

CAPABILITIES OF THE PROPOSED CENTER - CICI

West Virginia University

Dr. Udaya B. Halabe

CICI - GOAL

Promote the use of Composites in the Infrastructure (Civil and Military) and Open Up New Markets

Focus on Organic Composites, and Manufacturing Processes (Interaction with Industry)

- **Developmental Research**
- **Bring Research into Practice – Design Procedures, Manuals**
- **Educational Component – Train End Users**

Examples of Past Research at WVU

- **New Product Development**
- **Material Characterization at the Molecular Level**
- **Laboratory Testing – Characterizing Behavior at the Macro Level**
- **Theoretical and Numerical Models**
- **Research Publications and Patents**
- **Development of Simplified Design Equations for use in Design Codes by ACI & AASHTO**
- **Textbook Development**

Examples of Application Areas

- **GFRP Rebars, Beams, etc**
- **GFRP Decks and Panels**
- **GFRP and CFRP Wrapping of Concrete and Wooden Components (including Railroad Ties) for Rehabilitation Work**
- **Aging/Durability Studies including use of Nano Technology, Fire Retardant Materials**
- **Field Implementation (several bridges)**
- **Nondestructive Testing and Evaluation**

Examples of Available Equipment

- **300 kip Static/Dynamic Load Testing System**
- **400 kip Compression Testing Equipment**
- **Injection Molding Machine, Resin Transfer Molding, Compression Molding Machine, High Temperature Infusion, etc.**
- **Scanning Electron Microscope, Tunneling Electron Microscope**
- **State-of-the-art nondestructive testing (NDT) system including High Resolution Infrared Imaging System, Ground Penetrating Radar System, Ultrasonics, Acoustic Emission, Fiber Optics, etc.**
- **Continuous Improvement in Lab Facilities over the last 20 years**

Faculty Involved in Composite Research

WVU - DEPARTMENTS

- **Civil and Environmental Engineering**
- **Mechanical and Aerospace Engineering**
- **Chemical Engineering**
- **Electrical Engineering**
- **Industrial Engineering**
- **Mining Engineering**
- **Outside Engineering (Physics, Chemistry, Forestry, etc.)**

- **OTHER UNIVERSITIES**

Examples of Funding Sources

- **U.S. Department of Transportation – FHWA, FRA**
- **U.S. Department of Defense / Defense Contractors**
- **U.S. Department of Energy**
- **U.S. Department of Agriculture**
- **National Science Foundation**
- **National Academy of Sciences**
- **State DOTs**
- **Composite Manufacturers**

Examples of Future Work - CICI

(A) Bring Research into Practice

- **Develop design equations and procedures for Code Bodies and Design Engineers**
- **Develop user manuals, textbooks, etc.**
- **Develop and offer short training courses for practitioners**
- **Interaction with industry**

(B) Develop Innovative Applications for Composites

- **Mine Safe-House Box**
- **Composite Deck House – US Navy Destroyer Vessel DDG 1000 (NGSS)**
- **Cold Water Pipe – Offshore Thermal Energy Conversion (OTEC-Lockheed Martin)**
- **3-D Fabrics for Improved Blast Resistance**

(C) Rapid Construction Techniques to Enhance Productivity and Worker Safety



Thank You!