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ESR-2397

Reissued 02/2018

This report is subject to renewal 02/2020.

DIVISION: 21 00 00—FIRE SUPPRESSION
SECTION: 21 13 13—WET-PIPE SPRINKLER SYSTEMS

REPORT HOLDER:

TYCO FIRE PRODUCTS RESEARCH & DEVELOPMENT

**1467 ELMWOOD AVENUE
CRANSTON, RHODE ISLAND 02910**

EVALUATION SUBJECT:

**MODEL WS™-5.6 K-FACTOR SPECIFIC APPLICATION WINDOW SPRINKLERS,
HORIZONTAL SIDEWALL AND PENDANT VERTICAL SIDEWALL**



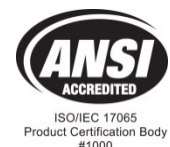
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DIVISION: 21 00 00—FIRE SUPPRESSION

Section: 21 13 13—Wet-Pipe Sprinkler Systems

REPORT HOLDER:

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EVALUATION SUBJECT:

MODEL WS™—5.6 K-FACTOR SPECIFIC APPLICATION WINDOW SPRINKLERS, HORIZONTAL SIDEWALL AND PENDENT VERTICAL SIDEWALL

1.0 EVALUATION SCOPE

Compliance with the following code:

- 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)[†]

[†]The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Alternative to a fire-resistance-rated wall assembly

2.0 USES

The automatic special-purpose sprinkler system incorporating the Model WS™ sprinkler is used in conjunction with a fixed glazed wall assembly to provide an alternative to a two-hour fire-resistance-rated nonload-bearing interior fire barrier assembly prescribed in IBC Section 707, fire partition assembly prescribed in IBC Section 708 or exterior wall assembly prescribed in IBC Section 705. The Model WS™ sprinklers are recognized as a means to achieve a fire-resistance rating on fixed glazed wall assemblies in exterior fire-resistance-rated walls only when the horizontal fire separation distance is 5 feet (1525 mm) or greater.

3.0 DESCRIPTION

3.1 General:

The Model WS™ window sprinklers are used as part of a wet-pipe fire suppression system to provide a two-hour fire-resistance rating to an interior nonload-bearing fire barrier, fire partition or exterior wall assembly consisting of fixed glazing as described in this report. When activated, the sprinklers are designed to wet the entire surface of the affected side of the fixed glazed openings in the fire barrier and exterior wall assembly in order to achieve the

fire-resistance rating of the wall. For exterior glazed assemblies that are permitted to be rated only from the interior, the sprinklers must be located on the interior side of the glazing. For interior glazed assemblies, the sprinklers must be located on both sides of the assembly. The primary components of the fire-resistance-rated assembly are as described in Sections 3.2 and 3.3.

3.2 Model WS™ Window Sprinklers:

The Model WS™ window sprinklers described in this report are quick-response sprinklers that are available in models that activate to release water flow when they reach an ambient temperature of either 155°F or 200°F (68°C or 93°C). The sprinklers have an orifice and thread size of 1/2 inch (12.7 mm). The sprinklers are manufactured for two orientations. The horizontal sidewall type (product number TY3388), as shown in Figure 1, is designed to face the glazing of the fire barrier assembly in a horizontal orientation. The pendent vertical sidewall type (product number TY3488), as shown in Figure 2, is designed to face the glazing of the fire barrier assembly in a vertical orientation.

3.3 Glazed Fire Barrier Assembly:

The glazing used in the fire barrier must be nominally 1/4-inch-thick heat-strengthened or tempered glass complying with ASTM C1048 or Federal Specification DD-G-1403B, installed as a single pane or dual pane. The exposed glass component of the wall assembly must not exceed 13 feet (4 m) in height. There is no exposed width restriction for the horizontal span, except where necessary to comply with the requirements of IBC Sections 2403 and 2404.

All interfaces between the fixed glazed wall assembly and adjacent wall assemblies must include termination of the glazing within a window frame as described in this section. The glazing is held in place by a metallic frame with an elastomeric seal allowing for thermally initiated contraction and expansion. Unframed vertical joints between glazing panels are permitted provided that such joints are sealed with silicone sealant. Intermediate horizontal mullions are not permitted as part of the fixed glazed wall assembly. The interface details and mounting method must be approved by the code official.

4.0 INSTALLATION

4.1 Sprinkler Orientation:

For the Model WS™ horizontal sidewall sprinkler, the deflector of the sprinkler must be placed from 1/2 inch to 4 inches (12.7 to 102 mm) away from the glass and 1 to 3 inches (25 to 76.2 mm) down from the top of the noncombustible frame as shown in Figure 3.

The Model WS™ pendent vertical sidewall sprinkler must be located 4 to 12 inches (102 to 305 mm) from the face of the glass and 2 to 4 inches (51 to 102 mm) down from the top of the noncombustible frame as shown in Figure 4.

Intermediate horizontal mullions are not permitted as part of the glass wall assembly. All combustible materials must be kept a minimum distance of 2 inches (51 mm) from the face of the glass. This can be accomplished by a 36-inch-high (914 mm) “pony wall” as shown in Figures 3 and 4. This “pony wall” is constructed using construction methods and materials as recognized in the applicable codes based on the building’s type of construction. The “pony wall” must be constructed in a manner which meets the minimum required fire-resistance rating which is sought for the fixed glazed wall assembly. This “pony wall” construction must be approved by the code official. The evaluation of alternative methods other than the “pony wall” to maintain a minimum 2-inch (51 mm) clearance of combustibles from the face of the assembly is outside the scope of this report.

The maximum distance between window sprinklers is 8 feet (2440 mm) on center and the minimum distance is 6 feet (1830 mm) on center, except where the sprinklers are separated by a noncombustible vertical mullion located between sprinklers. In this case, the maximum distance maintained between the sprinkler and the mullion must not exceed one-half of the distance required between sprinklers.

The automatic water supply must have the capability to supply water to the assembly for a time not less than the rating of the assembly. The maximum fire-resistance rating recognized in this report is two hours.

4.2 Hydraulic Requirements:

The code official must be consulted to determine the hydraulic requirements for each installation. Hydraulic calculations must show a maximum pressure of 175 psi (1207 kPa) on the vertical sidewall sprinklers and horizontal sidewall sprinklers separated by a noncombustible vertical mullion. Hydraulic calculations must show a maximum pressure of 70 psi (483 kPa) for horizontal sidewall sprinklers that are not separated by a noncombustible vertical mullion between sprinklers.

Interior Protection—Sprinklered Building: The compartmented area that has the most hydraulically demanding window sprinklers must be identified. The most demanding 46.5 linear feet (14.2 m) of Model WS™ Window Sprinklers is calculated based on $L=1.2 \sqrt{A}$, where A is system area of operation, and when A equals 1,500 square feet (139.4 m²), in accordance with NFPA 13 Light/Ordinary Hazard density curves.

If an area reduction for quick-response sprinklers is being utilized, the linear length of the calculated window sprinklers may be reduced, to 36 linear feet (11 m) or greater, based on $L=1.2 \sqrt{A}$, where A is a minimum of 900 square feet (83.6 m²). If a single fire can be expected to cause operation of the Model WS™ window sprinklers and sprinklers within the design area of a hydraulically calculated system, the water flow demand of the window sprinklers must be added to the water demand of the hydraulic calculations and must be balanced to the calculated area demand. If the window sprinklers are located in an area other than the hydraulic design area, the demand of the window sprinklers is not required to be added to the demand of the remote hydraulic design area; however, it is necessary to hydraulically prove that proper simultaneous operation of the Model WS™ window

sprinklers and the ceiling sprinklers adjacent to the Model WS™ window sprinklers will occur.

5.0 CONDITIONS OF USE

The Model WS™ window sprinklers described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The installation of the special-purpose sprinkler systems must be in accordance with the manufacturer's published installation instructions, this report and the applicable code. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs. A copy of the installation instructions and this report must be available at all times on the jobsite during installation.
- 5.2 The design, with plans and details of the specific installation of the fixed glazed assembly with special-purpose sprinklers, must be submitted to the code official for approval. The design must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.3 Where approved by the code official, the fixed glazed assembly described in this report, comprised of special-purpose sprinklers with fixed glazing having specific construction requirements, is intended to provide an alternative to a two-hour fire-resistance-rated nonload-bearing interior fire barrier assembly prescribed in IBC Section 707, a fire partition assembly prescribed in IBC Section 708 or an exterior wall assembly prescribed in IBC Section 705. The registered design professional must provide the code official with documentation outlining the basis of compliance with the criteria specified by the IBC for a code modification in accordance with Section 104.10 or for an alternative method of construction in accordance with Section 104.11.
- 5.4 The assembly must not be used in locations that contain materials that represent deflagration or detonation hazards.
- 5.5 Special-purpose fire sprinkler system piping must be designed, sized and installed in accordance with NFPA 13.
- 5.6 Use of the system is limited to wet-type special-purpose sprinkler systems and nonload-bearing wall assemblies.
- 5.7 Use of the special-purpose fire sprinkler system in exterior wall applications is limited to installations where the fire separation distance is greater than 5 feet (1524 mm) for the 2006 IBC, and 10 feet (3048 mm) for the 2015, 2012 and 2009 IBC.
- 5.8 The assembly is not permitted to incorporate penetrations. Openings must be protected in accordance with applicable requirements of the IBC for opening protection.
- 5.9 The fixed glazed assembly is not permitted to be used in lieu of firewalls. Where the assemblies are used as an alternative to fire barriers for exit-passageways, horizontal exits, or exit enclosures, the fire area (Section 202 of the IBC) in which the assembly is located shall be fully sprinklered in accordance with Section 903.3.1 of the IBC. The water supply duration for sprinklers, where used, shall be not less than the fire resistance rating that would have been

required for a fire barrier. In addition, the registered design professional shall provide the code official with documentation in accordance with Section 104.10 of the IBC for a code modification or Section 104.11 of the IBC for an alternative method of construction that addresses any anticipated impact on the functionality of the means of egress.

- 5.10** The fixed glazed assembly must not have intermediate horizontal mullions that interfere with the uniform distribution of water over the surface of the glazing.
- 5.11** All combustible materials must be kept a minimum distance of 2 inches (51 mm) from the face of the glass, such that the complete coverage of the glass by the sprinklers is not impeded. This is accomplished by a minimum 36-inch-high (914 mm) knee or “pony” wall at the base of the assembly. The means for

maintaining clearance must be as set forth in this evaluation report.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Special-purpose Sprinklers Used with Fixed Glazed Assemblies to Provide an Alternative to a Fire-resistance-rated Wall Assembly (AC385), dated February 2015.

7.0 IDENTIFICATION

For field identification, all Tyco Model WS™ window sprinklers are labeled with the manufacturer's name (Tyco), the product name, and the evaluation report number (ESR-2397).

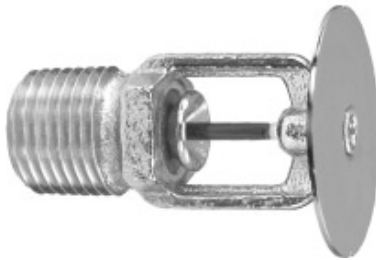


FIGURE 1—HORIZONTAL SIDEWALL SPRINKLER



FIGURE 2—PENDENT VERTICAL SIDEWALL SPRINKLER

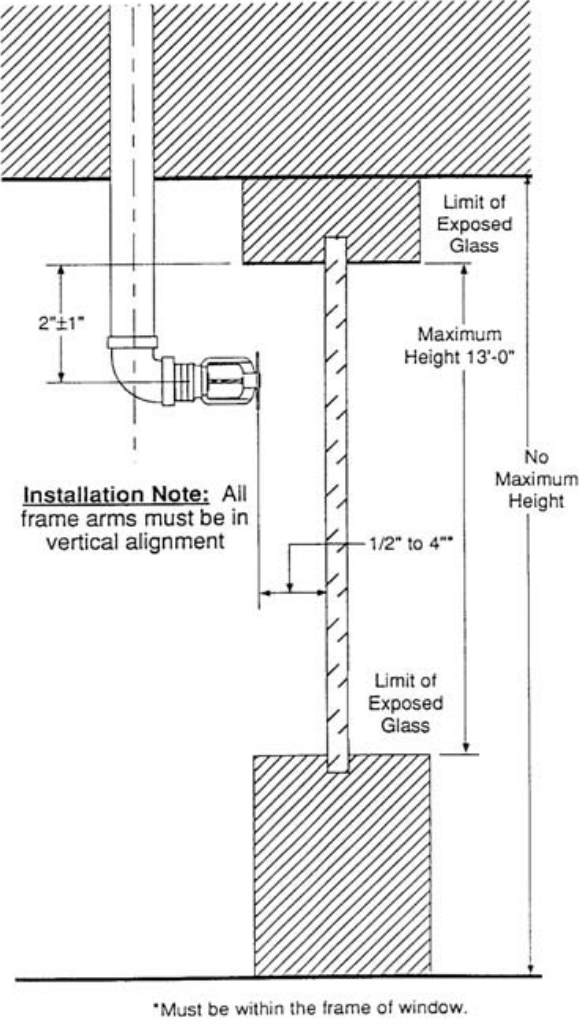


FIGURE 3—WS™ HORIZONTAL SIDEWALL
SPRINKLER INSTALLATION

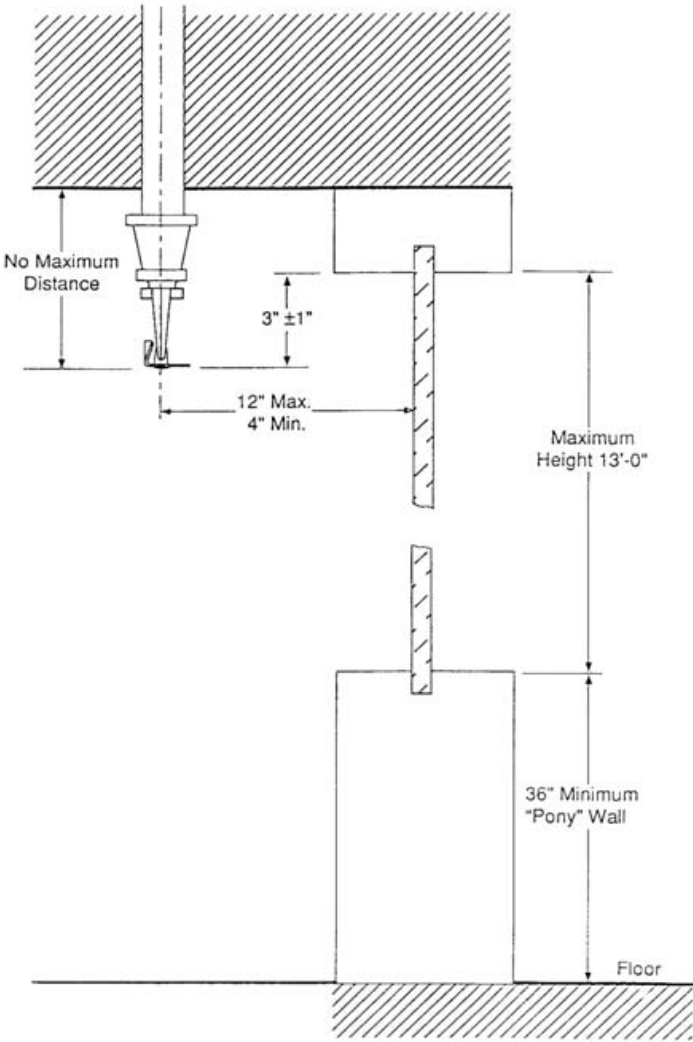


FIGURE 4—WS™ PENDENT VERTICAL SIDEWALL
SPRINKLER INSTALLATION