Rutgers the State University of New Jersey

Site Director: Bala Balaguru
Date: February 1, 2011
Status of the Site

- Additional Researchers
- Professors Hani Nassif and Kaan Ozbay
List of Projects at Site

- Evaluation of Retrofitted RC Beams at High Temperatures
- Composite Guard Rail System
- Protective Multi-Purpose Coatings
Project Manager / PI: P. Balaguru

Overview

Evaluate RC Beams retrofitted using Inorganic Polymer at 500 F. The tests were conducted by heating the maximum bending moment region.

Budget Update: New Project
Beam 6, 16 tows
Static Load Heat Test

Temperature (°F) and Load (lbs)

- Ambient Temperature (°F)
- Thermocouple Temperature (°F)
- Load

9:36:00 AM to 7:12:00 PM
Future Work / Conclusion

As expected the system behaves well at high temperatures

More tests at higher temperatures
LIFE Form Completion

[Add a project picture, etc...]
Proposed Project Title

Project Number: 2 Composite Guard Rail System

- Project Manager / PI: P. Balaguru and Husam Najm
- Overview
- Budget: Baltek $15,000
Outline

- Introduction
- Existing Railing Systems
- Suitable Railing System
- Proposed Railing Systems
- Comments
Introduction

- Different types of FHWA railing systems were studied to select a suitable railing system for BLATEK deck bridges
Existing Railing Systems

Concrete Barrier attached to the deck

This system is not suitable for the project
Railing attached to the deck

This system is also not suitable for the project
Railing cantilevered from girder

Bracket attached to exterior girder

This system is suitable for the project
Railing cantilevered from girder/concrete wall

- A side mounted open rail system and a solid concrete vertical wall rail is shown here for a PL-2 application (Louisiana DOT).
- Open rail systems are particularly useful where sight distance, bridge drainage and aesthetics may be of concern.
- Although open rail systems are usually more expensive, they can significantly improve visibility and drainage. Steel plate barriers formed to an F-shape are used on movable bridges with steel grid floor.

Side Mounted Rail (PL-2)
LADOTD
Proposed Railing Systems

By replacing concrete wall with steel girder in previous design, we can design suitable railing system for BALTEK deck

- Railing is attached to girder web
- The connection is designed as fully restrained moment connection for PL-4 loading case
2. Railing connected to I-beam web and bottom flange

- Railing is attached to girder web and bottom flange
- The connections design for tension and compression forces for PL-4 loading case
3. Railing connected to deck and I-beam bottom flange

- Railing is attached to deck and girder bottom flange
- The system is designed for high tension wires and welded connections
Simple railing connection

Railing welded to top and bottom flanges of girder.

Aitken Road Bridge (1950-2005)
(Sanilac County, Michigan)
4. Railing connected to I-beam top and bottom flange

- A welded connection
- Railing is attached to girder top and bottom flanges
- The connection is designed for tension and compression forces for PL-4 loading case
Proposed Project Title

Project Number: 3 Protective Multi-Purpose Coatings

Rutgers Facilities Department

Parking Decks
Animal Facilities
Graffiti Resistant Coatings
Stadium
Fire Test: CMU

- The following 3 slides show the fire test for the coated CMU (hollow core block)
- It can clearly seen from these slides that a high temperature flame does not produce any distress
- Additionally there is no smoke or any other fumes
- The coating does not disintegrate during the fire event or fuel the fire
- Once the flame is taken off the coating looks exactly like the initial applied coating
Fire Test: CMU Before the Flame

August 12, 2010
Fire Test: CMU with Flame
Flame Applied Directly to Surface for 60 Seconds
Fire Test: CMU After the Flame

Enlarged Image shows Absolutely No Fire Damage
Light Post Base on Rutgers Busch Campus
A number of color schemes have been developed using inorganic pigments.

The following slides present some of these colors on concrete and hollow core block surfaces.

There is also one slide that shows the various colors for side-by-side comparison.

Additionally, other colors can be formulated using these basic colors.
Hollow-Core Block

White
Yellow

Hollow-Core Block
List of Current Color Schemes
More colors can be formulated
Hollow core blocks (CMU) were coated on one side and submerged in a tub of water.

The blocks were submerged such that only a 0.25 inch of top coated side was not covered with water as shown in the next slide.

After 15 day analysis showed there were NO changes to the coated surface.

Note that the block is very permeable and therefore water will reach the top to the “interface of the block and coating” in a few minutes and DID NOT create any problems.

The coating self-cleaning property also helps to keep the surface unaffected.
Tests for the Effects of Moisture

CMU in Water (only top 0.25in left uncovered)
• This organic paint comes off easily (even with a fingernail!)
• Light abrasion, citric based remover, or high pressure water can be used to easily remove graffiti
LIFE Form Completion

[Add a project picture, etc...]