



U.S.-China Clean Energy Research Center Building Energy Efficiency (CERC-BEE) *Integrated Design, Construction and Industrialized Buildings*

About CERC-BEE

The U.S.-China Clean Energy Research Center, Building Energy Efficiency (CERC-BEE) program is a pioneering research and development (R&D) consortium to accelerate the development and deployment of advanced building technologies. For more information, visit <https://cerabee.lbl.gov/>.

Project Objective

Current building envelope energy-saving features are limited by poor construction site workmanship and/or energy code enforcement difficulties. Building envelope prefabricated construction provides a platform for optimal integration of energy-saving features. The energy-saving features that can be integrated include: insulation, air sealing, high albedo exterior surfaces, exterior shading of fenestration, and lower embodied energy and environmental impact materials. The



Air Sealing Trial

prefabricated/industrialized building advances are: (1) factory production of building envelope assemblies, (2) minimization of site construction assembly, (3) architectural feature integration, (4) materials waste reduction, and (5) building information modeling (BIM) for improved cost and quality assurance and quality control (QA/QC) management, and quality end product.

The project will develop one or more licensable packages of technology advancements for energy-efficient precast concrete wall systems that will enable licensees to reduce the contribution from the opaque part of walls to heating and cooling loads by 40% when compared to current practice. This project will also provide the construction industry with case studies that supply information on energy savings and payback periods from buildings envelope retrofits. Lastly, the project will test and evaluate the performance of two envelope air sealing products that have 50% to 75% faster installation times (when compared to traditional tape), resulting in increased cost-effectiveness and workmanship quality.

PROJECT IMPACT

The precast wall systems will lead to faster construction in the field, quality control of energy-saving features, and less construction waste. These 3D printed panels are expected to save 0.04 Quads of energy in the U.S. and 0.32 Quads in China in 2030. The building envelope retrofit case studies are expected to save 0.26 Quads in 2030. The air sealing products will save 0.6 Quads of energy in both the U.S. and China in 2030.

The Team



Recent Achievements

Primer-Less Self-Adhered Membranes That Require Half the Installation Time



Primer-Less Self-Adhered Membranes

- 3M and Oak Ridge National Laboratory (ORNL) developed a new self-adhered membrane for building envelopes which is easier and faster to install than the prevailing asphalt-based membranes.
- The new technology, introduced in U.S. market under the name “3M 3015,” is an air, water, and vapor barrier membrane that has excellent adherence to common building materials without the use of a primer.
- 3M 3015 allows for up to 2 times faster installation than membranes that require priming.
- 3M 3015 is ideal for winter construction because it can be installed at temperatures that are as low as 0°F.

Award-Winning Sprayable Liquid Flashing

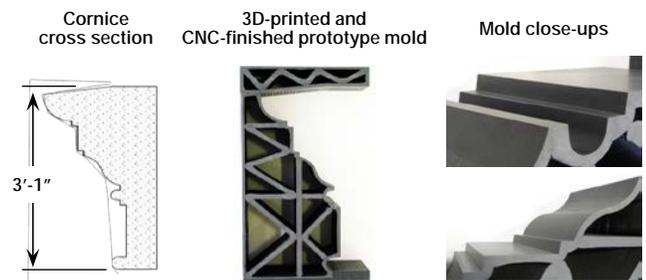


Sprayable Liquid Flashing Technology

- Dow and ORNL developed a sprayable liquid flashing technology – LIQUIDARMOR-CM and RS – that contributes to increasing the air tightness of commercial and residential buildings.
- It achieves a ~10% decrease in heating loads in commercial buildings in the U.S.
- LIQUIDARMOR reduces installation time by 50% to 75% when compared to tape, making it more cost-effective.
- It was selected as an R&D100 finalist in 2015 and won the 2016 Gold Edison Award for Building Construction & Lighting Innovations.
- It was awarded a patent (US 8,641,846 B2).

Next-Generation Precast Insulated Wall Panels for New Buildings

- ORNL, the University of Tennessee, and the Institute for Advanced Composites Manufacturing Innovation are collaborating with the Precast/Prestressed Concrete Institute to develop the next generation of architectural precast insulated wall panels.
- The goal is to develop wall panels that have 50% higher thermal performance and are 50% lighter without increasing the cost of the panel.
- Recent achievements include the manufacture of a complex prototype mold for concrete. The prototype was about 30% faster to manufacture through 3D printing and computer numerical control (CNC) finishing than through the typical manual assembly process.
- Precasters were very impressed with the finishing quality of the prototype mold.



Next-Generation Precast Walls