Overview of New Illinois Tollway
Accelerated Bridge Construction Process

Eric Ozimok
Goals for Presentation

- Define the new Illinois Tollway ABC Process
- Discuss how to incorporate ABC Process into current contracts
- Provide a brief overview of the decision making tools, technologies and resources
- Discuss Future Illinois Tollway ABC Goals
Let's talk ABC's

Dr. Seuss's

Aunt Annie's alligator

Big C,
little c,
what begins with C?

Big B,
little b,
what begins with B?

Barber, baby, bubbles,
and a bumblebee.

Camel on the ceiling.
C...c...C
What is the ABC Process?

- *Initial release focused on planning and design (Designer)*

- *Future updates will focus on construction and contract packaging (Contractor)*
  - Special Provisions
  - Standard Details
  - Contract Delivery and Bidding

The Illinois Tollway will provide appropriate direction during project development.
What is the ABC Process?

December 2016 - Released ABC Process

- Design Bulletin 16-03
- Provides consistent approach for evaluating, designing and constructing projects with ABC
What is the ABC Process?

- December 2016 - Released ABC Process

- Help Guide Project Specific Evaluation
- Standard Tools developed to Evaluate ABC
- Defines most common ABC Technologies Available
- Encourages Use of Alternate Design and Construction
What is the ABC Process?

- December 2016 - Released ABC Process

- Defines the Design Phase Project Deliverables required for ABC

- Provides a List of Key Resources

- Comprehensive example developed to aid DSE’s in evaluating ABC
What is the ABC Process?

- **December 2016 - Released ABC Process**

- DSE to incorporate into all Pre-Concept and Concept contracts under design

- If beyond Concept Stage does not apply

- All Future Tollway projects to incorporate into planning process
What is the ABC Process?

- *December 2016 - Released ABC Process*

- Exceptions shall be coordinated with the Project Manager and documented as a design deviation

- DSE will need to work with Tollway for Contract Documents and Packaging
Design Bulletin 16-03 will be included in the March 2017 update of the Structure Design Manual. No major revisions are anticipated.
Structure Design Manual

Section 27.0 Accelerated Bridge Construction

- 27.1 Introduction
- 27.2 Illinois Tollway ABC Committee
- 27.3 Decision Framework for ABC
- 27.4 ABC Technologies
- 27.5 ABC Project Delivery Methods
- 27.6 ABC References
27.3 Decision Framework for ABC

Meat and Potatoes of ABC Process

✓ Defines the Decision Making
✓ Helps DSE’s “think-through” and Execute Design
✓ Standard Tools Developed

GOAL = Start with Conventional Construction and try to Prove ABC provides a Benefit
27.3 Decision Framework for ABC

- Consists of a Two-Step Process

The ABC Two-Step
How to Evaluate for ABC?

Step 1
27.3 Decision Framework for ABC

- **Step One: ABC Decision Matrix Tool (DMT)**
  - Spreadsheet available for download
  - Master Plan or Pre-Conceptual Stage
  - Assessment of impact ABC Technologies may have at a Bridge Location
  - Does not specify which ABC Technologies

Determines if the site and bridge are a good candidate for ABC
27.3 Decision Framework for ABC

Step One: ABC Decision Matrix Tool (DMT)

✓ Only required for new bridges or existing bridges to be replaced or reconstructed

✓ Not required for bridge rehabilitation, retaining walls or culverts

✓ Shall be completed for each individual bridge

✓ Dual structures require only one ABC DMT

Assess the entire site and include all information
**THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY**

**ACCELERATED BRIDGE CONSTRUCTION (ABC) - DECISION MATRIX TOOL (DMT)**

<table>
<thead>
<tr>
<th>Prepared By</th>
<th>XX</th>
<th>Prepared On</th>
<th>XXXXXXX</th>
</tr>
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<tbody>
<tr>
<td>Checked By</td>
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<tr>
<td>Bridge No.</td>
<td>XXXX</td>
<td>Mile Post</td>
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<tr>
<td>Location</td>
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</table>

ABC Rating Procedure

December 2016

Note to User: Refer to Structure Design Manual Article 27.3.1 for general guidance on using this tool.

**Average Daily Traffic**

(Combined over and under)

- No traffic during construction
- Less than 20,000
- 20,000 to 50,000
- 50,001 to 100,000
- 100,001 to 150,000
- More than 150,000

**Traffic Impact**

(Based on Severity Index)

- Least severe traffic impact
- More severe traffic impact than 0
- More severe traffic impact than 1
- More severe traffic impact than 2
- More severe traffic impact than 3
- Most severe traffic impact

**Maintenance of Traffic**

- No impact
- Short duration with simple MOT
- Short duration with multiple staging
- Normal duration
- Long duration with simple MOT
- Long duration with multiple staging

**Economic Impact**

- Low business impact
- Medium business impact
- High business impact

**Bridge Classification**

- Typical bridge
- Essential bridge
- Critical bridge

**Railroad/Waterway Impact**

- No railroad or minor railroad spur or no waterway
- One mainline railroad track or waterway
- Multiple mainline railroad tracks or waterway with commercial traffic

**Environmental Impact**

- No impact
- Minimum impact
- Medium impact
- Maximum impact

**Economy of Scale**

(Total number of spans)

- 1 span
- 2 or 3 spans
- 4 or 5 spans
- More than 5 spans

**Use of Typical Details**

- Complex or unsymmetrical geometry
- Some complexity
- Simple, symmetrical geometry

**Accessibility**

- Unfavorable site with no ROW available
- Favorable site with some ROW available
- Favorable site with plenty of ROW available

- DSE inputs scores for 10 variables
- Scores are based on site specific constraints
- Level of subjectivity
- Tool Calculates ABC Rating Score based on input
- Provides a Yes/No answer
ABC RATING SCORE 0 to 30

Can project delivery be accelerated with ABC?

Do traffic volumes support the need for faster construction?

Do site conditions support an ABC approach?

Does ABC mitigate/manage a project risk?

Does structure geometry support an ABC approach?

Final Recommendation from DSE

Tollway Review

Evaluate Conventional Bridge Construction

Evaluate Accelerated Bridge Construction

Perform ABC BLCC

Identify Applicable ABC Technologies & Develop ABC Approach

0 to 30 - Conventional Construction shall be evaluated further

31 to 59 – DSE shall consider additional factors

60 or above – ABC shall be evaluated further
- 0 to 30 - Conventional Construction shall be evaluated further
- 31 to 59 – DSE shall consider additional factors
- 60 or above – ABC shall be evaluated further
Can project delivery be accelerated with ABC?

- ABC RATING SCORE 0 to 30
- ABC RATING SCORE 31 to 59
- ABC RATING SCORE 60 or above

- Can project delivery be accelerated with ABC?
- Do traffic volumes support the need for faster construction?
- Do site conditions support an ABC approach?
- Does ABC mitigate/manage a project risk?
- Does structure geometry support an ABC approach?
- Final Recommendation from DSE

- Evaluate Conventional Bridge Construction
- Tollway Review
- Evaluate Accelerated Bridge Construction

- Identify Applicable ABC Technologies & Develop ABC Approach
- Perform ABC BLCC
Do traffic volumes support the need for faster construction?
Do site conditions support an ABC approach?
Does ABC mitigate/manage a project risk?
Does structure geometry support an ABC approach?
0 to 30 - Conventional Construction shall be evaluated further

31 to 59 – DSE shall consider additional factors

60 or above – ABC shall be evaluated further
- DSE shall look at global perspective of project

- Final recommendation to be Included in Master Plan Study or Technical Memo
How to Evaluate for ABC?

Step 2
27.3 Decision Framework for ABC

**Step Two: ABC Bridge Life Cycle Comparison Tool (BLCC)**

- Spreadsheet available for download
- Concept Stage
- Helps compare and eliminate potential ABC technologies based on economic efficiency
- Does not calculate actual Life Cycle Costs
- Does not capture Service Disruptions
27.3 Decision Framework for ABC

Step Two: ABC Bridge Life Cycle Comparison Tool (BLCC)

- Only required for structures that recommend ABC to be evaluated further from ABC DMT
- Level of subjectivity to tool
- Tool makes assumptions about cost and service life

DSE has ability to change assumptions
INDIVIDUAL ABC BLCC RATING SCORE INPUT

<table>
<thead>
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<th>INITIAL COSTS (C)</th>
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<th>Estimated construction time &gt;= 18 months</th>
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<td>8 months &lt;= Estimated construction time &lt; 13 months</td>
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<td></td>
<td>4</td>
<td>3 months &lt;= Estimated construction time &lt; 8 months</td>
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<td>Deck type is precast concrete panels</td>
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<td>Superstructure type is precast concrete or steel</td>
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<table>
<thead>
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<tbody>
<tr>
<td></td>
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<td>Bridge Slide-In equipment required</td>
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<tr>
<td></td>
<td>3</td>
<td>Specialty Crane Based equipment required</td>
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<tr>
<td></td>
<td>4</td>
<td>Prefabricated Bridge Element System or Longitudinal Launch required</td>
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<td></td>
<td>5</td>
<td>Typical cast-in-place concrete/steel construction equipment required</td>
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<td></td>
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<thead>
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<th>Right-of-Way</th>
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<td>0.25 acres &lt; Required R.O.W. acquisition &lt;= 0.5 acres</td>
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<tr>
<td></td>
<td>4</td>
<td>0 acres &lt; Required R.O.W. acquisition &lt;= 0.25 acres</td>
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<tr>
<td></td>
<td>5</td>
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<table>
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<td>Minimum Impact</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>No Impact</td>
</tr>
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</table>

- DSE identifies ABC Technologies – “Bridge Alternatives”
- DSE inputs scores for variables in 3 categories
- Tool Calculates a Total ABC Rating Score
Based on comparison summary, DSE eliminates alternatives

Global perspective and final recommendation

Incorporate into Bridge Type Study

Perform cost comparison

Make Final Recommendation

TS&L Plans
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27.4 ABC Technologies

- Defines most commonly used technologies
- Encourages their use
- Provides General Guidance
- Includes Factors to Consider
- Provides Key Resources

Not intended to be all inclusive
Provided for information only
DSE to determine applicable Technologies
27.4 ABC Technologies

Most Common Prefabricated Bridge Elements

- Precast Deck Panels
- Precast Pier Cap/Columns
- Precast Abutment/Walls
- Precast Approaches
- Precast Foundations
- Precast Parapets

Tollway to Develop Base Sheets
27.4 ABC Technologies

- Most Common Prefabricated Bridge Systems
  - Prefabricated Super or Substructure System
  - Prefabricated Total Bridge Systems

Commonly used on Rail and Water Crossings
27.4 ABC Technologies

- Most Common ABC Materials
  - Consider material carefully
  - Service life and durability
  - Use caution selecting material types not used on Tollway
  - Coordinate with Tollway Materials

- Ultra-High Performance Concrete (UHPC)
  - Precast Deck Panels
27.4 ABC Technologies

- Most Common ABC Connections
  - Limit durability issues
  - Simplify details

- Most Common
  - Grouted Splice Couplers
  - Concrete Closure Pours
  - Traditional Post-Tensioning
  - Grouted Post-Tensioning
  - Welded Connections
  - Bolted Connections
27.4 ABC Technologies

- Most Common Bridge Installation Methods
  - Self-Propelled Modular Transporter (SPMT)
  - Lateral Slide-in
27.4 ABC Technologies

- Most Common Bridge Installation Methods
  - Longitudinal Launching
  - Crane Based

Contractor’s Means and Methods
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27.5 ABC Project Delivery Methods

- Most Commonly used Contract Provisions:
  - Incentive/Disincentive
  - Lane Rental
  - A+B Bidding

Tollway is planning to develop Special Provisions for several of these methods.
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Key References

FHWA
- Has been promoting, supporting and advancing ABC efforts nationwide

ABC University Transportation Center
- Experienced and knowledgeable bridge academics and engineers
- Supports research and initiatives to develop ABC
27.6 ABC References

- **Valuable Websites**
  - Can be used as resources for ABC

- **Key Publications**
  - Federal Highway Administration (FHWA)
  - Transportation Research Board – Strategic Highway Research Program (TRB-SHRP)
  - National Cooperative Highway Research Program (NCHRP)
Summary

- Design Bulletin 16-03
- Initial release focused on planning and design *(Designer)*
- Help Guide Project Evaluation
- Decision Framework for ABC
  - Two Step Process
    - ABC DMT
    - ABC BLCC Tool
Summary

- **ABC DMT**
  - Master Plan or Pre-Conceptual Stage
  - Determines if the site and bridge are a good candidate for ABC

- **ABC BLCC Tool**
  - Concept Stage
  - Helps compare and eliminate potential ABC technologies based on economic efficiency
Summary

- **DSE** to incorporate into all Pre-Concept and Concept contracts under design

- **Future updates** will focus on construction and contract documents (**Contractor**)

- **Work with Tollway for Contract Packaging**

**GOAL** = Start with Conventional Construction and try to Prove ABC provides a Benefit
The Future?
Future Goals

- Incorporate Design Bulletin 16-03 into SDM
- No Major Revisions Anticipated

- Develop Base Sheets and Special Provisions

- Incorporate bidding requirements for Bridge Installation Methods
Future Goals

- *Develop Pilot Projects*
  - Determine cost of ABC projects
  - Lessons Learned

- *Continue to Grow and Develop Policy*
  - Adapt to the industry
  - Update as necessary
  - Evolve
Thank you