Accelerated Bridge Construction: Four Bridge Deck Replacements in Region 5
These four bridges are included in the NYSDOT Accelerated Bridge Construction Program (ABC) mainly consisting of bridge decks replacements.

In spring 2012 these bridges were included in the Design-Build phase of the ABC program however, Design-Build prices came out too high.

Bridges were then split up by Region and included in the ABC Design-Bid-Build Contracts (Phase 1A).

TY Lin International was awarded the rehabilitation design of these four bridges in the fall of 2012.
Design Team

TY Lin International – Structural, M&PT

Watts Engineering – Environmental, Utility Design and Coordination, Sign Supports

Ravi Engineering – Survey

NYSDOT Region 5 – Pier Rehabilitation, Signal Conduit Layout
Map of Project Locations

EAST DELEVAN AVENUE

BRIDGE DECK
Map of Project Locations

Hospital Drive
Map of Project Locations

Bridge Deck

HOSPITAL DRIVE
Map of Project Locations

Deerfield Ave
Map of Project Locations

Bridge Deck

DEERFIELD AVENUE
<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rte 33 Kick-Off Mtg</strong></td>
<td></td>
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<tr>
<td>Oct 29</td>
<td>Oct 30</td>
<td>Oct 31</td>
<td>Nov 1</td>
<td>Nov 2</td>
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<td>Nov 5</td>
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<td>Nov 15</td>
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<td>Nov 14</td>
<td>Nov 16 (ABCD Conference)</td>
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<td>Nov 12</td>
<td>Nov 13</td>
<td>Nov 14</td>
<td>Nov 15</td>
<td>Nov 16 (Rte 33 Progress Submission)</td>
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<tr>
<td>Nov 19</td>
<td>Nov 20</td>
<td>Nov 21</td>
<td>Nov 22</td>
<td>Nov 23 (Thanksgiving Holiday)</td>
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<td>Nov 26</td>
<td>Nov 27</td>
<td>Nov 28</td>
<td>Nov 29</td>
<td>Nov 30</td>
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<tr>
<td><strong>Rte 33 Progress Set Comments Received</strong></td>
<td></td>
<td></td>
<td>Rte 33 ADP Submission</td>
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<td>Dec 3</td>
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<td>Dec 6</td>
<td>Dec 7</td>
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<td>Dec 10</td>
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<td>Dec 17</td>
<td>Dec 18</td>
<td>Dec 19</td>
<td>Dec 20</td>
<td>Dec 21</td>
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<tr>
<td><strong>Rte 33 PS&amp;E</strong></td>
<td></td>
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Objectives

- Provide proposal-type contract (no drawings)
- 8½” x 11” Sketches provided in the Contract Proposal Book
- Relying on the existing plans to provide details and features of the existing bridge.
- Refer the contractor to the Bridge Detail Sheets (BD) rather than detail everything out.
- Clearly define scope and limits of work
- Clearly identify how all items are paid
- Provide details for any non-standard element not covered by the BD’s or Standard Sheets.
Scope of Work

- Remove and Replace the Deck and Approach Slabs
- Perform Abutment Repairs as necessary.
- Eliminate the expansion joints at the abutments and provide a jointless detail.
- Replace Joints at the Piers.
- Provide new bridge railing/barrier.
- Add approach railing to all bridges.
- Reconstruct Approach Pavement and Sidewalks.
- Replace Pedestrian Fencing.
- Replace Bridge Lighting.
- Maintain Utilities.
- Load Ratings.
NOT INCLUDED:

- In-depth Inspection not included
- Bearing Replacement not included
- Elimination of Deck Joints at the Piers
- Full Survey not included
Proposal Document Content

- Title Sheet
- Scope of Work
- Location Map
- Bridge Deck Replacement Information
Bridge Deck Replacement Information

Geometry
Bridge Length from Bridge Begins to Bridge Ends (ft): 192'-4 1/4"
Existing Bridge Width (ft): 70'-0"
Existing Curb to Curb / Face of Rail to Face of Rail (ft): 55'-0" / 68'-2"
Assumed Existing Total Deck Thickness (in): 9.5"
Proposed Bridge Width (ft): 70'-10"
Proposed Curb to Curb / Face of Rail to Face of Rail (ft): 55'-0" / 68'-6"
Number of Spans: 3
Length of Each Span, CL to CL of Brgs (ft): 69'-6" / 63'-1 3/8" / 53'-6"
Skew Angle: WA &P1: 15.32°, EA&P2: 1.89°
Proposed Deck Thickness (in): 8.5"
Begin Approach Slab Length (ft): 11'-0"
Begin Approach Slab Width (ft): 55'-0" & VARIES
End Approach Slab Length (ft): 14'-0"
End Approach Slab Width (ft): 55'-0"
Bridge Deck Replacement Information

Superstructure
Number of Girders in Transverse Section: 9
Girder Type: Steel
Center to Center Girder Spacing (ft): 8’-1 ½”
Left Overhang - center of girder to edge of deck (ft): 2’-11”
Right Overhang - center of girder to edge of deck (ft): 2’-11”
Width of Left Brush Curb or Sidewalk (ft): 6’-2”
Width of Right Brush Curb or Sidewalk (ft): 6’-2”
Type of Shear Connectors: Studs
Number of Studs on Girder Flange Transversely by row: 2
Longitudinal Spacing of Rows of Studs (in): Varies
Scuppers: None
Bridge Deck Replacement Information

Superstructure Slab Reinforcement
Deck Reinforcement Design to be Provided: Isotropic
Type of Reinforcement to be Provided: Stainless Steel
Top Transverse Bar Size: #4
Top Transverse Bar Max. Spacing (in): 8”
Bottom Transverse Bar Size: #4
Bottom Transverse Bar Max. Spacing (in): 8”
Top Longitudinal Bar Size: #4
Top Longitudinal Bar Max. Spacing (in): 8”
Bottom Longitudinal Bar Size: #4
Bottom Longitudinal Bar Max. Spacing (in): 8”
Additional Top Overhang Reinforcement: #6 @ 8”
NOTE:

LEFT AND RIGHT ARE DETERMINED BY VIEWING UP-STATION ON EXISTING PLANS.
Proposal Document Content

- Title Sheet
- Scope of Work
- Location Map
- Bridge Deck Replacement Information
- General Notes – Includes Standard Notes, BD References, Pay Item Limit Notes
REFERENCE STANDARDS

THE FOLLOWING REFERENCE STANDARDS SHALL BE FOLLOWED IN THE PREPARATION OF PLACEMENT DRAWINGS:

BD – AB5E Example of Reinforcement Details for Stem, Backwall, Wingwalls, Headers and Pedestals

BD – AB6E Abutment Sections and Concrete Keyway Details

BD – AB8E Miscellaneous Abutment Details

BD – FD3E Pedestrian Fencing on Concrete Barrier and Parapet

BD – JT1E Armorless Bridge Joint Systems Typical Sections

BD – JT2E Armorless Bridge Joint Systems Typical Plans I

BD – JT3E Armorless Bridge Joint Systems Typical Plans II

BD – JT4E Armorless Bridge Joint Systems Typical Sections Along Joint

BD – MS4E Curb Types and Other Miscellaneous Details

BD-RC6E Vertical Faced Concrete Parapet Transition To Highway Box Beam

BD – RC8E Concrete Bridge Barriers - Texas Aesthetic Barrier Reinforcement Details

BD – RC9E Concrete Bridge Barriers - Texas Aesthetic Barrier Sections, Elevations & Details
Proposal Document Content

- Title Sheet
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- General Plan
Proposal Document Content

- Title Sheet
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- General Notes – Includes Standard Notes, BD References, Pay Item Limit Notes
- General Plan
- Bridge & Approach Cross-Section
Proposal Document Content

- Title Sheet
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- General Notes – Includes Standard Notes, BD References, Pay Item Limit Notes
- General Plan
- Bridge & Approach Cross-Section
- Profile
Proposal Document Content

- Title Sheet
- Scope of Work
- Location Map
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- General Notes – Includes Standard Notes, BD References, Pay Item Limit Notes
- General Plan
- Bridge & Approach Cross-Section
- Profile
- Detail Sheets
Details and Special Notes:

- Upper Backwall Removal and Replacement
- Upper Wingwall Removal and Replacement
- Abutment Re-facing
- Pier Cap and Column Rehabilitation
- Pier Cap Removal and Replacement
- Steel Repairs & Diaphragm Replacement
- 16 Different Approach Rail Configurations
- Moment Slab Detail
- Handicap Ramp Details on Bridge Sidewalk
- Texas Barrier Modifications & Medallions
Details and Special Notes:

- Sign Support Details
- Waterline Replacement
- Fiber Optic Line Relocation
- Bridge Lighting Details
- Pedestrian Signal Layouts
- Conduit Layout for Traffic Lights and Pedestrian Signals
- M&PT Layouts and Sign Details
U- Wingwall Replacement Detail:
Proposal Document Content - Delavan Ave

LIMITS OF BRIDGE

RTE 198 RAMPS

CL PIER
TEXAS AESTHETIC BARRIER WITH MOMENT SLAB
HOSPITAL DRIVE OVER ROUTE 33 TRANSVERSE BRIDGE SECTION

(Looking South)

Scale: 1/8" = 1'-0"

- 2" N.P.S. Conduit (Lighting)
  Item 670.2003
- 8" Granite Bridge Curb, Type F1
  Item 609.0302 (Typ.)
- 8" Min. Sidewalk Curb Item 557.30
- 8½" Concrete Deck
  With Stainless Steel Reinforcing
- Existing Gas Line to Remain
- 12" Water Line
  To Be Removed and Replaced
- Texas Aes
  Concrete Barrier
  Link Fence
  Items 569.0
  607.0511

SITE MEASUREMENTS:

- 37'-10" (Proposed)
- 38'-0" (Existing)
- 18'-11"
- 12'-0"
- 12'-0"
- 5'-4"
- 5'-4"
- 1'-2"
- 1'-2"

- Sidewalk
- 5" Curb
- Existing Girder (Typ.)
Proposal Document Content

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- Haunch Tables
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- Detail Sheets
- Haunch Tables
- **Estimate of Quantities Table**
Lessons Learned:

- Relying on Existing Drawings to show most of the detail of the existing structure.

- Very difficult to show the overall picture.

- Works best when there aren’t a lot of special details and everything is fairly standard.

- Puts a lot of extra effort on the contractor to pull it all together.

- Utility Coordination can be challenging in such a short design time frame.
Construction Phase

• Building a Bridge Job without Plan Drawings

• Contractor’s Perspective
Bidding - Site Conditions

• 4 Bridge Sites:
  – 3 in Buffalo, carry local streets, built 1963-1965
  – 1 in Cheektowaga, carries NY Route 277, built 1965-1967

• All overpass structures over Route 33 (6-lane, urban expressway, AADT = 100,000)

• All simple span, multiple stringer structures with similar details and original decks
Bidding - Scope of Work

• Replace Decks – All 4 Bridges
  – 2 under traffic / phased construction
  – 2 closed to traffic
  – All carry various utilities – to be “maintained”

• East Delavan Ave – extensive pier reconstruction

• Hospital Drive – waterline replacement

• Very little approach work
Bidding - Schedule per Proposal

• Letting: February 21, 2013
• Completion: December 31, 2013
• Interim Constraints:
  – all long term traffic control on the Kensington Expressway be removed by June 7, 2013
  – Union Road – requires a one-week duration for the closure of the Route 33 ramps.
Letting Results - 2/21/13

1. Oakgrove Construction, Inc.
   $7,233,233.00

2. The Pike Company
   $7,242,820.49

$\Delta = $9,587.49 (0.1%)
## Construction Phase

### Largest Items by Value ($1000’s)
(These 12 items constitute 75% of the $7.2M contract.)

<table>
<thead>
<tr>
<th>Item</th>
<th>Value ($1000’s)</th>
<th>Item</th>
<th>Value ($1000’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superstructure Decks</td>
<td>$1,920</td>
<td>Waterline (on Bridge)</td>
<td>$260</td>
</tr>
<tr>
<td>MPT</td>
<td>$860</td>
<td>Bridge Curb &amp; Sidewalk</td>
<td>$260</td>
</tr>
<tr>
<td>Remove Structural Slab</td>
<td>$540</td>
<td>Structural Lifting</td>
<td>$190</td>
</tr>
<tr>
<td>Texas Aesthetic Barrier</td>
<td>$390</td>
<td>Concrete Repairs</td>
<td>$180</td>
</tr>
<tr>
<td>Approach Slabs</td>
<td>$280</td>
<td>Structural Concrete</td>
<td>$170</td>
</tr>
<tr>
<td>Mobilization</td>
<td>$280</td>
<td>Concrete Removal</td>
<td>$140</td>
</tr>
</tbody>
</table>
Schedule - Actual

- Letting: 2/21/2013
- Award: 3/26 (33 days after letting)
- First day of work on job: 4/1 (6 days after award)
- First deck concrete placement: 5/24 (8 weeks after start)
- Final deck concrete placement: 8/1
- Interim Constraints:
  - long term traffic control removed from Expressway by 7/10 (per Proposal – by 6/7)
  - Union Road – Route 33 ramps closure duration – weeks (per Proposal - one-week)
- Substantial completion: 10/1 (total construction duration = 6 months)
Contractor Submittals

- All submittals made electronically via “ProjectWise”
- Most prepared by engineers familiar with NYSDOT practices
- All reviewed NYSDOT Main Office Structures
- Quick review turnaround is mandatory for successful Accelerated Bridge Construction
- “New York Works Program”
Required Submittals

• Rebar - Placement Drawings & Bar Lists
  – (45 dwgs, 35 resubmits)
• Texas Aesthetic Barrier - Elevations & Details
  – (20 dwgs)
• Structural Lifting
  – Drawings & Calcs
• Structural Steel Repairs, Bridge-Mounted Sign Structures
  – Shop dwgs, Erection dwgs, Welding Procedure Specs
• Various Others
Bridge Construction
over 6-8 Lane Expressway
Construction Phase

Over-Roadways are Busy Too
Construction Phase

Overlay Removal
Sidewalk Removal
Construction Phase

Getting Ready for Deck Removal
Construction Phase

Utility Coordination
Construction Phase

Utility Coordination
Unforeseen Conditions
Working around 50-year old conduits
Begin Deck Removal
Construction Phase
Construction Phase

Deck Removal
Construction Phase

S#*% Happens
Construction Phase

Deck Removed
Construction Phase

At Stage Line
Construction Phase

Substructure Modifications

[Image of workers on a construction site]
Construction Phase

Starting to Form Deck Overhangs
Construction Phase
Construction Phase
Construction Phase

Backwall Ready to Pour
Stay-in-Place Forms
Construction Phase
Construction Phase
Construction Phase

Finishing Machine - Set Up & Dry Run
Construction Phase

Deck Concrete Placement
Sawcut Grooving, Curb & Sidewalk
Texas Aesthetic Barrier
Construction Phase
Construction Phase
Construction Phase
Construction Phase
“8 ½ x 11 Delivery Method”

• Contractor’s Perspective
Drawbacks
Construction Phase

Drawback #1: Legibility
if you can’t read it, we can’t either

This is a D-size drawing, reduced to 8 ½” x 11” and inserted into the Proposal.
Construction Phase

Another Example
Drawback #2: Interpretations

- “Refer the contractor to the Bridge Detail Sheets (BD) rather than detail everything out.”
Drawback #3: Loss of The Big Picture

- Simplified details do not show the interrelationship between different components of the job. This limits the constructor’s ability to plan the work.

- Example: listing of proposed dimensions has all the data you need, but doesn’t clue you in that there is another bridge overhead that will be in your way.
### Bridge Deck Replacement Information

<table>
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Question: How long is my moment slab?
Answer: Not what you might think.
Drawback #4: Contractor Develops the Design

- Design engineers typically do this, so they are experts at it.

- Contractor’s engineers *can* do this, but it is not their ordinary line of business.

- Which way is better?
Drawback #4, cont.
Contractor Develops the Design

• In construction, there is not enough time to do sufficient field survey.

• Must rely on record drawings.
Drawback #5: Insufficient Time for Utility Coordination

- Utility Coordination takes time.
- Can physically put out plans out in 2 months.
- What happens when utility coordination takes longer than that??
Construction Phase
Utility Coordination is a Must

- You cannot get around utility coordination.

- Utility coordination should be done during design phase or problems are essentially guaranteed.

- If not during design phase, guess when?
Construction Phase

Misidentified Conduits
Bad Layout = Bad Day for Verizon
Utility Coordination is a Must

• City Street Lighting Dept. did not know about the job.
• National Fuel Gas not aware of plan for jacking at Hospital Drive.
• National Grid wanted non-metallic junction boxes at Delavan. Special order. No chance.
• Verizon had no idea about slack in lines to allow work around conduits.
• Summary: Disappointment all around.
Drawback #6
Is there Sufficient Time for Engineering???

• BD sheets include generic details.

• Details need to be tweaked to match the specifics of the job.

• Dealing with design details is time consuming and can be costly during construction.
Sidewalk?
Texas Aesthetic Barrier?
Handhole or Junction Box?
Anchorage Info?
Construction Phase

Detail Revised during Construction

SECTION A-A

NOT TO SCALE
Drawback #7: Design Discrepancies are Harder to Spot

Original Detail:
Bridge-Mounted Sign Structures

Dimensions don’t work out.
Member sizes too small for connections.
Drawback #8: Record Plans for Future Use

- What will the as-built plans look like for this job?
Advantages
Construction Phase

Advantage #1:

• Shorter design duration gets more work out on the street faster.
1. This project was part of what NYSDOT Program?

a) Design-Build Program

b) Accelerated Bridge Construction Program

c) Bridge Replacement Program

d) None of the above
1. This project was part of what NYSDOT Program?

a) Accelerated Bridge Construction (ABC) Program
2. What kind of system was used to support the new barrier in front of the existing pier At Delavan Ave?

a) Moment Slab

b) Sleeper Slab

c) Standard steel posts were used.

d) None, no approach rail was needed.
2. What kind of system was used to support the new barrier in front of the existing pier?

a) Moment Slab
3. The advantage(s) for using stainless steel deck reinforcement on this project was?

a) Allowed the deck thickness to be reduced by 1”.

b) Allowed for the construction of a concrete haunch without raising the roadway profile.

c) Reduced the dead load on the existing stringers yielding a higher load rating.

d) All of the above.
3. The advantage(s) for using stainless steel deck reinforcement on this project was?

d) All of the above.
Questions