WEATHERIZING THE OLDER HOME

The trick is to avoid creating moisture and indoor air quality problems

ENERGY-SAVING TECHNOLOGIES for new houses are deservedly getting a lot of attention these days, but they are not always good choices for older buildings. In fact, some measures may damage important architectural details or, worse, create moisture and indoor air quality problems that deteriorate building materials and even threaten the health of occupants.

"The people who built these buildings recognized that moisture was going to come in, so they designed them to let moisture out," Peter Taggart, the owner of Taggart Construction, said at a recent Landmarks program on preservation and sustainability. "By tightening them, we put the buildings in danger, but we do have the knowledge and the strategies to deal with moisture."

With its cold, wet climate and high radon levels, Maine is a particularly challenging setting for weatherizing buildings, according to building science analysts Terry Brennan and Bill Turner, who are working with the Maine Indoor Air Quality Council to develop a set of protocols for weatherization and energy-conserving retrofits. Seventy-one percent of 3,200 Maine homes surveyed had moisture problems, they reported at a recent day-long seminar for building professionals in Augusta; the national average is 35 percent.

"It's pretty much agreed that damp places are not healthy places to live," Brennan said. "If a house smells musty, there is at least a localized moisture problem and active mold growth. We know that disease rates rise with active mold growth." Occupants of damp, moldy buildings are more likely to suffer from asthma and bronchitis, and some studies suggest links with other health problems as well, including learning difficulties and chemical sensitivity syndrome.

Attic insulation can be a preservation strategy to avoid ice dams and reduce energy consumption.

Historic building owners have the added challenge of protecting their buildings' architectural details. They want to avoid retrofitting measures, such as replacing original windows or removing plaster to install insulation, that compromise the building's historic character.

Following is a closer look at some of the air quality and moisture issues, as well as preservation concerns, that should be considered when weatherizing older buildings.

Take a moisture assessment

Mother Nature supplies the moisture, but more often than not, building moisture problems are caused by the mistakes of their builders and owners, and weatherization may aggravate the problems. "For best practice conduct a moisture audit," Bill Turner advised, "and fix any problems as part of your energy retrofit."

As part of your moisture assessment, you'll be looking for dampness, peeling paint, water stains, efflorescence (white stains on brick), condensation, mold and decay. Inspect exterior drainage systems; roofing, flashing and siding; the attic and basement or crawlspace; windows, doors and the walls around them; and sinks, toilets, dishwashers.

PETER TAGGART PHOTOS

Historic building owners looking to make energy retrofits have the added challenge of protecting their buildings' architectural details, such as windows.

Excess humidity is not always obvious. "We're not good judges of humidity," Turner says. "You need to measure it. If your basement is 70 percent relative humidity, the rest of the house will be too high. Thirty percent is as high as you want to see in your bedroom." Humidity is easy to measure with a hygrometer, a relatively inexpensive instrument.

Causes of excess moisture vary. Stained plaster walls suggest a leaky roof, for example, while powdery-looking brick in the basement indicates water is migrating through the masonry; the solution may mean regrading the site to improve drainage.

Fireplaces, furnaces and backdrafting

When fireplaces, woodstoves, water heaters, furnaces and other combustion appliance are operating properly, their byproducts – carbon dioxide, nitrogen dioxide and carbon monoxide – are safely sucked up the chimney and out of the house. But running these appliances, along with clothes dryers, bathroom and kitchen exhaust fans, in a tightly sealed building can cause negative indoor air pressure, which leads to those polluting gases being sucked down the chimney and into the room. Gas-fired units are especially dangerous when they backdraft because, unlike fireplaces and oil burners, they emit no odor to warn occupants.

When undertaking a home energy retrofit, replace unvented fuel-burning appliances with vented ones or otherwise make sure they have an adequate air supply, Brennan recommends. If possible, have the water heater and furnace draw their intake air directly from the outside. Install a C02 monitor, and if you are in doubt about the adequacy of the ventilation in your home, consult a weatherization professional.

Bathroom and kitchen exhaust fans

Take an inventory of your home's exhaust fans to ensure they are adequately capturing moisture, grease and smoke and removing them from the building.If your gas stove or range does not have a hood vented to the outdoors, install one. Test an existing exhaust fan in the kitchen or bathroom by turning it on and placing a smoke emitter bottle beneath or piece of paper on the grill to see if it is producing suction. Also make sure the bathroom fans are vented to the outdoors and not pumping into the attic, where the moisture will promote mold growth. "Bathroom fans have been of poor quality and poorly installed in buildings for years," Peter Taggart observed.

Replace poorly operating fans with low-noise varieties that operate on timers or motion sensors. "One of the reason bathroom fans don't get used is they are noisy and they are on a switch – people tend to turn them off when they leave the bathroom, but it takes about 20 minutes for a bathroom to properly ventilate," Taggart explained. "If you get one with an automatic switch, you don't have to think about it."

Insulation and ventilation

"A lot of old houses are not well insulated," says preservation expert Noelle Lord, who is leading Landmarks' energy efficiency workshops in Portland neighborhoods this spring. "The best thing you can do is insulate the attic because heat rising through the roof is a major source of heat loss. It also is a non-invasive strategy; no plaster walls or siding are damaged in the installation."

Indeed, attic insulation can be a preservation strategy. Ice dams, caused by heat rising through a poorly insulated attic, threatened a block of townhouses that Peter Taggart is restoring in Brunswick. The addition of insulation sealed the air leaks and saved the building materials from further deterioration. "Energy conservation meets preservation," Taggart said. "By greening the building, we're also helping the historic fabric."

Be aware, however, that insulation does increase the likelihood of condensation. When insulation becomes saturated, it loses its effectiveness. The building materials suffer too. "Any time you insulate, you have to ventilate," Lord says. "Old houses were designed to breathe and that is probably why they are still here. The older the house, the larger the timbers; all that wood needs air flowing past it in order to dry out. Doing dishes, taking showers and other things we do in the house create moisture and you need to deal with it so it can leave the house."

Soffit, gable or ridge vents will release moisture without letting in cold air. This is not a job for the do-it-your-selfer. "Professionals will know the right number

continued on page 4

WEATHERIZING THE OLDER HOME

continued on page 3

and proper spacing," Lord advises. "They depend on the size of the house and other factors."

Wall insulation is often not recommended for historic buildings, especially those with wood frames, because it can result in "serious technical and preservation problems," writes architect Baird Smith in *Conserving Energy in Historic Buildings,* a Preservation Brief published by the Technical Preservation Services section of the National Park Service. "Introducing insulation in wall cavities without a vapor barrier and some ventilation can be disastrous. The insulation would become saturated, losing its thermal properties, and in fact, actually increasing the heat loss through the wall. Additionally, the moisture (in vapor form) may condense into water droplets and begin serious deterioration of adjacent building materials such as sills, window frames, framing and bracing. The situation is greatly complicated, because correcting such problems could necessitate the complete dismantling of the exterior or interior wall surfaces."

Test for radon

Many Maine homes rest atop radon-rich granite bedrock, and sealing air leaks can make an indoor radon problem worse. Registered testing labs, such as Radon Check in Scarborough, sell radon test kits for about $60. The right treatment system for high levels of radon depends upon whether the house has a concrete basement or slab or a dirt-floored crawlspace or basement. The systems cost between $1,500 and $3,000 and are best installed by a trained and registered contractor. ■

Weatherization and indoor air quality is a complicated and broad topic. The Maine Indoor Air Quality offers information, including the protocol, checklist and resources at www.miaqc.org.

Weatherization solutions for historic windows

The following is excerpted from "Conserving Energy in Historic Buildings," a Preservation Brief prepared by the Technical Preservation Services, Heritage Preservation Services Division of the National Park Service. To read the entire brief, visit www.nps.gov/hps/tps/briefs/brief03.htm.

BY BAIRD M. SMITH, AIA

WINDOWS ARE A PRIMARY SOURCE of heat loss because they are both a poor thermal barrier (R factor of only 0.89) and often a source of air infiltration. Adding storm windows greatly improves these poor characteristics. If a building has existing storm windows (either wood or metal framed), they should be retained. Assure they are tight fitting and in good working condition. If they are not in place, it is a recommended measure of a preservation retrofitting plan to add new metal framed windows on the exterior. This will result in a window assembly (historic window plus storm window) with an R factor of 1.79 which outperforms a double paned window assembly (with an air space up to ½ inch) that only has an R factor of 1.72. When installing the storm windows, be careful not to damage the historic window frame. If the metal frames visually impair the appearance of the building, it may be necessary to paint them to match the color of the historic frame.

Triple-track metal storm windows are recommended because they are readily available, in numerous sizes, and at a reasonable cost. If a preassembled storm window is not available for a particular window size, and a custom-made storm window is required, the cost can be very high. In this case, compare the cost of manufacture and installation with the expected cost savings resulting from the increased thermal efficiency. Generally, custom-made storm windows, of either wood or metal frames, are not cost effective, and would not be recommended in a preservation retrofitting plan.

Interior storm window installations can be as thermally effective as exterior storm windows; however, there is high potential for damage to the historic window and sill from condensation. With storm windows on the interior, the outer sash (in this case the historic sash) will be cold in the winter, and hence moisture may condense there. This condensation often collects on the flat surface of the sash or window sill causing paint to blister and the wood to begin to deteriorate. Rigid plastic sheets are used as interior storm windows by attaching them directly to the historic sash. They are not quite as effective as the storm windows described previously because of the possibility of air infiltration around the historic sash. If the rigid plastic sheets are used, assure that they are installed with minimum damage to the historic sash, removed periodically to allow the historic sash to dry, and that the historic frame and sash are completely caulked and weatherstripped.

Windows are a major source of energy loss in an older home; storm windows can make a significant difference.

In some cases, interior storm windows of either metal frames or of plastic sheets are not recommended for preservation retrofitting because of the potential for damage to the historic window. If interior storm windows are in place, the potential for moisture deterioration can be lessened by opening (or removing, depending on the type) the storm windows during the mild months allowing the historic window to dry thoroughly. ■