Demonstration of Fiber Reinforced Polymer Composite Bridge Decking as a Replacement for Deteriorated Steel Reinforced Concrete Bridge Decking

FY09 Army Facilities CPC Project
F09AR16

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U.S. Army Corrosion Summit
10 February 2010
## Demonstration of Fiber Reinforced Polymer Composite Bridge Decking as a Replacement for Deteriorated Steel Reinforced Concrete Bridge Decking

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### Abstract

2010 U.S. Army Corrosion Summit, Huntsville, AL, 9-11 Feb

### Security Classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Unclassified</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Report</td>
<td>Unclassified</td>
</tr>
<tr>
<td>b. Abstract</td>
<td>Unclassified</td>
</tr>
<tr>
<td>c. This Page</td>
<td>Unclassified</td>
</tr>
</tbody>
</table>

### Limitation of Abstract

Same as Report (SAR)

### Number of Pages

18
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Outline

- Background / Problem
- Composite System Designs / Advantages
- Deck Replacement Demonstration Project
- Load Testing
- Material Performance Testing
- Comparison with Recently Replaced Concrete Deck
- Conclusions to Date
The Problem

- Traditional steel reinforced concrete deck can fail in as little as 15 years on a bridge with 50 year design life
- Vast majority of Army bridges have reinforced concrete decks
- FHWA reports indirect costs due to traffic delays and lost productivity can be 10 times greater than direct costs
- Safety becomes a concern due to lane closures and traffic disruption
The Solution

Fiber Reinforced Polymer Composite Bridge Decks Offer Promising Solution:

- Do not corrode / degrade like concrete & steel
- Low maintenance for estimated 75 years
- Lighter in weight means reduced dead load and increased dynamic live load capacity
- Reduced construction time
- Reduced duration for traffic disruption
- Higher material costs offset by reduced labor to install
Replacement of Deteriorated Concrete Deck at Redstone Arsenal, AL
Materials Degradation on Bridge #18 at Redstone Arsenal, AL
Materials Degradation on Bridge #18 at Redstone Arsenal, AL
Materials Degradation on Bridge #18 at Redstone Arsenal, AL
Demolition of Concrete Deck
Installation of FRP Composite Replacement Deck
Installation of FRP Composite Replacement Deck
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Installation of FRP Composite Replacement Deck

- After guard railings, apply a polymer concrete wear surface on top of composite deck panels
- Conduct load testing for HS-20 rating
- Add markings and ready to open up to traffic
Laboratory Materials Testing

- ASTM Test Method D-790 Flexural Properties
  - Atmospheric exposure
  - Accelerated weathering with exposure to UVA 340 radiation
- Salt Water Exposure Cycle
Condition of Recently Replaced Reinforced Concrete Bridge Decks at Redstone Arsenal
Conclusions

- Need to continue performance monitoring for at least two years
- Need to develop cost data and expected Return on Investment based on the actual costs of implementation
- Develop engineering standards to enable use by the Army and the other Services
Questions ???