On Shade Screens

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It is obvious to anyone on a jobsite in Phoenix this time of year that that the best place to have a meeting is in the shade. The sun in the Valley can bludgeon us when it is hitting us directly and the same holds true for windows. Shade screens dramatically reduce the solar heat gain and glare through a window and in turn decrease cooling costs and enhance comfort. The conclusion I've drawn based on my research is that shade screens on clear windows in the desert, with the exception of fully shaded windows, are a no brainer.

Advanced Insulation is now offering shade screens because we want to have a greater impact on reducing a home's cooling load. Once Advanced Insulation establishes a guaranteed R-value in the attic of R-30 or R-38, the sensible heat gain through the ceiling averages only about 6% to 10% of the total heat gain on a house. Quality insulation is just one part of the solution to reducing a home's cooling load and now we offer another – shade screens.

Placing solar control over clear dual pane windows has the similar impact on energy efficiency that putting insulation over bare sheetrock has in the attic. As I have said in this column before, five percent missing insulation in an attic drops the overall R-value of the insulation 52%. Placing sunscreens over clear dual pane windows on the east or west side of a house reduces the heat gain by 53%. What both strategies have in common is that they provide huge reductions in heat gain without big sticker prices.

Windows that do not incorporate some kind of solar control strategy can have a profound impact on a home's total cooling load. When a house is insulated correctly and the duct system has minimal leakage, unwanted solar heat gain can account for 40% - 50% the workload placed on your air conditioning system. According to the Shade Screens and Window Treatments flyer on the APS website, "you could reduce the size of your air conditioning unit by ½ to 1 ton with properly applied window shading techniques."

In evaluating solar control strategies and the impact of solar gain on AC loads it is important to understand the two key definitions. The first is the shading coefficient or solar heat gain coefficient. These two terms measure how well a window blocks heat from sunlight (*I've opted to shading coefficient because this is the term my version of*

Manual J uses). The shading coefficient is expressed as a number between 1 and 0. The shading coefficient of a single pane of clear glass is 1. The lower the shading coefficient the less solar heat a window transmits.

In the desert as a measure of performance the shading coefficient of window is as important as the R-value, if not more. Direct solar radiation can overwhelm conduction and that is why the shading coefficient is so important. A standard dual pane window has a shading coefficient of 0.87. A 90% shade screen can reduce the shading coefficient to approximately 0.15. This drop in the shading coefficient has a huge bearing on the air conditioning load on a house or a room, as demonstrated by the next performance indicator.

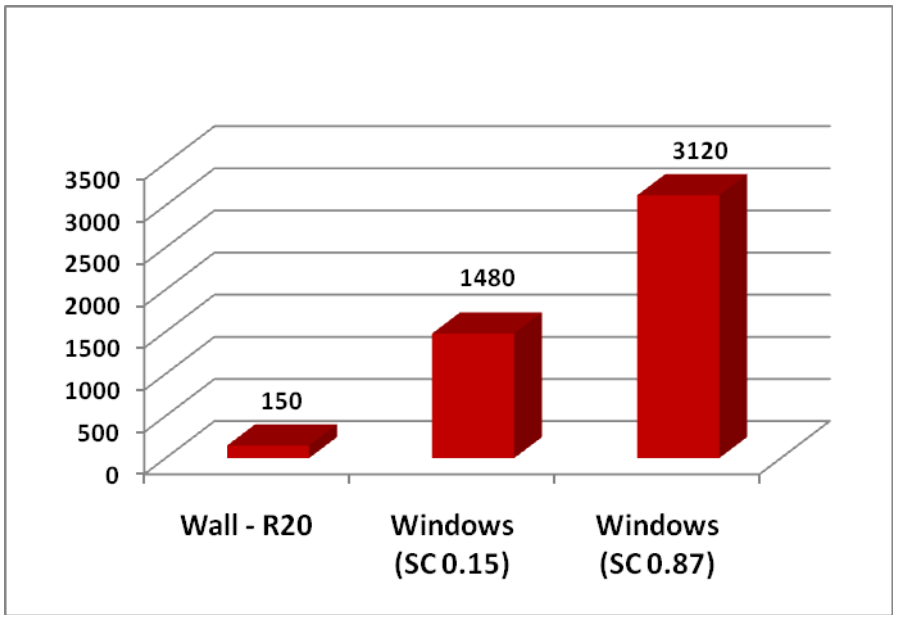
The second key concept most HVAC contractors will be familiar with is the heat transfer multiplier (HTM). The HTM comes right out of Manual J Residential Load Calculation. The HTM for a window takes into account the U-value of the glazing and frame as well as the amount of solar radiation that flows through the window. The HTM for an East or West is 78. The HTMs for all windows with the exception of windows that face directly north or that are fully shaded are quite high, which means there are big opportunities for load reductions on all windows.

Solar control can also reduce the peak load on room that proves difficult to cool. Most HVAC contractors have had jobs in which one room was overwhelmed by the sun and that room's load wasn't registering with the thermostat down the hallway. These peaks occur during the month and time of day when the maximum amount of sunlight is flowing through a window. Even putting another supply duct into the room often doesn't mitigate the comfort problem to the customer's satisfaction. One potent and often undervalued strategy to this problem is reducing the heat gain with shade screens.

Bear with me for a moment as I delve into a little math to drive home my point. Picture a customer who has an uncomfortable room with an exterior wall that faces directly to the west. The wall is fourteen feet long and ten feet high and it has two 4O x 5O windows that face the west. The wall has an area of is 100 square feet, R-value is 20 and an HTM of 1.5. You could argue that the exterior temperature of the wall could be 150˚F and this would increase the HTM to 3.5 which is almost inconsequential when compared to the windows.

The heat gain through the windows is entirely different story. The wall gains 150 Btus in an hour when it is 107˚F outside. The two windows have a total area of 40 square, shading coefficient of 0.87 and an HTM of 78. The total load from the two

windows is 3120 Btus in an hour when it is 107˚F outside. The total load through this wall not including infiltration is 3270 Btus. The heat gain through the windows accounts for 95% of the heat gain through the wall.



Breakdown of Heat gain through west facing wall

Now if we were to put two 90% sun screens over the windows the dynamics of the room changes significantly. The HTM for the windows drops to 37. The total heat gain through the windows is now 1480 Btus in an hour, not 3160 Btus. Two other benefits occur as well, the temperature in the room drops and the glare are reduced. The heat gain has been reduced by 53% by two shade screens that would cost approximately $200 installed.

Imagine what the cost of window replacement would be versus the solar screens. Sun screens are a simple fix compared to replacing a window. According to the Consumer Guide to Home Energy Savings, "although new windows are great, they can be expensive, and they rarely pay back their cost quickly enough to be a good investment on energy savings." P. 31 If the windows were single pane the HTM would be 99 and the conduction begins to get high enough where window replacement becomes a much more serious option. *Expect an article on low-e windows and window replacements in the near future.*

The payback period of sunscreens can be very quick. According to SRP, "shaded windows can save up to 25% of the cost of air conditioning, when compared to un-shaded windows." SRP states that in a typical 2000 square foot home that the average summer savings during summer months is $275. A 1988 study titled, Effect

of Shading Devices on Residential Energy Use in Austin Texas, "the annual energy cost savings for the top strategy (solar screens with the best properties) range from 10 to 14%."

My experience with sun screens at our Glendale location has been surprising. We just placed 80% and 90% shade screens on different low-e windows on our office. The first benefit is that we now keep the interior blinds open because the glare is reduced so dramatically. Now that the blinds are open we can now see out to our yard, which is helpful. The view through both the 80% and 90% screens is fine. According to our fabric supplier visible light is diminished by 15% to 40% depending on which fabric is selected. We now use less overhead lighting because of the amount of visible light is manageable and not overwhelming, which further reduces our utility bill.

Controlling glare is underrated. Too much sunlight in the summer can overwhelm a room. Homeowners will capitulate and just leave the blinds closed, which results in a lost connection to the outdoors. In some Valley homes you get a claustrophobic feeling because it is hard to see the outdoors. The shade screens knock down the glare and cool the frame and glazing which reduces the mean radiant temperature making the room much more livable.

It is also important to note that the internal blinds at our Glendale office are not nearly as effective as the shade screens "According to the U.S. Department of Housing and Urban development, stopping the heat before it penetrates windows and sliding glass doors is up to seven times more effective than using interior blinds or curtains." APS website The infrared scans we perform during audits supports this claim. One can see internal blinds glowing with heat through the infrared camera.

Advanced Insulation is now installing shade screens because we know they work. The proof can be found in Manual J as well as on APS and SRP's web sites. As I said in the introduction - shade screens are a no brainer in the Phoenix Metropolitan marketplace.

For further information on shade screens and insulation you can visit our web site www.advancedinsulationinc.com or call Advanced Insulation at 928-445-3828 and ask to speak me.