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Taping Foam Sheathing for Energy Performance and Moisture Control

When rigid foam sheathing was first popularized, there was confusion and debate over whether the seams should be sealed to improve performance or left unsealed so that the walls could "breathe." Foam manufacturers generally advised against sealing the seams because it would create an exterior vapor retarder. In fact, Celotex Corporation provided special corrugated "vent strips" to create intentional air gaps between the sheathing and framing (see ***EDU***, November 1983).

Building scientists now agree that airtight rigid foam sheathing will not cause moisture condensation problems because the foam keeps the temperature in the wall cavity above the dew point temperature. Celotex no longer sells or recommends vent strips. UC Industries, maker of Foamular-brand foam (now owned by Owens-Corning), sells its own brand of tape for sealing the joints of Foamular. Dow Chemical Company, maker of Styrofoam-brand sheathing, has no official policy on the topic and seems to be playing it safe for now. (A spokesperson at Dow's technical services department told us to ask our local distributor. Thanks a lot.)

The results of two new research studies now provide compelling evidence that rigid foam sheathing can allow significant quantities of air leakage, and that in order to prevent excessive heat loss from the building and moisture damage to the siding, the foam seams should be caulked, taped, or covered with housewrap.

80% loss of apparent R-value due to air leakage

The most surprising results are from laboratory tests on full-scale walls performed at Holometrix Laboratory in Cambridge, Massachusetts, for DuPont Corporation, maker of Tyvek-brand housewrap. The goal of the tests was to see whether housewrap could improve the performance of foam-sheathed walls. The results, which were presented fully in the August 1995 ***EDU***, showed that under simulated windy conditions, foam sheathing allows enough air leakage to significantly degrade thermal performance.

Holometrix technicians measured the air leakage and "apparent R-value" of walls with three types of foam sheathing under varying simulated wind speeds ranging from zero to 15 mph. The results showed that for both foil-faced foam (NRG Barrier) and tongue-and-groove extruded polystyrene (Styrofoam), the apparent R-value plunged as the wind speed approached 15 mph. For the 2 x 6-foot wall with Styrofoam sheathing, the apparent R-value dropped from R-17 with no wind to R-3 with 14.4 mph simulated wind.

There are plenty of qualifications one could make about the applicability of these laboratory measurements to the real world, especially since other laboratory tests on similar walls showed very different results (see ***EDU***, June 1994). Nonetheless, the results definitely show that at least in some situations, a significant amount of air leakage can occur and that to ensure optimal performance, the seams of foam sheathing should be sealed or covered.

Air leakage through foam causes siding rot problems

Another reason to seal the seams is to prevent siding rot. In a draft research report that will be presented at the *Thermal Envelopes Conference* in December, George Tsongas of Portland State University cites field studies that found moisture accumulation under the siding in foam-sheathed walls. Moist indoor air had apparently leaked through the joints in the foam sheathing and condensed on the back of the siding. Tsongas strongly recommends taping the joints to prevent siding problems.

Tsongas's concern over moisture leakage is reflected in the Canadian standard for air barrier systems, which specifies tightness according to indoor relative humidity: The higher the expected indoor humidity, the tighter the wall air barrier should be (see ***EDU***, June 1994).

For information on the DuPont/Holometrix study, contact Theresa Weston, DuPont Corporation, 5400 Jefferson Davis Highway, Richmond, VA 23234; (804) 383-4052. George Tsongas will present the results of his study at the *Thermal Envelopes Conference* in Clearwater, Florida (see Calendar, page 16). He can be reached at Portland State University, Mechanical Engineering Department, Portland, OR 97207; (503) 725-4292.