Experiences and Practices: Bridge Moves

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Presentation Outline

- ABC Implementation
- Contracting Methods
- Contract Documents
- SPMT vs. Lateral Slide
- Monitoring
- Contingency Plan
- Lessons Learned
ABC Implementation

History

- Half depth deck panels – 1999
- Full depth deck panels – 2004
- Precast Substructures – 2007
- Self Propelled Modular Transports (SPMT) – 2007
- Lateral slide – 2009
- Superstructure launch - 2010
ABC Implementation

Benefits

- Enhanced safety
- Shortened on-site construction time
- Reduced traffic/mobility impacts
- Potentially reduced project costs
- Improved quality
- Increased constructability

Contracting Methods

Design Bid Build

- Traditional contracting method
- No contractor involvement during design
- In house or consultant design
- Higher level of control and risk to owner
- Strong team partnering and coordination needed
**Contracting Methods**

*Design Build*

- Design and construction concurrent
- Early known cost (lump sum)
- Reduced delivery time
- Improved constructability
- Encourage innovation
- Risk mostly transferred to contractor
- Higher bidding effort for contractor

**Contracting Methods**

*Construction Manager/General Contractor*

- Contractor under contract to provide input during design
- Owner able to select innovations
- Reduce design errors, constructability issues, and change orders
- Identify and mitigate risk
- Allows for early procurement
- Limits negotiation on project costs
Contract Documents

**Plans**

- Level of detail
  - No detail regarding move
  - Show one viable option (schematic)
  - Show only permissible move details

**Specifications**

- Clearly define goals, limitations, and requirements of project
  - Submittal requirements
  - Contractor flexibility
  - Tolerance requirements
  - Maintenance of traffic requirements
  - Incentives and disincentives
Contract Documents

Submittals/Acceptance

- Allow for review time in schedule
- Based on level of detail of plans
  - Changes to contract plans
  - Temporary supports (including geotech evaluation)
  - Staging areas
  - Hour by hour schedule
  - Communication plan
  - Contingency plan

SPMT vs. Lateral Slide

<table>
<thead>
<tr>
<th>SPMT</th>
<th>Lateral Slide</th>
</tr>
</thead>
<tbody>
<tr>
<td>High equipment cost</td>
<td>Low equipment cost</td>
</tr>
<tr>
<td>Flexible staging area</td>
<td>Adjacent staging area</td>
</tr>
<tr>
<td>Pick points vary from final load path</td>
<td>Load path to supports remains constant</td>
</tr>
</tbody>
</table>
Monitoring

- Survey
- Levels
- String lines
- Measure gaps
- Simplistic
- Basic
Contingency Plan

- Hour by hour schedule
- Well coordinated public involvement
- Backup equipment
- Ability to adjust bridge alignment
Lessons Learned

SPMT

- Survey is crucial
- Account for all utilities in travel path
- Specifications need to clearly outline expectations
- Account for varying load paths
- Provide adequate roadway tie-in lengths

Lessons Learned

Lateral Slide

- Select appropriately based on site constraints
- Account for interaction between temporary and permanent supports
- Consider moving approach slabs with superstructure
- Provide adequate roadway tie-in lengths
Experiences and Practices: UHPC

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Why UHPC?

- Construction
  - Eliminate the need for post-tensioning
  - Reduce specialized construction equipment and labor
- Quality
  - Reduce joint size
  - Improve durability and continuity
  - Extend life expectancy
- Construction schedule
  - Reduce on-site construction time

Design Phase Decisions

Specification

- UHPC mix
- Field demonstration
- Quality control and acceptance testing
- Installation plan
- Measurement and payment
PART 2 PRODUCTS

2.1 UHPC

A. Use UHPC produced with “Ductal®” concrete materials manufactured by Lafarge North America (Provider). Obtain all UHPC components from this Provider.

B. UHPC mix requirements:
   1. Use Ductal® JS 1000 Concrete with the proportions of premix, water, super plasticizer liquid, and steel fibers based on the approved working drawings and Provider’s recommendations.
   2. Refer to the requirements in Table 1.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>Minimum Compressive Strength</td>
<td>AASHTO T 22</td>
<td>≥ 25 ksi</td>
</tr>
<tr>
<td>A-Heat-Treated</td>
<td></td>
<td>≥ 20 ksi @ 28 days</td>
</tr>
<tr>
<td>B-Not Heat-Treated</td>
<td></td>
<td>≥ 14 ksi @ 4 days</td>
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<tr>
<td>Split Cylinder Cracking</td>
<td>ASTM C 496</td>
<td>≥ 800 psi @ 28 days</td>
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</table>
**Specification**

*Quality Control and Acceptance Testing*

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**Sequence of UHPC placement (pour layout drawings)**

- On-site staging plan
- Bulkhead forming plan
- Underside of joint forming plan
- Camber strip forming plan
ON-SITE STAGING PLAN

Specification
Installation Plan

- Equipment needs
  - 300 KW generator to power mixers
  - Minimum 3 georgia buggies
  - Reach forklift

- Manpower
  - 16 people for operation/1.5 cy per hour
    (includes man power to cover the joints)
Specification

Installation Plan

Specification

Measurement and Payment

BULKHEAD FORMING PLAN
Specification

Measurement and Payment

Approach Slab-Deck Joint

Transverse and Longitudinal Deck Joints

Approach Slab Joint

Shear Blockout Detail

Girder Haunch

Leaders in Innovation
UHPC Quantities and Cost

- 80cy
- $6500/cy in place
Lessons Learned

**Design**

- Develop performance based mix design with owner-performed testing and acceptance
- Require field demonstration
- Simplify joint details at abutments
- Consider locations to block off pours
- Size longitudinal closure joint for build up of construction tolerances

Lessons Learned

**Construction**

- Leaks
- Block off location for pours
- Phasing of pours and cold joints