Level of Interest Feedback Evaluation

IAB Meeting
June 2, 2010

Resin Design for Fire Safety Requirements

Project Number: WVU-1

- Level of Interest Rating Results:

Very Interested	2
Interested	4
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	-

- Comments:
  - Correlation to E-84 for flame & smoke very important
  - Work with flame retardants such as ATH will be more practical

Resin Design for Fire Safety Requirements

Project Number: WVU-1

- Additional Comments:
  - Mechanical properties, etc. would be of great advantage
  - One hollow bar may have interesting potential for measuring internal temps (sensors) and fire delay or prevention (retardants in the hollow core)
  - There is an urgent need for identifying treatments/processes/coatings that significantly reduce combustibility of FRPs. Fire hazard is a key concern of DOTs when utilizing FRP materials in infrastructure applications
  - Very critical information needed for bridge designers to reach comfort level for FRP decks, P/T, wraps, etc.
  - What has been typical temps of fires that have occurred on bridges?

Strength and Fatigue Life Prediction

Project Number: WVU-2

- Level of Interest Rating Results:

Very Interested	2
Interested	2
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	2

- Comments:
  - Possible application for high strength hollow composite rebar?

Strength and Fatigue Life Prediction

Project Number: WVU-2

- Additional Comments:
  - Study results provide valuable information pertaining to service life & durability
  - Also critical information needed for designers

Aging-Durability Testing and Analysis of Composites
Project Number: WVU-3

- Level of Interest Rating Results:

Very Interested	2
Interested	3
Interested with Change	1
Not Interested	-
Abstain (Not Relevant to Company)	-

- Comments:
  - This is an excellent study that complements WVU-2 and will provide important data essential for sound design of FRP components and systems

Aging-Durability Testing and Analysis of Composites
Project Number: WVU-3

- Additional Comments:
  - This project seems to be too ambitious. Consider reducing some of the variables
  - Concentrate on fewer resin systems; favoring either vinyl ester and/or polyester commercially available products
  - Again, should be of high interest to bridge designers
  - Evaluation of natural fibers will address green/sustainability initiatives for infrastructure applications

Nondestructive Evaluation of FRP Composites using Infrared Thermography (IRT)

Project Number: WVU-4

- Level of Interest Rating Results:

Very Interested	3
Interested	3
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	-

- Comments:
  - Not sure how this may apply to FRP rebar in structures.

Nondestructive Evaluation of FRP Composites using Infrared Thermography (IRT)

Project Number: WVU-4

- Additional Comments:
  - Very useful study. Outcomes of the project can assist bridge inspectors to rapidly evaluate condition of FRP elements, wrapping, etc
  - Very needed NDE tool. Suggest construction specs for QC/QA that inspectors can use
  - Also, what repair procedure would be used once the defects are determined?
  - Project is on track. Fiber-Tech may be able to provide samples next spring
  - Sources of commercially available equipment could be helpful in the future

Design, Manufacture and Implementation of Structural Panels

Project Number: WVU-5

- Level of Interest Rating Results:

Very Interested	1
Interested	4
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	1

- Comments:
  - Could end up being usable alternative to AC & concrete pavements

Design, Manufacture and Implementation of Structural Panels

Project Number: WVU-5

- Additional Comments:
  - This is a very interesting project that can have a significant impact on the application of these panels in bridge structures. The durability of these panels is of significant concern for DOTs
  - Perhaps accelerate the work on glass fiber/fabric investigation. Look into knitted or 3D fabrics
  - Fiber-Tech is working independently on various end-user-driven similar projects

Guardrails for Composite Decks

Project Number: RU-1

- Level of Interest Rating Results:

Very Interested	2
Interested	1
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	3

- Comments:
  - System will receive wider acceptance by state bridge engineers if it is crash tested per NCHRP 350 test level requirements

Guardrails for Composite Decks

Project Number: RU-1

- Additional Comments:
  - The use of inorganic material as a bonding agent (resin) for FRP/CFRP attached to concrete elements is interesting and needs to be explored. The results could enhance the application of FRP in strengthening of bridge components

High Temperature Evaluation Inorganic FRP
Project Number: RU-2

- Level of Interest Rating Results:

Very Interested	-
Interested	4
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	2

- Comments:
  - Not sure of application potential for our hollow composite rebar

Protective Coatings
Project Number: RU-3

- Level of Interest Rating Results:

Very Interested	-
Interested	3
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	3

- Comments:
  - We are working on a potential design
  - What type of surface preparation is needed?

Protective Coatings

Project Number: RU-3

- Additional Comments:
  - The protective coatings are very useful in special situations.
  - Cost of coating needs to be discussed

Durability Study of RC Seawalls Constructed with GFRP I-Bars and Sip Panels

Project Number: UM-1

- Level of Interest Rating Results:

Very Interested	1
Interested	3
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	1

- Comments:
  - Although bridge engineers do not have much involvement with RC seawall, the technology could be transferred to bridge foundation design & construction

Durability Study of RC Seawalls Constructed with GFRP I-Bars and Sip Panels

Project Number: UM-1

- Additional Comments:
  - Agency has minimal involvement in seawall construction/ maintenance. Project looks very interesting and should yield needed information on durability of GFRP in seawalls
  - Another problem to investigate is concrete spalling in concrete high rise balconies in waterfront settings. This can cause catastrophic failure. Non-skid polyurethane coatings are used to mitigate this issue in some cases

Guide for Design and Use of Flexible Carbon Grid Reinforcement …

Project Number: UM-2

- Level of Interest Rating Results:

Very Interested	3
Interested	1
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	2

- Comments:
  - Applicable to balcony repair

Guide for Design and Use of Flexible Carbon Grid Reinforcement …

Project Number: UM-2

- Additional Comments:
  - Interesting project. Would like to see application in transportation structures.
  - Seawalls – very interesting application for hollow composite rebar!
  - Would provide a means to upgrade capacity of concrete slab bridge
  - Suggest looking at recently adopted AASHTO Guide for FRP Reinforcement & add design procedure to guide

Large-Diameter Composite Hollow Rebars
Project Number: UM-3

- Level of Interest Rating Results:

Very Interested	4
Interested	1
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	1

- Comments:
  - Interested in knowing other mechanical properties along with tensile properties

Large-Diameter Composite Hollow Rebars
Project Number: UM-3

- Additional Comments:
  - Good motivation. Successful completion should aid and speed commercialization
  - Very interesting product that needs considerable investigation of durability & application practicality
  - Innovative
  - Perfect for our rebar!
  - Promising alternative to current GFRP bars
    - Can bond test requirements be met?
    - Lap splice lengths per AASHTO being tested
    - Pull out test in concrete
    - Bond between outer shell and core

External Confinement of RC Columns by Means of GFRP Laminates

Project Number: UM-4

- Level of Interest Rating Results:

Very Interested	-
Interested	4
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	2

- Comments:
  - Good experimental plan

External Confinement of RC Columns by Means of GFRP Laminates

Project Number: UM-4

- Additional Comments:
  - The benefit of the proposed wrapping over traditional FRP wrapping (non-laminates) needs to be discussed. Does this approach improve performance?

ICE Methodology for FRP Construction

Project Number: UM-5

- Level of Interest Rating Results:

Very Interested	1
Interested	4
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	-

- Comments:
  - Future work?
  - Effect of various angles of wrap?

ICE Methodology for FRP Construction
Project Number: UM-5

- Additional Comments:
  - This is a very good fundamental study. However, the lack of implementation potential for a state DOTD is evident

Safety Analysis of Composite Materials for Existing and New Construction

Project Number: UM-6

- Level of Interest Rating Results:

Very Interested	1
Interested	4
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	1

- Comments:
  - Circular vs. prismatic cross sections
  - Reliability analysis – very interesting, good procedure for determining optimum safety factors

Safety Analysis of Composite Materials for Existing and New Construction

Project Number: UM-6

- Additional Comments:
  - Very useful study. Results could yield approaches to justify investments in FRP repair of infrastructure – based on safety considerations. Study can impact cost-benefit analysis of repair

Rapid FRP Repair of Damaged Reinforced Concrete Columns

Project Number: NCSU-1

- Level of Interest Rating Results:

Very Interested	1
Interested	3
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	2

- Comments:
  - Good experimental design
  - Very appropriate for high seismic regions of the country

Rapid FRP Repair of Damaged Reinforced Concrete Columns

Project Number: NCSU-1

- Additional Comments:
  - Interesting study. Development of methodology that can be implemented will be useful
  - Interesting technology

3-D FRP Sandwich Panels with Corrugated Sheets for Bridge Decks

Project Number: NCSU-2

- Level of Interest Rating Results:

Very Interested	1
Interested	3
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	2

- Comments:
  - Interesting demonstration of FRP panels

3-D FRP Sandwich Panels with Corrugated Sheets for Bridge Decks

Project Number: NCSU-2

- Additional Comments:
  - Will hopefully address problems of delamination that have occurred with existing sandwich panel decks
  - Will provide viable FRP deck panel alternative
  - Suggest conducting durability testing & overlay evaluation
  - This is a novel system. However, use of these panels would require an understanding of their durability and service condition, particularly with asphalt overlay

Innovative Bonding and Fibers for Strengthening Concrete Structures

Project Number: NCSU-3

- Level of Interest Rating Results:

Very Interested	2
Interested	2
Interested with Change	-
Not Interested	-
Abstain (Not Relevant to Company)	2

- Comments:
  - All interesting; not too applicable to our FRP rebar – yet!

Innovative Bonding and Fibers for Strengthening Concrete Structures

Project Number: NCSU-3

- Additional Comments:
  - Good basic study that provides useful information on a number of factors involved in FRP repair/strengthening on concrete structures
  - No directly implementable results for DOTDs
  - Good to have alternative systems available that can meet eventual AASHTO design specs

Innovative FRP Shear Transfer Mechanism for Precast Prestressed Concrete Sandwich Panels

Project Number: NCSU-4

- Level of Interest Rating Results:

Very Interested	-
Interested	3
Interested with Change	-
Not Interested	1
Abstain (Not Relevant to Company)	2

- Comments:
  - Great project, but not related to my agency
  - C-Grid: Precast/prestressed

FRP Anchorage Systems for Strengthening Infill Masonry Systems

Project Number: NCSU-5

- Level of Interest Rating Results:

Very Interested	1
Interested	2
Interested with Change	-
Not Interested	1
Abstain (Not Relevant to Company)	1

- Comments:
  - Good study but not relevant to my agency