The Effect of Reflected Sunlight from Low-e and other Double Paned Window Glass on Vinyl Siding

OVERVIEW

Glass in double paned windows may on occasion slightly warp or deflect due to a difference in barometric pressure between the interior of the glass panes and the outside air pressure. This can create a concavity in the glass. Such a concavity is a normal response to pressure differences, does not affect the performance of the window, and does not constitute a defective window condition. However, the concavity may focus sunlight reflected from the window in a fashion similar to the effect seen when light passes through a magnifying glass. The heat generated by the focused reflected sunlight has proven sufficient to visibly damage and distort vinyl siding on nearby houses. Any double paned window may cause this effect, but double paned low-e windows have a higher reflectivity quotient which can exacerbate the reflected light/vinyl distortion phenomenon.

VINYL SIDING

The Vinyl Siding Institute (VSI) states that temperature ranges beginning at 160-165 degrees Fahrenheit can soften normal grades of vinyl siding. Darker colors absorb more heat, and will soften before lighter colors of siding. Heat generated from double paned low-e window reflected sunlight has been measured in excess of 200 degrees Fahrenheit, more than sufficient to soften and distort any normal grade or color of vinyl siding. There have been some reports of reflected sunlight damage to materials other than vinyl siding. Occasional wood discoloration and charring, and damage to paint and other plastics (e.g., decking, window lineals, trim), have all been reported.

REFLECTED SUNLIGHT EFFECT

The use of double paned low-e windows will not necessarily result in any damaging reflected sunlight incident. A combination of contributing factors must be present before the effect occurs or causes damage to any nearby materials, including vinyl siding. The presence of the concavity in the double glass panes (resulting in the magnifying glass effect with a focused light beam) appears to be the primary cause of the heat generation, more so than the mere increased reflectivity of the low-e window. The angle of the sun is also a factor. A low angle

of sunlight (such as might occur in late fall, winter, or early spring) is more likely to produce the effect. Other factors, such as proximity to the adjoining house, wind speed, air temperature, and the presence of buffering foliage are all said to have an impact on whether a damaging reflected sunlight effect does in fact occur.

RANGE and EXTENT of OBSERVED EFFECT

Distortion to vinyl siding from reflected sunlight has been reported in all geographic regions where vinyl siding is used. First reported in the late 1990's, observed incidents have risen proportionally with an increase in the use of low-e windows in residential construction. While the exact number of reflected sunlight damage incidents is unknown, this effect has been observed in Minnesota, Illinois, New Jersey, Maryland, Virginia, North and South Carolina, and Georgia. There are fewer reports of reflected sunlight distortion in areas such as Florida and Texas where vinyl siding is less frequently used, and fewer reports from Western states where there is a manufacturing requirement for the use of capillary tubes in double paned window construction. There are also fewer incident reports from areas where fresh air ventilation is more commonly used than air conditioning, apparently due to the diffusing presence of window screens.

REMEDIATION EFFORTS – Just replacing damaged vinyl siding is not a permanent solution since the atmospheric conditions resulting in the reflected sunlight damage effect can reoccur. Suggestions for remediation include placing a screen over the window to diffuse the reflected light, or blocking the reflected sunlight by hanging an awning over the window or by planting intervening trees and shrubs. However, if the homeowners with the reflecting windows are uncooperative, or the side yard lacks a suitable space for planting shrubs and trees, these suggestions could be difficult to implement. Replacing damaged vinyl siding with another exterior cladding or with a different grade or type of vinyl siding are also suggested as solutions, but expense becomes a factor with this course of action, and potentially mismatched colors or textures in replacement cladding might pose aesthetic objections as well. Replacing low-e windows with clear glass windows has been suggested as a remedy, but depending on the

jurisdiction, low-e coated windows might be mandated by the local building code (making the use of clear glass illegal). Also, since a concavity present in any double paned window (even without the enhanced reflectivity of the low-e glass) could still cause a reflected sunlight damage effect, just using double paned clear glass might not be effective.

CAPILLARY TUBES - Another suggestion for avoiding the reflected sunlight damage effect involves the use of double paned windows equipped with capillary tubes installed during the window manufacturing process. The capillary tube connects the interior space between the window panes to the outside air, permitting a gradual equalization of barometric pressure, and thereby lessening the possibility that a concavity will develop in the glass. Without the concavity in the glass, reflected sunlight is unfocused, its intensity is diminished, less heat is generated, and there is less likelihood that nearby vinyl siding will become distorted.

In the mountainous Western States, capillary tubes for double paned windows are mandated in houses located at greater than 5000 feet in altitude. The tubes are required because the reduced outside air pressure found at high altitudes can result in distorted or cracked window glass. There are few reports of reflected sunlight damage to vinyl siding in the Western States. Capillary tubes in low-e windows may be the reason why. As evidence, there was a reported incident of vinyl siding distortion damage in the Tacoma, Washington area (elevation below 5000 feet). The builder replaced the original double paned windows (not equipped with capillary tubes) with windows that were equipped with capillary tubes. After replacement, there has been no reported reoccurrence of vinyl distortion from reflected sunlight.

Low-e windows supplied east of the Mississippi do not as a practice come equipped with capillary tubes, but builders can request tube equipped windows from the manufacturer. The additional cost of tube equipped windows is said to be nominal, from $0 to $1.00 per window.

ARGON/KRYPTON LOW-E WINDOWS

There are different types of low-e windows available in specific climate zones. Low-e windows with high solar heat gain coefficients and low conductivity are preferred for northern climates where passive solar heating is advantageous. In order to retain the passive solar heat in the home, a dense, low conductivity gas (commonly argon or krypton) fills the area between the sealed glass panes. The presence of a capillary tube in a low-e window would allow this gas to immediately escape. So, if the local building code requires argon or krypton gas filled low-e windows, a capillary tube solution to the reflected sunlight damage effect is not an option.

But, in more southern climates where summer cooling is an important consideration, low-e windows with low heat gain coefficients (reflecting solar energy outward) are favored, with less need for a conductivity barrier. These low-e windows often have air, rather than argon or krypton gas, between the panes, and are not affected by the presence of capillary tubes.

DOUBLE STRENGTH GLASS

Double paned windows are normally manufactured with single strength glass 3/32" thick. Double strength glass 1/8" thick is also commonly produced by glass manufacturers, but not routinely used for windows. Double strength glass keeps a flatter surface, and is less subject to deflection. That would lessen the possibility that a concavity will occur in the glass panes, and lessen the chance that reflected sunlight will be focused and cause damage to nearby vinyl siding. Reportedly, there is very little cost difference involved in manufacturing windows with the thicker glass.

HEAT RESISTANT VINYL SIDING

The Lubrizol Corporation and the Kaneka Texas Corporation each manufactures a CPVC product for use in vinyl siding. CPVC siding is said to withstand heat ranges of 185 to 220 degrees Fahrenheit (normal grade vinyl siding begins to distort at 160 – 165 degrees). The cost of CPVC siding is currently several times that of regular siding.

The Vinyl Siding Institute reports that other chemical companies and vinyl siding manufacturers are actively exploring/developing heat resistant vinyl siding products, but these are not yet in production.

LIABILITY

To date, there has been no reported litigation concerning damage caused to vinyl siding by sunlight reflected off low-e or other double paned windows. Home owners with distorted vinyl siding routinely make warranty claims against their builders, the siding supplier, and the manufacturer.

CONCLUSION

For more information about vinyl siding, visit the Vinyl Siding Institute (VSI)web site at http://www.vinylsiding.org

For more information about capillary tubes and double strength glass, contact your window manufacturer.

For more information on CPVC heat resistant vinyl siding, visit the web sites of the Lubrizol Corporation http://www.lubrizol.com , or the Kaneka Texas Corporation http://www.kanekatexas.com

For more information on the issue of reflected sunlight distortion to vinyl siding, contact David Crump, NAHB Director of Legal Research at 800-368-5242 x 8491, or at dcrump@nahb.org

This document is not a substitute for considered professional advice. If specific legal advice or professional assistance is required, the services of a qualified professional should be sought.