



Advisory

Aug. 22, 2017

Subject:

Sprinkler Protected Glazing Systems

Background:

Office space tenants often wish to interconnect one or more floors with a staircase that is visible from the rest of the office area, for aesthetic, security and other reasons. This type of design is realized using sprinkler protected glazing (SPG) systems, where all or part of the staircase is surrounded by glass walls and sprinkler heads are installed in the ceiling, very close to the top of the glass. The staircase installation requires cutting an opening in the floor, which compromises the required fire separation between floors. However, through testing, the SPG systems have been shown to perform equivalent to a fire separation constructed out of solid materials, such as gypsum board.

When designing SPG systems, designers and tenants often want the glass surrounding a staircase to extend from the floor to the ceiling. In addition, usually there is a desire to install a glass door in the enclosure around the staircase. While this is possible, designers must be aware of some building code compliance nuances.

Advisory:

SPG systems are permitted by the Alberta Building Code (ABC) through [STANDATA 06-BCV-010, 'Sprinkler Protected Glazing in Fire Resistant Wall Assemblies'](#). Designers should consult this STANDATA prior to starting design work.

There are very few sprinkler heads listed by certification bodies for use in SPG systems. Over the last decade, the Tyco WS sprinkler head has typically been used. There may be other suitable sprinkler heads; designers should research the listings of certification bodies, such as Underwriter's Laboratories of Canada, to determine the full range of products available.

The [Tyco WS manufacturer's installation and maintenance instructions](#) have very specific requirements for floor to ceiling glass and operable pieces of glass. Floor to ceiling glass is only permitted where fire protection rated glass is used. Otherwise, a 914 mm high *pony wall* must be constructed at the bottom of the glass, to limit the probability of thermal shock damage. It has been found that a small fire close to the glass could heat the glass significantly, but not be hot enough to activate the sprinkler heads in the ceiling until a long period of time has passed. This can cause the glass to heat up so much that once the sprinkler heads do activate and spray water on the glass, the glass can break. If the glass breaks, there is no longer a fire separation between floors in the building, which can be a major life safety hazard.

The Tyco WS manufacturer's installation and maintenance instructions also state that the glass being protected by the SPG system must be fixed in place. This precludes the use of a glass panel for the door into the glass enclosure. For an SPG system to function as a fire separation, there must always be a surface for the sprinklers to spray onto. Operable glass panels will interrupt the continuity of that surface.

You can design floor to ceiling glass with a glass door through an alternative solution, in accordance with the ABC. If floor to ceiling glass in the stair enclosure is desired and it is not feasible to use fire protection rated glass, one way to demonstrate equivalency with the ABC is to prepare a fire model of the design. Designers should work with a consultant that has

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expertise in Computational Fluid Dynamics modelling or other fire protection engineering analysis methods. The modelling must take into account the total number of stories being penetrated. To date, this approach has been the only alternative solution approach accepted by The City of Calgary.

It is also possible to achieve a glass door through an alternative solution. There are two approaches currently accepted by The City of Calgary. One approach is to prepare a fire model of the design as described above. A second option is to install some type of upgraded sprinkler system (such as closely spaced sprinklers or deluge sprinklers) at the glass door. Fire protection engineering analysis, illustrating how the operable glass door is equivalent to a fire separation, must be provided. Temperatures of smoke and fire gases on the non-fire side of the door, effects of toxic and light-obscuring smoke and effects of radiation from flames and fire gases on occupant movement, reliability of the sprinkler system, and other issues should be considered in the analysis. Another option is to install a fire protection rated door, with a steel frame, in accordance with the ABC. This would not require an alternative solution.

Note:

Although this advisory focuses on glass enclosed internal staircases in office buildings, the STANDATA permits SPG systems to be used in a variety of other settings. The information in this advisory bulletin applies to all of these other types of installations.

If you have any questions regarding this information, please contact The City of Calgary Technical Assistance Centre by phoning 311 or 403-268-5311, or by e-mail at building.TAC@calgary.ca.