

Project Need & Purpose

- ▶ Existing Bridge
 - 145' x 30' Continuous Concrete Voids Slab – Built in 1965
 - Deck needed to be replaced
 - Approach slabs needed major repairs
- ▶ Existing Roadway
 - Regularly overtopped
 - Closures for significant time periods



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Proposed Solution

- ▶ Raise Roadway
 - Minimum 4.5'
 - Reduce overtopping frequency from 2 yr. to 100 yr.
- ▶ Replace Bridge
- ▶ Evaluate Accelerated Bridge Construction
 - ABC Rating Score
 - This project score was 57

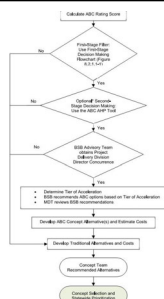


Figure B.2.1-1 ABC Decision Process Flowchart
* This step may be eliminated as discussed in B.2.1



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Proposed Solution

Concept Alternatives

- ▶ Off-site Detour
 - 7.4 mile detour
 - 150 days
- ▶ ABC Construction
 - Use lateral slide
 - Detour for maximum of 21 days
- ▶ On-Site Runaround
 - 2,400' long runaround
 - Temporary bridge



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Alternative Review

On-Site Detour

Construction Cost	\$ 2,740,200
User Cost	\$ 837,000
County Road Maint.	\$ 55,000
Detour Signing	\$ 10,000
Total Cost	\$ 3,642,200

ABC Construction

Construction Cost	\$ 3,470,300
User Cost	\$ 117,000
County Road Maint.	\$ 8,000
Detour Signing	\$ 10,000
Total Cost	\$ 3,605,300

On-Site Runaround

Construction Cost	\$ 4,789,800
Other Cost	\$ 0
Total Cost	\$ 4,789,800



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Design Challenges

- Foundation Issues
- Pier Type
- Superstructure Type
- Precast & CIP Details
- UHPC Details

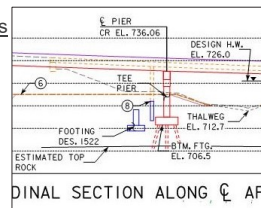


Building Connections
Resolving Issues

Foundation Issues

Tee Pier on Spread Footing on Piles

- Short piles (~10')
- Construction time



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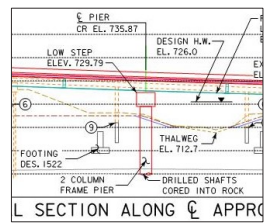
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Foundation Issues

Revised to Drilled Shafts

- ▶ Shifted away from existing pier
- ▶ Extend casing to bedrock
- ▶ Cored into bedrock



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Pier Type

2 Column Frame Pier

- ▶ Construct Drilled Shafts outside existing bridge
- ▶ Feedback from AGC
 - Clearance required from existing bridge
- ▶ Remove curb and railing

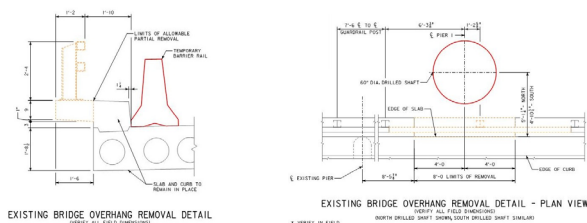


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Overhang Removal Details



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Pier Type

2 Column Frame Pier

- ▶ 6' deep cap with 43' Span
 - 38' between shafts
- ▶ Precast cap option
- ▶ Allowed construction prior to critical closure.



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Superstructure Type

2 Span Continuous Girder

- ▶ Initially Prestressed BTB Beams
- ▶ Revised to CWG
- ▶ Lighter superstructure



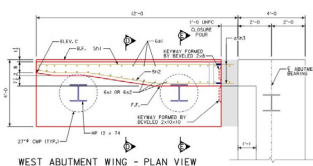
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Precast vs CIP Details

Abutments

- ▶ Plans included alternates for precast or CIP footings
- ▶ Plans included only precast wings
 - Required UHPC Closure pour
 - Required CMP Pile Encasements
- ▶ Revised to CIP Wings
 - Contractors Request



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Precast vs CIP Details

Pier

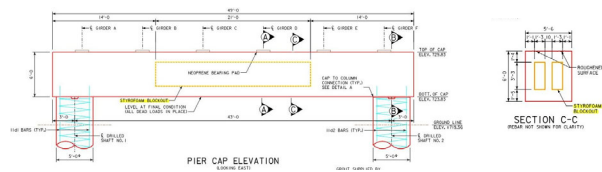
- ▶ Planned option for CIP or Precast Cap
 - Contractor used CIP
- ▶ Precast cap required special details
 - Styrofoam blockouts
 - Grouted splice coupler details



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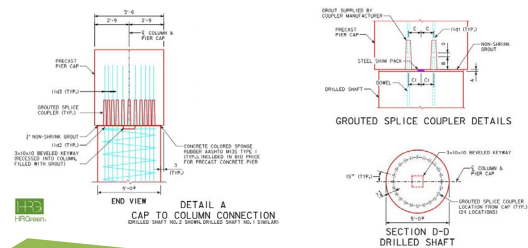
Precast Pier Cap Details



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Precast Pier Cap Details

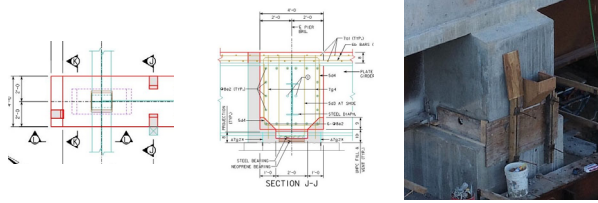


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UHPC Details

- Used at Abutments & Pier



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Building Communities.
Empowering Leaders.



Jesse Peterson, PE
Structures Field Engineer

Iowa DOT

Construction and Materials Bureau

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Non-Traditional Aspects of Construction

- Acknowledgments for photos and videos:

- Designers: HR Green
- Contractor: Kraemer North America
- Foundations Field Engineer: Desiree McClain

- ABC Construction

- A lot to do, a little time to do it in.
- 110 Working Days
- Critical Closure – 20 Calendar Days
 - Incentive: \$15,000 / day
 - Liquidated Damages: \$7,000 / day



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▶ Drilled Shaft Construction:

- ▶ Located tight to the existing bridge
- ▶ Worked with the AGC ahead of time to determine fit
- ▶ Cut the deck
- ▶ TBR up above



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▶ Pier Cap Under the Existing:

- ▶ Designed to be constructable under the existing.
- ▶ Allowed to be placed prior to demolition of the existing bridge.
- ▶ The Contractor protected during demo.



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▶ Temporary Works:

- ▶ Used large diameter pipe piles.
- ▶ Triple beams tied to the new substructure to negate push pull effects



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► **Superstructure Construction:**

- Constructed off alignment on the temporary works.
- 2 Span Continuous Steel Girders
- Traditional 8" concrete deck



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► **Superstructure Construction:**

- Again, temporary works enable the off alignment construction.
- Deck is covered and curing – next up, rail.



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► **Critical Closure:**

- The real countdown begins...
- The road and bridge are removed.
- Road work continues in parallel with bridge work.
- Prepare to roll the bridge:
 - Abutments are installed.
 - Guide channels are installed.



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► Day of the roll:

- Threaded inserts were cast into the pier cap and the abutments. Threaded rebar will be inserted after the roll.
- Panoramic is immediately before the roll (looking North along the top of the pier cap).



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► Time to roll:

- Close up of Hillman roller and shim plates in specifically designed roller and jacking pocket.



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► Time to roll, Continued:

- Chicken and the egg debate
– Are there any uplift forces when the roller goes from the temporary works to the permanent structure?




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► **Time to roll, Continued:**

- An opportunity for public outreach and education surrounding ABC construction.
- Took approximately 2 to 3 hours with about 20 minutes to park the bridge in its final location. (0:09 to 0:14)
- Afterward, break time and then jacking and lowering the bridge into place.



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► **UHPC Mixing:**

- Clean the truck
- Super sack of mix goes in
- Ice to keep it cool
- Steel fibers go in
- Final 2 gallons of water are added
- 5 cy total mix time of ~ 1 hour



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► **UHPC Joint Install:**

- Mix is ready to be installed
- Poured down preformed ducts
- Plexiglass windows to monitor progress
- Too low? No problem.



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► Paving:

- Grade raise & pave
- Oftentimes the paving will delay the opening...but not at Muchakinock.
- Opened on time



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Questions



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