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Condensation on Windows

Condensation on windows spells trouble—and not just for the windows.

A BUILDER IN THE CHICAGO AREA ASKS: “I have customers who complain about condensation forming on double-pane windows, and they claim the problem is with the windows. Is the window at fault or is there another reason?”

Steve responds: Windows do not cause condensation; high humidity does. Understanding how condensation forms on windows will inform how we correct the problem.

Causes of condensation. Moisture vapor in the air tends to condense on cold surfaces in a home where the air reaches its dew point. This is common when there is great difference between inside and outside temperatures and when the relative humidity of the warm side is high. Glass is generally colder in winter due to the fact that windows typically have lower R-values than the rest of the building envelope.

Chronic condensation can create a significant moisture problem that leads first to peeling paint, then to mildew and mold, and eventually to rot. Keep in mind that condensation on windows is not just an inconvenience to the person who is looking through the glass. If condensation is frequently forming on the glass, it’s likely to be forming inside walls where there are pockets of poor insulation (and where air leaks are bringing warm moist air into contact with cold surfaces).

Solutions to the problem. In winter, don’t over-humidify homes. The first sign of over-humidification is condensation on double-pane windows. Second, ventilate. We always control moisture at

the source so make sure customers properly use bathroom and kitchen exhaust fans to remove excess moisture. If the relative humidity is greater than 50% under cold conditions, condensation may be inevitable. The first line of attack should always be to examine the humidity conditions in the home. Keeping humidity levels as low as possible in very cold weather is the first, best strategy, but it is not the only cure. It is also important to select high performance windows. These windows are better insulators and have warmer surfaces that are less likely to create conditions for condensation.

Window options. Advising customers to switch from a double-pane to a double-pane low-e window will often solve the problem. It’s not uncommon to see condensation on single-pane windows, even in normal humidity conditions.

Investing in a window that uses warm-edge technologies to reduce con-

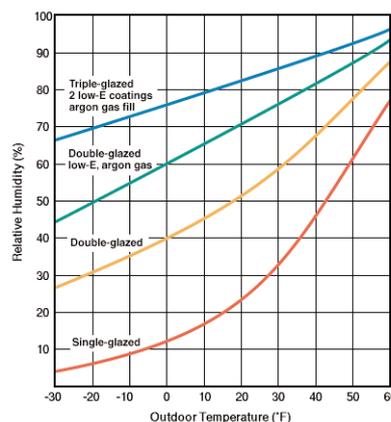
duction at the edges of insulated glass units also makes sense. These technologies keep the window edges warm and reduce the chances for condensation to form. Windows with an argon or krypton gas fill provide a little better insulation value and reduce convection between the panels. These gasses further reduce the potential for condensation.

The graph (shown) helps to explain when condensation will occur, depending on the type of window. The left axis shows indoor “Relative Humidity (%)” from zero to 100%. Across the bottom of the graph, the outdoor temperature ranges from 30°F to 60°F. This graph shows when we’ll likely get condensation on window glass for the four windows plotted. So, for example, looking at the single-pane glass (the red curve on the bottom) and an average winter outdoor temperature of 30°F, we’ll get condensation on the window when it’s only 32% RH inside. That’s pretty low indoor humidity. To solve this condensation problem, simply switching to double-pane windows will do the trick. Also note that even at 0° outside, a low-e, argon window will not get condensation until the indoor relative humidity is about 60%.

I always recommend windows with a minimum NFRC label U factor of .4 or lower (see www.nfrc.org). U factor is a rating of how much heat a window conducts. Some manufacturers are including a condensation resistance factor. This is a rating between 1 and 100. The higher the number the better the window resists condensation. ■

Have a question to ASK THE EXPERT? Send it to expert@lbmjournal.com.

STEVE EASLEY, president of Building Media, a company that offers consulting and training on building science issues, has more than 30 years of hands-on industry experience. Easley’s seminars show builders how to design and build homes that are comfortable, healthy, moisture-resistant and durable. To see educational videos on these topics, click on “Projects” at www.buildingmedia.com.



Source: Lawrence Berkeley National Laboratory. Available online at the Efficient Windows Collaborative, www.efficientwindows.org/condensation.cfm.