

Advanced, Engineered, Rapidly Deployable Manufacturing Methods and Materials For Environmentally-Benign and Energy Efficient Housing Construction

Overview

The upward spiraling costs of construction materials, labor, and energy for building utilities have diminished the possibility and practicality of home ownership for many to little more than a dream. Changing severe weather patterns and storms create greater probabilities for catastrophic property casualty losses and higher insurance premiums for the homeowner. Even in the absence



of severe weather, pest and fungal attack in moist environments and the damaging ultraviolet radiation from the sun can accelerate building maintenance costs to extreme levels. This research will address and mitigate these factors by creating novel and new processes and techniques for designing and constructing advanced, engineered, rapidly deployable manufacturing methods and materials for *environmentally-benign, energy efficient, cost-effective, extended life cycle housing for the prospective homeowner.*

This research will create a *joint university-industrial collaborative research initiative* that will focus upon the development of advanced, environmentally-benign manufacturing methods and engineered materials for the fabrication of sandwiched insulated panels (SIPs). SIP panels are advanced engineered sandwiched composites comprising at least two outer structural skin layers and at least one internal, recyclable foamed core layer. Dwellings constructed from SIPs, are engineered for performance and value, and demonstrate:

- (1) **Strength and durability** with excellent resistance to wind damage,
- (2) **Energy efficiency** with heating energy cost reductions by 50%, and
- (3) **Affordability** with reduced life cycle costs (service and maintenance) by as much as 50% compared to conventional stick-built housing.
- (4) **Aesthetically-pleasing** architectural and engineered designs for residential dwellings and commercial structures.



Technical Approach and Resource Requirements

- 🏠 Advanced manufacturing methods research and development.
- 🏠 Development of new, cost effective foaming technologies.
- 🏠 Continuous, on-site sandwiched foam manufacturing and in-line assembly processing.
- 🏠 Process equipment will be purchased and installed at **SIPs of America, Inc.** in Blairs, VA to perform this phase of the research with university (**Virginia Tech**) collaboration.
- 🏠 Advanced engineered materials research and development will be conducted at the Advanced and Applied Polymer Processing Institute (AAPPI) located at the **Institute for Advanced Learning and Research (IALR)** in Danville.
- 🏠 Project funding of \$1,250,000 (\$400,000 for automated SIP production manufacturing instrumentation, \$100,000 for a CNC machine with software and training for cutting windows and doors in SIP panels, and \$150,000 for large-scale toll manufacturing services to provide **commercial-scale validation and implementation** of research results.)
- 🏠 Equipment will be installed and jointly operated by Virginia Tech, the IALR, and SIPs of America, Inc. at the SIPs of America, Inc. production facility in Blairs, VA. The remainder of the funding will sponsor AAPPI research and will comprise \$450,000 for direct research personnel support and \$150,000 for the upgrade of existing AAPPI research equipment.

Societal Impact and Economic Benefits

- 🏠 Up to 50% reduction in housing manufacturing costs.
- 🏠 Reduce public petroleum dependence.
- 🏠 Lower housing energy costs and lifetime cycle costs by 50% each.
- 🏠 Stimulation of the growth of a new industry in Southside Virginia.

Contact Us for More Information

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