Is Condensate or Ice that Forms on Windows in the Extreme Cold a Problem?

I have a client that has concerns about their windows in their townhouse icing up and they feel a draft from their relatively new windows as experienced over this past very cold week-end (Feb 3-5th, 2023). A photo of their concern is shown. Here was my response;

"You have double glazed regular performance windows. They will perform this way in the extreme cold (allow condensation and that turns to ice). If the condensate (when the ice melts) isn't an issue (i.e. damages drywall or other materials or generates mold) you have these options;

- Wipe up the water regularly to avoid staining (assumes there are no other issues like water infiltration into the wall assembly and/or mold growth).
- Lowering the indoor humidity will reduce but not eliminate the problem. This unfortunately is the time you want humidity and they're opposing forces (i.e. the colder it is you'll have more condensate issues but you'll also want humidity to counteract the "dry" air comfort issues).
- Replace your windows with high performance triple glazed windows.

The Building Science Trust Inc.
888 Meadowlands Dr., P.O. Box 38071,
Ottawa, ON, K2C 3Y7
telephone: 613.981.2612
www.buildingsciencetrust.com

Condensate occurs when there are relative humidity levels above 25 %, the outdoor temperature is below -25 C and the window frames have lower R values (less than R 1.0). ASHRAE (American Society of Heating Refrigeration and Air Conditioning Engineers) recommends a minimum of 30% relative humidity in the winter, the temperature in the Ottawa area will drop below -25 every winter, so these can't change but we can install highly insulting frames and windows. Note that I don't recommend this except at the end of life of windows and your windows have a long remaining life. It is not recommended because the condensate is typically a minor issue, replacement windows are very expensive and the energy savings do not justify early retirement of the windows from a financial or carbon reduction point of view.

- Alternatively, use the window insulation kits until you're ready to replace the windows. These typically add R 1.0 to the window assembly. They are a bit of labour to install each year and have sub-optimal visual qualities but provide an alternative to expensive window replacements and lower the annual energy consumption of the house.

- Sealing of your relatively new windows might not be an issue. The windows may be sealed well enough. You may be experiencing a natural draft caused by air cooling over the window and dropping due to buoyancy. This air movement is due to convection and not poorly sealed windows. In effect the air cools over the window drops in front of the window and when you stand or sit near the window you feel a breeze. The solution is to replace the windows with high performance triple glazed windows (again very expensive) or live with the issue. High performance windows are about $110/square foot of window area. You have nearly $30,000 of window replacement costs if this were a critical issue for you. A less costly way to mitigate the issue is to add insulating blinds or curtains to lower the comfort issues but these will increase the condensate and ice issues. Also you can confirm if the windows are leaking (significant air infiltration) during a blower door test offered by an Energy Advisor. Just have him/her check air leakage before the test and during the test to see if the leakage increases during the test (sealed windows that just have a convection problem do not change in leakage during the blower door test). In your case do this test when the EA returns for the follow up tests to confirm your energy improvement upgrades.

Bottom line is that like many other building components windows are a compromise between costs, performance, waste, environmental concerns etc. Given all these you likely have windows that are adequate for your needs, just regularly wipe up the condensate.

Yours very truly,

Building Science Trust

Dan Vivian, P.Eng, REA
Principal

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