2010 Western Bridge Preservation Partnership Meeting

UTAH BRIDGE DECK STRATEGIES

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UDOT Bridge Decks

Topics of Discussion

• Life of a Utah Bridge Deck
• Causes of Deterioration
• UDOT Load Rating Project (Virtis)
• Deck Maintenance/Preservation Strategies
• Research Study Findings
Life of a Utah Bridge Deck

- 40 Year Average Bridge Deck Life
- Factors that Affect Bridge Deck Life
  - Design Practices
  - Construction Practices
  - Environmental Conditions
  - Overloads
  - Preservation/Maintenance Practices
Causes of Deterioration

• Design Practices
  – Geometry – High Skews, Curved Girders
  – Double Overhangs
  – 7” Bridge Decks (OLD STANDARD)
  – 1 ½” Cover on Top Rebar Mat - (OLD STANDARD)
  – Multi-Span Simply Supported (More Joints)
  – Unprotected Reinforcement (Black Bar)
Causes of Deterioration Cont’d…

• Construction Practices
  – Inadequate Rebar Cover
  – Overworking of Concrete
  – Poor Materials
  – Inadequate Cure Times
Causes of Deterioration Cont’d...

• Environmental Conditions
  – UDOT’s Bare Roads Policy (De-Icing Salts)
  – Temperature Extremes
  – Freeze/Thaw Cycles
**UDOT Load Rating Project (Virtis)**

- **Overloads/Superloads**
  - Simplified Load Equation used for permitting of Trucks (Modified Formula B)
  - $W = 1.47 \times 500 \left( \frac{LN}{N-1} + 12N + 36 \right)$
  - Annual Permit up to 129,000 lbs.
  - Single Trip Permit +129,000 lbs.

- **Virtis Software/Project**
  - Every Bridge to be re-rated based on current condition in Virtis
  - Uniformity and Consistency for calculating of load ratings
  - Analyze Overload/Superload impacts on bridge inventory
Bridge Deck Maintenance/Preservation Strategies

• Deck is to a Bridge What a Roof is to a House

• Deck Maintenance
  – Seal Parapets
  – Clean/Repair Joints
  – Sweep Deck

• Deck Preservation
  – Polymer Overlay (<5 yrs old)
  – Healer/Sealer (+5 yrs old)
  – Waterproofing Membrane w/Asphalt Overlay (15-20 yrs old as potholes develop)
  – Hydro-Demo with HPC’s (+20 yrs old)
Research Study Findings

- **UDOT Bridge Deck Index Equation (BYU – Dr. Spencer Guthrie)**
  - Age
  - Top Cover
  - Chloride
  - Half/Cell
  - Scale 0-100
  - Correlates to Suff. Rating

UBDI = 100-0.67(A-T)-150(-0.35-H)-15(2.5-D)
• Effect of Initial Surface Treatment Timing on Chloride Concentrations in Concrete Bridge Decks (BYU – Dr. Spencer Guthrie)
  – 2 lbs/cy Chlorides Threshold Level
  – Presence of Stay-in-Place Forms
  – Cover Depth

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<tr>
<th>Cover Depth (in.)</th>
<th>Deck Age for Surface Treatment Application (yr)</th>
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<tr>
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<td>With SIPMFs</td>
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<tr>
<td>2.0</td>
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<td>2.5</td>
<td>3</td>
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Other Bridge Deck Research Efforts in Progress

- Evaluation of Bridge Deck Seal Treatments for ABC Bridge Decks (U of U – Dr. Chris Pantelides)
- Installation and Instrumentation of Two Glass-Fiber-Reinforced-Polymer (GFRP) Bridge Decks (U of U – Dr. Chris Pantelides)
- Quest for Perfect Pre-cast Deck Panels (Post-tensioning, Blind grout pockets, etc.)
Research Study Findings Cont’d…

Find Research Reports on UDOT Website

-  www.udot.utah.gov
  - Inside UDOT
  - Systems Planning and Programming
  - Research Division
  - Published UDOT Research Projects
  - Structural
Any Questions