

The Use of Fire-Rated Glass in High Rise Construction



Fire rated glazing is clear, yet provides safety

By Bret Penrod

Modern high-rise buildings are becoming increasingly complex, the urban environment congested and the use of buildings more varied. This presents fire safety professionals with increased challenges compounded by diverse occupancies and multiple uses.

Modern methods of construction and the use of specialized materials also present a new set of challenges. The use of fire-rated glass in the interior and the external envelope of the building adds to the comfort of the internal environment while providing passive fire protection.

Fire-rated glass provides interesting clear views inside

and outside of the building, and allows natural daylight to stimulate the people who use the building where there otherwise would have been an opaque wall. The optical quality and clarity of fire-rated glass is so great that most people will never realize that this high-performance product is so sophisticated.

In high-rise construction, the key strategic objectives for fire safety are to allow safe escape for the occupants without panic, combined with allowing safe unhindered access for the firefighters and rescue workers to do their job. Fire-rated glass provides protected separation from the flames, heat, smoke and other products of combustion, which is critical for safe egress.

Secondly, the fire must be contained to its place of origin and prevented from spreading, so that the structure is protected from local or general collapse. Fire-resistant glass can be more effective at fulfilling these objectives than traditional solid walls. This is due to the advantages of transparency and openness provided by glass, especially promoting easier vision and therefore less panic and more streamlined crowd movement. Fire-resistant glass based on the intumescent interlayer technology – which in the event of a fire turns from a clear to an opaque insulating barrier- is particularly effective because it points to the fire's location behind the glass as it blocks the fire with a functional fire and heat barrier.

Total Fire Protection includes Compartmentation and Structural Fire Resistance, Sprinkler and Suppression Systems, Alarm Systems, and Occupant/Firefighter Education. The Compartmentation discipline is one of the basic principles of fire safe building design.

Fire-rated glass used in walls, openings and doors can contain a fire in the compartment of its origin. Clear fire-rated glass which has been tested to ASTM E 119, the fire-resistance standard used for walls, can now effectively serve as transparent wall assemblies.

This provides architects a new dimension when designing a building for daylight and life safety. Fire-resistance rated walls composed of clear fire-rated glass with intumescent interlayers are being used throughout many buildings including high-rise construction. A crucial benefit of passive fire protection such as Compartmentation is that there are no electronic or other controls that must be triggered to help contain the fire.

Fire-rated glass has many applications beneficial for high-rise buildings. The stairwells in parking garages can now be visually opened for greater security while offer-

ing protection from a burning vehicle or other fires. The use of fire-rated glass allows the people in the stairwells to see who may be lurking about and for the security personnel to have a clear view as to who is coming and going in and out of the building. Adding fire-rated glass also allows natural daylight or passive light to penetrate dark areas that might otherwise need to use artificial lighting, thus decreasing energy usage and bills.

For the building envelope, fire-rated glass can now incorporate many of the high-performance "low e" (low energy use) coatings and tinted glass products that are on the market today. Fire-resistance-rated curtain wall systems have now been tested and listed by independent laboratories for use with fire-resistance glass in wall applications. This allows for broad expanses of fire-resistance-rated glass coated with energy efficient low e coatings or tinted glass to be used for building envelope applications where fire-rated glass is needed for lot line protection while comfortably meeting a U-factor or solar heat gain coefficient energy specified by the energy codes. Triple glazed insulated glass units incorporating fire-rated glass are available to meet even the most stringent U-factor requirements.

In the building interior, fire-rated glass can also be combined with decorative glass, sandblasted for opacity or design features. Fire-rated glass manufactured from a special low iron glass composition is colorless for excellent visible light transmission and does not detract from the desired effects of the functional element or when combined with other glass products. There are many cases where sound absorption specifications must be met as well. The fire-rated glass with the multi-layer intumescent interlayers have especially good STC ratings up to 46 dB and can be further improved with high performance glass products with specific sound absorbing properties to further improve the acoustic performance.

One of the most important aspects of preventing fire spread in high-rise construction is to limit the risk of possible fire movement from floor to floor through the façade elements. Glass facades are vulnerable, but the risk can be countered by installing horizontal strips of fire-resistant glazing at especially high-risk locations (e.g. external to vertical escape stairs and on either side of internal re-entrant corners). Elevator shafts are also now being built with the use of fire-rated glass. Natural daylight is highly desired in these applications where there is the risk of power failure and the potential loss of electrical lighting.

There are also cases, such as police or security stations, where there is fire-rated glass with bullet-resistance ratings. The multi-layer laminated fire-resistance glass can meet level I through level III bullet standards with an anti-spalling film applied to the protected side. There are



Fire rated glazing provides options for designers

also applications where fire-rated glass with a bullet rating and one-way mirrors are required and is now in use.

Fire-rated glass floors with listings of up to two hours are now available. The fire-rated glass floors must be tested by third party laboratory as a system; glass with frames, to ASTM E 119, to the required loading. The walking surface is a layer of glass separated in the frame above the fire-rated glass, normally with an anti-slip surface. The same fire-rated glass used in floors can also be used in skylights where there is no human traffic. Fire-rated glass floors and skylights bring daylight right into the heart of the building.

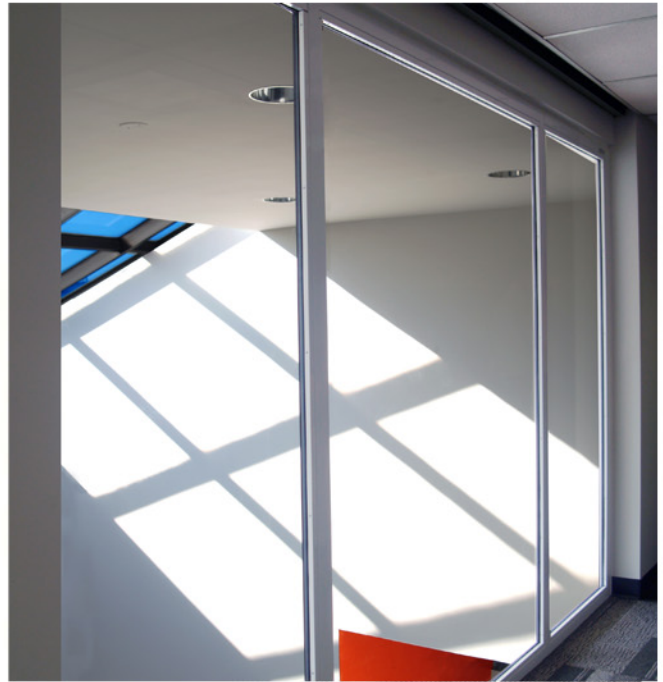
When selecting, specifying or approving a fire-resistance-rated glass, ensure the glass has been tested and is listed by a third-party laboratory, such as Underwriters Laboratories, Inc. All of the test standards for fire-rated-glass rated greater than 20 minutes includes the hose stream test, which protects it from breakage resulting from thermal shock in the event that the glass is quickly

heated by the fire and then rapidly cooled by operation of an automatic sprinkler, or other force.

All glass, including fire-rated glass, used in applications where people can come into contact must pass the human impact safety standards set forth by the Consumer Products Safety Commission (CPSC). In the past, fire-resistance-rated glass was often limited to the 45-minute fire protection rating of wire glass, which does not block the radiant heat from a fire or meet the highest levels of human impact safety.

Now the options for fire-rated glass are expansive and ever increasing. Fire rated glass can help to make high-rise buildings safer, brighter and sustainable with most people not even knowing that the glass has all of the high-tech attributes. Complex buildings with all of the concerns met for safety are now possible with the use of high-performance fire-rated glass. 🔥

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Fire resistance from fire rated glazing