

# WINDOWS IN RATED APPLICATIONS

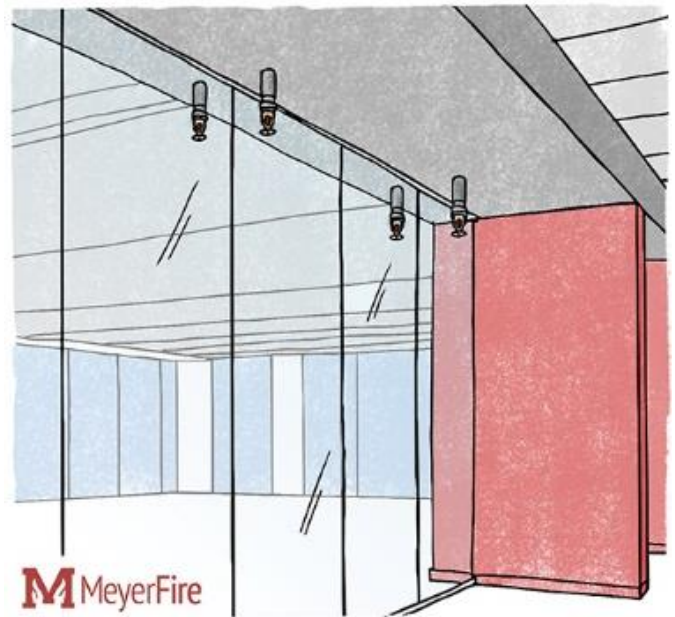
## A SUMMARY OF RATED WINDOWS, ATRIA, & WINDOW SPRINKLERS

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Protection of windows within a rated assembly is a surprising complex topic within fire protection due to a combination of passive and active fire protection elements. Three principal options are available to architects and engineers looking to address windows within rated applications; a rated window assembly, closely-spaced sprinklers for atrium enclosures, and use of special application window sprinklers.

The following summary is a starting point for comparison, which considers requirements from the International Building Code (2000-2018 Editions), NFPA 13 (only 2016 and 2019 have requirements), NFPA 101 (2003-2018 Editions), ICC-ES ESR-2397 Report (2018-2020 Issuance), and Tyco's WS Sprinkler Product Data and Listing. Refer to the cited codes and standards for full details and requirements.

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### CODE REFERENCES

APPLICATION	RATED WINDOWS	CLOSELY-SPACED FOR ATRA	TYCO WS SPRINKLERS
<b>Where Applied?</b>	Fire Partitions & Fire Barriers	In lieu of Atrium 1-hour Enclosure [IBC 2000-06 404.5, 2009-18 404.6, or NFPA 101 2003-18 8.6.7(c)]	Fire Partitions (IBC 708), Fire Barrier (IBC 707), or Exterior Wall (IBC 705) for up to 2-hour fire-resistance rating [ICC-ES ESR-2397 3.1, 5.3]
<b>Alternative to Code? Requires AHJ Approval?</b>	No; rated glazing can meet prescriptive code requirements.	No. [IBC 2000-06 404.5, 2009-18 404.6, or NFPA 101 2003-18 8.6.7(c)]	Yes; alternate method. [IBC 2003-18 104.11] [ICC-ES ESR-2397 3.3] [NFPA 101 2003-18 1.4.3]
<b>Supporting Documentation</b>	-	-	ICC-ES ESR-2397 Report [ <a href="#">ICC-ES Link</a> ]
<b>Building Code Criteria Apply?</b>	Yes.	Yes.	N/A
<b>NFPA 13 Criteria Apply?</b>	N/A	No. [NFPA 13 2016 A.8.15.26(3), 2019 A.9.3.15(3)]	Yes. [NFPA 13 2016 A.8.15.26(3), 2019 A.9.3.15(3)]
<b>Fire Separation Distance for Exterior Wall Use</b>	N/A	N/A	IBC 2006: 5-ft (1524 mm) min IBC 2009-15: 10-ft (3048 mm) min. [ICC-ES ESR-2397 5.7]
<b>In Lieu of Firewall?</b>	-	No. [IBC 2000-06 404.5, 2009-18 404.6, or NFPA 101 2003-18 8.6.7(c)]	No. [ICC-ES ESR-2397 5.9]

## GLASS & WALL CONSTRAINTS

	RATED WINDOWS	CLOSELY-SPACED FOR ATRA	TYCO WS SPRINKLERS
Doors Permitted?	Yes; use of rated door assembly permitted.	<p><i>IBC</i>: Yes, self- or automatic-closing doors are permitted. [IBC 2012 404.6.1.1.2, 2015-18 404.6.1.1.3]</p> <p><i>NFPA 101</i>: Yes, but doors must resist smoke and be self-or automatic-closing upon smoke detection. [NFPA 101 2003-18 8.6.7(c)(v, vi)]</p>	No, glazing must be fixed. [NFPA 13 2016 8.15.26(3), 2019 9.3.15(3)]
Glazing Type	N/A	<p><i>NFPA 101</i>: Laminated, tempered, or wired. [NFPA 101 2003-18 8.6.7(c)(iii)]</p>	<p><i>ICC</i>: ¼-in thick heat-strengthened or tempered glass [ICC-ES ESR-2397 3.3]</p> <p><i>NFPA 13</i>: Glass ceramic, heat-strengthened, or tempered. [NFPA 13 2016 8.15.26(3), 2019 9.3.15(3)]</p> <p><i>Tyco</i>: heat-strengthened and tempered (1/4-in, 6mm min.), FireLite Plus WS ceramic glass (5/16-in, 8 mm min), or stronger [WS Product Data p3]</p>
Gasketing System		<p>Must deflect in gasketed frame w/o breaking before sprinklers operate. [IBC 2000-06 404.5(1), 2009-18 404.6(1)] [NFPA 101 2003-18 8.6.7(c)(iii)]</p>	<p>Metallic frame with elastomeric seal. [ICC-ES ESR-2397 3.3]</p>
Load Bearing?	Yes, where permitted by IBC.	-	<p>Not Permitted. [NFPA 13 2016 8.15.26(5), 2019 9.3.15(5)] [ICC-ES ESR-2397 3.1, 5.6]</p>
Horizontal Mullions Permitted?	Yes	<p><i>NFPA 101</i>: No horizontal mullions permitted. [NFPA 101 2009-18 8.6.7(c)(vii)]</p>	<p><i>ICC</i>: No. [ICC-ES ESR-2397 3.3, 5.10]</p> <p><i>NFPA 13</i>: horizontal members cannot interfere with uniform distribution of water. [NFPA 13 2016 8.15.26(6), 2019 9.3.15(6)]</p>
Any Obstruction Permitted?	N/A	<p><i>NFPA 101</i>: No window treatments or obstructions that would interfere with wetting of glass surface. [NFPA 101 2009-18 8.6.7(c)(vii)]</p>	<p>No; obstructions cannot obstruct water distribution. [NFPA 13 2016 8.15.26(6), 2019 9.3.15(6)]</p>
Maximum Height of Glass	-	-	<p>13-ft (4 m) [ICC-ES ESR-2397 3.3] [WS Product Data p3]</p>
Nearby Combustible Materials?	N/A	N/A	<p>All combustibles must be 2-in (51 mm) from glass. Can be 36-in rated “pony wall”. No deflagr. or detonation hazards. [ICC-ES ESR-2397 4.1, 5.4] [WS Product Data p3]</p>

## SPRINKLER CONSTRAINTS

	RATED WINDOWS	CLOSELY-SPACED FOR ATRA	TYCO WS SPRINKLERS
<b>Sprinkler Type?</b>	N/A	Any permitted (commonly standard-spray pendent recessed or concealed)	Tyco WS Sprinkler, TY3388 or TY3488
<b>System Type?</b>	N/A	-	Wet-pipe only. [NFPA 13 2016 8.15.26(2), 2019 9.3.15(2)] [ICC-ES ESR-2397 3.1, 5.6]
<b>Sprinklers Required on Both Sides?</b>	No.	<i>IBC:</i> Yes, or on room-side-only if there is no walkway on the atrium side. [IBC 2000-06 404.5(1), 2009-18 404.6(1)] <i>NFPA 101:</i> Yes, or only on non-atrium side where there is no walkway or other floor area on atrium side above main level. [NFPA 101 2003-18 8.6.7(c)(iv)]	Yes, where assembly is required to be protected by both sides. [NFPA 13 2016 8.15.26(4), 2019 9.3.15(4)] [ICC-ES ESR-2397 3.1]
<b>Distance from Glass</b>	N/A	<i>IBC:</i> 4-in (102) to 12-in (305 mm) [IBC 2000-06 404.5, '09-18 404.6] <i>NFPA 101:</i> 12-in (305 mm) or less [NFPA 101 2003-18 8.6.7(c)(ii)]	<i>Horizontal Sidewall:</i> Deflector ½-in (12.7) to 4-in (102) from glass and 1-in (25) to 3-in (76.2 mm) down from top of frame. <i>Vertical Sidewall:</i> 4-in (102) to 12-in (305 mm) from face of glass and 2-in (51) to 4-in (102 mm) down from top of frame. [ICC-ES ESR-2397 4.1] [WS Product Data p3]
<b>Entire Surface Wet?</b>	N/A	Yes; entire surface must be wet upon activation [IBC 2000-06 404.5(1), 2009-18 404.6(1)] [NFPA 101 2003-18 8.6.7(c)(ii)]	Yes, as governed by listing and ICC-ES Report. [ICC-ES ESR-2397 4.1] [WS Product Data p3]
<b>Sprinkler Spacing (along glass)</b>	N/A	6-ft (1830 mm) on center [IBC 2000-06 404.5(1), 2009-18 404.6(1)] [NFPA 101 2003-18 8.6.7(c)(i)]	6-ft (1830 mm) minimum 8-ft (2440 mm) maximum [ICC-ES ESR-2397 4.1] [WS Product Data p3]
<b>Sprinkler Distance from Vertical Mullion</b>	N/A	-	4-in (101.6 mm) minimum 4-ft (1.22 mm) maximum [WS Product Data p3]

## HYDRAULICS

	RATED WINDOWS	CLOSELY-SPACED FOR ATRA	TYCO WS SPRINKLERS
<b>Sprinkler Type?</b>	N/A	Any permitted (commonly standard-spray pendent recessed or concealed)	Tyco WS Sprinkler, TY3388 or TY3488 [ICC-ES ESR-2397 3.2]
<b>Water Supply Duration</b>	N/A	-	Not Less than Required Rating (Typically 1 or 2-hour) [NFPA 13 2016 8.15.26(7), 2019 9.3.15(7)] [ICC-ES ESR-2397 4.1]
<b>Maximum Pressure</b>	N/A	(Per listing of sprinkler)	<i>Horizontal Sidewall:</i> 175 psi (1207 kPa) when separated by vertical mullion, or 70 psi (483 kPa) when not separated <i>Vertical Sidewall:</i> 175 psi (1207 kPa) [ICC-ES ESR-2397 4.2] [WS Product Data p3]
<b>Remote Area</b>	N/A	Not specifically addressed; NFPA 13 provides similar criteria for Water Curtains to meet minimum remote area length of NFPA 13 [NFPA 13 2002 11.2.3.8.2, 2007-16 11.3.3.2, 2019 19.4.3.2]	Most demanding 46.5 linear feet (14.2 m), or 36 linear feet where quick-response reduction is used. Added to remote area. [ICC-ES ESR-2397 4.2]
<b>Window Sprinklers Added to Remote Area?</b>	N/A	Not specifically addressed; NFPA 13 requires both closely-spaced and adjacent sprinklers be calculated for Water Curtains where a single fire can cause operation of window and ordinary sprinklers. [NFPA 13 2002 11.2.3.8.3, 2007-16 11.3.3.3, 2019 19.4.3.5]	Yes, where a single fire can cause operation of window and ordinary sprinklers. [ICC-ES ESR-2397 4.2]
<b>Minimum Flow per Sprinkler</b>	N/A	Not specifically addressed; NFPA 13 provides similar criteria for Water Curtains of 3 GPM per lineal foot (37 L/min per lineal m), and not less than 15 GPM (57 L/min) each [NFPA 13 2002 11.2.3.8.1, 2007-16 11.3.3.1, 2019 19.4.3.1]	20 GPM (75.7 LPM) for spacing of 6-ft to 8-ft, or 15 GPM (56.8 LPM) for sprinkler spacing less than 6-ft (1.83 m) [WS Product Data p4]