EXPOSED CONCRETE
BRIDGE DECKS:
PRACTICES AND PERFORMANCE

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NYS Bare Deck History

- CONCRETE BEAMS
  - Early 1970’s
  - Adjacent box girders
  - 6” PCC bonded deck
- Moving to alternate beam designs
## NYS Bare Deck History

- **STEEL BEAMS - First monolithic deck in 1967**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>DECK DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>7.5” deck with 1.5” cover over black bars</td>
</tr>
<tr>
<td>1974</td>
<td>9.25” deck with 3.25” cover over black bars</td>
</tr>
<tr>
<td>1976</td>
<td>8.5” deck with 2.5” cover over epoxy bars</td>
</tr>
<tr>
<td>1992</td>
<td>9.5” deck with 3.5” cover over epoxy bars</td>
</tr>
<tr>
<td>1996</td>
<td>9.5” deck with 3” cover over epoxy bars using HPC, bottom cover increased to 1.5”</td>
</tr>
</tbody>
</table>
Current Design

- Concrete beams
  - Adjacent box beams
  - 6” deck
  - WWF or #4 epoxy bars, 12” oc

- Steel beams
  - 9.5” deck, SIP forms
  - 2 mats epoxy bars
    - isotropic design
    - 3” top cover and 1.5” bottom cover
  - Longitudinal bars nearest surface
Construction Practices

- Mixture – HPC, friction aggregates
- Pre-placement meeting required
  - Equipment, personnel and experience, resources
  - Mixture characteristics expected
  - Construction techniques proposed
    - Placement rate
    - Conveyance
    - Finishing
    - Jointing
    - Curing
Construction Practices

- Concrete placement / conveyance
  - Crane and bucket
  - Conveyor
  - Pumping
Conveyance

Acceptance of conveyance equipment based on uniformity between point of concrete delivery and point of discharge

TABLE 555-1 CONCRETE CONVEYANCE UNIFORMITY

<table>
<thead>
<tr>
<th>Test</th>
<th>Permissible variation (samples taken at two locations in the handling process)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Content, % by volume of concrete</td>
<td>1.5%</td>
</tr>
<tr>
<td>Slump</td>
<td></td>
</tr>
<tr>
<td>Average slump 100 mm or less</td>
<td>25 mm</td>
</tr>
<tr>
<td>Average slump greater than 100 mm</td>
<td>40 mm</td>
</tr>
</tbody>
</table>
Construction Practices

- Consolidation
  - 1 vibrator / 30 CY / hr, 2 operating w/ backup
- Finishing
  - Finishing machines required
  - Hand work limited
  - QA
Construction Practices

- Texturing
  - Apply texture while plastic
  - Keep operation tight
- Problems???
Construction Practices

- Curing
  - 14 days wet curing
  - 14 days drying period
- Saw cut grooving
- Sealers
  - Silane / Siloxane
Performance

- **Strength**
  - Mix average – 5500 psi

- **Cracking**
  - Continuous structures
  - Shrinkage

- **Corrosion resistance**
  - Original decks
  - Since Epoxy reinforcing
Performance

- Scaling and Freeze / Thaw durability
  - Concern with late season placements
- Abrasion resistance
  - Some polishing
- Surface texture / friction
Future

- Design changes
  - Establish crack control measures
- Specifications
  - Performance specifications
- Materials changes
  - Cements, pozzolans
  - Admixtures – types/uses
- Construction
  - Diamond grinding
Specification details

- Deck specifications
  - Section 557 of standard specifications
    - Revised 2004, issues under EI 04-021

- Web location:
  http://www.dot.state.ny.us/specs/
  updatedspecbook.html

Thank You!