Insulating Cavity Walls During Renovations

While many older and historic buildings are beautiful examples of architecture, they tend to suffer from the same problem: they are not energy efficient. Old inefficient buildings cost much more to heat and cool than newer efficient ones, are drafty and uncomfortable, and allow outside noise and pollutants to enter through the building envelope. One of the single biggest improvements that can be made to older buildings is the addition of thermal insulation into empty wall cavities.

But insulating wall cavities brings new challenges in that the walls tend to be more susceptible to moisture accumulation and condensation problems. Cavity spaces play an important role in how a building manages rainwater penetration and interior humidity. The challenge faced by renovators is therefore how to insulate cavity walls in older buildings in a way that protects against moisture accumulation, without having to fully dismantle the wall.

Pour Fill Solutions

The most common materials for cavity fill applications are cellulose, rock wool, or vermiculite. These materials are blown into the cavity through holes made through either the exterior cladding or the inside finish. In heating climates, however, the addition of insulation prevents heat from reaching the exterior sheathing of the cavity, resulting in exterior sheathing that is very close to outside ambient temperature. This leads to an increased likelihood that the exterior sheathing will act as a condensation plane for any interior humidity that reaches this surface. While these cavity insulation materials can supply a sufficient level of R-value to the wall, their use does not supply an adequate level of protection from condensation, or even address issues of energy losses that are not due to conduction.

Beyond the fundamental issues of energy efficiency and moisture protection, traditional solutions are also susceptible to issues of installation. It is often impossible to guarantee complete filling of the cavity due to interior obstructions, with the solution typically involving hammering of the wall in the hope that this will shake the material down. Similarly there is the possibility that these materials can settle in time, leaving a void at the top of the cavity. These workaround solutions can often add significant time and cost to the project, without any guarantees of long-term performance or overall effectiveness.

Combined Insulation / Air Barrier Systems

Condensation in wall systems is generally a result of moisture movement by either diffusion or air leakage. However, it is generally accepted in the industry that air leakage is a far more significant mechanism for moisture transport than diffusion, due to the fact that air can carry very large volumes of water in the form of water vapor / humidity. As a result, insulation materials that also supply an air barrier to the wall cavity can dramatically reduce moisture movement & the resulting exterior wall condensation problems.

Icynene® Pour-Fill Formula

Icynene® LD-CP-50® is a combined insulation and air barrier material, and is therefore able to both insulate & prevent convective moisture accumulation. It provides a monolithic barrier against heat loss & air leakage, and will not shrink, degrade, or settle over the life of the building.

Although Icynene® LD-CP-50® provides convective (air borne) moisture protection to the exterior condensation surfaces, the insulation is not a vapor retarder, and therefore an interior vapor retarder may be required in cold heating climates where the interior relative humidity is high (high vapor drive). The vapor permeability of Icynene® does not impede drying of other building materials in the event of pipe/roof leaks or rainwater intrusion. While moisture is free to diffuse through the insulation, continuous contact with the exterior sheathing ensures that this moisture remains in a vapor state and passes through the assembly without condensing on exterior or interior surfaces. Rain penetration is generally not a problem either, because Icynene® has a high perm rating, and does not exhibit any capillary action.

Installation

The Icynene LD-CP-50® cavity fill formulation is installed by injecting a liquid into closed wall cavities, though small holes ranging in size from a ½-inch (13 mm) to 1-inch (25mm) diameter. As a two-component liquid material, Icynene® runs to the bottom of the

cavity, filling every void and bonding to the interior surfaces. Over a 2-3 minute period, the foam expands to approximately 40 times the volume of the original liquid. As the foam expands to fill the cavity, it remains in a pliable state, setting into inert, soft, fine-celled foam plastic. By remaining flexible and bonding to the interior surfaces, Icynene® LD-CP-50® is able to supply a durable air-seal for the life of the building, regardless of how the building expands and contracts due to wind loading, thermal cycling, or seasonal changes in moisture content.

Site Assessment & Installation

An assessment of the building envelope is the first step in deciding if Icynene® Pour Fill is suitable.

1. Existing insulation materials interfere with the proper expansion of Icynene®, and must be removed prior to installation.
2. Uninsulated wiring (knob and tube wiring) must be removed, as it is generally incompatible with any type of insulation.
3. The building envelope should be leak free, the cavity space should not be integral to the drying of the exterior cladding.
4. The interior plaster/drywall must be able to resist the expansion of the insulation. While plaster in good condition can easily satisfy this requirement, plaster that is damaged or in poor condition should be repaired prior to the application of insulation.

The width and depth of the cavities are measured (using a probe) so that the amount of insulation to be injected may be determined. The location of diagonal cross bracing is detected this way, and additional holes are made below so that the foam may be injected into the space below the bracing.

Injection of insulation can be made from the inside or outside of the building. The method employed often depends on whether interior or exterior surfaces and finishes are to be renovated. Injections are timed so that there is minimal risk of bowing or blowing off interior finishes. Any excess material that oozes through the application holes is easily trimmed by hand.

Because it is installed as a liquid, there is minimal risk of Icynene® getting "hung-up" on plaster keys or nails. During expansion, the foam rises upward from the bottom of the cavity, completely filling the space through which it moves. However, if the style of construction indicates that there might be large obstructions within the wall (cross-bracing, etc), infrared thermography can be used to locate any pockets under large obstructions so that they can be filled. Once the insulation process is finished, the refinish of application holes is generally the responsibility of the finishing contractor or homeowner.

Better Performance: Old Buildings

In most climates, installing Icynene® LD-CP-50® in cavities as small as 1½ inch (38 mm) deep can result in a 80% reduction in heat flow through the cavity, while improving a building's ability to manage moisture. Installing Icynene® Pour Fill material is one of the most effective ways to reduce excess energy consumption and improve the performance of old buildings. When combined with a mechanical ventilation system, the interior space will be quieter, more comfortable, & more energy efficient than ever before.