City of Jacksonville
Historic Preservation Commission
WINTER 2008 NEWSLETTER

Conserving Energy in Historic Buildings

These segments, taken from Baird Smith's August 2007 Old House Journal article, are intended to help property owners in saving energy and money. The first part, in the HPC Summer 2007 issue, discussed inherent characteristics of many older buildings, while the second, published in the Fall 2007 HPC Newsletter, explored passive and retrofitting measures. This final installment reviews other passive and retrofitting measures.

Doors and Storm Doors: Historic solid or paneled wood doors have fairly good thermal properties plus important architectural features, and should not be replaced. Maintain doors and frames with regular painting, proper caulking and weather stripping.

While a storm door will improve thermal performance of a historic door, it is rarely cost effective. Since many historic doors of atypical sizes require expensive special orders, storm doors should only be added to homes in cold climates. The storm door style and installation should be compatible with the building's architectural character to minimize its visual impact. It may be painted to match the historic door or home colors.

Vestibules: A secondary air space, either interior or exterior, at a doorway reduces air infiltration when the primary door is open. It is recommended to keep existing vestibules, but not usually to add one on historic structures. While energy savings are usually relatively small compared to construction costs, in very cold climates or for high door use a vestibule may be beneficial. First, consider the visual impact to the building character.

Replacement Windows: Unfortunately, replacing historic windows with modern double paned windows is a common weatherization measure, especially in larger buildings, to improve thermal performance and ease maintenance. Adding exterior storm windows are a proven and recommended alternative to replacing historic windows, but if severe deterioration makes repair impractical or economically unfeasible, then either wood or metal replacement windows may be an option, provided they closely match the original windows in shape, size, number of panes, frame, muntins, color and glass reflectivity.

Wall Insulation - Wood Frame: Adding wall insulation in smaller wood frame buildings is seldom a preservation retrofitting recommendation due to high costs and the risk of damage to historic building materials. Un-insulated walls account for relatively little of total heat loss, especially in smaller, one story frame structures with measurable infiltration. In cold climates, wall insulation may be an option for historic buildings of two or more stories, provided extreme care is taken during installation.

Installing wall insulation in older frame buildings poses real problems because insulation must stay dry to function properly. Introducing insulation into wall cavities with no vapor barrier or air circulation allows moisture absorption and loss of thermal properties, increasing heat loss through the wall. Moisture vapor can also condense on adjacent building materials and deteriorate window frames, sills, framing, and bracing. Repairing this damage may require costly dismantling of wall surfaces.

If adding wall insulation to wood frame buildings is deemed absolutely necessary, first check whether the exterior siding can be carefully removed without serious damage and reinstalled later, then use batt insulation facing the vapor barrier inward. When feasible, this method is the best solution for adding wall insulation and also offers a chance to investigate any hidden structural problems or check for insects.

Other wall insulation methods inject foam or blow loose-fill insulation into a wall cavity. Since a vapor barrier cannot be injected into the space, create equivalent protection by covering all interior wall surfaces adjacent to the insulation with impermeable paint layers. Two coats of oil base or one layer of impermeable latex paint make an acceptable vapor barrier. Pay heed to major sources of interior moisture (laundry, kitchen, and bathrooms).

Important ventilation for insulation and wall materials can be provided by installing small screened vents at the base of each stud cavity, making the two-inch-diameter vent as inconspicuous as possible. Separating horizontally lapped siding at the overlaps by inserting and twisting a chisel is another way to provide air circulation, so long as the joints are not later painted closed.

With vapor barrier and ventilation provided, select appropriate wall insulation: blown cellulose (with boric acid fire retardant), vermiculite, or perlite. Cellulose is preferred for its higher R factor and ability to flow well into various wall cavity spaces.

Two wall insulation types are not recommended: ureaformaldehyde foams, and cellulose with aluminum or ammonium sulfate fire retardant. Sulfate treated cellulose reacts with air moisture to form sulfuric acid which corrodes many metals and causes building stones to disintegrate. While ureaformaldehyde foams flow into any wall cavity space and have a high R factor, they carry large amounts of moisture into the wall system to be absorbed by adjacent materials, causing paint to blister and water to actually puddle at the wall base, increasing the risk of serious deterioration to historic building materials. Foams are a two-part chemical installed by franchised contractors who must mix and install under controlled temperature and humidity conditions to attain desired R factors and avoid formaldehyde odors. Also, the advertised 3% maximum post-curing shrinkage has proven to double. Until these materials are further developed to eliminate risks, they are inappropriate preservation retrofitting materials.

Conserving Energy in Historic Buildings (continued)

Wall Insulation - Masonry Walls: Introducing insulation into masonry cavity wall construction ignores the acceptable thermal performance that usually exists without improvement. Insulating the cavity will likely cause condensation problems by changing the intended function. An air cavity acts as a vapor barrier where moist air passes through the inner brick, meets the cold face of the outer wythe and condenses. Water drops that fall to the wall cavity bottom are channeled out through weep holes. The air cavity slows the transfer of heat or cold between wythes, making the two wall masses function independently with a thermal cushion between and improving the wall's thermal performance.

Insulating this cavity alters the air space vapor barrier and thermal cushion functions, likely clogging weep holes and causing moisture to pool at the wall base. Adding insulation moves the moisture dew point (where moisture condenses) from the inside face of the outer brick to the outer wythe itself. In winter, this condensation will freeze, causing spalling and severe deterioration. Thus, introducing any type of insulation into a masonry cavity wall is not recommended in preservation retrofitting plans.

Wall Insulation - Installed Inside: Either 1 or 2 inch thick rigid insulation or 3.5 inch thick batt insulation can be added to wooden or masonry walls by attaching it to furring strips mounted on interior wall faces with the vapor barrier facing in. Rigid plastic foam insulation can emit dense smoke and rapidly spread flames when burned, so it must be installed with a fireproof covering, usually 1/2-inch drywall. Insulation installed inside tends to be expensive and is only recommended for larger buildings in cold climates, and only if the interior spaces and features have little or no architectural significance. Do not use inside-installed insulation if it requires relocating or destroying important architectural decoration, like chair rails, cornices, or window trim, or if it harms historic plaster or other wall finishes.

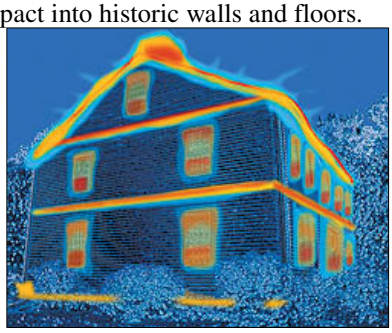
Wall Insulation--Installed Outside: Aluminum or vinyl siding applied directly over historic wood siding is supposed to reduce long-term maintenance and improve thermal performance of the wall, but is considered bad from a preservation stance. New siding hides existing or potential deterioration problems or insect infestations. Its installation often causes damage or changes existing decorative features like beaded weatherboard, window and door trim, corner boards, cornices, or roof trim. Comparing the costs of installing synthetic siding with its low impact on thermal performance makes it a poor energy-saving measure.

Proper maintenance and preservation of existing siding includes periodic painting and caulking. Where deterioration is present, individual pieces of siding should be removed and replaced with matching new ones. Earlier segments of this article offer recommendations for retrofitting actions that improve the thermal performance of wood frame walls.

Masonry Waterproof Coatings: Contrary to popular beliefs, waterproof masonry coatings do not boost thermal performance by keeping masonry dry to achieve a better R factor (the ability to reduce heat flow, with higher numbers being better) than when it is wet. It actually traps moisture within the masonry and can cause spalling and severe deterioration during a freeze cycle. When historic brick is already painted, maintain it with periodic painting as a great preservation treatment. Consider using light historically compatible colors in warm climates or dark colors in cold climates to reduce summer heat gain or winter heat loss.

Mechanical Equipment

Without detailing recommendations or cautions on heating or cooling equipment, or alternative energy sources like solar or wind, this article advises ensuring that existing mechanical equipment in historic buildings works efficiently. If a professional suggests replacing any existing equipment, consider these points: First, as technology advances, today's equipment will be outdated soon relative to the life of the historic building. Consider waiting and watching for new technology (i.e., solar energy) to become more efficient, feasible, and affordable. Next, ensure new equipment and ductwork installation, or possible later removal, does not permanently damage significant historic building materials. Complete invisibility (hiding piping and ductwork within wall and floor) may be inappropriate for older buildings due to resulting damage. Choose a mechanical system with the least intrusive installation that allows updates or changes without major impact into historic walls and floors. Weigh the merits of replacing a less efficient system with a costly new system that result in substantial damage to the historic building materials and that may prove inefficient in the future.



Summary

This three part article has described methods for saving the most energy in historic buildings with the least risk to architectural, cultural and historical qualities that set the property apart by focusing on the passive methods in the first segment, and recommended retrofitting actions in the last two excerpts. By encouraging these measures by done in phases, each action's expected actual energy savings can be realized, and the maximum feasible savings will be in place, eliminating the need for "not recommended" retrofitting measures that can damage or alter historic building materials.

Finally, it is important to realize that retrofitting and weatherization technologies relatively new. Unfortunately, most current research and product development is directed toward new construction. It is hoped that reports such as this, and the understanding that fully 30% of all construction in the United States now involves work on existing buildings, will stimulate the development of new products that can be used with little hesitation in historic buildings. Until that time, owners of historic buildings can utilize preservation retrofitting measures that are recommended here and greatly reduce the energy used for heating and cooling, without destroying those historic and architectural qualities that make the building worthy of preservation.

Baird Smith's complete article by this name, and related reading, is available at www.oldhousejournal.com (click on Preservation How-To for a list of topics and articles).

Save this sheet...
...more styles in the next edition!