




Madison 502

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January 21, 2020


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Madison 502

Project Overview

- Located in Downtown Anderson, IN
- Eighth Street over the White River – Eisenhower Veterans Memorial Bridge
- Existing grade steep to clear abandoned railroad
- Historic property NE



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Project Overview

- West end had CIP retaining walls on each side of road
- Jail in NW quadrant – Health Department SW
- Building under Span 2
- Levee on east end
- 24" Watermain under bridge, river and levee
- Two Trails



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Project Overview

- In August of 2007, BLN performed a hands-on inspection on bridge



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Project Scope

- Developed Engineering Assessment
 - *Alternate 1 – Substructure Rehabilitation - \$233,000*
 - *Alternate 2 – Overlay with Substructure Rehabilitation - \$2,083,000*
 - *Alternate 3 – Deck Repl. with Substructure Rehab. - \$8,192,000*
 - *Alternate 4 – Bridge Replacement - \$13,283,000*
- Eliminated Alt. 1 & 2 due to deck chloride contamination
- Eliminated Alt. 3 because after considering the life cycle cost, the total cost was similar to Alt. 4

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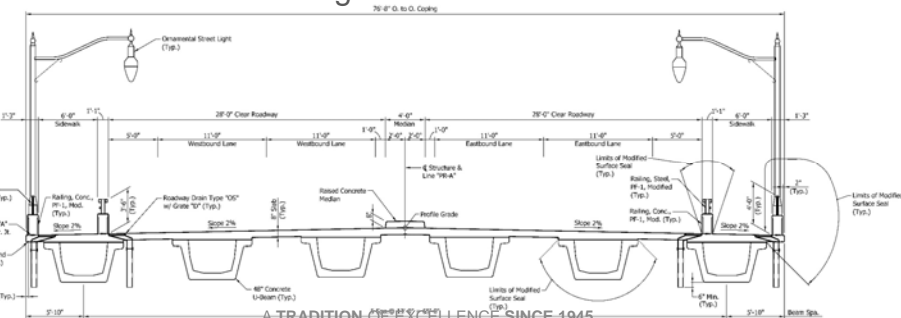
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Bridge Design

- Typical Bridge Section – 76'-8" O-O Coping – U-beams
- Separated Sidewalks
- Architectural Streetlights
- Overlooks
- Form Liner



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Bridge Design

- Semi-Integral End Bents – 35 degree skew
- Eliminated West Span
- Hammerhead Caps on Circular Columns on Pile Caps
- Open Concept underneath



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Cap Design

- 1" Open Joint between caps to facilitate phased construction
- Also reduced thermal strain on the columns
- Caps support Overlooks



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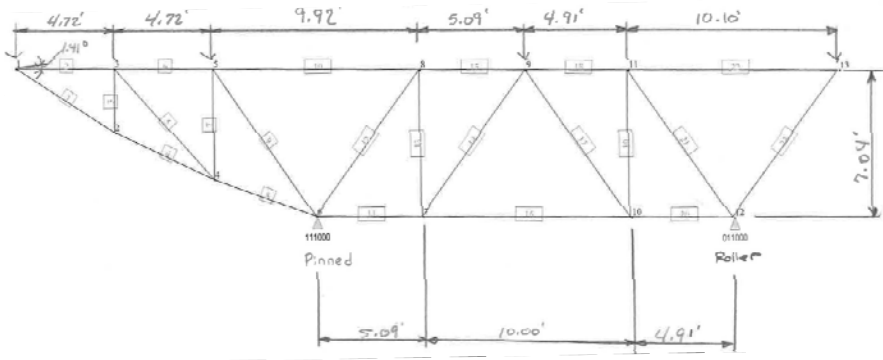
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Cap Design

- Strut-and-Tie Modeling of Pier Cap per LRFD Requirements



A technical diagram showing a strut-and-tie model for a pier cap. The model consists of a top horizontal chord, a bottom horizontal chord, and a series of diagonal struts connecting them. The top chord is divided into segments with lengths: 4.72', 4.72', 9.92', 5.09', 4.91', and 10.10'. The bottom chord has segments of 5.09', 10.00', and 4.91'. The vertical height of the cap is 7.04'. The model is supported by a 'Pinned' support on the left and a 'Roller' support on the right. Reinforcing bars are indicated by small squares along the chords and struts.

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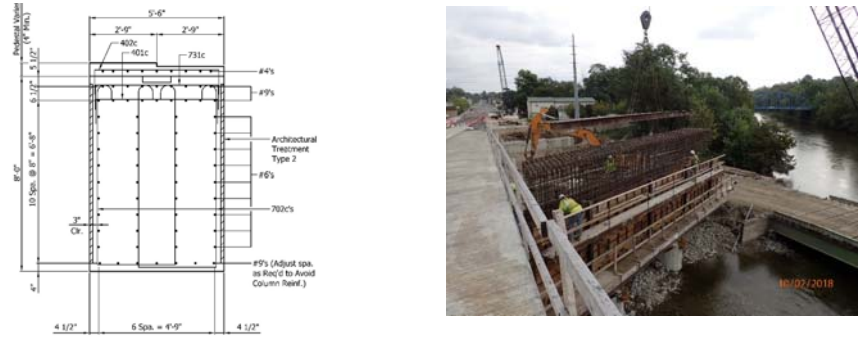
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Cap Design


- Reinforcing Steel mimicked Strut and Tie Model
- Reinforcing Steel tied on ground and lifted into place



On the left is a detailed cross-section of the pier cap showing the reinforcing steel layout. The cap is 5'-6" wide and 7'-0" high. It features a top layer of #4 bars, a middle layer of #9 bars, and a bottom layer of #6 bars. Vertical spacing is indicated as 10 Sp. @ 12" = 4'-0". Horizontal spacing is 4 1/2" on the ends and 5 Sp. @ 4'-9" in the center. A note states: "#9's (Adjust sps. as Req'd to Avoid Column Reinf.)". On the right is a photograph of the construction site showing the steel reinforcement being lifted into place by a crane. A date stamp '10/07/2018' is visible in the bottom right corner of the photo.

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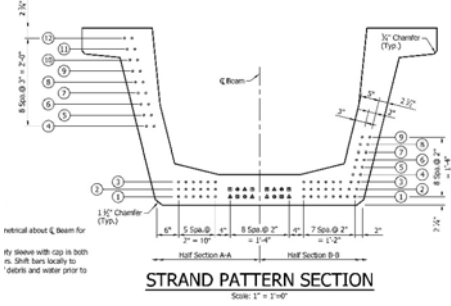


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Beam Design

- U Beams Selected
 - *Limited Maintenance*
 - *Limited Bird Roosting*
 - *Slim Aesthetic Appeal*






STRAND PATTERN SECTION
Scale: 1" = 1'-0"

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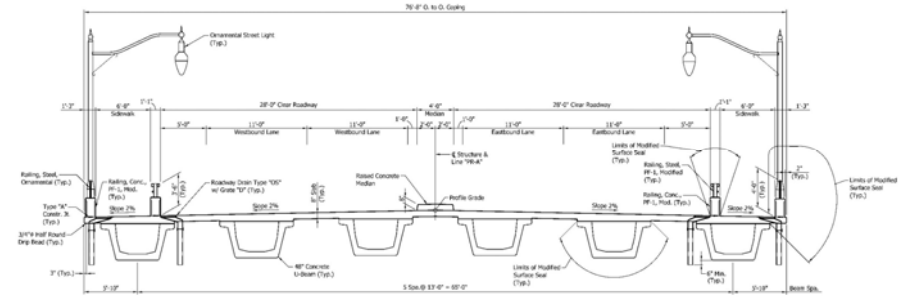
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Beam Design

- Six 48" U Beams were spaced at 13' – Could be spaced up to 20' depending on Span.
- 5'-10" overhang used. Larger overhangs could be used, but web bending needs to be accounted for.



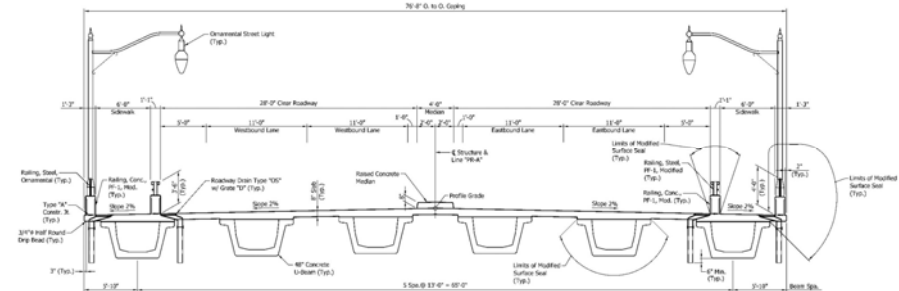
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Beam Design

- Intermediate Internal Steel Diaphragms used at 3rd Points.
- Utilized High Strength High Performance Concrete to increase beam spacing and span lengths – $f'c = 9$ ksi.
- Beams were set so flanges were parallel to the cross-slope




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Beam Design

- Modeled in PSBEAM
- 3D Model used to determine Racking Stresses and Torsion Stresses
- Used displacement to size incidental pieces



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Levee Connection

- USCOE required that all floodwater below flood elevation had to be contained on east end
- Needed joints between bridge and CIP Levee wall
- Separate joint was provided at Bent Cap Level than at Diaphragm Level

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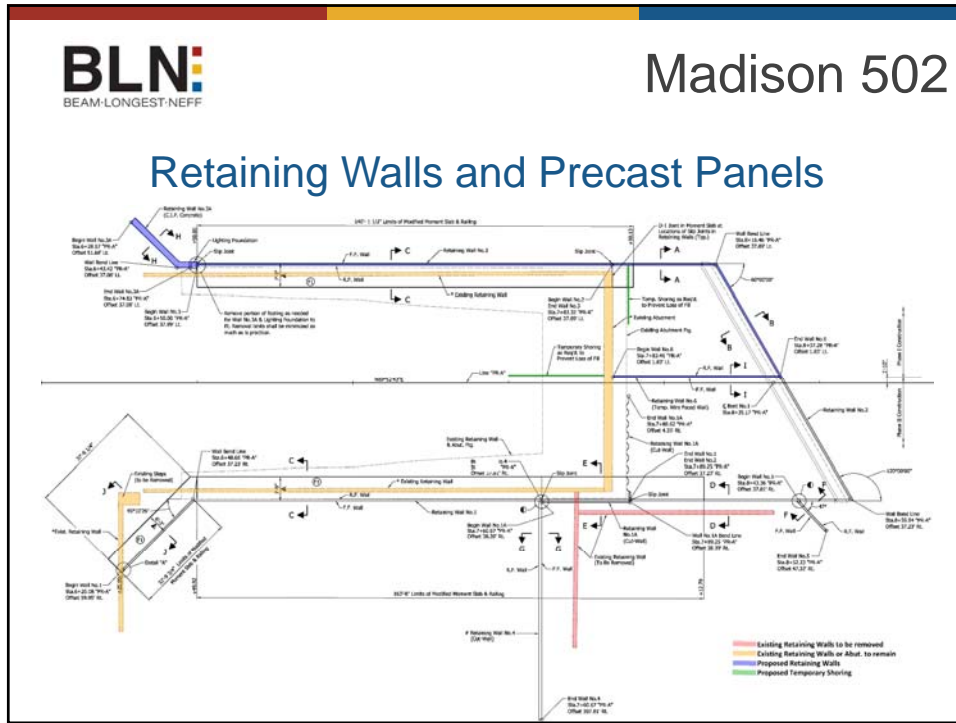
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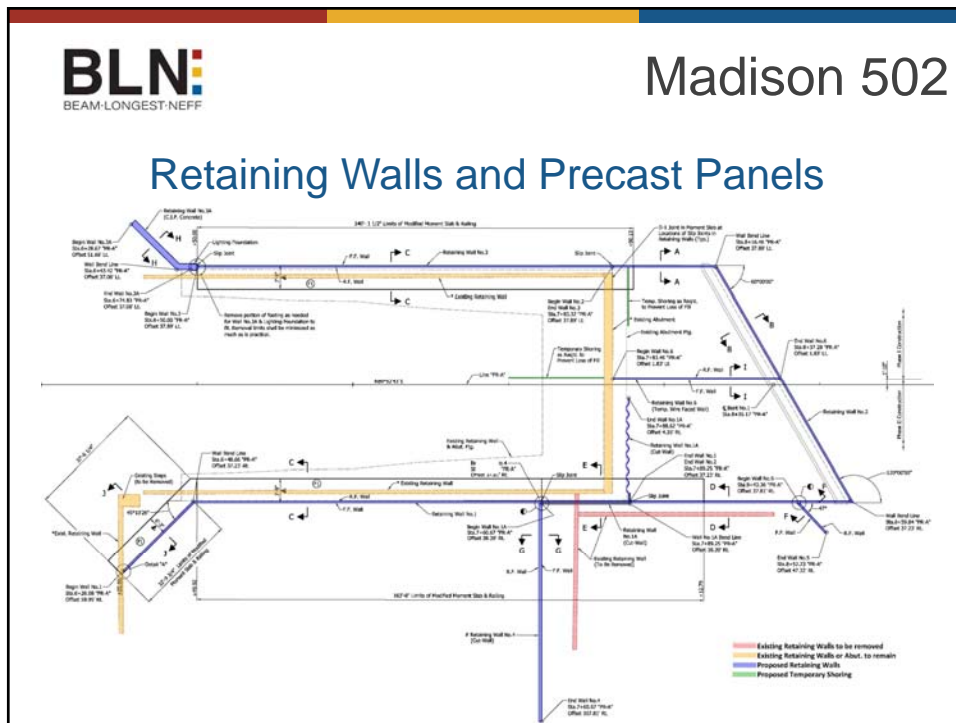
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Retaining Walls and Precast Panels


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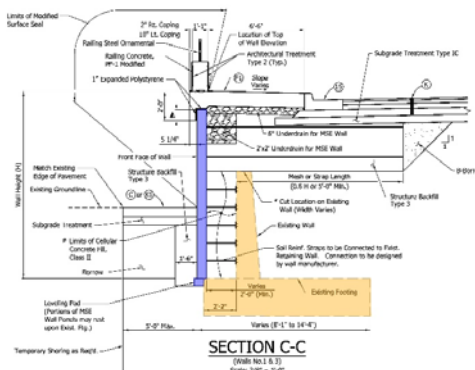
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Retaining Walls and Precast Panels


- Using Existing Retaining Walls prevented the need for costly shoring
- Tops of Retaining Walls Removed



SECTION C-C
(S&B 101.2.1.1)
Scale: 3/8" = 1'-0"

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Retaining Walls and Precast Panels

- Precast Panels placed 2' +/- in front of retaining walls
- Precast Panels anchored to existing walls
- Void filled with Cellular Concrete Fill placed in 3' lifts



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Retaining Walls and Precast Panels

- Block Retaining Wall in front of CIP wall that would be impacted and would undermine Footing
- Filled in existing Span 1 and Placed MSE wall in front of Existing Abutment
- There were pockets of unsuitable soil that extended below Existing Abutment Footing



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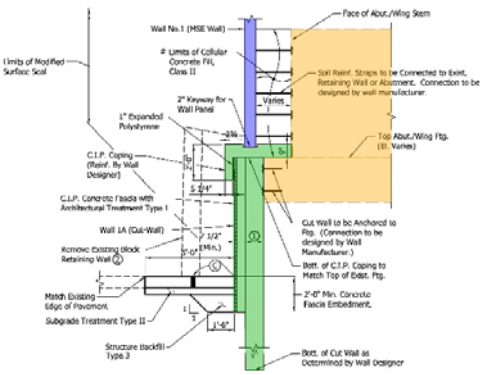
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Retaining Walls and Precast Panels

- Existing Abutment was Exposed and Sheet Piling Driven
- Sheet Piling Designed as Permanent Cut Wall
- CIP Facing with Form Liner used in front of Cut Wall
- Top of Cut Wall used as Leveling Pad for Panels



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Pier Cofferdam



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Pier/Footing Reinforcement



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MSE Panels and Cellular Concrete Fill



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The image shows a construction site for a retaining wall. Large, grey, rectangular MSE panels are being installed. The panels are connected by metal brackets. The area between the panels is filled with cellular concrete. The ground is uneven and appears to be a construction site. There are some orange markings on the panels.

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Temporary Bridge and Causeway



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The image shows a construction site for a temporary bridge and causeway. A large, temporary bridge structure is visible, supported by concrete piers. The bridge is made of metal and wood. A causeway is being built across a body of water. A green generator is on a barge in the water. A white tracked vehicle is on the causeway. The background shows trees and a building. A date stamp '02/12/2018' is visible in the bottom right corner of the image.

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Levee Construction

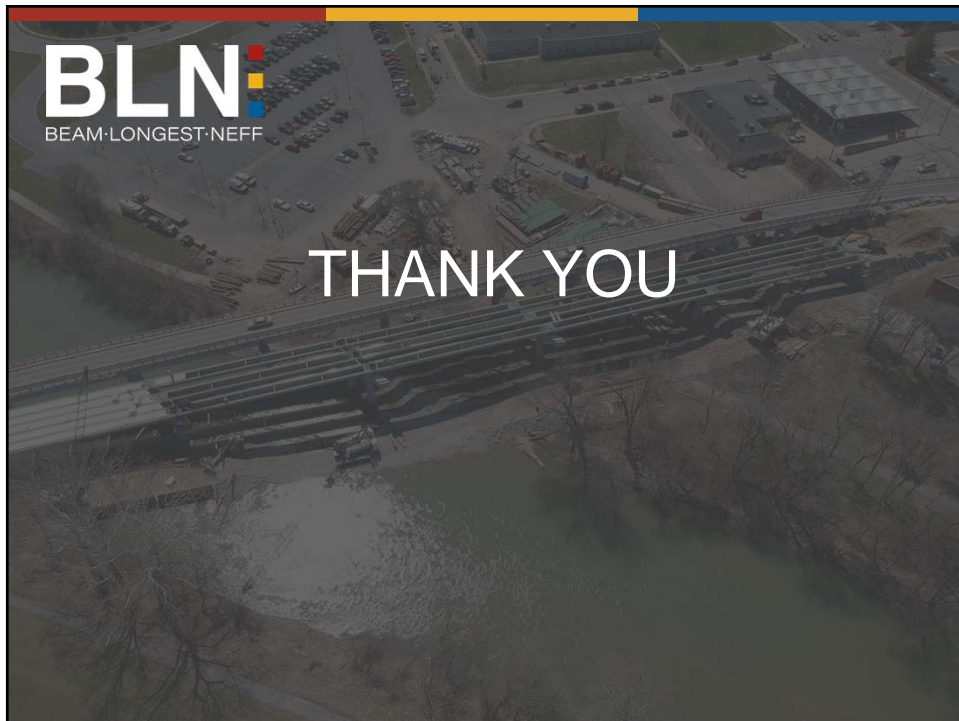


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THANK YOU



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