A SPUI Design to Integrate Complex Transit Solutions
Barrington Road Interchange and Park-n-Ride at the Jane Addams Memorial Tollway (I-90)

14th Annual SEAOI Midwest Bridge Symposium
April 27, 2017

Agenda

Brief Overview of Project
Study Phase
Engineering/Design
Questions
Construction
### Description of Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
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<tbody>
<tr>
<td>Barrington Road Interchange at I-90</td>
<td>Conversion of a partial access interchange to a full access interchange</td>
</tr>
<tr>
<td>I-90 Rebuild and Widen</td>
<td>$2.5 billion ($240 million in transit accommodations)</td>
</tr>
<tr>
<td>I-90 Park-n-Rides - Barrington Road Park-n-Ride</td>
<td>Construction of a new expressway based Park-n-Ride facility</td>
</tr>
<tr>
<td>RTA Community Planning Grant</td>
<td>Flexible Transit Service Operations Plan</td>
</tr>
<tr>
<td>Village Comprehensive Bicycle Plan</td>
<td>Future Access to Transit projects</td>
</tr>
</tbody>
</table>

### Innovation

- First Single Point Urban Interchange (SPUI) on the Illinois Tollway
- Express Bus Ramps within Interchange
- SPUI / Park-n-Ride Configuration
- First Illinois Tollway Public Pedestrian Overpass
I-90 Corridor

Project Study Area
Original Interchange

Study Phase
Final Interchange Type Alternatives

1. Single Point Urban Interchange (SPUI)
2. Modified Partial Cloverleaf with Slip Ramp at Higgins #1
3. Modified Partial Cloverleaf with Slip Ramp at Higgins #2

Evaluation Criteria

<table>
<thead>
<tr>
<th>#</th>
<th>Evaluation Criteria</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Addresses the Problem Statement</td>
</tr>
<tr>
<td>2</td>
<td>Permanent Traffic Impacts</td>
</tr>
<tr>
<td>3</td>
<td>Safe Bicycle and Pedestrian Provisions</td>
</tr>
<tr>
<td>4</td>
<td>Economic Impacts</td>
</tr>
<tr>
<td>5</td>
<td>Environmental Impacts</td>
</tr>
<tr>
<td>6</td>
<td>Public Transportation</td>
</tr>
<tr>
<td>7</td>
<td>Temporary Traffic Impacts</td>
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<tr>
<td>8</td>
<td>Emergency Vehicle Response and Transport</td>
</tr>
<tr>
<td>9</td>
<td>Cost</td>
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</table>
Transit Configurations for Interchanges

- Center
- Offsite
- Ramps

Preferred Alternative

Alternative to accommodate future STAR Line
Proposed I-90 Mainline Typical Section

Section showing future STAR Line

Bridge Rendering
Engineering / Design

Bridge Area Needs
Structural Alternatives

- Rectangle Deck
- Dual Trapezoid Deck
- Parallelogram Deck

Alt 1 – Trapezoidal Deck on 72” Bulb T-Beams
Alt 2A – Rectangular Deck on 72” Bulb T-Beams
Alt 2B – Skewed Parallelogram Deck on 72” Bulb T-Beams
**Structural Alternatives**

Alt 2C – Skewed Parallelogram Deck on 63” Bulb T-Beams

Alt 3 – Trapezoidal Deck on 42” Welded Steel Plate Girders, with 54” Fascia Beams

**Structural Evaluation Summary**

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2A</th>
<th>2B</th>
<th>2C</th>
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<tr>
<td>Beam Material Type</td>
<td>PPC Bulb-T</td>
<td>PPC Bulb-T</td>
<td>PPC Bulb-T</td>
<td>PPC Bulb-T</td>
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<td>72</td>
<td>63</td>
<td>42 Interior 54 Fascia</td>
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<td>Deck Area (SQFT)</td>
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<td>Opinion of Probable Cost ($ million)</td>
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<td>$220</td>
<td>$173</td>
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Structural Evaluation Criteria

- Opinion of Probable Construction Cost
- Efficient Deck
- Beam Material Type
- Available Lanes During Construction
- Beam Depth/Weight
- Deck Width vs Profile

Structural Alternative Screening

<table>
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<tr>
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- ✓ Complies with Criteria or Most Favorable

Criteria:
- Beam Material Type
- Available Lanes During Construction
- Beam Depth/Weight
- Deck Width vs Profile
- Beam Erection Time

Available Lanes During Construction:
- Beam Material Type
- Beam Depth/Weight
- Deck Width vs Profile

Beam Erection Time:
- Beam Material Type
- Beam Depth/Weight
- Deck Width vs Profile

- ✓ Complies with Criteria or Most Favorable
Recommended Alternative
Alternative 1 – Trapezoidal Deck on 72” Bulb T-Beams

Superstructure Analysis in LARSA
Superstructure Analysis

Superstructure Design in CONSPAN

FULL BRIDGE MODEL

UNIT 1

UNIT 2

UNIT 3

BEAM DESIGN – 72” BULB T-BEAM
Substructure Design

UNIT 1

UNIT 2

UNIT 3

CONSYS ANALYSIS

INTEGRAL ABUTMENT

MSE Wall used by Contractor

Substructure Design
Other Items

- Beam Layout
- Deck Pour
- Deck Rebar Details
- Monotube Support
- Corner Monument
- Embedded Conduits

BRT Lanes and Underpasses

- North Underpass
- North BRT Station
- North Multi-Purpose Path

- South Underpass
- South BRT Station
- South Multi-Purpose Path
Pedestrian Overpass

First Express Bus Pedestrian Overpass in Chicago Area

I-90 Mainline Typical Section At Pedestrian Overpass/Station

Barrington Road Pedestrian Bridge and Station
Access Building - RISA Models

Construction
Construction Photos

East Side Deck Complete – April 2015

Corner Monuments - May 2015

Construction Photos

East Side Girders Looking South - May 2015

Old Bridge / New Bridge - May 2015
Construction Photos

Deck Removal – June 2015

North Pier Removal – June 2015

Construction Photos

West Stage Abutments and Pier Complete – September 2015

West Girders ERECTED – October 2015
New Express Bus Routes Operational – December 27, 2016

Pedestrian Overpass Status – January 23, 2017

Pedestrian Bridge Service Buildings – March 2017
Pedestrian Bridge Skelton – March 2017

Questions?
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Thank You!