



CONDO WINDOWS: REPAIR OR REPLACE? A when-to guide for boards and managers

Imagine you are driving an older car and the engine light comes on. You may wonder how much it will cost to fix it. You may also wonder if it is worth fixing. Are you throwing good money after bad? Like cars, windows also wear out and become obsolete over time. Although windows do not have a specific expiration date, they do have a finite effective service life.

How long windows will last—provide acceptable performance, for instance—will depend on the original design and the skill of the original fabricators and installers. Were the original windows Toyotas or were they Yugos?

For buildings built in the 1980's or 1990's, there is likely a window project coming up in the reserve fund study. Not only is the project a large expense, but the work will be very disruptive to every single owner in the building. As such, it is important to understand whether repairing the existing windows is a potential option, either as a stopgap to get to replacement, or as a feasible medium or longer-term solution.

FUNCTION

A definition of a window is an opening in the wall of a building that is fitted with glass or other transparent material in a frame to admit light or air and allow people to see out. Windows must also be adequate in the following categories:

- Structural: Must not fall out of the building or break in the wind.
- Water penetration: Must not leak water.
- Air penetration: Must not leak conditioned air and odours.
- Condensation: Must not be so thermally inefficient that condensation occurs on the interior.
- Energy conservation: Must not leak too much heating or cooling energy.
- Overheating: Should not overheat the space.
- Safety: You should not fall out of the building if you lean on the glass.
- Comfort: You should be able to sit next to the window on a cold day.
- Acoustics: It would be great if it did not sound as if you were outside.
- Durability: Must last a long time.

The above performance requirements are generally outlined in the Ontario Building Code, the "A440 NAFS" 2 windows standard, and the Ontario Supplementary Bulletins SB-10 and SB 123. Much of the performance criteria (structural, water penetration, air penetration) of the window system is covered by the NAFS standard which is a testing-based standard.

Windows are sent to a laboratory for third party independent verification of their performance levels. This generally involves hooking the windows up to a giant supercharged vacuum cleaner to see how much water or air can be pulled through them, or if the frames deflect too much. It should be noted that the resulting ratings that are used to sell thousands of windows are based on a single test. As such, site testing to confirm the installed performance is often recommended (although not required by building code).

A note on durability and planning for the future: The durability of the window may

have a greater impact on the long-term value than the purchase price. Many older windows need replacement because they have become too difficult to operate or because they have become leaky over time. Surprisingly, there is only one durability test⁴ for new windows in the NAFS standard and it is only required for the AW Performance Class of operable windows (most windows won't be tested for durability).

NEW IS BETTER, RIGHT?

Reasons for replacement may include leaks, condensation, fogged insulated units, overheating, and aesthetics, to name a few.

It is logical that the new windows will be superior to the existing old windows. There have been many advances in window technologies including new frame materials, new thermal break materials, high performance low emissivity coatings, and high performance glass spacers. Many of these advances lead to improved energy performance, which is being driven by ongoing building code updates. Window USI values (thermal transmittance $W/(m^2 \cdot K)$) have come down from 7.2 (Single glazed) to 2.3 (Double glazed low e) to 1.2 (Double glazed high performance) to 0.85 (Triple glazed passive house).

However, building permits are not required for most window replacement projects and many of the advanced technologies cost more money than standard products available on the market (which may have the same technology as the existing windows to be replaced). Building Owners will have to make educated choices about how much to invest in windows and when. Because the replacement is so intrusive, service life so long, and so much of the cost related to access and finishes, the best value approach may be to purchase windows on the higher end of the performance scale. It's as if you could get the Lexus for a bit more than the Toyota; they have the same maintenance costs, and you plan to drive it for 40+ years.

In terms of planning for the future, it is likely that triple glazed windows will likely become the norm in the next decade. As such, it is worth considering going above current code minimum so that the windows (and the building) do not become out of date shortly after the replacement work. In other words, why replace a double glazed window with a double glazed window?

REPAIRS

Window repairs can improve performance, particularly in regards to air and water leakage, but the improvements for operable windows often have a ceiling based on their original construction.

In regards to the effective service life of windows, it must be noted that aluminum, the primary material in many window frames, generally does not corrode or degrade with time. Rather, it is typically the sealing materials at the aluminum joints and operable windows that can degrade. The seals at the framing joints can be addressed by adding exterior sealant to the window frame, but repairing the operable windows may not be so easy.

Horizontal sliding windows are a very common operable window type and their strength lies in their simplicity. With no gears or hidden hardware, they can be easily repaired by replacing the weather-stripping at the sashes. Replacing the weather seals and weather-stripping has resulted in some retrofit windows achieving water penetration resistances of 200 Pascals or 300 Pascals (B2 or B3 under the old CSA A440), which may meet the current building code requirements depending on the building height. However, some buildings have very large sliding window sashes which have become difficult to operate. In those scenarios, which may be due to the frame bending or the sash not being square, repair may not be possible.

Newer windows are generally more energy efficient (lower thermal transmission). The main improvements are in the new glass (low emissivity coatings and high performance spacers) and the installation detail (insulation at the window perimeter). However, many window replacements are completed without improving the installation perimeter details and with mediocre low-e coatings. In those cases, value is lower as most of the cost has occurred, but not all of the gain. Greater value could have been achieved by investing in repairing the existing windows if the new windows would be only average.

Another repair option involves replacing the glass within the existing window frame. This may be considered where the existing frame is providing adequate performance—thermally broken, no leaks, for example. Changing from clear glass to a high performance low-e glass would substantially improve interior occupant comfort with much less cost and interior impact than full window replacement.

For all repair options, mock-ups and performance testing are necessary to determine the level of improvement that can reasonably be expected. Windows are a long term investment that can significantly impact occupant comfort and pride of ownership. When considering replacement, the best long-term value is likely in the highest performing and most durable products.

Repairing windows can be an appropriate strategy to improve performance, extend service life, and maximize return on investment. Engineering study and testing can identify the potential gains, inform good decision-making and result in greater value and confidence for the ownership. When that engine light flashes, just know that there are options.

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