

Comparative Study of the Cumulative Energy Use of Historical Versus Contemporary Windows

Abstract

Owners of historical homes often wonder if they should keep their cherished windows or replace them with contemporary windows employing new technologies promising significant conservation of energy. While published studies have analyzed the thermal performance of new and old windows, as well as the embodied energy of new windows, no study has compared in detail the cumulative energy use of a new window from birth with the cumulative energy use of an old window, including maintenance, over a prolonged time, e.g., multiple decades, using meaningful accounting methods. We propose to create a new algorithm to compute the cumulative energy use of any window.

Our algorithm will permit a comparison of any two windows over any period of time using any assumptions the user wishes to make about embodied energy, installation cost, energy costs, initial thermal performance, decay in thermal performance, maintenance, warranties, and replacement. All elements, from energy to labor and replacement parts, will be converted to dollars of the current year. Present value accounting will be used to discount dollars in the out years. The discount rate for money and the assumed escalation in energy prices will be adjustable parameters.

We shall run one comparison as an illustration: in the New England climate, a well maintained double-hung historical window with a storm unit versus a double-hung vinyl replacement window (brand and model to be determined). We expect the result will be counter-intuitive for a number of reasons, including the time value of money.