

MULTIFAMILY PERFORMANCE PROGRAM

Technical Topic – Existing Buildings

Windows – Looking beyond Energy Star

Summary

- ◆ Infiltration, often the most important factor affecting energy use, is not a factor in qualifying Energy Star windows and is not noted on National Fenestration Rating Council labels.
- ◆ In addition to crack length and width, and design elements such as weatherstripping, infiltration is affected by deflection under structural and wind loads and by thermal expansion and contraction of the window unit.
- ◆ Easy operability is important to ensure that building occupants, particularly elderly people, are able to close windows securely. A window that will not latch is a leaky window.
- ◆ In buildings with overheated areas, tenants often use windows to regulate indoor temperatures. Unless the overheating is corrected, it is unreasonable to assume that the windows will remain closed during the heating season. Even with a balanced heating system and improved room temperature controls, tenants who have developed the habit of opening windows in winter may prefer opening windows to turning down the thermostat and may be hard to retrain.
- ◆ Residential grade windows are generally not appropriate for mid-rise and high-rise buildings because they are not designed to resist the structural and wind loads encountered in buildings over three stories tall. Generally, commercial or heavy commercial grade windows are required.
- ◆ Careful installation is essential to ensure that windows are secure against infiltration by wind and water. To ensure the desired performance, consider including language in the work scope that requires field testing of a sample of installed windows to confirm compliance with infiltration specifications before the remainder of the windows are installed.
- ◆ Frame material affects design, rigidity, and thermal expansion/contraction:
 - In low-rise buildings, vinyl-framed windows tend to be the low bid because the framing material lends itself to meeting U-value requirements. Windows with vinyl frames tend to expand and contract more than windows with other frame materials. To avoid excessive leakage in winter, consider requiring an infiltration rate more stringent than the NFRC and AAMA standards of 0.3 cfm/sf of window area at 75 pascals of pressure difference. One major installer specifies a maximum of 0.1 cfm/sf for vinyl-framed windows.
 - In mid- and high-rise buildings, aluminum-framed windows tend to be the low bid because the framing material lends itself to meeting structural integrity/wind load requirements. The thermal break in these windows is critical factor to their U-value. Make sure the window warranty explicitly covers the thermal break.

Commercial Window Classification

For safety reasons, windows for buildings over 60 feet tall are subject to different standards than windows designed for low-rise buildings. Most Energy Star windows do not have the rigidity required to resist the structural stresses encountered in mid-rise and high-rise buildings.

The American Architectural Manufacturer's Association, Window and Door Manufacturers' Association, and Canadian Standards Association issue the North American Standard/Specification for

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Windows, Doors, and Skylights, AAMA/WDMA/CSA 101/I.S. 2/A440-08. This standard defines the criteria for window ratings. Windows are classified as R (residential), LC (light commercial), C (commercial), HC (heavy commercial), or AW (architectural windows) and are tested for ease of opening, and resistance to deflection under structural loading, air infiltration, water penetration, and forced entry. Test results are provided for units of a specified size and construction.

What window class and performance grade does your building require?

There is no simple rule of thumb for selecting windows for multi-family buildings, although mid-rise and high-rise buildings normally require windows classified as C or HC. It is not common practice to mix windows of different classifications within a building.

HC and AW windows tend to be more expensive than LC or C windows of the same style. It is worth studying a building to determine what classification is needed rather than assuming that HC windows are required. The choice of window style (e.g., casement, double-hung, slider) also affects the price. It may be possible to buy a better window at a lower cost by selecting a less expensive style.

Energy-related aspects of window selection

The taller the building and the higher the wind load, the more important is the role of air infiltration in determining energy use in the building. Window consultants and architectural testing firms have equipment for testing air infiltration through installed window units; the test procedure should conform to ASTM Standard E283. Infiltration varies with window condition and with the wind regime at the site; there are no commonly-accepted rules of thumb for estimating leakage at installed windows. Consider specifying infiltration rates for new windows below the AAMA maximum (0.3 cfm/sf – tested at 75 pascals for R, LC, C and hung and sliding HC windows, tested at 300 pascals for other HC styles and all AW windows).

In general, the Energy Star label indicates a window designed for a low-rise residential building. To earn the Energy Star label for New York State and other states within the Northern zone, the window unit need only prove a U-value less than or equal to 0.35. Solar heat gain is not a factor in the Energy Star window standard for New York State and other northern locations, but can be significant in tall buildings (especially on the west-facing façade), which may not be shaded by their surroundings.

Proper installation is critical for energy conservation, including filling voids around the window opening and caulking around the frame on both the interior and exterior of the building. A poorly-installed replacement window may not save energy and could even use more energy than the window it replaces.

It is important to specify that occupants must be able to operate the windows. Operable windows of any style can present problems in this regard. For example, a double hung window will only latch when the upper sash is properly located at the top of the frame. If the upper sash slips downward while the window is unlatched, air will leak through the cracks at the top and middle of the window. It can be difficult to push the upper sash of the window into place and support it while latching the window. To counteract this problem, specify a latch on the upper sash to keep it from slipping downward.

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