

*2010 Western Bridge Preservation
Partnership Meeting*



UTAH BRIDGE DECK STRATEGIES

*Sacramento, California
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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)
 - $W = 1.47 \times 500 (LN/N-1 + 12N+36)$
 - 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

$$UBDI = 100 - 0.67(A-T) - 150(-0.35-H) - 15(2.5-D)$$



Research Study Findings Cont'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

Cover Depth (in.)	Deck Age for Surface Treatment Application (yr)	
	With SIPMFs	Without SIPMFs
2.0	1	5
2.5	3	9
3.0	5	15

Research Study Findings Cont'd...



- **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

