

SPRINKLER-PROTECTED GLAZING IN FIRE-RESISTANT WALL ASSEMBLIES

PURPOSE

This variance sets out the conditions for a safety codes officer to accept the use of sprinkler-protected glazing assemblies in interior and exterior fire rated wall assemblies.

DISCUSSION

Sentence 3.1.7.1.(1) of the Alberta Building Code 2014 (ABC 2014) specifies that the fire-resistance rating of a material, assembly or structural component shall be determined by testing to CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials."

Designers want to install clear glass in fire separations and exit enclosures to provide greater visibility within the building. Glass block and wired glass panels do not provide the visibility that designers would like to incorporate into their designs. As such, an alternative to using glass block and wired glass panels has been requested by designers and other code users.

"Sprinkler-protected glazing" is a design alternative that has been in use for years. It varies slightly from the concept of using glass block and wired glass panels in that the glazing that is protected is not to be considered as a closure in a fire-rated assembly. Instead, the fire-resistance rating assigned to the combination of glazing assembly and sprinkler heads must be able to achieve at least the same fire-resistance rating of the fire separation it is being installed within. Unfortunately, ULC-S101 does not contain requirements that adequately address "sprinkler-protected glazing."

Since the "sprinkler-protected glazing" is used as an alternative to the traditional fire-rated assembly, the installation of the sprinkler-protected glazing panels does not reduce the number of unprotected openings permitted in a given exterior wall assembly. Consequently, glazing assemblies are permitted to be installed for interior or exterior fire rated assemblies that are required to have a fire-resistance rating without being tested to CAN/ULC-S101 as required by Sentences 3.1.7.1.(1) and 9.10.3.1.(1) provided they are protected by a fixed, automatic sprinkler system and the criteria of this variance are followed.

A Variance STANDATA entitled "Sprinkler-Protected Glazing In Fire-Resistant Wall Assemblies" (06-BCV-010) was in place to allow for this alternative solution, relying on ULC/ORD C263.1-99, "Sprinkler-Protected Windows Systems". This Other Recognized Document (ORD) expired on October 29, 2004 and can no longer be used as a valid document for this alternative solution.

Unless stated otherwise, all Code references in this STANDATA are to Division B of the Alberta Building Code 2014.

Issue of this STANDATA is authorized by
the Provincial Building Administrator

[Original Signed]
Paul Chang

Alberta
Government

CODE REFERENCES

1. Sentence 3.1.7.1.(1) states:

3.1.7.1. Determination of Ratings

1) Except as permitted by Sentence (2) and Article 3.1.7.2., the rating of a material, assembly of materials or a structural member that is required to have a *fire-resistance rating*, shall be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials."

2. Sentence 9.10.3.1.(1) states:

9.10.3.1. Fire-Resistance and Fire-Protection Ratings

1) Where a fire-resistance rating or a fire-protection rating is required in this Section for an element of a building, such rating shall be determined in conformance with the test methods described in Part 3, A-9.10.3.1. in Appendix A, or Appendix D.

3. Sentence 3.2.5.12.(1) states:

3.2.5.12. Automatic Sprinkler Systems

1) Except as permitted by Sentences (2), (3) and (4), an automatic sprinkler system shall be designed, constructed, installed and tested in conformance with NFPA 13, "Installation of Sprinkler Systems." (See Appendix A.)

VARIANCE

This variance provides approximately equivalent or greater safety performance with respect to persons and property as that provided for by the Safety Codes Act and the ABC 2014.

Glazing assemblies are permitted to be installed for interior or exterior fire rated assemblies that are required to have a fire-resistance rating without being tested to CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials" as required by Sentences 3.1.7.1.(1) and 9.10.3.1.(1) provided they are protected by a fixed, automatic sprinkler system and the following criteria are met:

1. installation shall conform to NFPA 13;
2. sprinklers shall be listed as specific application window sprinklers;
3. sprinklers shall be supplied by a wet-pipe system;
4. glazing shall be heat-strengthened, tempered, or glass ceramic and shall be fixed;
5. where the assembly is required to be protected from both sides, sprinklers shall be installed on both sides of the glazing;
6. if the assembly is located in a loadbearing assembly, all loadbearing components shall have a fire-resistance rating not less than that required for the supported assembly;
7. the glazed assembly shall not have any horizontal members that would interfere with uniform distribution of water over the surface of the glazing, and there shall be no obstructions between sprinklers and glazing that would obstruct water distribution;
8. the fire-resistance rating of the sprinkler-protected glazing system shall be not less than the fire-resistance rating required for the wall assembly that it is being installed within, sprinkler-protected glazed wall assemblies to be constructed in accordance with the requirements of the listing of the window sprinkler;

9. the assembly is not installed in:
 - a. a firewall or within a door installed in a firewall,
 - b. a building that contains a high hazard industrial occupancy,
 - c. a location where there is a risk of explosion, or
 - d. any part of a required exit serving
 - i. a floor area subject to the requirements of Subsection 3.2.6.,
 - ii. a care, treatment or detention occupancy, or
 - iii. a residential occupancy.
10. where the assembly is installed in exits not mentioned in item (4.d.) above, the exits shall not comprise more than one half of the required number of exits from any floor area;
11. The window sprinkler system shall:
 - a. be identified at the isolation valve as supplying a window sprinkler system,
 - b. be provided with a placard adjacent to the incoming water service with the following wording: "SPECIAL WINDOW SPRINKLER HEADS ON THIS SYSTEM ARE AN INTEGRAL PART OF THE FIRE SEPARATIONS. THIS WATER SUPPLY MAY ONLY BE SHUT OFF AFTER ALL THE PROPER AUTHORITIES HAVE RECEIVED NOTICE IN WRITING". Font size to be 12mm high. Placard to be "RED" in colour with white lettering. Mount to existing wall with appropriate anchors. Adhesive is not acceptable.
 - c. have a water supply duration for the design area that includes the window sprinklers shall not be less than the required fire resistance rating of the assembly; and
 - d. incorporate the criteria as identified in Appendix A of this Interpretation.

Notes:

1. As with all fire protection measures, care must be exercised in the design, installation and maintenance of the active fire protection system to ensure its reliability throughout the life of the building.
2. Sprinkler-protected glazing may be used as a protected opening in an exposing building face where sprinkler heads are provided on the interior side of the glazing only.
3. Sprinkler-protected glazing may be used in an interior fire separation if sprinkler heads are provided to protect both sides of the glazing.
4. Sprinkler-protected glazing may be used in a sprinklered or an unsprinklered building.
5. The installation of sprinkler-protected glazing will also require the installation of a fire alarm system for the building, as required by Article 3.2.4.1.

This VARIANCE is applicable throughout the province of Alberta.

Appendix A

Installation Guidelines for Sprinkler-Protected Window Systems

A1. General Information

A1.1 Scope

A1.1.1 This document establishes the minimum design, performance and installation requirements for sprinkler protected window systems. A sprinkler protected window system will provide a fire integrity rating as determined by the listing of the window sprinkler.

A1.2 Significance

A1.2.1 The purpose of this document is to outline the requirements for the appropriate use, design, installation and testing of sprinkler protected window systems. Other than stated herein, it is intended that the design, installation and testing of the sprinkler system portion of the system be in accordance with the current edition of NFPA 13, Standard for the Installation of Sprinkler Systems and also the referenced edition of the Alberta Building Code 2014 (ABC 2014).

A1.3 Glossary

A1.3.1 Automatic Sprinkler – A device which is automatically activated by the sensing of heat to distribute water or water based extinguishing agents in the fire area.

A2. System Requirements

A2.1 System

A2.1.2 If the system is installed in an area subject to freezing conditions, the system shall be protected with antifreeze system. The system shall meet the design requirements for an antifreeze system as detailed in NFPA 13.

A3. Installation Requirements

A3.1 Installation Instructions

A3.1.1 The sprinkler system shall be installed in accordance with NFPA 13 and as described below.

A3.1.2 Sprinklers shall be installed according to their Listing.

A3.1.3 Sprinklers may be concealed behind bulkheads or similar architectural construction or within the window frame itself provided that it can be demonstrated that the location of the sprinkler does not have a negative effect on its operating characteristics (i.e. operating time and spray pattern).

A3.1.4 Window sprinklers located less than 1.83 (6ft) from ceiling sprinklers shall be protected from overspray by baffles or similar construction. Sprinklers shall not be installed in such a way that their operation is affected by architectural designs. For sprinklers with spray patterns of less than 1.83 m, the heads shall be protected by a baffle. For sprinklers with spray patterns greater than 1.83 m, baffles shall be provided to prevent water interference to adjacent heads.

A4. Design

A4.1 The sprinkler system shall be designed in accordance with the hydraulic calculation method outlined in NFPA 13 and described below:

A4.2 The window sprinkler system shall be independent of the floor sprinkler system and/or standpipe system with the exception of a common riser.

A4.3 The window sprinkler system shall have a separate zone control valve arrangement including supervisory tamper switch, check valve, flow switch and inspector's test connection and drain for each zone. Each zone shall be sized and separately annunciated as outlined in the ABC 2014 for fire alarm zones.

A4.4 Each sprinkler shall deliver sufficient water to all areas of the glass surface to prevent the glass from cracking or breaking in accordance with the Manufacturer's Listing.

A4.5 The demand for the window sprinkler system shall be added to the floor (and other) sprinkler system demand at the point of system connection plus hose demand, if applicable.

A4.6 The design area shall include the most hydraulically demanding window sprinklers. For a sprinklered building, the window sprinkler design area shall be based on the design area of the floor sprinklers. The area of sprinkler operation shall be superimposed on the area of the window sprinklers. Window sprinklers within or along the perimeter of this area shall be included. If the window sprinklers protect more than one floor level (i.e. atrium spaces) a minimum of two floor levels of sprinklers must be calculated.

A4.7 Glazing and frames must be installed in accordance with the sprinkler Manufacturer's Listing, glazing and framing Manufacturer's installation instructions and good engineering/architectural practice.

A4.8 Glazing surfaces must be identical to those contained in the Listing. Any modifications to the glazing component that impact on the wetting characteristics of the glazing (i.e. etching, surface treatments, films etc.) are not permitted unless covered in the individual Listings.

A4.9 There shall be no obstructions (e.g. window coverings) that will delay or impede the spray distribution onto the glazing surface.

A4.10 When multiple levels of sprinklers are located in a common vertical plane, measures shall be taken to ensure that the operation of any sprinkler does not offset the operation and wetting pattern of sprinklers located below it.

A4.11 The maximum height of the glazing and the minimum height above the floor must be as specified in the individual Listing.

A4.12 In any case where the sprinklers would be located less than 1.83 m apart, as may be the case in corners and corridors, measures shall be taken to prevent the cold soldering of adjacent sprinklers located in a common plane. these measures can include the following:

- A As tested in the individual Listing.
- B Vertical baffles of sufficient depth (<1.83 m and >3.048 m).

A5. Plans and Calculations

A5.1 The sprinkler system drawing and calculations shall be in accordance with NFPA 13 requirements.

A6. Water Supplies

A6.1 The water supply duration shall be equal to the fire resistance rating of the fire separation into which the window system is incorporated.

A7. System Acceptance

A7.1 The window sprinkler system must be tested in accordance with NFPA 13.

A7.2 Sprinkler head, type and positioning with respect to the glazing must be inspected to ensure that the requirements of the Manufacturer's Listing are met.

A7.3 Copies of the test results must be provided to the Owner and Authorities Having Jurisdiction.

A7.4 The system shall be tested in accordance with the ABC 2014.

A8. System Maintenance

A8.1 The Owner is responsible for maintaining the system and keeping the system in good operating condition. The system shall be maintained to provide at least the same level of performance and protection as designed.

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