The NEXT Beam
A Superior Alternative to Concrete Box Beams for 30’ – 90’ Spans
Presentation Overview

- The High Bridge Team
- Development of NEXT Beam
- Current Projects
- NEXT Beam Details
  - “F” (Form) beam
  - “D” (Deck) beam
- Costs
- Opportunities with the Next Beam
The High Bridge Team

• Joint Venture between:

  – High Steel Structures Inc.
    • Bridge Industry Leader
    • Lancaster, PA

  – High Concrete Group LLC
    • Precast Industry Leader
    • Denver, PA
NEXT Beam Development

• PCINE Bridge Technical Committee
  – Established 1990
  – Develops and implements standards
  – Members
    • State DOTs: CT, MA, ME, NH, NY, RI, VT
    • Precasters
    • Consultants
    • Academia

– Developed NEXT Beam
NEXT Beam Development

• Why Develop a New Bridge Section?
  – Box Beams have limitations
    • Closed cells limit inspectability
    • Durability concerns
    • Multi-step fabrication process
    • Difficult to accommodate utilities (adjacent boxes)
    • Not Accelerated Bridge Construction friendly
      – Deck Forming
      – Joint Grouting
NEXT Beam Development

- NEXT Beam Characteristics:
  - Open Double Tee, Single Pour Production
  - Depths 24” – 36” in 4” increments
  - Width will vary 8’-0” – 12’-0”
  - Accommodates utilities
  - Suited for ABC
  - Spans: 30’ – 90’
NEXT Beam Development

PCI Northeast Bridge Beam Sections
Common Span Ranges

<table>
<thead>
<tr>
<th>Beam Type</th>
<th>Span Length (feet)</th>
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<tbody>
<tr>
<td>Adjacent Slabs/Deck Beams</td>
<td>30-60</td>
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<tr>
<td>Adjacent Box Beams</td>
<td>40-150</td>
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<tr>
<td>NEXT Beams</td>
<td>50-120</td>
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<tr>
<td>Bulb Tee Beams</td>
<td>60-150</td>
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NEXT Beam is a superior alternative to longer slab/deck beam bridges and short box beam bridges

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NEXT Beam Approved States

• The NEXT Beam is approved for use in the following states:
  – CT, MA, ME, NH, NY, RI, VT
  – DE, MD, NJ open to use of NEXT Beams

• PennDOT Strike Off Letter released 3/31/10 for the “F” (Form) beam, using 0.5” dia. special strand
NEXT Beam Types

- **F (Form) Beam** - Partial flange thickness serving a form for CIP deck
NEXT Beam Types

- **D (Deck) Beam** - Full flange thickness serving as riding surface, with overlay.
NEXT Beam Projects

• ME New Bridge over York River
  – 7-span, 510’ bridge, 38’-2” deck width, Int. Abuts.
  – 28 NEXT F Beams, 55’ or 80’ long
  – 7” NWC CIP Deck with 3-1/4” Bit. Wrg Surface
  – Designer: Vanasse Hangen Brustlin, Inc.
ME New Bridge over York River

www.highbridgeteam.com
ME New Bridge over York River
ME New Bridge over York River
ME New Bridge over York River
ME New Bridge over York River
NEXT Beam Projects

• NYC Queen’s Blvd over Van Wyck Expressway
  – CD’s specified NEXT F Beams (114 beams)
  – Variable-width roadway; SS and Cont. Beams
  – Beams skewed with respect to Traffic
  – Beam Lengths: approx. 70’ to 93’
  – 8” LWC CIP Deck
  – Awarded to High Bridge Team; 2012 Delivery
  – Designer: Hardesty & Hanover
NEXT Beam Projects

- NYC Queen’s Blvd over Van Wyck Expwy
Form Beam Details

**Bridge Section with Maximum Width Beams**

Trial maximum span design - Next 36" x 144"
Maximum span = Approx. 74 feet (4^0 C = 8 KSI)

**Bridge Section with Minimum Width Beams**

Trial maximum span design - Next 36" x 96"
Maximum span = Approx. 65 feet (4^0 C = 8 KSI)
Form Beam Details

Next Beam - Section Properties

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<thead>
<tr>
<th>Beam Designation</th>
<th>Beam Width (inches)</th>
<th>Beam Depth (inches)</th>
<th>Beam Base Stem (inches)</th>
<th>Area (in²)</th>
<th>I (in⁴)</th>
<th>Yb (inches)</th>
<th>Yt (inches)</th>
<th>St (inches)</th>
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Form Beam Details

- Extend stirrups to provide horizontal shear resistance (typ).
- Add additional reinforcing for overhang loads (typ).
- Place WWF if possible.
- 2\textfrac{1}{2} \text{"} (typ).
- Rake finish.
- 4 \times 4 \text{WWF} placed at mid-depth of top flange.
- #4 stirrups (typ).
- 2 strands at top of each stem.
- 1\textfrac{3}{4} \text{"} cover with #4 stirrup (typ).
- 4 SP @ 2\text{"} (typ).
- 4 SP @ 2\text{"} = 8\text{"} (typ).
- 2\textfrac{1}{2} \text{"} (typ).

TYPICAL BEAM REINFORCING
TYPICAL BRIDGE SECTION WITH MAXIMUM WIDTH BEAMS

STRAND PATTERN AREA (TYP)

THREADED INSERTS IN BEAM (TYP)
#5 THREADED DOWEL BAR (TYP)

BRIDGE SECTION AT ENDS

TYPICAL CONCRETE BRIDGE BARRIER SHOWN. OTHER BARRIER TYPES PER DM-4 AND BD STANDARDS ARE PERMITTED
Form Beam Details

BLOCK OUT TOP FLANGE TO ALLOW FOR FLOW OF DIAPHRAGM CONCRETE

REINFORCED DECK SLAB
REINFORCING NOT SHOWN

END DIAPHRAGM

APPROACH SLAB

R5 (TYP)

EXPANDED POLYSTYRENE FOAM AROUND BEARINGS AND BELOW DIAPHRAGM

SECTION THROUGH DIAPHRAGM

END DIAPHRAGM DETAIL W/ APPROACH SLAB
Form Beam Details

Block out top flange to allow for flow of diaphragm concrete.

Saw cut joint and fill with an approved sealer.

Bituminous pavement.

Reinforced deck slab reinforcing not shown.

End diaphragm.

#5 (Typ)

Expanded polystyrene foam around bearings and below diaphragm.

Section through diaphragm.

End diaphragm detail w/o approach slab.
Form Beam Details

#4 bars placed at mid depth of top flange. See Note 3

Recommended 30 degrees max. Beams may be fabricated with higher skews. However additional cracking in the top flange may occur

Bursting zone vertical reinforcing. See Note 1

Plan - Skewed End

Shear reinforcement used for bursting steel in end zone

Stirrups may be bundled in end zone if required

Blockout (see state standards)

Additional end zone verticals

Anchor rear face verticals in middle of strand grid

End elevation - Stem End

Elevation - Stem End

Beam end reinforcing details

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Form Beam Details

PLAN

#5 Dowel
4"x4" Keyway (Typ)
Foam Backer Rod (Typ)
Fill Void with Non-Shrink Grout
Loop Dowel (Typ)
Normal Parapet Reinforcing (Typ)

Typical Section
Precast Parapet Options

- Waterproofing Membrane Curb Details as per State Standards
- Precast Concrete Curb Section with Bars Projecting into the Deck Slab
- Overhang (if desired)
- Place Curb in Grout Bed
- Drip Edge
- Membrane Waterproofing
- Cast Deck after Curb Placement
- Wearing Surface
- Transverse Deck Reinforcing
- Joint Seal
- Bars Projecting from Precast Curb into Deck Slab Overpour

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FORM BEAM DETAILS

SAMPLE INTEGRAL ABUTMENT SECTION
Form Beam Details

SAMPLE PIER CONTINUITY DETAIL
Form Beam Details

Front Elevation:
- Beam Stem
- Elastomeric Bearing
- Bridge Seat
- Tapered Internal Sole Plate
- Beam Stem
- Elastomeric Bearing
- Bridge Seat

Side Elevation:
- Tapered Elastomeric Bearing Details

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## Form Beam Design

### F Beam Design Table
1/2" Dia. Special 270ksi Low-Lax Strand

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<tr>
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Deck Beam Details

TYPICAL BRIDGE SECTION WITH MAXIMUM WIDTH BEAMS
(NEXT 40 D x 120" SHOWN)

TYPICAL BRIDGE SECTION WITH MINIMUM WIDTH BEAMS
(NEXT 40 D x 120" SHOWN)
Deck Beam Details

NEXT BEAM - SECTION PROPERTIES

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MAXIMUM WIDTH BEAMS

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Deck Beam Details

- #5 HEADED CONNECTOR BAR, 12" ON CENTER
- DECK FINISH
- 2 STRANDS AT TOP OF EACH STEM
- #4 STIRRUPS (TYP)
- 1 3/4" COVER WITH #4 STIRRUP (TYP)
- 4 SP @ 2" (TYP)
- 2 1/2" (TYP)
- 7 1/2"
- 3'-4"
- 7 1/2"
Deck Beam Details

**Section**
- 3/4"x3/4" Chamfer
- 2-#5 Tied to heads of bar

**Details**
- Fill with non-shrink grout
- #5 reinforcing bar with anchor head (ASTM A970, typ)

**Plan**

**Flange Connector Details**
Deck Beam Details

- Membrane Waterproofing
- Wearing Surface
- Cast in place Concrete Curb
- Cast in place in the field or at the Precast Facility
- Overhang (if desired)
- Drip Edge
- Next Beam
# Deck Beam Design

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<td>1.10</td>
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<td>24</td>
<td>20</td>
<td>24°</td>
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<td>1.05</td>
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1/2" Dia. Special 270ksi Low-Lax Strand
Cost Comparisons

• Bid Results from ME New Bridge
  – Two P/S Options in CDs—NEXT Beam, NEBT
  – 4 of 5 Bidders bid NEXT Beams; 1 bid NEBT
  – Low and Awarded Bid utilized NEXT Beams

• Project Cost Savings vs. Adjacent Box Beams
  – Fabrication, Delivery, Erection Costs (Fewer Beams)

• Project Cost Savings vs. Spread Box Beams
  – Fabrication, Delivery, Erection Costs (Site Formwork)
  – Added Safety of inherent work platform
NEXT Beam Advantages

• Cost Savings

• Accelerated Bridge Construction

• Ease of Inspection

• Improved Durability
Opportunities with the Next Beam

- Value-Engineering or Alternate Design
- Design-Build
- Design-Bid-Build
- Accelerated Projects
The NEXT Beam
Contact Rich Truxel, Sales Manager
717.207.4303 or RTruxel@high.net