WINDOWS: REPLACE, REPAIR OR RENEW?

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Given the significant improvements in window technology over the past decade, deciding whether to replace, repair or renew windows can be as difficult as deciding whether to replace or repair an aging car engine or opt for a brand new vehicle.

As with the car analogy, there are a number of factors to consider when deciding the fate of aging windows. This includes comfort, energy utilization, acoustics, aesthetics and function.

Energy and Comfort

Discomfort associated with old or poorly functioning windows is a common complaint among building owners, managers and tenants. Windows that allow too much heat inside during summer months or are cold and drafty in winter not only beget discomfort but waste energy.

Poor performing windows can be replaced completely or, alternatively, existing glazing units (glass without a frame) can be replaced to improve the overall performance of the window unit. With advancements in technology, glazing units and frames are more thermally efficient and comfortable today.

Upgrading single-glazed to dual or even triple-glazed insulating glass units (IGUs) and more thermally efficient window frames can improve both comfort and energy use.

Low-conductivity window frames, such as fibreglass, wood or vinyl, are 25 to 50 per cent more thermally efficient than typical thermally broken aluminum frames. Where aluminum frame windows are required in non-combustible construction, high-performance frames with large thermal breaks are recommended; however, not all thermally broken aluminum frames are created equal.

Low-emissivity (low-E) coatings can improve the insulating value of an IGU by up to 70 per cent over clear glass units. Low-E coatings reduce heat loss through the IGU in winter and the amount of solar heat gain in summer. Low-E coatings also reduce fading of interior finishes and furnishings.

Tinted glass can be used to further reduce solar heat gain by blocking solar transmission. Commonly used in commercial buildings to reduce cooling loads year-round, tinted glass is becoming increasingly popular in residential highrises to minimize overheating during summer months where air conditioning systems are not present.

Inert gas fills, such as argon or krypton, can further improve the insulating value of an IGU and reduce heat loss by 25 to 40 per cent. Argon is a relatively low-cost upgrade, which typically provides a return on its investment over the life of the IGU. While more expensive than argon, krypton allows for thinner double and triple IGUs where size is an issue.

IGU performance can also be improved by installing low-conductivity glass edge spacers. Stainless steel, fibreglass, silicone and plastic spacers offer thermal improvements over conventional aluminum. Edge of glass temperatures and energy loss through windows is improved with low-conductivity IGU spacers.

Upgrading old single-glazed or clear double-glazed aluminum windows to modern low-E, argon-filled double or triple-glazed windows will reduce monthly energy bills. But upgrading windows in the hopes they will effectively 'pay for themselves' is not often feasible during a 20 to 30-year service life, particularly in temperate climates such as coastal B.C.

However, if windows must be replaced, the additional incremental costs of small thermal improvements, such as low-E, argon and low-conductivity window frames, over a base window design will provide a reasonable payback in energy savings. Moreover, upgrading windows will enhance the building's aesthetic, improve internal comfort and, ultimately, enrich the tenant experience.

Acoustics

When it comes to windows, sound and acoustics are closely linked to comfort and air leakage. Put simply, the greater the air leakage through a window assembly, the greater the noise penetration. As a result, reducing air leakage has the added benefit of reducing noise penetration.

The secondary means of noise transfer is through the IGU itself. Unfortunately, techniques typically used to improve the thermal performance of IGUs, such as low-E coatings and gas fills, only minimally mitigate sound penetration. The most common way to reduce sound transmission is to use thicker glass, laminated glass or provide increased air space within the IGU. However, since the human ear becomes more sensitive to sound as the volume reduces, replacing IGUs solely to reduce sound penetration may not have any significant impact.

Aesthetics and Age

Window frame coatings and paint fade and chalk with age and will eventually deteriorate with exposure to weather and ultraviolet light. If the paint has deteriorated and there are no other problems, refinishing or repainting the window frames may be a viable option. However, repainting window frames on a highrise can be extremely expensive.

Operable hardware becomes loose with use and may break over time. Hardware and fasteners can be replaced or often adjusted to improve window operations. However, if regular maintenance and inspections are not performed, windows may break and fall from the building, posing a life safety risk to the public.

Regular cleaning and ongoing maintenance is required to keep windows and hardware in tip-top shape. When necessary, renew and repair gaskets and exterior sealants aged from ultraviolet exposure and weather. This will maintain the water shedding air-tightness properties of the windows.

Air Drafts and Leaks

Often, older window frames are susceptible to air leakage, which is not only uncomfortable but can contribute to significant heat loss in winter. While it is possible to repair drafty window frames by replacing gaskets or adding sealant around the glazing units, operable window units (vents) within older frames are difficult to repair, particularly horizontal sliders. These vents are often quite drafty as they rarely contain air-sealing gaskets and their metal-to-metal joints are not airtight. As a result, replacement may be the only effective option. Modern windows, with significantly reduced air leakage, will yield energy savings.

Fogging

The expected lifespan of an IGU (20 to 25 years) is dependent on the edge seal technology and service environment of the window.

Fogging is typical of premature IGU failure. On average, one per cent of all windows in a building may require replacement each year due to fogging, with this number increasing as the windows near the end of their service life.

Fogging occurs as water vapour condenses between the glass panes when the edge seal desiccant becomes saturated. The desiccant can become saturated prematurely due to manufacturer defects, voids in the edge seals or if the perimeter edge seals are exposed to water.

For IGUs containing a low-E coating, corrosion and spoiling of the coating can occur, which, consequently, reduces its thermal benefits. IGUs cannot be repaired if the interior of the glass panes is marred by water staining or low-E corrosion. Repairs to dry out clear, lightly fogged IGUs are advertised as low-cost, short term solutions, however, they do not address the cause of the initial fogging — the edge seal defects. Therefore, these "solutions" should only be considered temporary measures, improving visibility until new IGUs can be purchased.

Condensation and Frost

Condensation and frosting on interior surfaces of windows, particularly during winter months, is a function of building operating conditions, window properties (including frame type, glazing properties and glazing edge spacer) and interior and exterior temperatures. Condensation on window frames can be resolved by mechanical means (for example, through dehumidification or mechanical louvers that blow hot air over the windows) or making thermal improvements to the glazing, window frames and installation detailing. Condensation can also be reduced by opening curtains and blinds every day to increase airflow over the windows and occasionally opening windows to increase ventilation and lower indoor humidity.

If condensation or frost is severe and cannot be addressed using mechanical means, the windows may not be suitable for their intended purpose. In cases where condensation and frost is frequent, damaging or a nuisance, new high-performance windows are recommended.

Recycling Old Windows

Older windows removed from a building can be reused or recycled. Greater value is achieved through sale for reuse in other buildings, however, if windows cannot be reused, their components can be disassembled for recycling.

Old aluminum frames can be sold to scrap metal recyclers for 50 cents to $1 per pound. The selling price will depend on whether the thermal break has been removed and local demand. For a 30-storey highrise, this return may amount to more than $50,000.

Fibreglass, wood and vinyl window frames can be recycled into post-consumer and industrial filler and then used in new products.

Old glass is typically crushed and then landfilled as it has little value, however, it can be recycled if demand is high. ❖

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