A Rotting Timber Frame

Foil sheathing, too much moisture, and a broken vapor barrier almost spelled disaster for a four-year-old timber-frame house in southern Vermont.

by Steven Bliss

"If you don’t put in a vapor barrier, your house is going to rot away." You’ve heard this many times, but it’s not so simple.

Thousands of insulated houses with no vapor barrier (or a lousy vapor barrier such as kraft paper) have not rotted away. Furthermore, nailing a sheet of poly to the wall is no guarantee against problems. Take the rotting timber-frame house that I visited in southern Vermont last November...

The 1,800-square-foot, 1-1/2-story Cape is four years old. The walls are framed with 8x8 timbers, which are exposed on the interior of the house. Between the 8x8s the builder framed-in with 2x4s to provide nailing and a place for fiberglass insulation. The frame was sheathed with one-inch boards, then wrapped with one-inch-thick, foil-faced isocyanurate, which was taped and caulked. Clapboard siding was installed over felt paper (see diagram).

Rotting Beams

The owner discovered the problem when a renovation contractor opened up the south side of the house in order to add a sunspace. He found extensive decay in and around the timbers. The rot occurred on the outer face of the timbers—up to two inches deep in some sections—and in the sheathing and 2x4s wherever they touched the timbers.

To learn more, the owner cut out sections of siding and sheathing on all sides of the house and found decayed wood on the north, south, and west. Only one hole was cut on the east side, and showed only minor damage.

No decay was found in the wall sections between the beams, or elsewhere—although a thorough search was not made of all areas.

Looking Further

When I visited the house in November, I looked for evidence of high moisture levels. It was a sunny day in the 40s—too warm for condensation to form on the windows. But all the second-floor windows—and most on the first floor—were badly stained from pooling condensation.

The owner confirmed that the east, west, and south sides of the house were covered by plastic sheeting from arrive condensation. The east and shingles and siding, which were heavily checked on the inside (right) and rotting on the outside (left).

Decay was concentrated on the outer portion of the timber frame and the adjacent sheathing, as shown in the darkened area. The beams were heavily checked on the inside (right) and rotting on the outside (left).
Why Two Inches of Foam Are Better Than One

Insulating foam sheathing is becoming fairly common in cold climates. But in most cases, it is all too easy to install it in a way that will make the moisture problems worse. A building with insufficient insulation is like a large sponge: it is both permeable and easy to fill. The problem is exacerbated when the moisture is not allowed to evaporate easily from the surface. This can happen if the insulation is not properly installed or if the building is exposed to extreme weather conditions.

In the case of foam sheathing, it is important to use the correct thickness to ensure that moisture is not trapped within the walls. A thickness of two inches is recommended to allow for proper drying of the walls. This thickness provides a balance between thermal performance and moisture control.

The R-value of foam sheathing is directly proportional to the thickness. Therefore, the use of two inches of foam provides a significant improvement in moisture control compared to thinner materials. This is because the increased thickness reduces the rate of moisture transfer through the wall assembly, which helps to prevent condensation and mold growth.

When installing foam sheathing, it is important to ensure that it is properly sealed and insulated to prevent moisture from entering the building. This can be achieved by using a combination of insulation materials and vapor barriers to create an airtight barrier.

In conclusion, two inches of foam sheathing is the recommended thickness for cold climates to provide optimal moisture control and thermal performance. This thickness helps to prevent moisture problems and ensures a comfortable indoor environment.