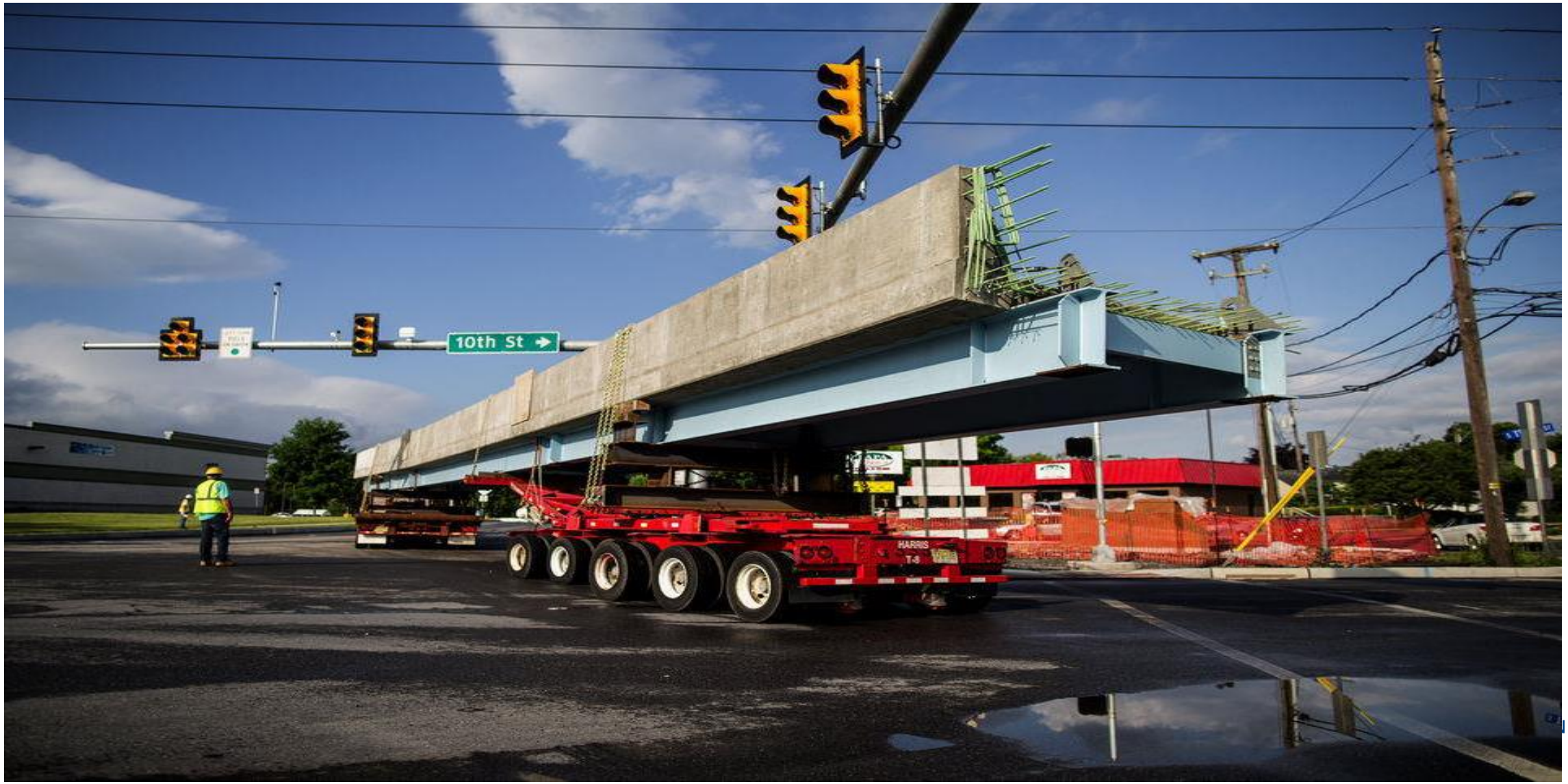


Prefabricated Superstructure Built Near Bridge Site

Cutting Existing Bridge into Section to be Removed by Truck

Removing existing bridge section

Bridge Section Being Placed on SPMT Crawler to be Transported to Lift Site


10th St
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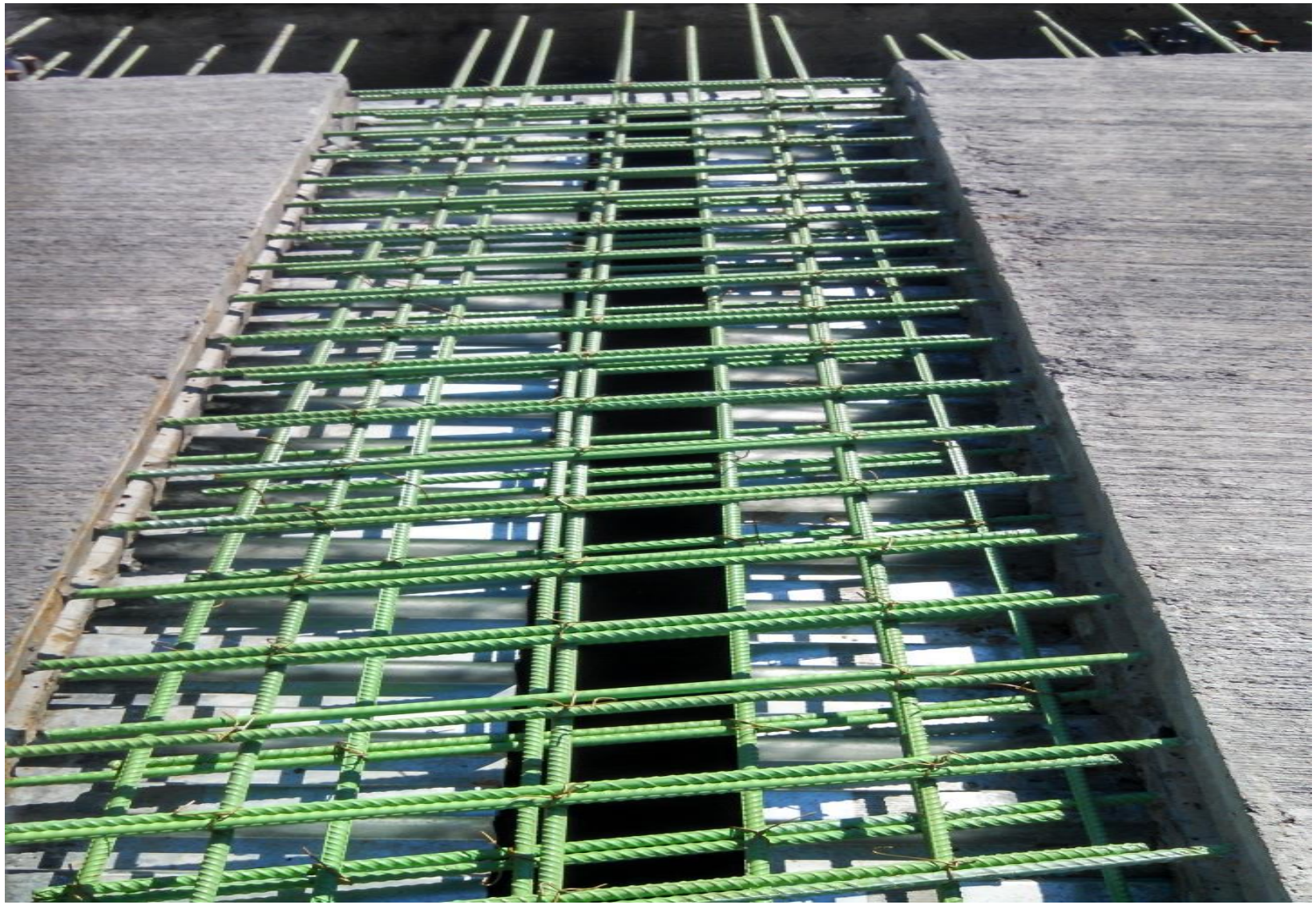
Placing New Bridge Section

Placing Last Section

Typical Joint Section



Placing Latex Modified Concrete

Finished Bridge

Summary

- ABC techniques do add costs to projects at this time
  - Some estimates up to 20% extra but this can vary
  - SR 288 extra ~$200,000 for additional beam line
  - SR 4009 – additional ~$75,000
  - SR 2014 – savings of ~$150,000
- Non-culvert complete replacements have been completed from 7 days to 21 days
  - District 4 has done culverts in a weekend
- Consider using ABC when detour is 7 miles or greater
- Proper assessment of RULDs is recommended to avoid temporary run arounds being cheaper
- Owner needs to be committed to ABC for the project (contractor will sometimes want to go back to traditional methods to reduce risk)