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Article

From products to performance

What you need to know about fire-rated glass and framing

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Fire-rated glazing products are not your typical building materials. They serve a unique purpose, as they are required by building codes in certain applications. For decades, traditional wired glass was the only product option that could pass a fire test. While its wires were often misinterpreted as adding a level of security, the reality is they were only there to hold the glass in place during a fire. The material was actually a low-impact product, and the wires could cause significant injury when broken. Additionally, it wasn't necessarily an aesthetically-pleasing product, making its use limited in terms of design and visibility. As new wireless products for fire-rated applications were developed, and as building codes changed to eliminate the use of traditional wired glass in certain applications, the industry now has many options for designing fire-rated applications that offer both safety and aesthetics.

What is fire-rated glass?

Fire-rated glass is specially designed to prevent the spread of flames and smoke, and depending on product makeup, the transfer of radiant and conductive heat. The product's rating, from 20 minutes to three hours, is determined through rigorous testing (see "Passing the test" sidebar) conducted at independent laboratories such as Underwriters Laboratories, Inc.® (UL). The rating reflects the amount of time the material has been tested to remain in place to help stop the spread of fire and smoke. This is called "compartmentation."

The introduction of glass ceramic products for fire-rated applications in the 1980s took compartmentation to the next level, creating many new opportunities and uses. These wireless products look similar to ordinary window glass, providing great design flexibility. As with wired glass, fire-rated glass ceramics can withstand the thermal shock of water from sprinklers or fire hoses. Where impact safety is required, they are available with up to Category II impact-safety ratings (CPSC 16CFR 1201). (See "Safety glazing" sidebar). This is the highest standard impact-safety rating available, and indicates the glass can safely withstand an impact similar to that of a full-grown, fast-moving adult.

Safety glazing classifications

CPSC 16 CFR 1201 (Category II): Meets 400 feet pounds pressure requirement.

CPSC 16 CFR 1201 (Category I): Meets 150 feet pounds pressure requirement; permitted up to 1,296 square inches.

ANSI Z97.1 (traditional wired glass only): 100 feet pounds pressure requirement; permitted up to 1,296 square inches.

Some other important fire-rated glass ceramic considerations include:

- The products can be cut and handled like regular float glass; allowing local availability and processing from certified distributors;
- The products can be insulated when necessary, providing daily thermal efficiency as well as fire-rated performance;
- While ordinary glass breaks at 250 degrees F, glass ceramic maintains its stability where temperatures may exceed 1,600 degrees F;
- Fire-rated glass ceramic passes fire and hose stream tests without wires; and
- These products look like typical float glass; and can be used in much larger sizes than traditional wired glass.

Code changes

While the use of traditional wired glass is still allowed in certain applications, building codes have evolved to limit the allowable use. For example, the 2003 International

Building Code (IBC) restricted the use of traditional wired glass in hazardous locations in schools, athletic facilities and daycares. In 2006, the IBC extended the restriction to all building types. "Hazardous" locations include doors, sidelites, transoms, windows near the floor, and other areas at risk for impact. Per the code, glazing in these locations must also pass impact safety testing, which measures the ability of the glass to withstand impact. Ratings are given in levels based on the amount of force the glass can withstand.

Fire-rated framing

In addition to the glass, a fire-rated glazing system also requires special framing. The frame's rating must equal that of the glass.

Hollow metal steel frames are most common, but there are also alternatives such as modern steel fire-rated frames that provide a higher level of performance or aesthetic. Many of these products are representative of traditional storefront and entrance systems. They feature narrow sightlines and can support increased glass lite sizes. They can be installed into finished openings and offer narrow stile and concealed hardware options.

Protective vs. resistive

Fire-rated glass and frames can be described as either fire-protective or fire-resistive. While fire-protective products stop flames and smoke, they are not a barrier to radiant and conductive heat. The material class includes offerings, such as traditional wired glass, glass ceramic, hollow metal steel frames, etc. These applications typically may not exceed 25 percent of the aggregate length of the wall and may not exceed 120 square feet per opening. In addition, products with fire-ratings over 20 minutes must pass the required hose stream test.

Fire-resistive products, including both glass and frames, are designed to stop flames, smoke and radiant and conductive heat transfer. These are tested to fire resistance standards for wall construction and therefore classified as a wall rather than an opening (i.e., window). Both the glass and frames must block the passage of radiant heat.

Fire-resistive framing is rated up to 120 minutes and is required as an assembly, meaning both glass and framing. It's not only fire-rated, but is also hose-stream tested, a barrier to heat and positive pressure tested. Several framing options are available including filled profile systems, aluminum-clad systems, butt-glazed systems, and various curtain wall systems, such as structural glazing, among others.

In addition, fire-rated products can be used in exterior applications, as well as glass flooring, among other specialty applications. Due to these systems being tested to the same fire test standards as wall construction, they are not limited to the total area or individual opening size limitations of fire-protective assemblies.

To learn more about fire-rated glazing products and applications, visit fireglass.com or contact an Allegion Hardware Consultant.

Code-compliant ceramic

Glass ceramic products can meet safety code requirements when they are filmed or laminated to meet impact safety requirements. With filmed glass, a fire-rated film is applied to one side of the fire-rated glass ceramic. These products can meet both Category I and II requirements. With laminated glass, two or more pieces of ceramic glass are sandwiched together with a fire-rated interlayer. These products can also meet both Category I and II requirements.

Impact-rated ceramics, which are rated up to three hours, are both clear and wireless. They are also available in large sizes at the same ratings as wired glass and offer high impact safety.

Passing the test

Various levels of testing are required to ensure the fire-rated glazing product's level of performance. The fire test measures the amount of time, in minutes or hours, that materials or assemblies can withstand fire exposure in a test furnace without shattering or allowing flames on the non-fire side of the assembly.

In addition, the hose-stream test is required for products rated 45 minutes and up. In this test, heated glass and frames are subjected to water from a fire hose. This evaluates the impact, erosion, and cooling effects of water and eliminates inadequate materials or constructions that may fail under similar conditions.

About Allegion

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