

MATERIALS THAT IMPROVE THE COST-EFFECTIVENESS OF AIR BARRIER SYSTEMS

Building Envelope

Joint Project

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Research Objective

This project seeks to develop technologies that will improve the cost-effectiveness of air barrier systems by reducing their installation time and enhancing their performance. These technologies will be applicable to residential and commercial buildings, as well as to new and existing construction in the US and China.

Technical Approach

Dow Chemical and ORNL

Develop a sprayable liquid flashing that

- Serves as an air and liquid water sealant;
- Seals gaps that are up to ¼" wide without a supporting material;
- Adheres to most construction materials;
- Reduces the amount of time it takes to seal gaps around penetrations through the air barrier system by up to 75%; and
- Decreases the exposure of workers to volatile organic compounds (VOCs) given its water-based formulation.



Figure 1. The sprayable liquid flashing can be applied with a regular professional paint sprayer, roller or brush.

3M and ORNL

Develop a primer-less self-adhered membrane that

- Serves as the air, liquid water, and water vapor barrier;
- Adheres to most construction materials without a primer;
- Reduces the installation time of the air barrier system by up to 50% when compared to membranes that require priming; and
- Decreases the exposure of workers to VOCs because solvent-based primers are not needed.



Figure 2. The primer-less self-adhered membrane can be installed on most construction materials without a primer.

ORNL

- Develop and execute a durability test protocol to evaluate the performance of the new technologies.

Recent Progress

ORNL

- Finished the durability test protocol, which consists of a series of standardized tests that evaluate air and water penetration through the developed technologies before and after these have been aged due to exposure to wind pressure and thermal cycles. The sequence of standardized tests is: ASTM E283-04 (2012), ASTM E331-00 (2009), ASTM 1424-91 (2008), ASTM E2357-11, AAMA 501.5-07, and ASTM E2268-04 (2011).
- Completed setting up ORNL's heat, air and moisture penetration chamber so it can execute the durability test protocol.

Dow Chemical and ORNL

- Conducted the durability test protocol on two 8'×10' test walls where the substrates were THERMAX and DensGlass sheathings. After the wind pressure and thermal cycling, both of the walls had air leakage rates that were lower than the required 0.2 L/(s·m²) at 75 Pa.
- Installed the liquid flashing in demonstration buildings in the US and at the China Academy of Building Research in Beijing.
- Dow was awarded the patent US20130042961A1 for the sprayable liquid flashing technology.
- In February 2014, launched the residential version of the liquid flashing in the US as LIQUIDARMOR – RS.
- In September 2014, introduced the commercial version of the liquid flashing in the US as LIQUIDARMOR – CM.

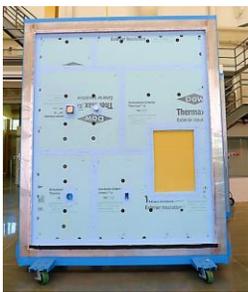


Figure 3. Test wall with liquid flashing sealing the gaps around penetrations and joints between THERMAX boards.



Figure 4. Demonstration building with liquid flashing sealing the gaps around penetrations and joints between THERMAX boards.

3M and ORNL

- Installed the primer-less self-adhered membrane in several demonstration buildings in the US and at the China Academy of Building Research in Beijing.
- ORNL and 3M were successful in securing funds from DOE's 2014 Emerging Technologies / Commercial Building Integration Lab Call in order to continue conducting research on air barrier technologies.



Figure 5. Demonstration buildings with the primer-less self-adhered membrane on DensGlass and concrete masonry blocks.

Expected Outcomes

- The development of two technologies that will contribute to the reduction of infiltration through the building envelope and its related energy penalties.
- The two new technologies will reduce the amount of time and labor it takes to install air barrier systems.
- Energy savings estimates in the US and China due to the implementation of the newly developed technologies.