**Synopsis:**

In an effort to find funding for rehabilitating three steel open-grate deck bridges, Lewis County applied for Innovative Bridge Research and Construction (IBRC) grants from FHWA. The County was awarded its first grant in 2001 and has since completed its second FRP deck project in 2003. A third project was completed in 2004. The IBRC Program was part of the TEA-21 Program from 1998-2003.

This presentation will provide an overview of the design and construction of the 3 FRP deck projects. It will include discussion of design considerations such as the selection of deck thickness, loads and wearing surface treatments. It will also cover the diagnostic load testing and load rating of the finished bridges.

**About the Presenters:**

**James Craig** received his B.S. in Civil Engineering from the University of Buffalo in 1993. Jim has been a design engineer/project manager on more than 15 bridge projects in his 8 years of working with bridges.

Jim has been the design engineer/project manager on four Fiber-Reinforced Polymer (FRP) Deck projects in the State of New York. All of the FRP Deck projects were funded through the FHWA’s Innovative Bridge Research and Construction (IBRC) program. Jim has worked closely with Lewis County on the design and construction of three FRP Deck projects.

**Thomas Sweet** received an A.A.S. degree in Construction Technology from Canton College in 1966. Tom has worked for seven years with the NYSDOT Region 7 Engineering Department. He has twenty-two years of construction experience including work in buildings, hydros, dams, highway and bridge construction. Tom has worked as estimator, project manager and superintendent. He was appointed Lewis County Highway Superintendent in November of 1997.
FRP Decks

Eleventh Statewide Conference on Local Bridges
Presentation Outline

I. Introduction

II. FRP Deck Information

III. FHWA – IBRC Program

IV. Lewis County Bridges

V. Future of FRP Decks

VI. Summary
“Innovation meets Opportunity”

Parallels to Themes of Local Bridge Conference....

Innovative ways to fund and build better bridges ....through cooperation between Local, State and Federal agencies.
What is FRP?

- Fiber Reinforced Polymer
- Fiberglass fiber sheets (E-glass)
- Polymer resin matrix
Advantages of FRP

- Corrosion resistant
- Lightweight - high strength
- Fatigue resistant
- Rapid installation
Where has FRP been used?

- Historic trusses
- Posted bridges
- Lift bridges
Statistical Data on FRP Decks

• 10 in NYS
• 100 in US
• 40 funded through IBRC
FRP Deck Fabrication

Assembly of FRP panels (8’-10’ wide)
FRP Deck Installation

- SHEAR STUDS
- GROUT
- FOAM DAM
- HAUNCH ANGLE
- GIRDER
FRP Deck Construction

1 - UNLOAD PANELS

2 - ALIGN FIRST PANEL....
3 - MIX ADHESIVES

4 - APPLY ADHESIVES...
FRP Deck Construction (cont.)

5 - JACK PANELS

6 - DOWELS ....
FRP Deck Construction (cont.)

7 – FIELD SPLICE JOINTS

8 - SHEAR STUDS
9 - INSTALL GROUT

10 - WEARING SURFACE
FHWA – Innovative Bridge Research and Construction (IBRC) Program

- TEA-21 1998-2003 (100% FHWA)
- 40 – FRP deck projects
- Construction $100 M
- Research $7 M
IBRC Innovative Materials

- FRP (35% - Largest)
- HP Concrete
- HP Steel
- Rebar (MMFX, stainless)
IBRC Program

Program has launched FRP into the bridge industry!
Lewis County Bridges

92 County bridges
248 miles County roads
1300 total miles of roads

New York
Getting Started

- Review bridge inventory
- Visit candidate bridges
- Submit IBRC applications
Project Collaboration

Lewis

OWNER

Lewis County N.Y.

ENGINEER

C&S Companies

NYSDOT

FRP SUPPLIER

Martin Marietta Composites

FHWA

United States of America
Design Phase

- Preliminary design tasks
- Prepare Scope Summary Memorandum
- Preliminary plan - DOT review
- Coordination w/ FRP supplier
Design Considerations

- New abutment
- New scour protection
- No joints
- Bearings

Life of bridge components (FRP - 75 years)
Design Phase (cont.)

- Design Advisory 02-003
- Special specifications - DOT
- Shop drawings - DOT
- No advertising/bidding
CR 46 / East Branch Salmon River

Completed in 2001
CR 46 / East Branch Salmon River

- Originally built 1950
- Span = 33 ft., Width = 26 ft.
- 7 - W 21 x 62 @ 4 ft. spacing
- 2 1/2” steel grate deck w/ 5” sleepers
CR 46 / East Branch Salmon River

- 1st 5” thick MMC FRP deck in U.S.
- 2003 NYS ACEC Gold Award Winner
Compatible bridge

Girder spacing = 4 ft.
Installation by County forces ....

No Crane Rental needed
with help from others ..... Lewis

THIS PANEL DOESN'T FIT !!!!!!!

WHADDYA SAY - NICE FIT?

!@#$ ENGINEERS!!!!
5 FRP Deck panels

All panels installed in 1/2 day
Erie Canal Road / Independence River

Complete installation in one week
2003
Erie Canal Road / Independence River

- Originally built 1966
- Span = 86 ft. , Width = 26 ft.
- 7 - W 33 x 141 @ 4 ft. spacing
- 2 1/2” steel grate deck w/ 5” sleepers
- 20 ton load posting
Erie Canal Road / Independence River

- 8” MMC FRP Deck
- 45 degree skew
- 5 new W36 x 245 girders
- Salvaged W33 girders
- Bridge rail attachment
Erie Canal Road / Independence River

14 FRP panels
Glendale Road / Roaring Brook

Complete installation in one week
2004
Glendale Road / Roaring Brook

- Originally built 1970
- Span = 64 ft., Width = 26 ft.
- 7 - W 24 x 110 @ 4 ft. spacing
- 2 1/2” steel grate deck w/ 5” sleepers
- 20 ton load posting
Glendale Road / Roaring Brook

- 5” MMC FRP Deck
- 5 – W33 x 141 girders (Erie Canal Rd.)
- 3 - new W33 x 141 girders
- Bridge rail attached thru FRP & girders
Glendale Road / Roaring Brook
Why Load Test? …

Load Test / Load Rating

Load Test by Bridge Diagnostics, Inc.
Why Load Test?

- FRP material still new
- First time use of 5” Deck
- LL Distribution Factors?
- Two load tests – 1 yr. apart

Can we accurately design/load rate steel girder/FRP deck systems by theoretical methods?
# Theoretical vs. Load Test Results

## LIVE LOAD RATINGS SUMMARY

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<th>THEORETICAL</th>
<th>LOAD TEST</th>
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<td>HS 18.4</td>
<td>HS 22.4</td>
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<td>Erie Canal Rd.</td>
<td>HS 27.0</td>
<td>HS 38.0</td>
</tr>
<tr>
<td>Glendale Rd.</td>
<td>HS 21.3</td>
<td>Oct. 2004</td>
</tr>
</tbody>
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Current Deck Condition……..

“LIKE NEW“ CONDITION

• CR 46 / East Branch Salmon River - 2001

• Erie Canal Road / Independence River – 2003

• Glendale Road / Roaring Brook – (Oct. 2004)
Future of FRP Decks ……..

- Life cycle costs vs. maintenance costs
- Construction time
- Standardization – research ongoing ……..
- Continued support from IBRC
Summary

“Use innovation and agency cooperation to fund and build better local bridges”
ANY QUESTIONS?

LEWIS COUNTY BRIDGE CREW
LET’S TAKE A BREAK !!!