Summer 2008

Preserving Forest Grove

Newsletter of the Historic Landmarks Board

Window Energy Concerns: Restore or Replace?

by
Claude Romig

I recently received a quote from a heating oil distributor to fill up my oil tank. It turned out to be the sticker shock of my life. I decided to take a step backwards and reconsider my energy options. Insulation? That was a no-brainer. But what about windows? I discovered that in an otherwise well-insulated house up to 30% of energy (heat) loss occurs throughwindows. I thought: fuel prices are never going to get any cheaper. Thirty percent might turn out to represent quite a lot of money, even in the short term. What are the options? What about my old windows—after all, they have been part of my house for a hundred years—should I replace them? What kind of energy calculations do I need to take into account?

Historic Double-hung windows, 1905

Well, it turns out that there has been a great deal of debate about replacing versus restoring historic windows in the last few years within the architectural and historic preservation communities, and also among manufacturers and suppliers of new window units. This debate centers on the apparently mutually exclusive themes of energy efficiency and historic preservation. Unfortunately, there are not much useful data out there. There is also conflicting information, or misinformation, promulgated by manufacturers. The popular wisdom seems to be, "replace the windows!" New windows are much more energy efficient than old, historic double-hung windows, right? Not necessarily.

Energy efficiency is a complex issue; there are many pieces to the puzzle, some of them not intuitively obvious. For example, there is a concept known as embodied energy. This is the sum total of all the energy required to extract raw materials, manufacture, transport, and install building products. Typically, embodied energy is measured as a quantity of non-renewable energy per

unit of building material, component or system (e.g., MJ/kg). A holistic-thinking homeowner might want to consider this "green" concept in his/her calculations. Another piece of the energy puzzle is heat conduction; everyone knows, of course, that heat is lost via conduction through the glass. Less widely known, but also obvious once you think about it, is the energy lost due to infiltration of outside air.

Infiltration of outside air is an example of convection and is the primary way a window unit contributes to energy loss. Convection is heat transfer by mass motion of a fluid, such as air or water, when the heated fluid is caused to move away from the source of heat, carrying energy with it. According to Paul Fisette, in *Fine Homebuilding* (114, 1998), "Air leakage siphons about half of an average home's heating and cooling energy to the outdoors. Air leakage through windows is responsible for much of this loss." Restoring the integrity of the fit between the frame and building wall should be the first component of a preservation approach. This has become easier due to the ever-increasing supply of high quality weatherstripping products on the market. In fact, the energy efficiency of restored windows incorporating retrofit components (weatherstripping and weatherseals combining pile, brush, bulb, or "Z" spring seal) can meet and even exceed the efficiency of replacement units.

Conduction, the second piece of the energy puzzle, is heat transfer by means of molecular agitation within a material without any motion of the material as a whole. This is what most people tend to think of when they consider energy loss: the heat lost through the glass itself. While not as significant as other forms of energy loss, conduction does need to be taken into account. There are a number of glass alternatives on the market designed to reduce heat loss, including insulated glass and laminated glass.

Insulated glass is the primary choice for replacement windows. The effectiveness of an insulated glass unit depends on the depth of the space between inner and outer panes as well as on the properties of the seals around the unit. A drawback to having insulated glass units is that when these materials degrade and fail (and they will) it becomes necessary to replace the replacement. This is difficult and costly. An additional drawback comes with the additional weight and thickness of insulated glass units. To compensate for their heft, mullions, sash and frames are bulkier than their historic counterparts. As a result, Chad Randl, writing in *Preservation Tech Notes* (2002) remarks that visible daylight levels are reduced by 15% or more; views are similarly interrupted.

There is an often-overlooked alternative to insulated glass: laminated glass. Laminated glass (usually marketed as "safety" glass) offers enhanced U-values for historic windows without having to materially alter the mullions of the historic sash into which it is being fitted, as would be required in the case of insulated glass (U-values are a rating of energy efficiency; the lower the U-value, the better the rating). According to an article in the *Journal of Preservation Technology* (36:4, 2005), "Historic glass may be laminated, offering energy and noise benefits while maintaining an authentic finish. Laminated glass is far easier and less expensive to procure and install and allows for field cutting." The article also mentions that a variety of features, including UV protection, polarization, translucency, etc. can be incorporated as layers within laminated

glass. I have not spoken to anybody who has worked with laminated glass, but it seems well worth considering.

Finally, there is the relatively new concept of conservation of embodied energy. The materials used in many replacement windows, such as aluminum, vinyl and new glass possess levels of embodied energy that are extremely high compared to other building materials. In addition, there are environmental costs associated with these materials: manufacturing vinyl and PVC produces toxic by-products. Restoring historic windows reduces environmental costs by eliminating the need for removal and disposal of existing units, as well as the manufacture and transportation of new units. Preserving historic windows not only conserves their embodied energy, it also eliminates the need to spend additional energy on replacement windows.

Convection, conduction, embodied energy—there are many pieces to the energy puzzle, each significant in its own right. Furthermore, energy decisions ought to take into account the idea of sustainability. Environmentally responsible choices include the whole gamut of associated costs and effects. There are also many points of view when it comes to replacing versus restoring historic windows. From an esthetic point of view, retrofitting historic buildings with modern replacement windows can result in a mechanical, contrived, or sterile appearance. Worse, when historic windows are replaced, authenticity is lost forever. From an energy point of view, there is an unfortunate lack of cost-comparative analyses between a replacement window and its restored, authentic counterpart. But field experience suggests that restoration is on a par, cost-wise, with a middle-of-the-road replacement. Again, from the *Journal of Preservation Technology*, "Cheap replacement windows will always exist to superficially counter the cost-basis argument for restoration; [however], high-quality equivalent replacement units have been shown in practice to cost as much as three times that of restoration." The answer is not as simplistic as some would lead us to believe.

Historic District Design Guidelines Outreach

by Neil Poulsen

Over the past several months, the Forest Grove Landmarks Board has been preparing Design Guidelines as a resource to aid Forest Grove residents in restoring historic homes.

Part of the outreach phase of their adoption, the guidelines recently received a well-informed and thorough review at B.J.'s Coffee house by Forest Grove historic homes veterans Terry Harris, Cheryl Hunter, Mary Jo Morelli, and Carol Drew. This review was also attended by the author. Two hours of active discussion resulted in a much improved document.

The guidelines themselves are simply stated.

A. Maintain the architectural design, pattern and details of the original construction and site.

B. Maintain the original materials of the building(s) and their construction.

C. Maintain the original colors, or use colors that are consistent with the architectural concepts of the building(s) and site.

D. Adopt landscaping and grounds characteristics that are consistent with the architecture of the building and site.

E. Avoid new construction or additions to the site, or include them in a way that they aren't visible from the street.

Guidelines, Cont.

Onward and forward! Prior to actual adoption, the guidelines document is in it's final review by the Forest Grove Landmarks Board. When completed, the guidelines will be presented to the Forest Grove City Council for final approval.

Begun as part of the Clark Historic District project, and later generalized for all Forest Grove historic districts, the Historic District Design Guidelines will be an excellent resource for Forest Grove's restoration community.

The Forest Grove Historic Landmarks Board

Jon Stagnitti (chair)	503-357-6369	jonstagnitti@johnlscott.com
George Cushing (secretary)	503-357-3389	greenacres2@verizon.net
Claude Romig	503-359-1886	kalekop@comcast.net
Cindy Kistler	503-359-9148	scrhk@msn.com
Margie Waltz-Actor	503-357-2770	clay.margie@verizon.net
Kevin Kamberg	503-357-8736	kevin@preemptivekarma
Neil Poulsen	503-359-7812	neil.fg@comcast.net

Preserving Forest Grove is a quarterly newsletter published by the Forest Grove Historic Landmarks Board to help fulfill its duty of public education regarding the preservation of cultural resources. If you would like to be on the mailing list, please call James Reitz at 503-992-3233, or jreitz@forestgrove-or.gov.

Historic Landmarks Board
City of Forest Grove
PO Box 326
Forest Grove, OR 97116

In this issue: