TCE & Associates, Inc. Consulting Structural Engineers
Preserving Your Past, Building Your Future®

SELECTING WINDOW & DOOR SYSTEMS

There are numerous factors to consider when selecting a window, door or curtain wall system for buildings. Not all fenestration systems are created equal and it's important to determine the right design criteria before making your choice. With so many types, operating styles, series, materials, finishes and features from a variety of manufacturers, it can be overwhelming to select the proper fenestration system. Most importantly, the system should meet the performance needs for your building. This applies for replacement windows for an existing building or systems for a newly constructed building. The purpose of this article is to outline the main performance criteria for selection of a window or door system.

Structural - AAMA Classification: The American Architectural Manufacturers Association (AAMA) developed a system of performance classifications for fenestration systems. One of the main performance criteria is based on structural loading from wind. The design wind loads will need to be determined in order to select the proper classification. Design wind loads are calculated based on the following factors:

- Geographic Location
- Building Height
- Building Wall Dimensions
- Building Type (i.e. apartments, hospital, storage facility)
- Topography (is it on flat ground, hill, mountain etc.)
- Surrounding Features (surrounding by buildings, by a body of water, by open field)

Air Penetration & Water Resistance: The design criteria should establish the amount of air penetration and water resistance allowed for the fenestration system. Typical windows and door system are tested by certified agencies to determine how much air passes through the system and what wind pressures are allowed before leakage occurs. These tests are performed in the laboratory with issued test reports. Field testing is also performed during installation process as required by the specifier. It is important to select the proper criteria for air penetration and water resistance to mitigate infiltration into the building.

Thermal Requirements: The design criteria should determine the thermal requirements for the window, namely a thermal broken frame system and insulated glass panels. A thermal barrier is a strip of low thermal conductivity, typically high density polyurethane resin, placed within the window frame to reduce the flow of heat/cold between conductive materials on exterior side of the frame to interior face within the building. Insulated glass consist of two panes of glass with an air space between the glass panels. The air space is filled with a compressed air and services as the thermal barrier between the exterior and interior glass. Insulated glass and thermally broken frames helps eliminate condensation in addition to improving energy efficiency. For a window assembly, the rate of heat loss is indicated in terms of the U-factor.

Sound Transmission: Sound transmission class or STC is a number rating of the effectiveness of the window/door assembly to retard the transmission of airborne sound. The STC rating is the average amount of noise stopped at 18 different frequencies, measured in decibels. The ASTM AAMA 1801 test procedure is used for fenestration systems. Window systems with higher STC are needed for noisier locations where occupants are impacted by surrounding such as a residence across the street from an emergency facility or airport.

Wind Borne Debris Regions: In many coastal environments susceptible to hurricane and other large wind storms, design for wind borne debris is imperative for protection and meeting code requirements. Window failures can occur from airborne items such as tree branches, roof fragments, lumber, etc. resulting in large amount of water to enter the building causing extensive damage. In addition, these window failures breach the building envelope thereby increasing wind pressures inside the building resulting in further damage. Fenestration systems within wind borne debris should be impact-resistant and fall into the category of large missile impact or small missile impact.

Summary: The fenestration system is an important component of the building envelope. It is important to determine performance criteria for fenestration prior to selecting and ordering the products to ensure serviceability and longevity of the building. TCE has experience in designing and specifying fenestration systems for existing and newly constructed buildings. TCE has completed numerous projects in the Washington DC Metropolitan area and other areas along the east coast region.

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