

Hose Stream or Smoke Screen?

What door manufacturers really need to know about fire-rated glass...

By Jeff Griffiths



This is a photo of a door assembly in a fire resistive application. The entire assembly (glazing and framing) is rated to 90 minutes and is tested to ASTM E-119, which limits the temperature rise on the non-fire side to no more than 250 F. The assembly is also impact safety rated to CPSC Cat. II, the highest federal impact safety standard.

IN THE ARTICLE TITLED *STRENGTH UNDER FIRE*, WHICH appeared in this magazine last November, the author drew an analogy between a pilot's flight test and the code required hose stream test. The assumption here seems to suggest that the hose stream test replicates reality. Does it really?

An independent position paper on thermal shock analysis compiled by the Schrimmer Engineering Corporation (SEC) in 2001 examines the key terms of the hose stream test standard cited in *Strength Under Fire*: impact, erosion, and cooling. This position paper notes that an impact is typically a "collision

between two bodies, where relatively large forces result over a comparatively short amount of time...by definition an impact does not involve the creation of a temperature gradient, which causes thermal stresses." SEC contacted Dr. Paul Spinn, a member of the ASTM E05 Committee, who contended that the purpose of the hose stream test "is to measure an assembly's ability to withstand a lateral impact from falling debris during the fire endurance period and before active suppression begins." Considering that the hose stream test evolved from structural impact testing using swinging weights, similar to test methods currently used to enforce safety glazing impact resistance standards, the introduction of the cooling effects of water skewed the entire nature of the impact.

The SEC report goes on to note that, "Although NFPA has provided a rational explanation for the terms "erosion" and "cooling", it is not clear what erosion and cooling are actually representing in a fire scenario. The hose stream test has nothing to do with fire fighting practices or strategies." Since the hose stream

is delivered with a force of 57.7 lbf at 30 psi and 86.6 lbf at 45 psi, it does not represent the “erosion” and “cooling” of modern day fog nozzles or sprinkler systems. In addition, given that the hose stream is applied 20 feet from the test unit and typical corridors protected by fire-rated glazing are only 6 to 8 feet wide, the impact doesn’t replicate the water-jet force from a fire hose in close quarters. No manufacturer of fire-rated glazing has ever demonstrated their product’s ability to withstand the hose stream’s impact within such close proximity.

The reality is that the hose stream test is not universally accepted. In 1953, the hose stream test was dropped from the British test standard BS 476 for several reasons, including the fact that the test did not reproduce conditions in an actual fire. The ISO test standards adopted in Europe and elsewhere followed suit in eliminating the hose stream test as well. When faced with challenges to hose stream requirements for fire-protection glazing, debate within reviewing IBC code committees has never been unanimous. Given that deaths due to fire in the United States and Canada, the only two countries still imposing the hose stream test, continue to be in the range of 2 to 3 times the death rates in the U.K. and Europe, an attempt to equate the hose stream test with fire-rated glazing safety without any corroborating evidence seems to be a stretch of the imagination and not a reality.



Why Should Door Manufacturers Care About the Glass?

It is generally accepted among door manufacturers that approximately 75% of the U.S. fire-rated door market is comprised of 20-minute product, which is exempt from the hose stream test requirement. Over the past one hundred years, the predominant fire-rated glazing of choice has been polished wired glass, a relatively inexpensive option. With the adoption of International Building Code (IBC) 2003 and IBC 2006 now sweeping across the United States, Consumer Product Safety Commission safety-rated glazing requirements are raising the cost of wired glass. Specialty tempered 20-minute products have usurped the economic advantage once held by traditional wired glass, leaving ceramic glass products solely manufactured abroad and distributed in the U.S. a far distant third in terms of cost.

Up until recently, most door manufacturers were content with leaving the glass up to either their fabricators/distributors or the glazier in the field. But the notion of requiring third-party certification of glass installation, much like

Here are photos of independent testing on 3 types of fire protective glazing to demonstrate effects radiant heat.

1. Here are the samples in front of the test furnace.
From left to right: Ceramic, Wired, Heat Reflective Specialty Tempered
 2. Mannequin behind the wired glass spontaneously ignites (approx. 9 minutes)
 3. Mannequin behind the ceramic glass spontaneously ignites (approx. 11 minutes)
- Here are some door assembly photos, and from here you can see the difference between a fire protective door assembly (45 mins and less; blocks smoke and flame) and a fire resistive door assembly (over 45 mins; blocks smoke, flame and radiant heat). Also, the glazing in the fire protective assembly is limited to 25% of the total wall area due to radiant heat concerns, while the glazing in the fire resistive assembly is not subject to size limitations when combined with an appropriately rated framing system since it is tested to ASTM E-119, the wall standard.



This is a photo of door assembly in a fire protective application. The glazing in the door uses specialty tempered 20-minute glass, and the sidelites use 45-minute heat reflective specialty tempered. Both glazings are impact safety rated to CPSC Cat. II, the highest federal impact safety standard.

what is currently required for hardware preparation, is gaining interest and support. The Window and Door Manufacturers Association (WDMA) has submitted a NFPA code change proposal that would require glass to be "installed in accordance with the manufacturer's inspection service procedure and under label service."

According to Mr. Dan Hibbs, Chairperson of WDMA's Interior Products Code Committee, "Where fire protection of the opening depends on the integrity of the glazing installation, it is not enough to simply call out the glazing to be installed per the manufacturer's glazing instructions...glazing systems that require elements or procedures the contractor is unfamiliar with too often lead to incomplete or improper installations."

There's more at stake than just the door

Without providing any engineering data to support the change, IBC 2000 parted ways with NFPA standards in requiring the previously hose stream exempt glass in the sidelites and transom of a 20-minute door assembly to meet 45-minute rating requirements, including the hose stream test. To nobody's surprise, manufacturers and distributors of wired and ceramic glass were quite pleased with this inexplicable change. Their only regret was that the doors held onto the 20-minute rating. As a result, sales of specialty tempered 20-minute glass took a nose dive and sales of more expensive ceramic glass products got a welcomed boost.

If WDMA and similarly minded supporters of third-party oversight of glazing in doors are successful, door manufacturers are going to be compelled to become far more interested in the finer points of fire-rated glass. The economics of fire-rated glazing is going to have a direct impact on delivered product costs. Knowing your fire-rated glazing options will be essential to remaining competitive.

The IBC 2000 code change affected the limited construction budgets of public entities such as schools, universities, hospitals, and government, along with the R&D budgets of door manufacturers. Architects and Construction Managers had to reconsider the need for wire-free glass in sidelites and transoms given the increased cost of fire-rated options meeting the newly imposed criteria. The added cost of separate fire testing of doors and sidelites immediately affected a manufacturer's bottom-line as well. In turn, the elimination of expanded assemblies by architects, design committees, and building owners cut into the door manufacturer's potential sales.

Despite being a distributor of ceramic and wired glass products, SaftiFirst Inc. (a manufacturer of fire-rated glass, doors, and glazing systems) continues to submit IBC code change proposals intended to reverse the IBC fire-rating distinction within the door assembly. According to SaftiFirst's President, Mr. Bill O'Keeffe, "For me, it's just a matter of principle. When the IBC code change passed, there was no technical or fire case history to show that products tested without hose stream pose a fire safety threat. As a matter of fact, the technical evidence and actual fire case data showed, and continues to show, that these products provide the necessary fire protection and do not fail under real fire conditions. Glazing products tested without hose stream to NFPA 252 had been listed in the U.S. for use in 20-minute sidelite and transom assemblies since 1991 without any documented failure. Plus millions of square feet have been supplied worldwide since 1983 without any incident."

SaftiFirst has offered a patented and listed heat-reflective, specialty

tempered glass without hose stream testing since the mid-1990s. The product continues to be specified by architects and approved by local authorities having jurisdiction in accordance with IBC guidelines for use in sidelites, transoms, and corridor windows because of its economic, aesthetic, and radiant heat-protection advantages over wired and ceramic glass. The equivalent product has been in use abroad for over twenty-five years without any reported failure or related fatalities.

What about the remaining 25% of the market?

The most vocal supporters of the hose stream test often take a different approach to safety when it comes to interpreting ratings of 60-minutes

and above, where limitations on the use of non-radiant heat barrier ceramic and wired glass products are imposed by code. For example, by advertising product listings for “non-temperature rise” door applications in excess of 45 minutes, such glass suppliers are asked for and provide quotations for their product in excess of 100 square inches despite code restrictions. When asked if there are any applications in the IBC for fire-protection glazing in 60 and/or 90-minute doors that are NOT subject to the 100 square-inch size limitations specified in Section 715.4.6.1, Page Dougherty, Senior Technical Staff member of ICC Architectural and Engineering Services, simply replied, “No.” Despite claims to the contrary by fire-rated glass suppliers, there would seem to be no such thing as a

non-temperature rise 60 or 90-minute door. Most door manufacturers know that doors rated for 60 minutes and upward require fire-resistive glazing for use beyond 100 square inches, but architects and glaziers unfortunately rely on and misinterpret potentially misleading marketing information.

So, what are the real issues that door manufacturers need to keep in mind when it comes to fire-rated glazing? Know the product and the glass supplier’s vested interests. Keep tabs on fire-rated glazing code changes affecting your market. Take responsibility for every aspect of your fire-rated product because your label ultimately confirms code compliance and product safety. **dh**

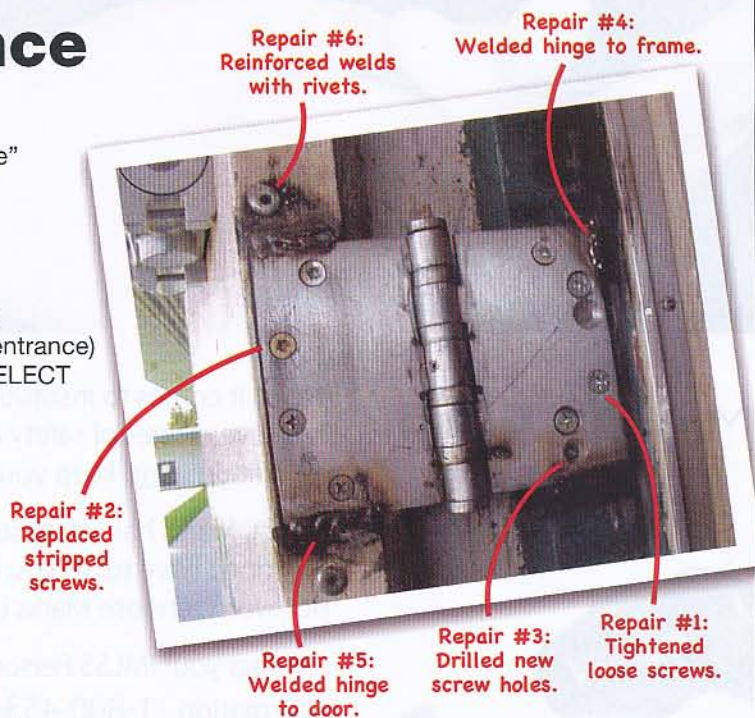
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