



## Weatherizing & Improving the Energy Efficiency of Historic Buildings

Weatherization means implementing cost-effective measures to make a building's envelope more energy efficient. Weatherizing a historic building requires undertaking those measures in ways that have minimal impact on the historic building's design and materials.

### Utilize Existing Green Features & Modify Behavior

User behavior and climate have a great effect on energy use and should be considered before developing a weatherization and energy efficiency plan. For example, reducing air infiltration around a door will not be effective if a tenant has a habit of propping the door open. Additionally, take advantage of those inherently green features common to historic buildings, such as:

- Utilize historic vestibules
- Operate windows, skylights, and clerestories
- Retain historic lightwells
- Maintain interior transoms and borrow lights
- Retain and operate interior and exterior shutters
- Maintain wide overhangs and open porches
- Utilize passive heating and cooling properties of massive masonry walls
- Maintain splayed window reveals
- Retain high ceilings

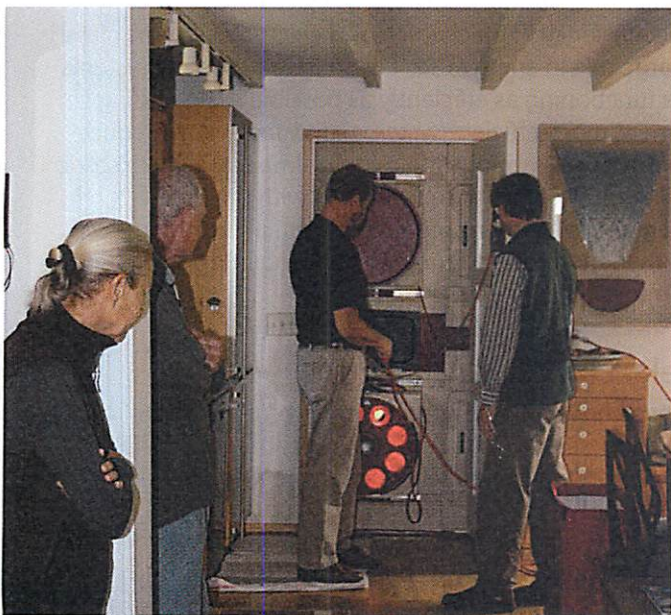


According to a study conducted by Historic Scotland, closed shutters can reduce the heat loss through single-glazed windows by more than 50%.

Photo by Jenny Parker

### Conduct an Energy Audit

An energy audit should be undertaken before developing a plan and certainly before energy-improvement measures are implemented. The audit evaluates a building's current thermal performance and identifies any deficiencies in the building envelope or mechanical systems.



A blower door test can help historic property owners determine where air is escaping or entering a building.

Photo by Liz Petrella

### Develop a Plan

Developing a weatherization plan tailored specifically to the building, site, climate, and occupancy will be an effective tool in reducing energy consumption. By broadening the scope to include not just the building envelope but also systems, appliances, and lighting, it is possible to develop a more comprehensive energy-efficiency plan. Any work should be evaluated based on its effect on the historic building and its potential to increase energy efficiency. After first conducting an energy audit, the following are common energy conservation measures that should be considered for most historic buildings:

- Reduce air infiltration
- Select efficient heating, cooling, and electrical systems with programmable controls
- Select efficient appliances
- Repair and upgrade windows and doors
- Install insulation in the attic, basement or crawlspace and around pipes and ducts
- Add shading devices (shutters, awnings and trees)



Photo by Liz Petrella

## Reduce Air Infiltration

Air infiltration is the exchange of air through cracks and gaps in the outside shell of a building. There are many simple, low-cost improvements that can reduce air infiltration in your historic building, such as caulking and weather-stripping. Caulking should be done with care to ensure that the function of a building element is not impaired. For example, caulking may be added to close a gap between window frames and the outside wall if needed, but not between window sash and the jamb which would prevent the window from opening. Instead, weatherstripping can be added to exclude air and allow the sash to operate.

## Repair and Upgrade Historic Windows

Historic windows and doors can often be repaired or upgraded to improve energy efficiency and occupant satisfaction. The common misconception that replacing windows will save as much as 50% in energy costs is simply not true. The windows in many historic buildings have functioned for more than 100 years and, with regular maintenance, will usually survive many more decades. Unlike most historic windows, new window assemblies cannot be repaired; they can only be replaced once again. The sustainable choice is to repair historic windows whenever possible.

Energy loss at windows occurs both by conduction through the glass and by infiltration around the sash and the frame. Conducting a window inspection is a good way to assess the overall condition of your windows and to determine whether repair or replacement is the better alternative. Caulking and weatherstripping to seal air leaks should always be done before considering replacements. To further enhance energy performance, a good storm window can be installed.

## Install Insulation

Installing insulation in certain spaces can be a cost-effective solution to heat loss. However, determining where to install insulation can be a more complex decision than many people realize. In general, the safe approach in a historic building is to first install insulation in the attic, basement and crawl-spaces and around pipes and ducts.

When considering adding wall insulation, keep in mind that buildings were designed to function as a system. The many different types of wall assemblies and various climatic factors prevent us from recommending or discouraging specific products or retrofit measures. However, adding wall insulation where moisture problems exist has been known to accelerate deterioration, but under different circumstances wall insulation has performed well. The services of a professional with experience with historic structures following the results of an energy audit will generally produce the best results.

## Add Shading Devices

Installing appropriate shutters or awnings on your building or planting deciduous trees can provide shade in the summer and reduce energy needs. Shade trees can reduce surrounding air temperatures as much as 9°F. Because cool air settles near the ground, air temperatures directly under trees can be as much as 25°F cooler than air temperatures above nearby blacktop.

## Select Efficient Systems (with programmable controls)

The efficiency of mechanical and electrical systems plays a large role in energy use. Ensuring that existing systems are functioning as efficiently as possible or upgrading to new, more-efficient systems can substantially reduce energy consumption with minimal impact on the historic building. Doing so in combination with the use of programmable thermostats and ventilation systems can further improve efficiency while maintaining occupant comfort.

## Select Efficient Appliances

When choosing new appliances for your historic building, select products that have earned the ENERGY STAR rating. They meet strict energy efficiency guidelines set by the EPA and US Department of Energy, and the results are already adding up. In 2008, Americans saved enough energy using ENERGY STAR appliances to avoid greenhouse gas emissions equivalent to that of 29 million cars — all while saving \$19 billion on utility bills.