THE IMPORTANCE OF AIR INFILTRATION TO WINDOW PERFORMANCE

It is a known fact that even moderate air leakage can increase BTU loss in an average home. There is even a formula to quantify it: Air leakage (cu.ft. /hr) times the temperature difference between outside and inside (ΔT) x .018 = BTU/hr. A small difference of 1 cu.ft./hr on a day where the temperature is 30˚ F outside and 70˚ F inside can impact home heating loads by over 60 BTU/hr. Multiply that by a full day and multiple window and door products and there is a significant impact when windows and doors leak.

Presumed airtight windows have been installed for years (especially in retrofit applications) using methods that are unable to restrict air infiltration around the window to levels attained by the windows themselves. AWDI has found that this is the root of the complaints consumers often raise about feeling "drafts" when new windows have been installed. Blower door testing of homes also confirm the air leakage around windows.

AWDI tested two methods of installation for thermal properties and air leakage. Following recognized ASTM testing procedures, windows were installed fully exposing gap between the window and the frame to which they were fastened and subjected to air leakage testing. The results clearly show significant air leakage occurs from the gap that can reduce the effective thermal performance of the installed window up to 50%.

This shows that a consumer can purchase an R-5 window, but using industry accepted installation methods could render the installed R-Value to below 3, or worse.

The results show a marked difference. When present industry accepted installation procedures are used, the advantages of using high performance windows can be lost. The net effect might be no better than installing a single pane window. As tested, inclusion of air leakage in the calculations is shown to reduce the effective, in service R-Value of the window installed by industry accepted standards, by nearly 75%.

Extrapolation of these results, substituting a window with a U-Value of .30, presently accepted replacement installation methods would yield an effective, in service R-Value of 1.06 (U-value of .95), while the use of the multi function foam sealing tape would produce an effective in-service R-Value of 3.5 (U-Value .28).

These results were for the overall, installed product, and show how the performance of the small percentage of installation gap can degrade the overall performance significantly where there is air leakage. What has been quantified is why homes where replacement windows have been installed still leak air and why consumers report in large numbers "…still feeling drafts" from recently replaced windows.

This lab verified performance demonstrates the effect air infiltration from the installation has a bigger impact on energy consumption than air leakage from the windows, themselves. It also demonstrates the need for air leakage evaluation of present installation methods, and should be included in demonstrated benefits for replacement window sales.

For more information, contact AWDI at info@awdi.com