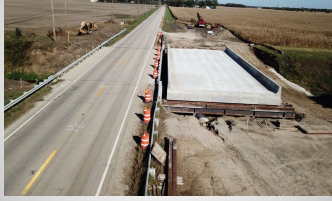


## IL DOT Accelerated Bridge Construction Pilot Project

Illinois Route 115 over Gar Creek in Kankakee County



Chad Hodel, P.E., S.E.

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## IL DOT ABC Pilot Project - Introduction

- Background Information
- Construction Engineering
- Lessons Learned



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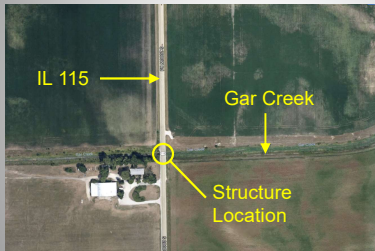
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## Background Information

- Location: IL DOT District 3 – SW of Kankakee, IL



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### Background Information

- Existing Structure – deteriorated 1976 1-span PPC deck beam
- Why use ABC?
  - 30 mi state detour route or....
  - \$900k in local roads improvements
- IL DOT → Accelerated Innovation Development (AID) grant through FHWA
  - Demonstrate techniques to reduce time
  - Assess contractor skill and staffing




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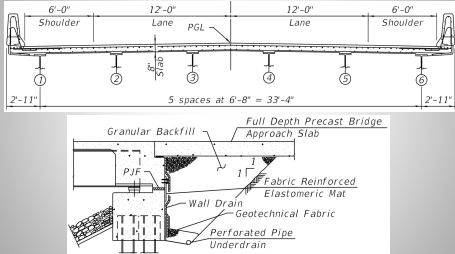
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### Background Information

- New structure: 82' single span WF & semi-integral abut.'s




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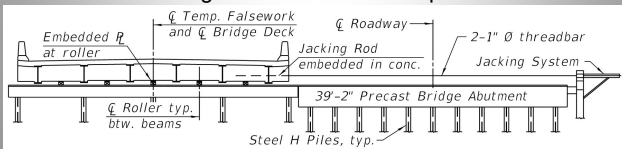
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### Background Information

- Contract documents indicated ABC concept:
  - Adjacent superstructure construction → lateral slide
  - Precast abutments & bridge approach slabs
  - Driven HP's grouted in abutment cap sleeves




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### Background Information

- Special Prov.'s for Lateral Slide:
  - Detailed list of submittal items for ABC method
  - Contractor's S.E. responsible for means & methods:
    - i.e., temporary works & handling PC elements
  - High-early strength grout mix for pile sleeves
  - Contingency plans: equip. failure
- 6" test move prior to road closure
- Geometry control → Final placement tolerances (1/4" horiz., 1/8" vert.)
- Post slide inspection for cracking / induced distress
- 72 hour road closure → \$2k/hour LD's

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### Background Information

- Bidding – March 2017 Letting
  - Normal IL DOT design-bid-build procedures used
  - 2014 estimate: \$847k
  - 5 bidders: range of \$1.34 to \$1.68 million
  - "Lateral Slide-In Bridge Superstructure" pay item ranged from \$150k to \$330k
  - Low bid: Tobey's Construction & Cartage (small-to-medium size contractor w/ extensive IDOT experience)

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### Construction Engineering

- WHKS & Co. retained by Tobey's
- Structural engineering for contractor's means & methods
- Road closure on-site assistance: structural issues
- Required by project specifications



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### Lateral Slide Concept Revisions

- Use Barnhart Crane & Rigging Co. hydraulic powered roller w/ integral hydraulic jack
- Placed under each beam

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### Lateral Slide Concept Revisions

- Used 2 rows of piles w/ each temp. bent
- Approx. 10' loose sand → increased lat. stiffness
- Increased support points for bearings, formwork, and roller system

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### Lateral Slide Concept Revisions

- Provided shelf / notch in front of abut. for rollers
- Adjusted front pile locations to center under rollers

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### Lateral Slide Concept Revisions

3" Dia. Grout Tube  
2" Dia. Pipe Sleeves  
4 1/2" 1'-9" 1'-9" 4 1/2"  
4'-3"  
SECTION THRU ABUTMENT

- Moved 3" dia. pile sleeve grout tube to top of cap
- Included 2" dia. vent tube

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### Existing Structure Demolition

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### Temporary Bent & Superstructure Construction

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### Abutment Construction

- 13-HP 10x42 each abut.
- Driven  $\approx$  15' through loose sand to rock
- Abut.'s  $\approx$  80' apart  $\rightarrow$  only one driving rig used for safety reasons



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### Abutment Construction



- WHKS responsible for handling design for  $\approx$  80 kip abut. cap
- Fine aggregate bedding to seal base of pile sleeve

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### Abutment Construction



- Only 3" tolerance for the pile sleeves – tight fit!!!

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### Abutment Construction

- 2 piles needed trimmed
- Exact reasons unknown - suspected of shifting during driving
- With tight tolerances, problems were anticipated
- Contingency plans evaluated during design



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### Abutment Construction

- Vertical geometry control – abut. elev's must match already constructed temp. bents for rollers
- 4 piles/abut. precisely cut to match the top of pile sleeve – all other piles rough cut 1" short.



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### Abutment Construction

- Grout pumped into top of the pile pipe sleeves



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### Abutment Construction

- Spec's req'd 3500 psi grout strength
- Tobey's evaluated many sack mixes requiring manual mixing
- Time, consistency, & strength problems
- IL DOT allowed high-early strength pavement patching (PP-5) mix → onsite mobile mixer
- With a learning curve → ≈ ½ hour to grout an abut.
- PP-5 strengths: 3700 psi / 4 hrs, 5400 psi / 5.5 hrs
- *Due to material loss, insufficient grout quantity for 2 abut's resulting in ≈ 4 hour delay!!*



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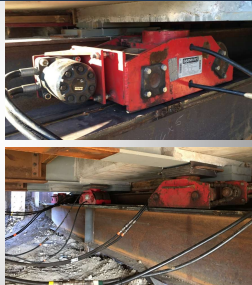
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### Lateral Slide

- Hydraulic powered rollers & control center



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### Lateral Slide

- Roller track and guide rod



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### Lateral Slide

- Geometry control

Rollers pushed tight against guide bar towards the back of abut.

Lasers mounted to rollers

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### Lateral Slide

- Geometry control – total station equip. & prisms adhered to bridge parapets

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### Lateral Slide

- Let the move begin!!!

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Lateral Slide



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Lateral Slide



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### Lateral Slide



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### Lateral Slide

- 2 hours to complete slide w/ 1 hour delay (bound up roller)
- Slide completed at hour 40 / 72 hour closure



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### Bridge Approach Slabs

- Precast Footings
- $\approx 1' \times 10' \times 38'$
- $\approx 60$  kips



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### Bridge Approach Slabs

- Precast 12' wide driving lanes (68 kips)
- Precast 6' shoulders w/ parapet (50 kips)
- Approaches completed at hour 54 / 72 hour closure



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### Paving & Guardrail



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### Lessons Learned

- Replacement of single span bridge w/in 72 hrs possible w/ modest means → possibly w/in 48-56 hrs
- ABC cost premium offset by user costs and detours
- Incentivize contractors → reward shorter closures
- Require devoted staff to monitor work/anticipate problems
- Hydraulic rollers superior to horizontal jacking

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### Lessons Learned

- Include extra material to minimize schedule impact
- Design abut's with added capacity for potential problems
- Accurate layout is essential
- IL DOT PP-5 mix promising for precast connections - additional testing suggested
- Look to modify details such as paved shoulders within guardrail limits to shorten construction

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### 2019 INTERNATIONAL ACCELERATED BRIDGE CONSTRUCTION CONFERENCE

INCLUDING AUTOMATION, SERVICE LIFE AND ULTRA HIGH PERFORMANCE CONCRETE (UHPC)  
December 12<sup>th</sup> - 13<sup>th</sup>, 2019  
Workshops December 11<sup>th</sup>

- Best ABC Project Lateral Slide Technology (Highway Bridge):  
  
IL 115 over Gar Creek Accelerated Bridge Replacement



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### IL DOT Accelerated Bridge Construction Pilot Project



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## Questions

- Visit [whks.com](http://whks.com) for a time lapse video link

The screenshot shows the whks.com website. At the top, there is a navigation menu with links for ABOUT US, OUR SERVICES, LETTING INFO, CAREERS, ONLINE NEWSLETTER, and CONTACT US. Below the menu is a large image of a bridge over a creek. A red oval highlights a section titled "Featured Projects +", which contains the text "Lateral Slide Design for IL 115 over Gar Creek Accelerated Bridge Replacement, Kankakee, Illinois" and a "FEATURED PROJECT" button. The footer of the website includes the year 2021, logos for ACEC, IOWADOT, and the Federal Highway Administration, and the text "Iowa Transportation Conference" and the whks logo.

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