

AIA Best Practices



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Course Description

Introduction to Architectural Fire-Rated Glazing

AIA Course Number: VSGNA 1.0

AIA Credit: 1 LU/HSW



Health, safety, and welfare remain a fundamental aspect of building design practices. Incorporating fire-rated glass products provides creative design options while adhering to current model building codes. The new generation of fire-rated products is available in larger sizes that can withstand a fire for longer periods of time, and many fire-rated products can provide high impact safety rating, solar control, sound reduction, bullet resistance and hurricane impact safety, to name only a few multi-functional features. This course will define categories of fire-rated glass products, as well as the related test standards and current building code requirements for specifying architectural fire-rated glazing.

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SAINT-GOBAIN



GREENLITE
GLASS SYSTEMS

Pushing the Envelop with Fire Rated Glazing

BC BEC

Ryan Dennett,
Greenlite Glass Systems



SAINT-GOBAIN



On the **safe** side

- > Founded in **1980** to develop fire resistant safety glass
- > Saint-Gobain founded in **1665**, France
- > Multifunctional product range.
dedicated to **fire** and **high-security** glass solutions.
- > Operating in **66** countries with over **840** people.
- > Manufacturing in **8** main production sites on **3** continents
- > Closest is Auburn WA (Seattle area)

Learning Objectives

Introduction to Architectural Fire-Rated Glazing

AIA Course Number: VSGNA 1.0

AIA Credit: 1 LU/HSW



- > **Review** the evolution of fire-rated glass and define how modern wire-free glazing can improve fire and impact safety ratings.
- > **Establish** the differences between FIRE PROTECTIVE and FIRE RESISTIVE rated glazing products.
- > **Understand** the methods of heat transfer and how these affect building occupants.
- > **Explain** the code requirements and testing standards for fire and energy performance of fire-rated glazing.



Building Elements

Glazed fire resistive systems

- Fire Doors
- Windows
- Partitions
- Curtain wall
- Skylights
- Glass Floors
- Smoke Barriers



Partitions



Skylight



Doors



Floors



Curtain Wall

Areas of Application

Designed to Compartmentalize

Most Critical Areas of Application

- > Fire doors
- > Elevator lobby
- > Atrium wall assemblies
- > Fire Exit staircase
- > Egress Corridors
- > Exterior walls
- > Car Parking Areas (Basement)
- > Areas of Refuge
- > Data server rooms / Instrument control rooms





Building Segments

Visual Transparency & Day Light

Non-Residential

- Offices
- Health care
- Education
- Airports & Transport
- Public Administration

Multi-Family Residential

- Multi-use occupancy
- Property line separations
- Vertical fire spread





Review: Evolution of Fire-rated Glass

Learning Objective 1

Evolution of Fire-rate Glazing



Wired Glass Introduced in 1899 after fire insurance companies in North America mandated the product could be utilized as a fire protectant in elevator and shaft enclosures.

1900

1977



Consumer Product Safety Commission
Establishes standards to protect people from injuries due to accidental impact with glazing.



Ceramic Glazing: Introduced as an alternative “wire-free” building material following its initial conception in 1940 to meet the requirements of the market for domestic heating appliances.

1980's

1990's



Intumescent Glazing: State of the art glazing that can block significant amounts of heat from transferring through the glass.

Wired Glazing

Fire-Protective Rated



- > Rated up to 45 Minutes.
- > Traditional wired glass is **NOT** safety glass.
- > Imbedded wire weakens the glass and increases the likelihood of breakage.
 - > Breakage occurs under the minimal impact of 100ft./lb. (the force of a small child).
 - > The impact of a child's hand or leg through easily broken wired glass can be snared by the wire resulting in more severe injury.
- > 2003: Wired glazing forced to comply with CPSC impact-safety standards.
- > 2006: **Wired Glass Banned.**
 - > Available with surface applied Safety Film.



45 Minute Rated Wired Glass

Ceramic Glazing

Fire-Protective Rated



- > $3/16$ " thickness – 20 min to 3 hour fire rating.
- > $5/16$ " thickness – 20 min to 3 hour fire rating.
- > Most common application: 45 minutes
- > Available as filmed or laminated safety glass to meet impact rating (Cat I & Cat II).
- > Resists high temperature & thermal shock.
- > Transparent and wireless.
- > Cost effective and sustainable.
- > Ideal for borrowed lites, sidelites, doors, and transoms.
- > Available in insulated glass unit (IGU) make-ups that comply with energy codes for exterior application.



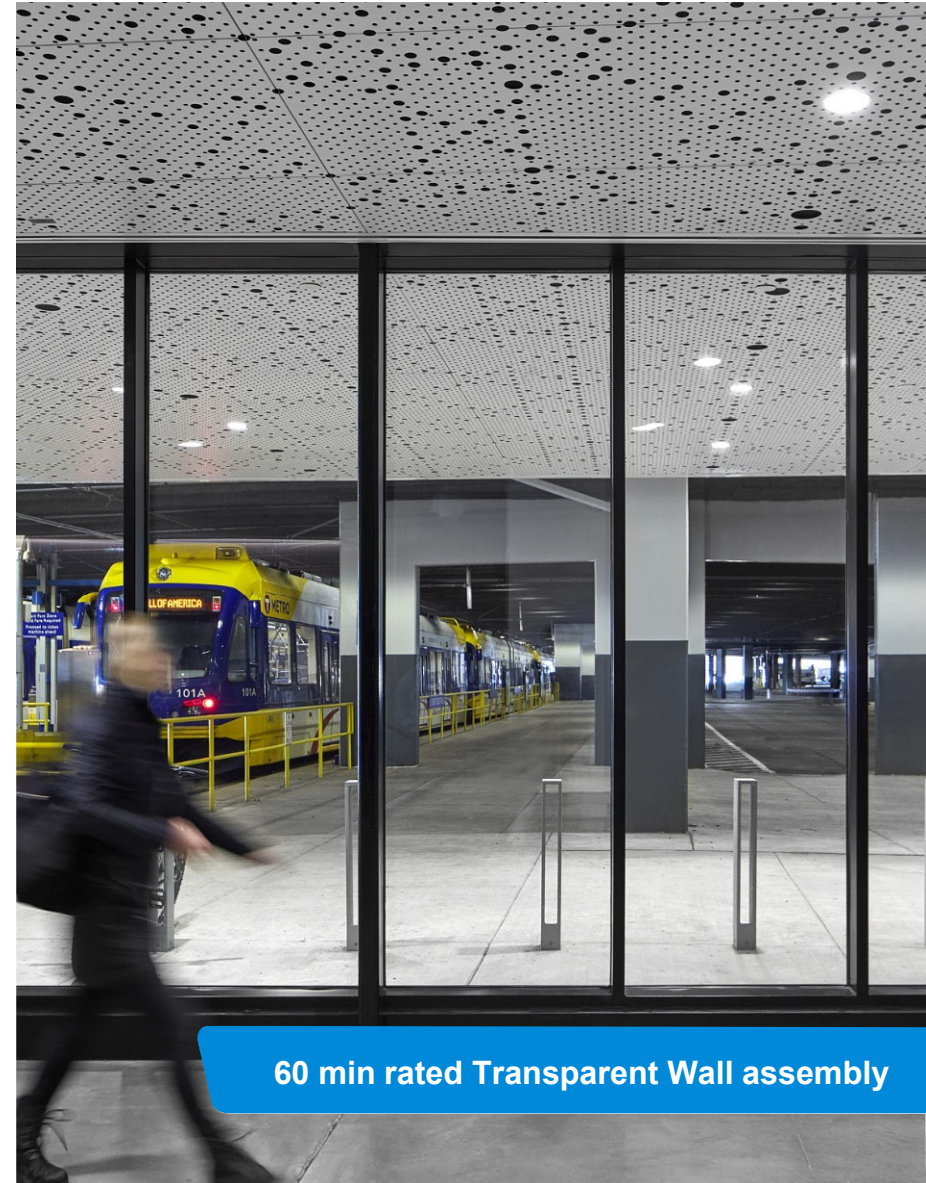
45 min rated ceramic door lites + sidelites

Intumescent Glazing

Fire-Resistive Rated



- > 3/4" up to 4" thickness – 45 min to 180 min fire rating.
- > Most advanced in design by compartmentalizing smoke flames, and the dangerous transfer of radiant heat.
- > Products:
 - > Heat absorbing polymer gel between 2 layer of tempered glass.
 - > Thin layers of transparent intumescent material sandwiched between layers of either tempered or annealed glass.



60 min rated Transparent Wall assembly

Intumescent Glazing

Fire-Resistive Rated



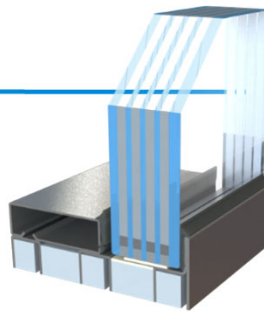
- > When heated, a series of reactions occur:
 - > Exposed layer of glass cracks.
 - > First layer of intumescent material is activated.
 - > Panel becomes opaque, reducing heat transmission.
 - > Heat eventually degrades intumescent and second layer of glass cracks.
 - > Process repeats itself through all layers, depending on fire rating.
- > When exposed to fire, glass on unexposed surface remains cool and does not slump.



60 min rated Transparent Wall assembly

CONTRAFLAM

INTUMESCENT



- > A high degree of light transmittance
- > Tempered glass, offering a higher resistance to impact
- > The longest fire protection possible (up to 3 hours)
- > The best UV stability (not affected by UV rays)
- > Soundproofing properties
- > Becomes the equivalent of a fire-rated wall, when combined with VDS® frames
- > Proudly Produced in Auburn, Washington



FIRE
RESISTIVE



IMPACT
RATED



COLOR
SHAPES



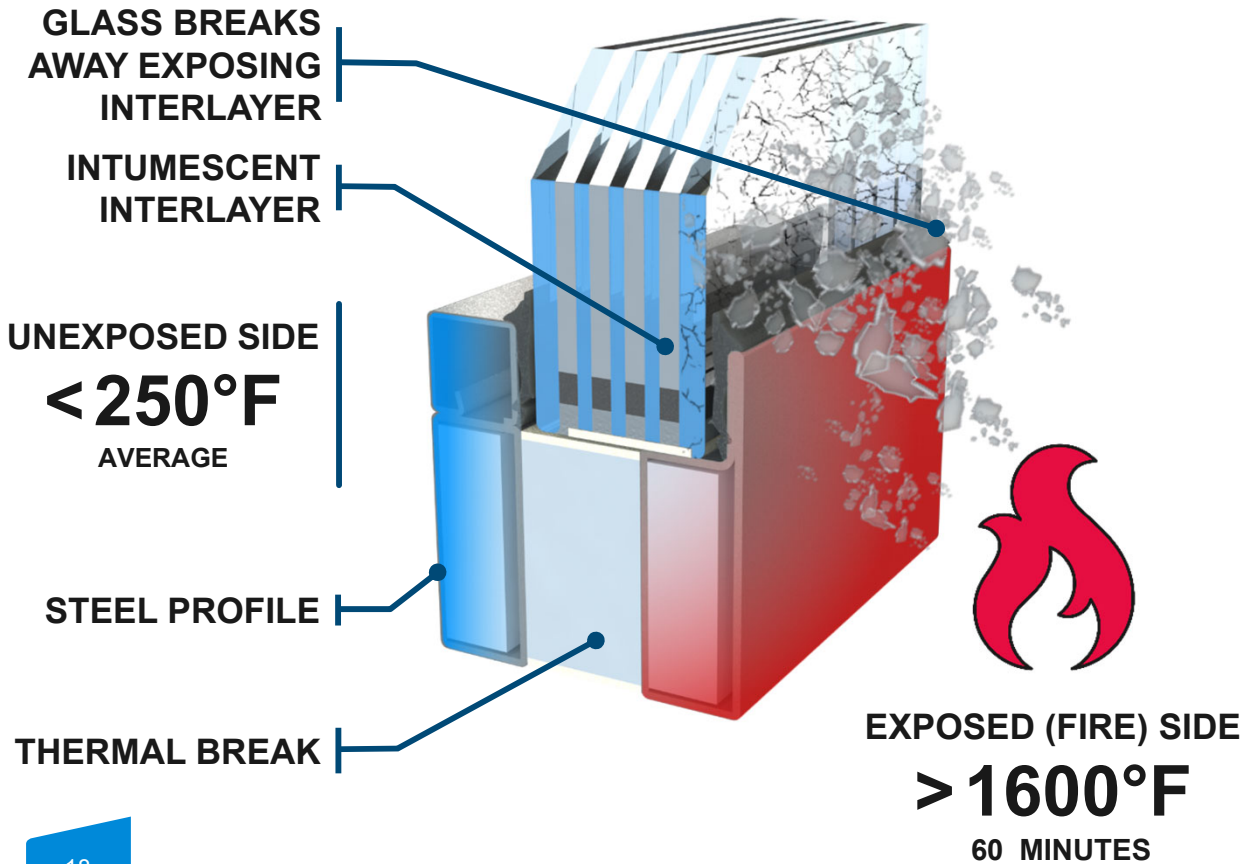
INSULATED
SOLAR CONTROL



Contraflam

Fire-Resistant Frame Systems

Complete assembly (**Glass & Frame**) must maintain the same fire rating!



- > Thermally broken steel profile systems used **in conjunction** with fire and safety-rated glazing products provide a barrier to radiant and conducted heat transfer.
- > Interlayer absorbs energy from fire and limits transmission of radiant heat to non-fire side.

Fire-Protective vs. Fire-Resistive

Learning Objective 2





Fire Protective

Defends Against
Smoke
Flames



Fire Resistive

Defends Against
Smoke
Flames
Radiant Heat



Rated for 
20 -180 minutes

Fire Protective

CAN.ULC-S104 / Doors
CAN.ULC-S106 / Windows

Defends Against

Smoke
Flames

Does Not protect against
radiant heat

Products

Wired Glass
Tempered Glass
Ceramic Glass



*Rated for
60 -180 minutes*

**ASTM E119/
CAN.ULC-S101**

Does protect against radiant
heat

Does need to be installed in
a fire-rated frame



Fire Resistive

Defends Against

**Smoke
Flames
Radiant Heat**

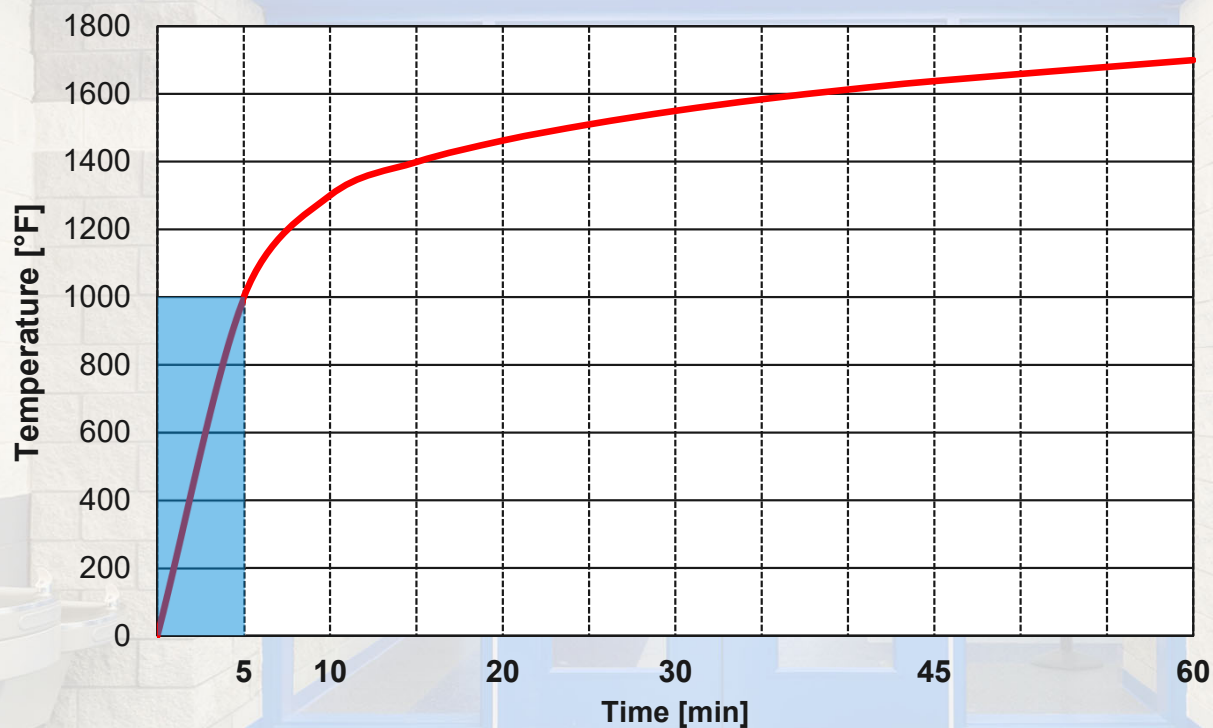
Fire Test

RADIANT HEAT COMPARISON



TEMPERATURE-TIME CURVE

Representation of relatively severe building fire



**5
mins**

The fire has reached
in excess of 1,000°F

Note that the temperature-time relationship of this test method represents
only one actual fire situation

Hose Stream Test

Understanding Thermal Shock

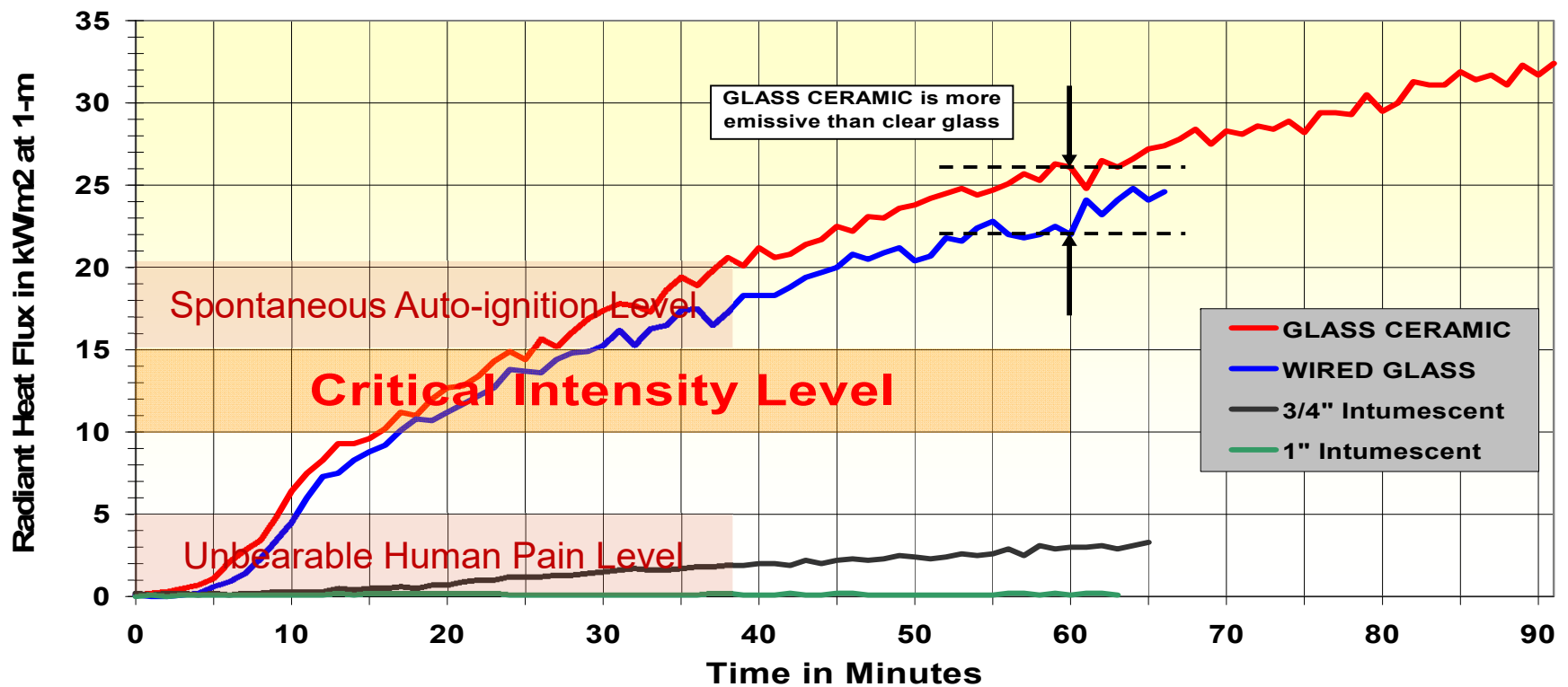


Understanding the Effects of Heat Transfer

Learning Objective 3



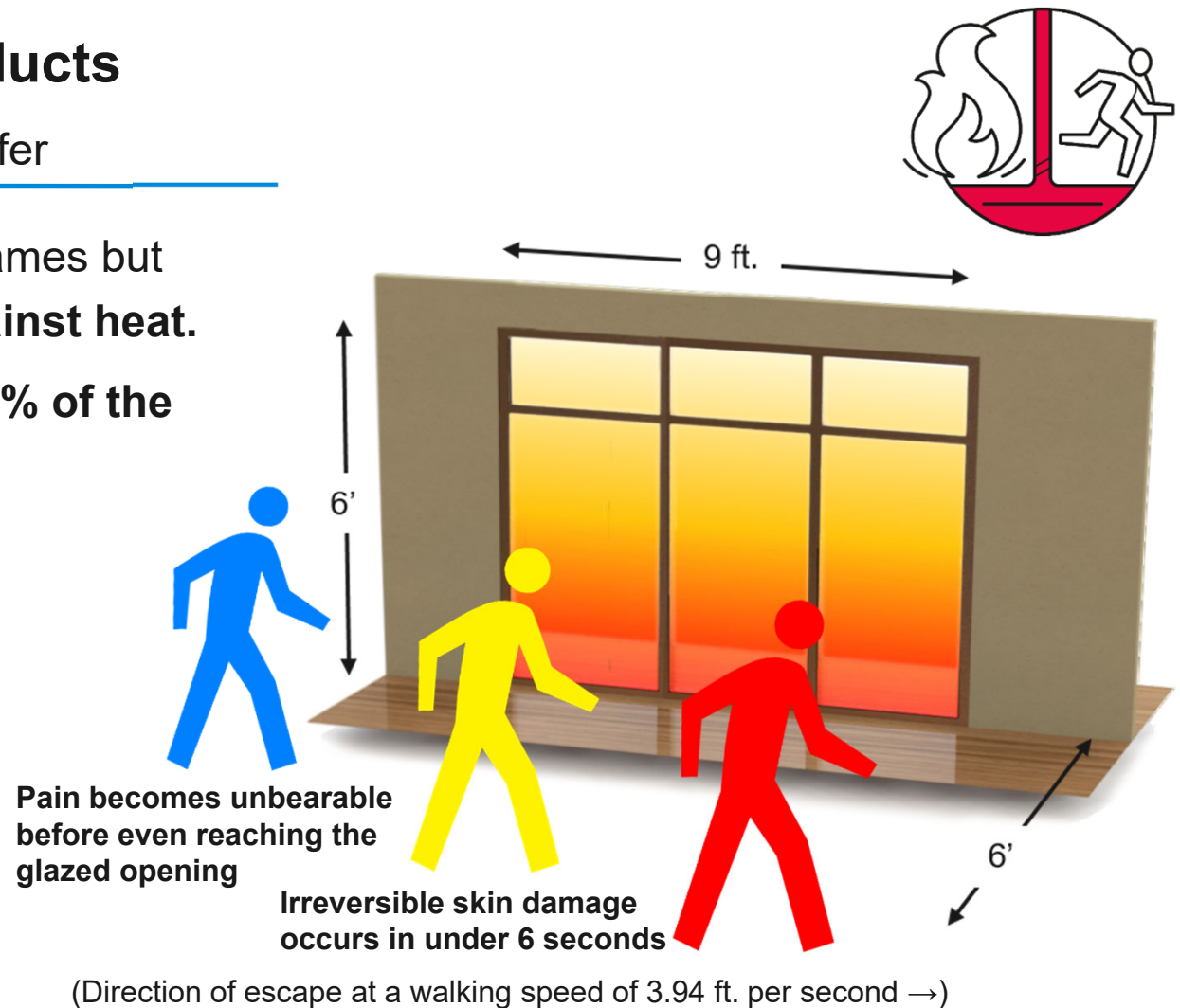
UNDERSTANDING HEAT TRANSFER



Fire-Protective Products

Understanding Heat Transfer

- > Contains smoke and flames but **does NOT protect against heat.**
- > **IBC cannot exceed 25% of the total wall area.**
- > Typical Fire Ratings:
 - > 45 min
 - > 90 min



PROTECTIVE

Limitations in the BC Building Code



- The fire protection rating of closures in fire separations is determined by Code; BCBC table 3.1.8.4 and Sentence 3.1.8.10 (1)
- Fire Protective Glazing in openings is limited to:
 - not more than 11 m², with no dimension more than 3.7 m, if not sprinklered on either side
 - not more than 22 m², with no dimension more than 6 m, if sprinklered on either side
- Fire Protective Glazing in temperature rise door locations is limited by Code (BCBC Table 3.1.8.15)

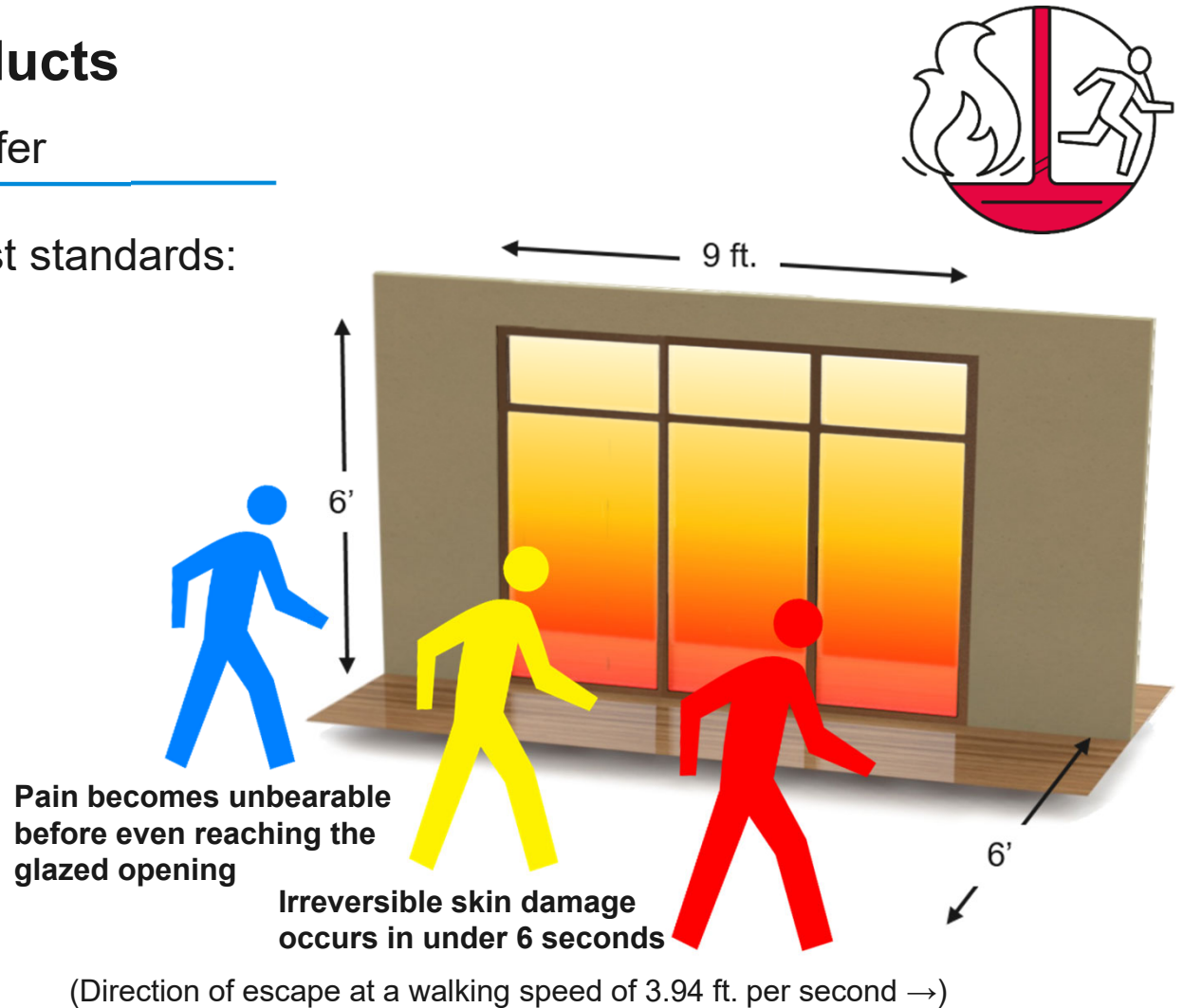
Fire-Protective Products

Understanding Heat Transfer

Subject to the following test standards:

- > Fire Door Tests
 - > NFPA 252
 - > NFPA 80
 - > UL 10B / UL 10C
 - > CAN.ULC-S104

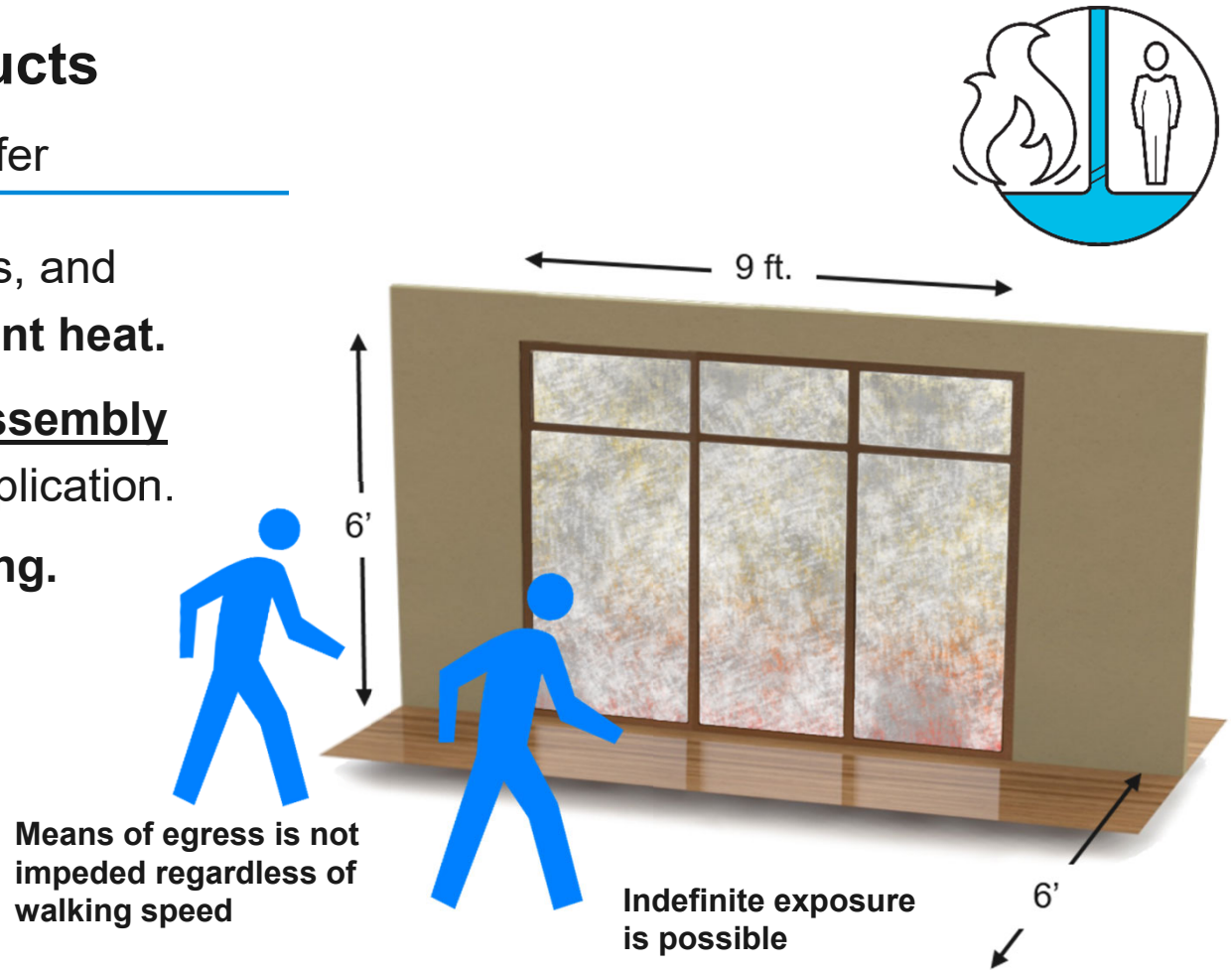
- > Fire Window Tests
 - > NFPA 257
 - > UL 9
 - > CAN.ULC-S106



Fire-Resistive Products

Understanding Heat Transfer

- > Contains smoke, flames, and **protects against radiant heat.**
- > **“Transparent Wall” Assembly** not limited in size or application.
- > **Must include framing.**
- > Typical Fire Ratings:
 - > 60 min
 - > 120 min



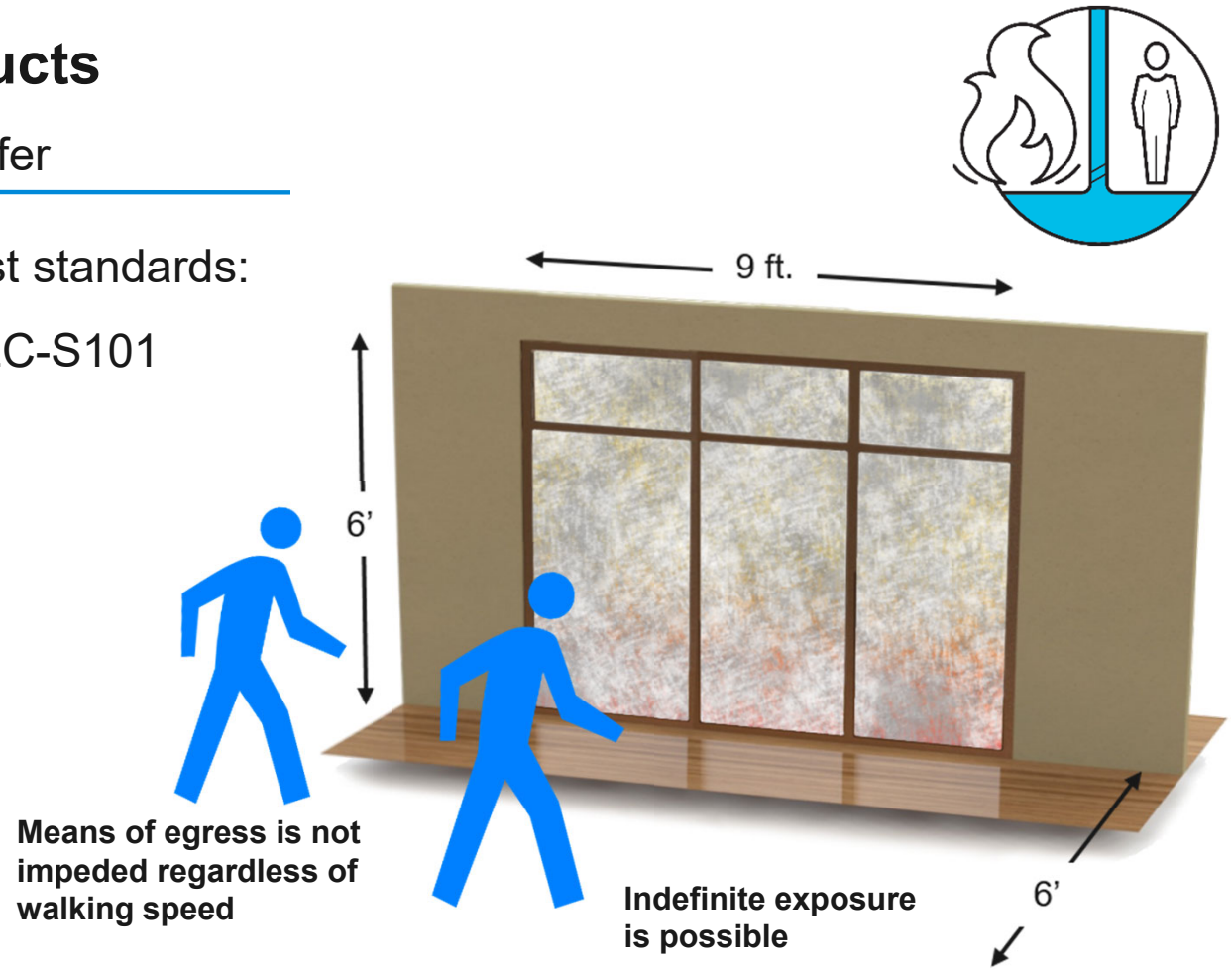
(Direction of escape at a walking speed of 3.94 ft. per second →)

Fire-Resistive Products

Understanding Heat Transfer

Subject to the following test standards:

- > ASTM E 119 / CAN.ULC-S101
- > UL 263
- > NFPA 251



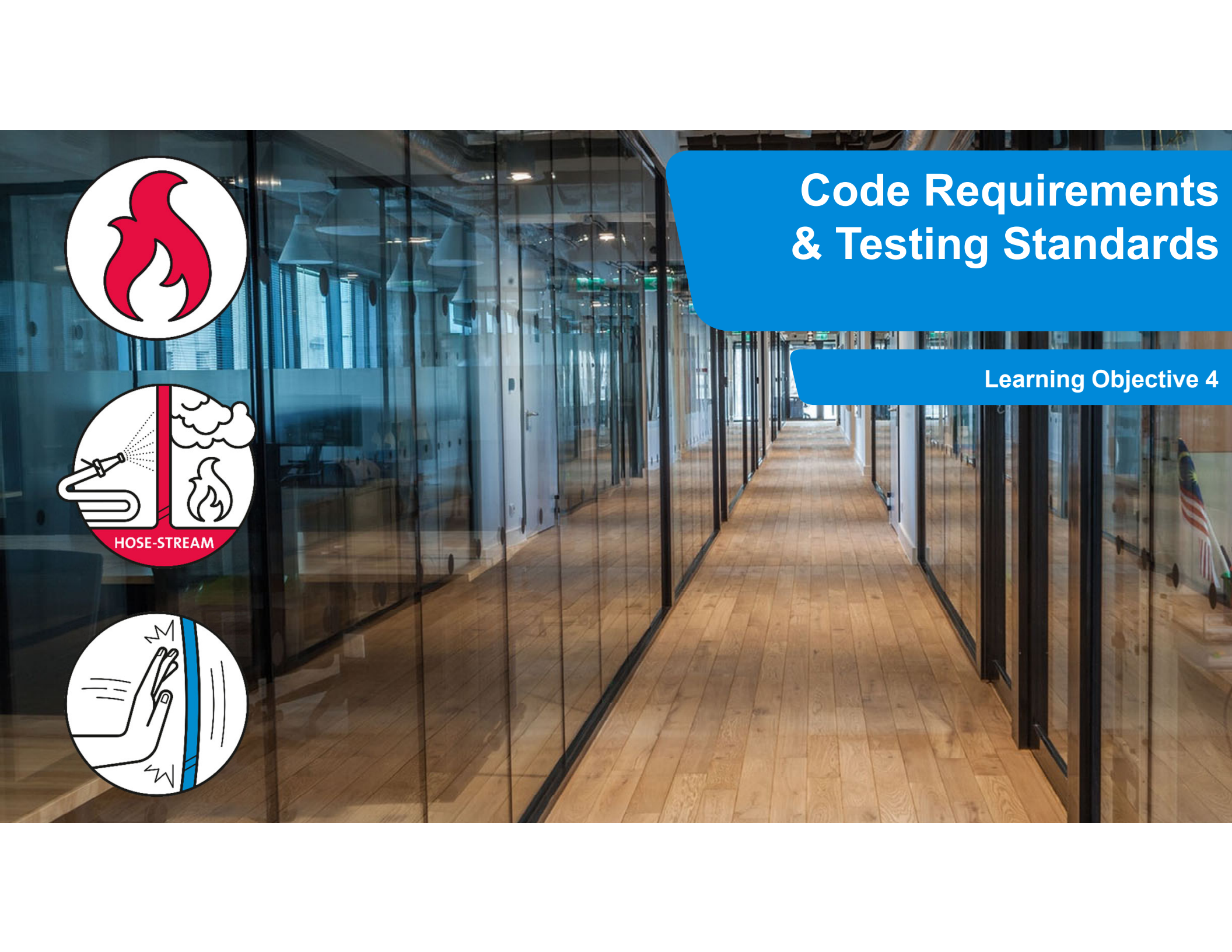
(Direction of escape at a walking speed of 3.94 ft. per second →)

RESITIVE

No Limit 😊



- FIRE RESISTIVE products allow building occupants to pass glazed areas without the risk of burn injuries due to radiant heat exposure
- FIRE RESISTIVE products for use in Fire Separations / **Fire Walls are not limited by Code in sizes / area.**
(Maximum tested sizes / area still apply.)
- Products with this classification must conform with CAN/ULC-S101 "Fire Endurance Tests of Building Construction and Materials"



Code Requirements & Testing Standards

Learning Objective 4



ASTM

American Society for Testing Materials is a global leader in the development and delivery of voluntary consensus standards. With over 12,000 used around the world to improve product quality and consumer confidence



UL

Underwriter Laboratories is a third-party certification company that's been around for over a century. They certify products with the aim to make the world a safer place for both workers and consumers.



NFPA

National Fire Protection Association is a global self-funded nonprofit organization, devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards.

Important Fire Testing Standards

ASTM E119 CAN.ULC/S101

Standard Test Methods for Fire Tests of Building Construction and Materials.

NFPA 80

Standard for regulating the installation and maintenance of fire protective openings in walls, floors and ceilings

NFPA 252 CAN.ULC/S104

The standard for fire door systems.

NFPA 257 CAN.ULC/S106

The standard for windows, glass block and other lite-transmitting assemblies.



Ask us about attending a fire test!

Introduction to Fire Rated Assemblies

Fire-rated glass is classified as a life-safety building material

- Governed by the International Building Code (IBC)
- Rated by performance in standardized testing of how long the glass will stop the spread of fire and smoke
- Typical clear glass will fail at temperature difference approaching 250° F
- Fire-rated glasses can protect people and property at temperatures exceeding 1,600° F

Fire Rated Assemblies

IBC Code Requirements

- Occupancy Separation (Table 508.4)
- Building Elements (Table 601)
- Fire Separation Distance (Table 602)
- Fire Barrier Assemblies (Table 707.3.9)
 - Fire Barriers – Section 707
 - Fire Partitions – Section 708
 - Smoke Barriers – Section 709
 - Smoke Partitions – Section 710
- Fire Door and Fire Shutters (Table 715.4)



A fire test in progress

**TABLE 716.5
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS**

| TYPE OF ASSEMBLY | REQUIRED WALL ASSEMBLY RATING (hours) | MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours) | DOOR VISION PANEL SIZE ^b | FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^d | MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours) | | FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL | |
|------------------|---------------------------------------|--|-------------------------------------|---|---|-----------------|--|-----------------|
| | | | | | Fire protection | Fire resistance | Fire protection | Fire resistance |
| Fire and fire | 4 | 3 | See Note b | D-H-W-240 | Not Permitted | 4 | Not Permitted | W-240 |
| | 3 | 3 ^a | See Note b | D-H-W-180 | Not Permitted | 3 | Not Permitted | W-180 |
| | | | | ≤100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90 | Not Permitted | 2 | Not Permitted | W-120 |

IBC Table 716.5

Opening Fire Protection Assemblies

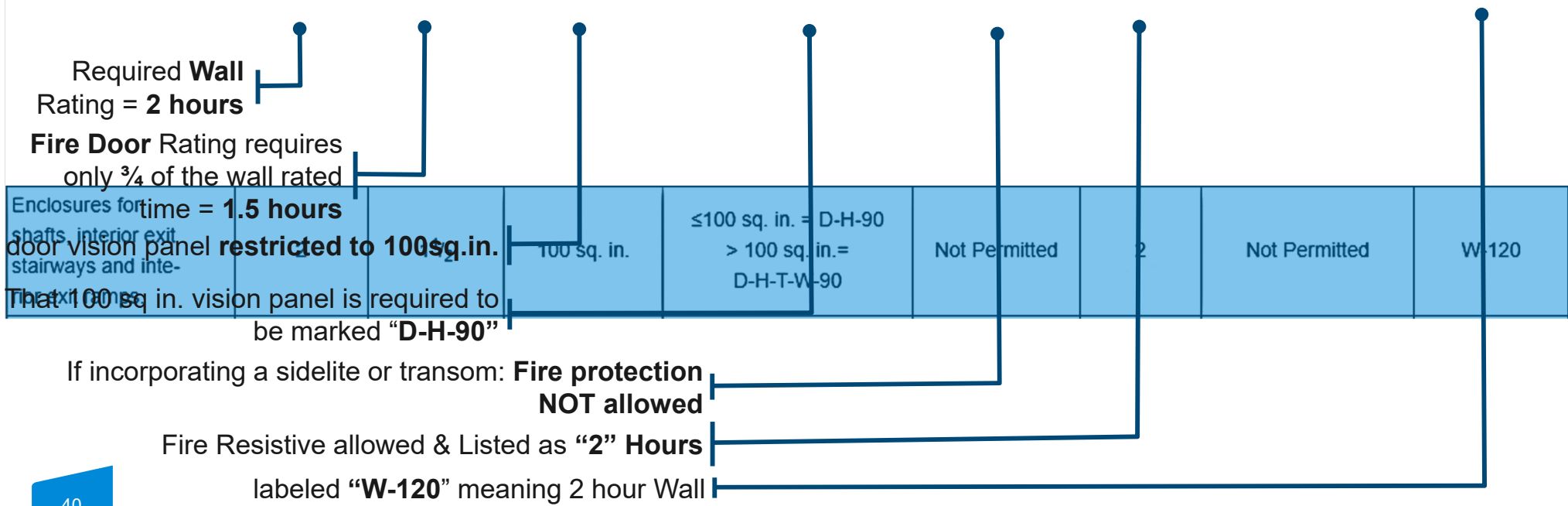
International Building Code: Chapter 7 Section 703

- IBC 2015 - limits the size of **fire protective** glazing, such as safety wired glass and safety ceramic, used within vision panels for 60 or 90 minute temperature-rise doors to **no more than 100 square inches**.

Now Let's Walk Through a Scenario...

**TABLE 716.5
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS**

| TYPE OF ASSEMBLY | REQUIRED WALL ASSEMBLY RATING (hours) | MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours) | DOOR VISION PANEL SIZE ^b | FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^d | MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours) | | FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL | |
|------------------|---------------------------------------|--|-------------------------------------|---|---|-----------------|--|-----------------|
| | | | | | Fire protection | Fire resistance | Fire protection | Fire resistance |



Fire Rated Door Assemblies

Code Requirements

| Rating | Glazing Limitations | Building Code Marking / Comments |
|--------|-------------------------|---|
| 45' | Maximum Size Tested | D-H-45 / Hose Stream Test required |
| 60' | 100 sq.in. Vision Panel | D-H-T-60 / Fire- <u>Resistance</u> -Rated glazing >100 sq.in. permitted when tested as component of door assembly and max. transmitted temp. of 450 °F after 30 minutes |
| 90' | 100 sq.in. Vision Panel | D-H-T-90 / Fire- <u>Resistance</u> -Rated glazing >100 sq.in. permitted when tested as component of door assembly and max. transmitted temp. of 450 °F after 30 minutes |
| 180' | 100 sq.in. Vision Panel | D-H-180 / Hose Stream Test required / Allowed in Horizontal Exits only |

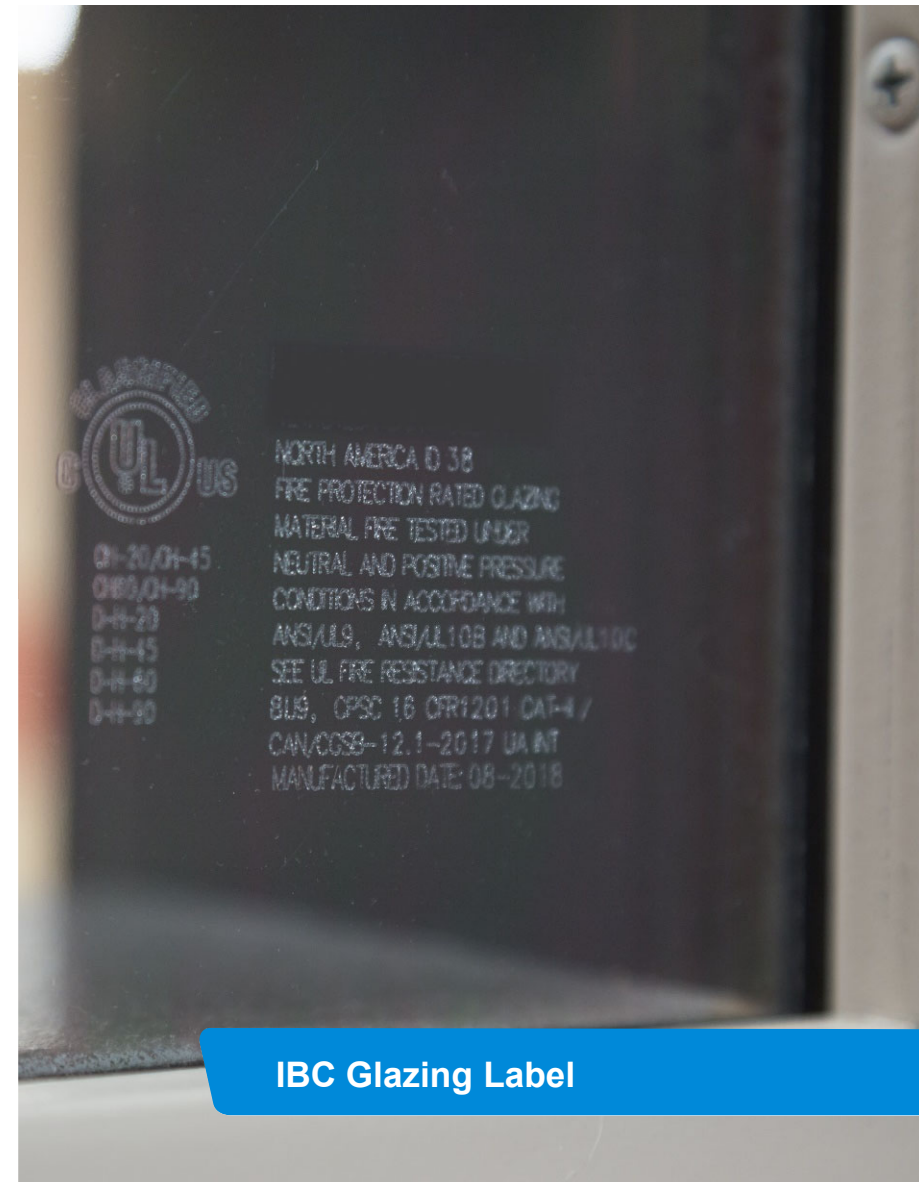
Refer to NFPA 80 & IBC 716.1(2)

Fire Rated Glazing Labels

Label Requirements

| Marking | Definition of Marking |
|------------|--|
| W | Meets wall assembly criteria. ASTM E 119 or UL 263 |
| OH | Meets fire window assembly criteria including the hose stream test. NFPA 252 or UL 9 |
| D | Meets fire door assembly criteria. NFPA 252 or UL 10B or UL 10C |
| H | Meets fire door assembly “Hose Stream” Test. NFPA 252 or UL 10B or UL 10C |
| T | Meets 450°F temperature rise criteria for 30 minutes. NFPA 252 or UL 10B or UL 10C |
| XXX | The time in minutes of the fire resistance or fire protection rating of the glazing assembly. |

Source: 2012 IBC Table 716.3, Marking Fire-Rated Assemblies



BC Building Code Requirements

Learning Objective 5



BCBC 3.2.3.15

Wall Exposed To Adjoin Roof

3.2.3.15. Wall Exposed to Adjoining Roof

1) Except as permitted by Sentence 3.2.3.19.(4), if a wall in a *building* is exposed to a fire hazard from an adjoining roof of a separate *fire compartment* that is not *sprinklered* in the same *building*, and the exposed wall contains windows within 3 *storeys* vertically and 5 m horizontally of the roof, the roof shall contain no skylights within 5 m of the exposed wall.

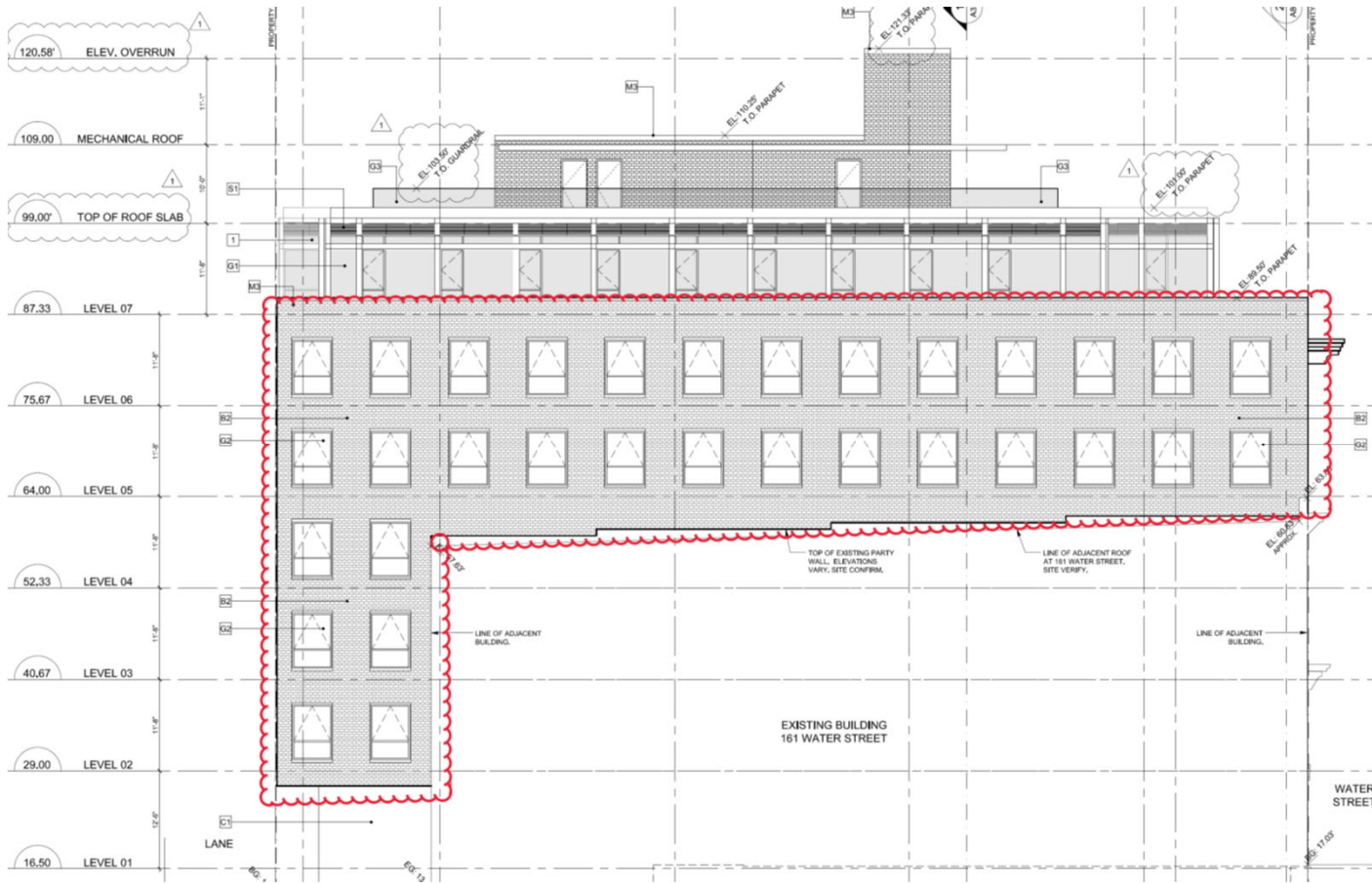
155 Water St. Vancouver

Wall Exposed To Adjoin Roof

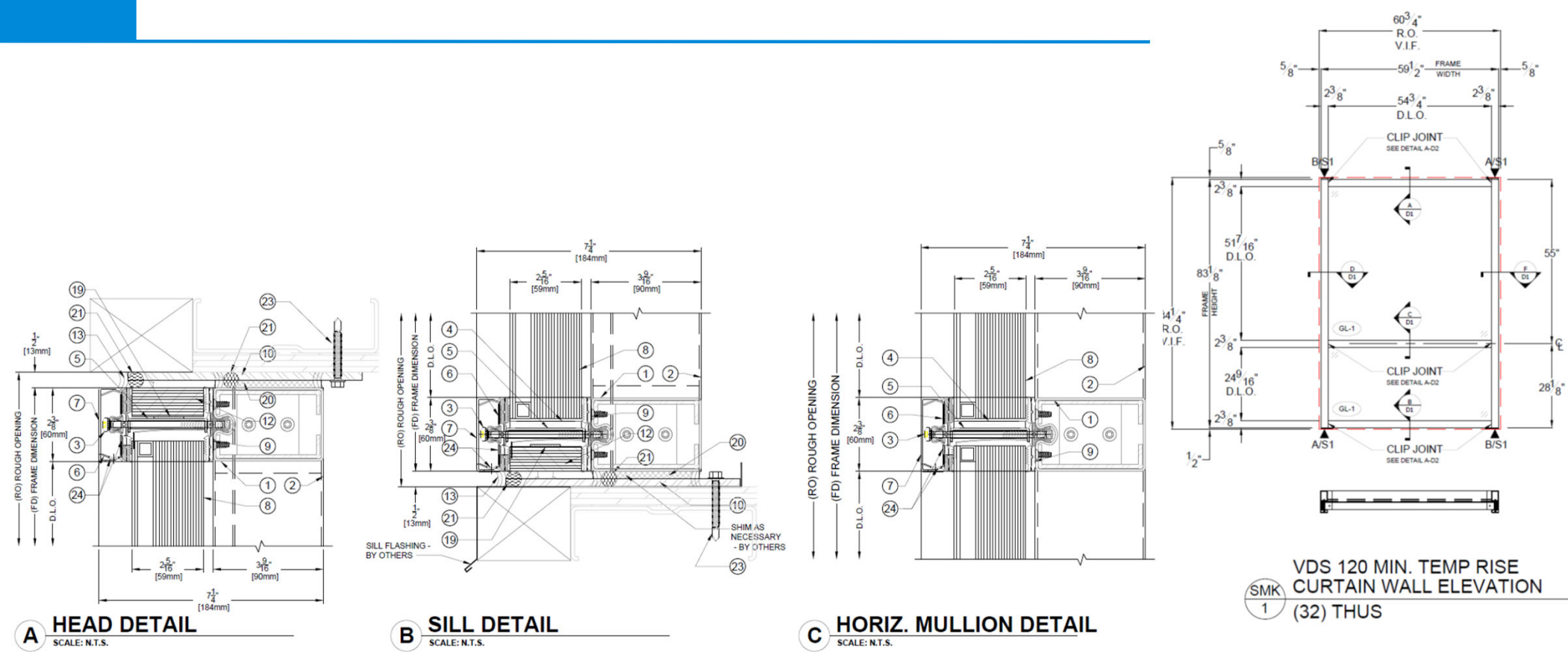


155 Water

Wall Exposed To Adjoin Roof



155 Water – 2hr VDS Curtainwall Punched Windows



VDS 120 MIN. TEMP RISE CURTAIN WALL ELEVATION (32) THUS

SMK 1

3.2.3.14 Wall Exposed to Another Wall

3.2.3.14. Wall Exposed to Another Wall

1) Except as required by Sentences (3) and 3.2.3.13.(1) or as permitted by Sentence 3.2.3.19.(4), if an *unprotected opening* in an exterior wall of a *fire compartment* is exposed to an *unprotected opening* in the exterior wall of another *fire compartment*, and the planes of the 2 walls are parallel or at an angle less than 135°, measured from the exterior of the *building*, the *unprotected openings* in the 2 *fire compartments* shall be separated by a distance not less than D_o where

$$D_o = 2D - (\theta/90 \times D)$$

but in no case less than 1 m, and

- D = the greater required *limiting distance* for the *exposing building faces* of the 2 *fire compartments*, and
- θ = the angle made by the intersecting planes of the *exposing building faces* of the 2 *fire compartments* (in the case where the exterior walls are parallel and face each other, $\theta = 0^\circ$).

(See Note A-3.2.3.14.(1).)

2) The exterior wall of each *fire compartment* referred to in Sentence (1) within the distance, D_o , shall have a *fire-resistance rating* not less than that required for the interior vertical *fire separation* between the *fire compartment* and the remainder of the *building*.

- 3) Sentence (1) does not apply to *unprotected openings* of *fire compartments* within a *building* that is *sprinklered* throughout, but shall apply to
 - a) *unprotected openings* of *fire compartments* on opposite sides of a *firewall*, and
 - b) exposure from *unprotected openings* of a *fire compartment* that is not protected by an automatic *sprinkler system*.

Pendrellis

Deep Energy Retrofit project, non-sprinklered

- By code, the project would likely only need $U_{IP}-0.38$ windows
- But the project has GHG emissions reduction targets
- Need higher-insulating fenestration to hit those targets
- Target U-value is 0.20
- 60min Fire-Resistive Glass and Framing required



Pendrellis – Deep Energy Retrofit

VDS Curtainwall - NFRC Guide



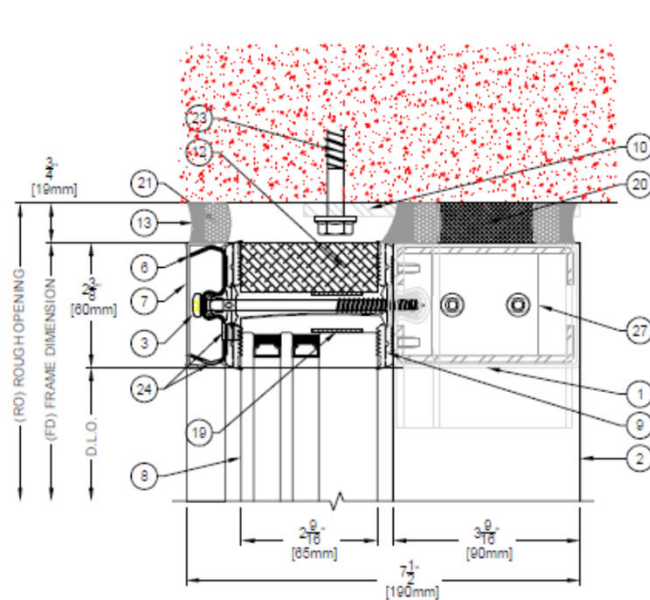
NFRC Reference Guide For VDS Curtain Wall Simulated Values

Energy information from the National Fenestration Rating Council

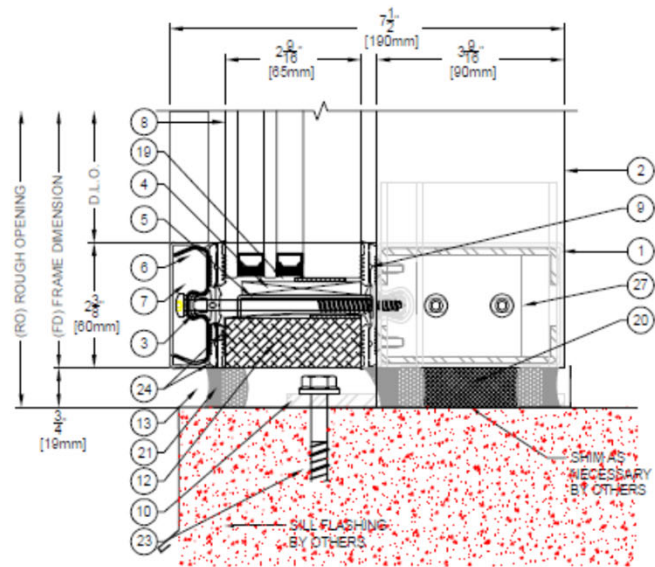
| Mullion Part # | Mullion Width (mm) | Mullion Depth (mm) | | Pilk Energy Adv. Air Space CONTRFLAM 120 | Solarban 60 Air Space CONTRFLAM 120 | Solarban 70 Air Space CONTRFLAM 120 | Pilk Energy Adv. Air Space CONTRFLAM 120 STRUCTURE | Solarban 60 Air Space CONTRFLAM 120 STRUCTURE | Solarban 70 Air Space CONTRFLAM 120 STRUCTURE | Pilk Energy Adv. Air Space CONTRFLAM 60 | Solarban 60 Air Space CONTRFLAM 60 | Solarban 70 Air Space CONTRFLAM 60 | Pilk Energy Adv. Air Space CONTRFLAM 60 STRUCTURE | Solarban 60 Air Space CONTRFLAM 60 STRUCTURE | Solarban 70 Air Space CONTRFLAM 60 STRUCTURE | VDS CW System Section Construction | | |
|----------------|--------------------|--------------------|----------------------|--|-------------------------------------|-------------------------------------|--|---|---|---|------------------------------------|------------------------------------|---|--|--|------------------------------------|------|------|
| 76.852 | 75 | 75 | Glass Thickness (mm) | 58 | 58 | 58 | 71 | 71 | 71 | 47 | 47 | 47 | 50 | 50 | 50 | | | |
| | | | SYSTEM DEPTH (mm) | 168 | 168 | 168 | 181 | 181 | 181 | 157 | 157 | 157 | 160 | 160 | 160 | | | |
| | | | U-Factor | 0.33 | 0.3 | 0.3 | 0.32 | 0.3 | 0.3 | 0.29 | 0.34 | 0.31 | 0.31 | 0.31 | 0.35 | | 0.33 | 0.32 |
| | | | SHGC | 0.52 | 0.34 | 0.24 | 0.5 | 0.33 | 0.23 | 0.54 | 0.35 | 0.24 | 0.53 | 0.34 | 0.24 | | 0.24 | |
| | | | VT | 0.6 | 0.57 | 0.53 | 0.56 | 0.54 | 0.49 | 0.63 | 0.61 | 0.55 | 0.6 | 0.58 | 0.53 | | 0.53 | |
| CR | 60 | 61 | 61 | 58 | 59 | 59 | 56 | 56 | 56 | 56 | 55 | 57 | 58 | | | | | |
| 76.853 | 90 | 90 | SYSTEM DEPTH (mm) | 183 | 183 | 183 | 196 | 196 | 196 | 172 | 172 | 172 | 175 | 175 | 175 | | | |
| | | | U-Factor | 0.33 | 0.31 | 0.3 | 0.32 | 0.3 | 0.3 | 0.34 | 0.31 | 0.31 | 0.31 | 0.36 | 0.33 | | 0.32 | |
| | | | SHGC | 0.52 | 0.34 | 0.24 | 0.5 | 0.33 | 0.23 | 0.54 | 0.35 | 0.24 | 0.53 | 0.34 | 0.24 | | | |
| | | | VT | 0.6 | 0.57 | 0.53 | 0.56 | 0.54 | 0.49 | 0.63 | 0.61 | 0.55 | 0.6 | 0.58 | 0.53 | | | |
| | | | CR | 60 | 61 | 61 | 58 | 59 | 59 | 56 | 56 | 56 | 57 | 56 | 58 | | | |
| 76.854 | 45 | 110 | SYSTEM DEPTH (mm) | 203 | 203 | 203 | 216 | 216 | 216 | 192 | 192 | 192 | 195 | 195 | 195 | | | |
| | | | U-Factor | 0.33 | 0.31 | 0.3 | 0.32 | 0.3 | 0.3 | 0.34 | 0.32 | 0.31 | 0.31 | 0.36 | 0.33 | | 0.33 | |
| | | | SHGC | 0.52 | 0.34 | 0.24 | 0.5 | 0.33 | 0.23 | 0.54 | 0.35 | 0.24 | 0.53 | 0.34 | 0.24 | | | |
| | | | VT | 0.6 | 0.57 | 0.53 | 0.56 | 0.54 | 0.49 | 0.63 | 0.61 | 0.55 | 0.6 | 0.58 | 0.53 | | | |
| | | | CR | 60 | 61 | 62 | 59 | 60 | 60 | 56 | 57 | 57 | 57 | 56 | 58 | | | |
| 76.855 | 130 | 130 | SYSTEM DEPTH (mm) | 223 | 223 | 223 | 236 | 236 | 236 | 212 | 212 | 212 | 215 | 215 | 215 | | | |
| | | | U-Factor | 0.33 | 0.3 | 0.3 | 0.32 | 0.3 | 0.3 | 0.29 | 0.34 | 0.31 | 0.31 | 0.35 | 0.33 | 0.32 | | |
| | | | SHGC | 0.52 | 0.34 | 0.24 | 0.5 | 0.33 | 0.23 | 0.54 | 0.35 | 0.24 | 0.53 | 0.34 | 0.24 | | | |
| | | | VT | 0.6 | 0.57 | 0.53 | 0.56 | 0.54 | 0.49 | 0.63 | 0.61 | 0.55 | 0.6 | 0.58 | 0.53 | | | |
| | | | CR | 59 | 61 | 61 | 58 | 59 | 59 | 55 | 56 | 56 | 56 | 55 | 57 | | | |
| 76.856 | 150 | 150 | SYSTEM DEPTH (mm) | 243 | 243 | 243 | 256 | 256 | 256 | 232 | 232 | 232 | 235 | 235 | 235 | | | |
| | | | U-Factor | 0.34 | 0.31 | 0.31 | 0.33 | 0.3 | 0.3 | 0.34 | 0.32 | 0.32 | 0.32 | 0.36 | 0.34 | 0.33 | | |
| | | | SHGC | 0.52 | 0.34 | 0.24 | 0.5 | 0.33 | 0.23 | 0.54 | 0.35 | 0.24 | 0.53 | 0.34 | 0.24 | | | |
| | | | VT | 0.6 | 0.57 | 0.53 | 0.56 | 0.54 | 0.49 | 0.63 | 0.61 | 0.55 | 0.6 | 0.58 | 0.53 | | | |
| | | | CR | 61 | 62 | 63 | 60 | 61 | 61 | 57 | 58 | 58 | 57 | 59 | | | | |

VDS Curtainwall and Window - Triple Glazing Solution

For Pendrellis Deep Energy Retrofit



A HEAD DETAIL
SCALE: N.T.S.



B SILL DETAIL
SCALE: N.T.S.

3.2.3.13 Protection of Exit Facilities

3.2.3.13. Protection of Exit Facilities

1) Except as required by Sentence (3) and as permitted by Sentence 3.4.4.3.(1), if the plane of an exterior wall of an *exit* enclosure forms an angle less than 135° with the plane of an exterior wall of the *building* it serves, and an opening in the exterior wall of the *exit* enclosure could be exposed to fire from an opening in the exterior wall of the *building*, the opening in either the exterior wall of the *exit* or the exterior wall of the *building* shall be protected in conformance with the requirements of Sentence (4) where the opening in the exterior wall of the *building* is within 3 m horizontally and

- a) less than 10 m below an opening in the exterior wall of the *exit*, or
- b) less than 2 m above an opening in the exterior wall of the *exit*.

(See Note A-3.2.3.14.(1).)

2) If an unenclosed exterior *exit* stair, ramp, or confined path of travel could be exposed to fire from an opening in the exterior wall of the *building* it serves, the opening in the exterior wall of the *building* shall be protected in conformance with the requirements of Sentence (4) where the opening in the exterior wall of the *building* is within 3 m horizontally and

- a) less than 10 m below the *exit* stair, ramp, or confined path of travel, or
- b) less than 5 m above the *exit* stair, ramp, or confined path of travel.

3) Except as permitted by Sentence 3.4.4.3.(1), if an exterior *exit* door in one *fire compartment* is within 3 m horizontally of an opening in another *fire compartment* and the exterior walls of these *fire compartments* intersect at an exterior angle of less than 135° , the opening shall be protected in conformance with the requirements of Sentence (4).

4) The opening protection referred to in Sentences (1), (2) and (3) shall consist of

- a) glass block conforming to the requirements of Article 3.1.8.16.,
- b) a wired glass assembly conforming to D-2.3.15. in Appendix D,
- c) a *closure* conforming to the requirements of Subsection 3.1.8. and Articles 3.2.3.1. and 3.2.3.14., or
- d) a dedicated sprinkler water curtain in accordance with Sentence (5).

3.2.3.13 Protection of Exit Facilities

FIRE SAFETY UPGRADES – SCHEMATIC DESIGN (2 OF 3)

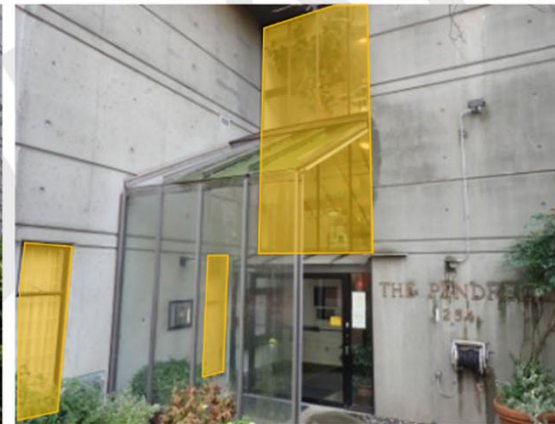
EXPOSURE TO EXIT CONDITIONS

The exterior egress facilities are exposed to nearby fire compartments. The unprotected openings exposing the exterior egress paths are indicated in the images below. Protection measures to limit exposure from unprotected openings include:

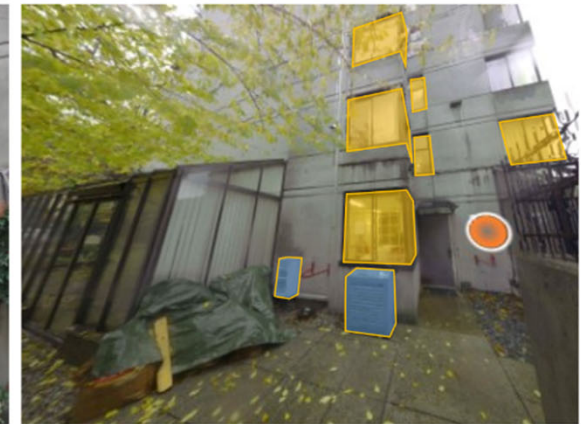
- Installing glass block in lieu of fiberglass framed windows at re-entrant (kitchen) windows and at the laundry room. Installation of glass block is only applied where necessary as glass block assemblies have a lower thermal performance than fiberglass framed windows.
- Installing fire dampers at exterior vents. These locations are highlighted blue in the figures.
- Installing projections (canopies) over exits to interrupt the line-of-sight exposure from unprotected openings above. Some projections may be continuous with redesigned solaria roofs.
- Relocation of the west exterior egress route away from the solaria glazing (shown on previous page).



UNPROTECTED OPENINGS NEAR EXTERIOR EGRESS FACILITIES AT EAST ELEVATION



UNPROTECTED OPENINGS NEAR MAIN ENTRANCE AT NORTH ELEVATION



UNPROTECTED OPENINGS NEAR EXTERIOR EGRESS FACILITIES AT WEST ELEVATION

Clear Vision Fire Glass vs Alternate Solutions

Glass is great for occupant wellbeing – lots of natural light. However, need to use a fire-rated assembly.



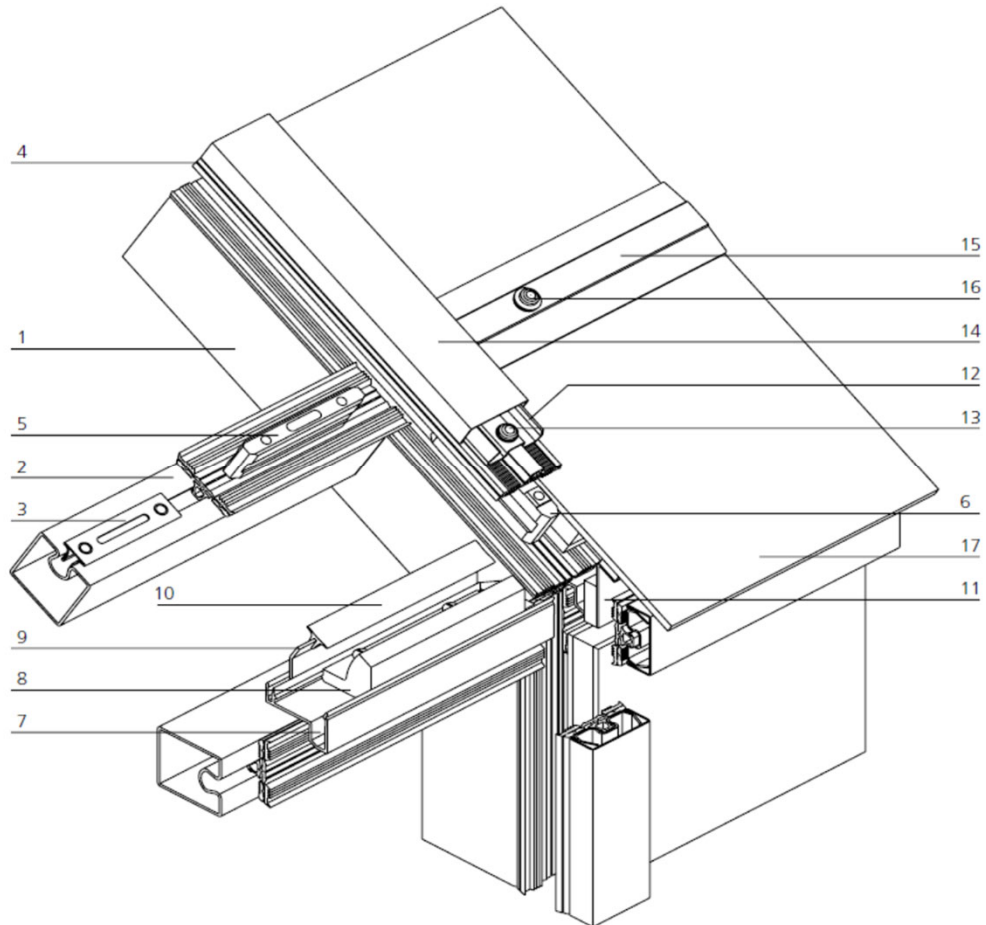
Residential
suite

Common
lounge

Fire egress
path

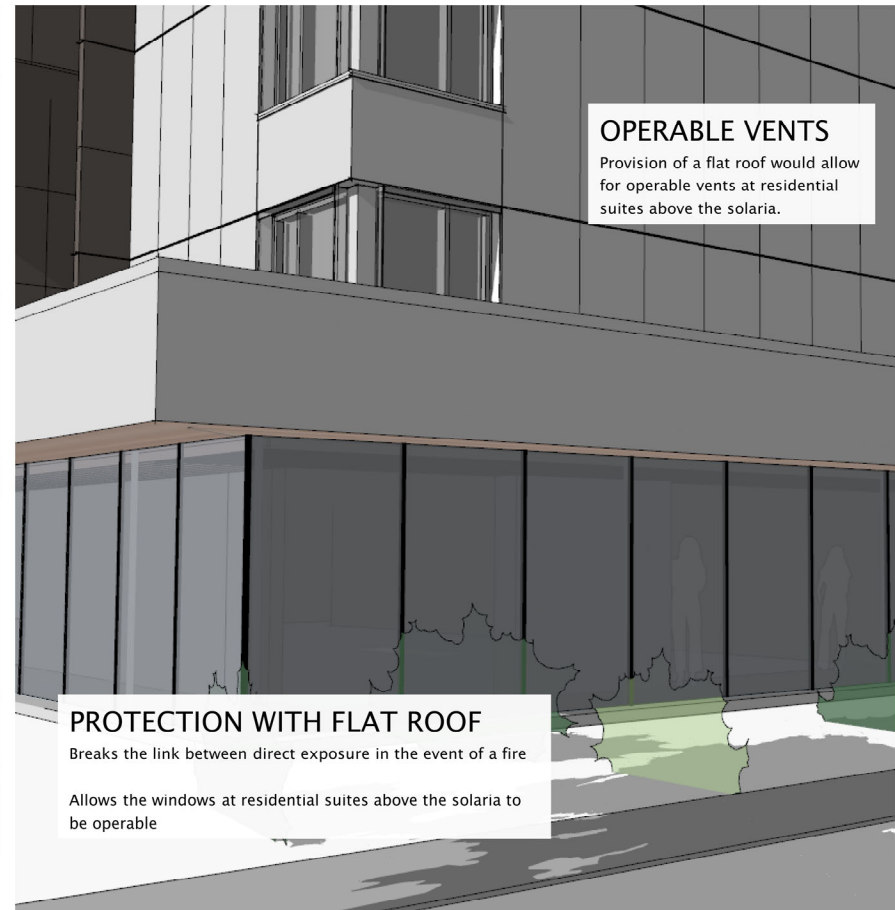
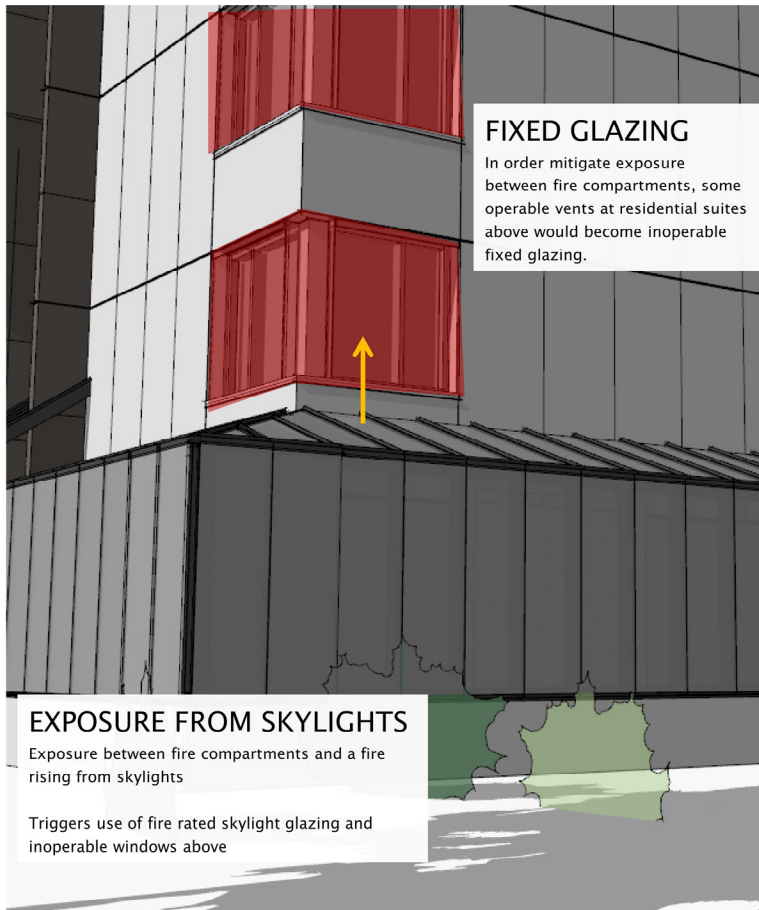
Skylight Curtainwall Fire-rated Glass Solution

VDS Sloped Curtainwall



Alternate Solution - Opaque Roof

BUILDING ENCLOSURE – SOLARIA AND FIRE SAFETY (2 OF 3)



Section 3.2.3 Part 3

Building application to walls that are close to or at property line

3.2.3. Spatial Separation and Exposure Protection

(See Note A-3.2.3.)

3.2.3.1. Limiting Distance and Area of Unprotected Openings

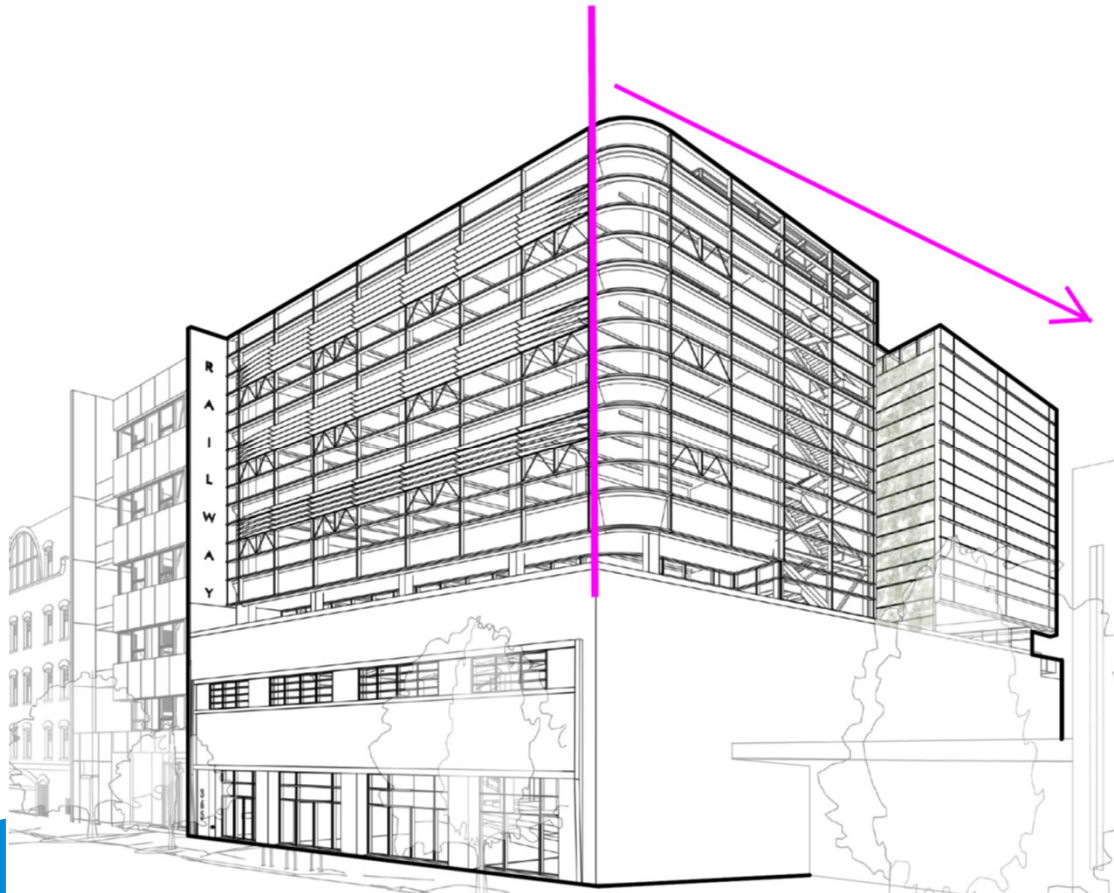
- 1) Except as permitted by Articles 3.2.3.10. to 3.2.3.12., the area of *unprotected openings* in an *exposing building face* for the applicable *limiting distance* shall be not more than the value determined in accordance with
 - a) Table 3.2.3.1.-B or 3.2.3.1.-C for an *exposing building face* conforming to Article 3.2.3.2. of a *building* or *fire compartment* which is not *sprinklered*, or
 - b) Table 3.2.3.1.-D or 3.2.3.1.-E for an *exposing building face* conforming to Article 3.2.3.2. of a *sprinklered fire compartment* that is part of a *building* which is *sprinklered* in conformance with Section 3.2.

(See Note A-3.)

(See also Article 3.1.6.3.)

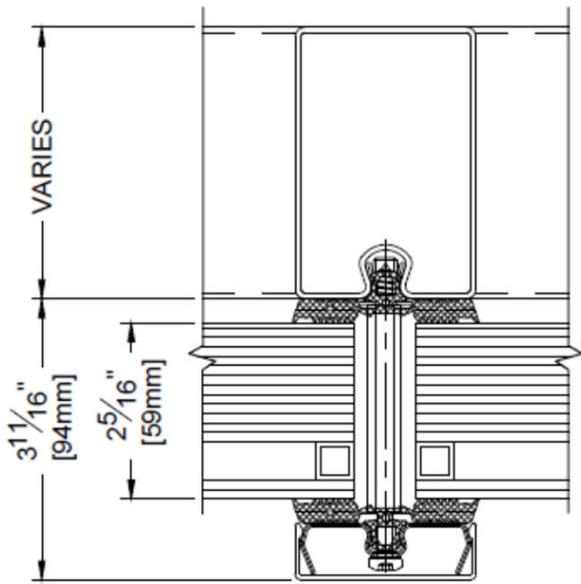
Example: 365 Railway

Building application to walls that are close to or at property line

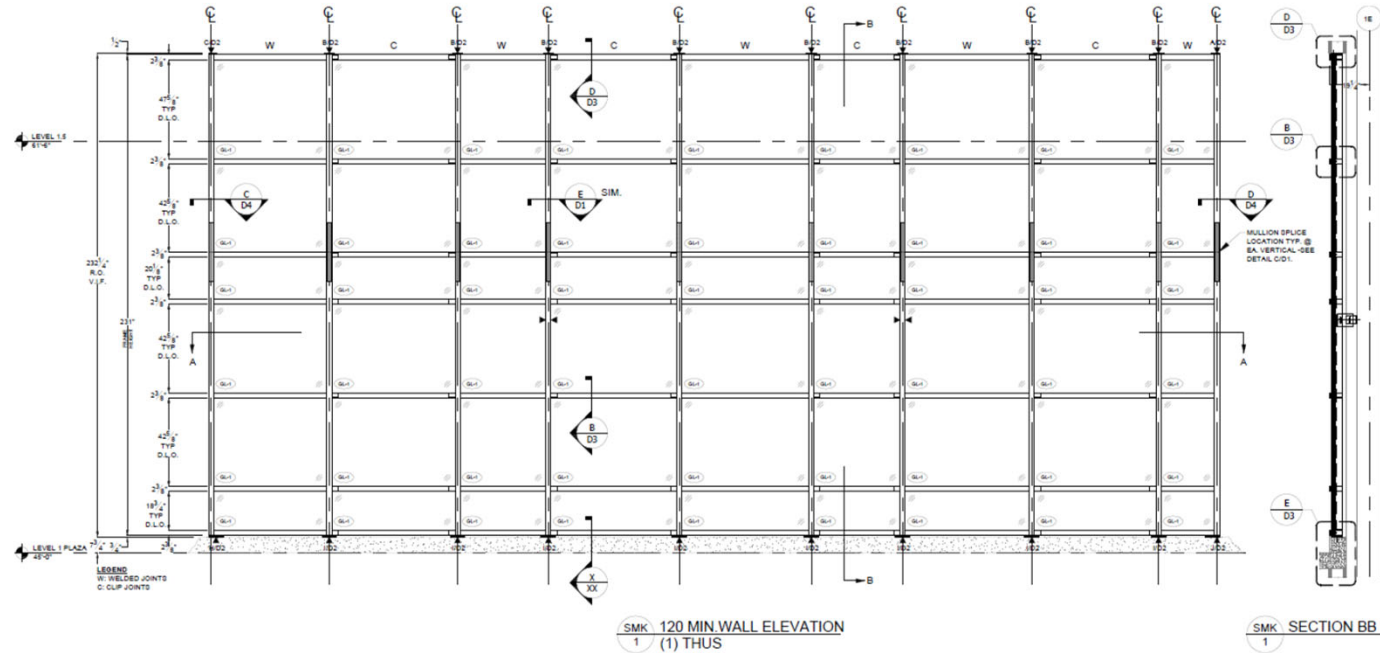


120min Fire-Resistive
Assembly

365 Railway – 2hr Curtainwall Solution



D **CONTRAFLAM 120 IGU**
WITH 1/2" AIR SPACE
 120 MIN. EXTERIOR
 TEMPERATURE RISE
 APPLICATION



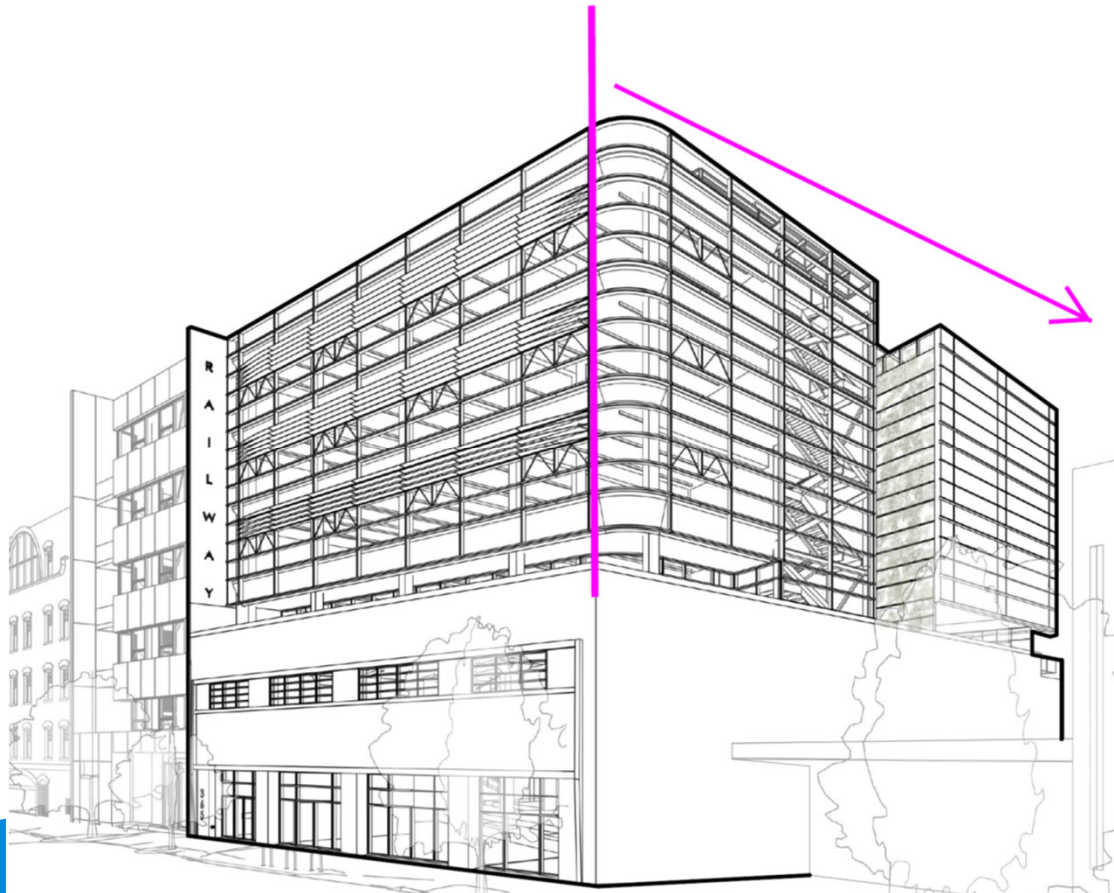
Achieving TEDI Requirements

New Buildings

- No requirements for specific R-values and U-values
- Conduct energy modelling according to the City of Vancouver Energy Modelling Guidelines – U-value of windows must be based on actual project sizes
- **Trade-off:** add insulation in some areas and decrease in other areas
- 120-minute rated VDS Curtain Wall system with 1 low-e (Solarban 70): U-0.29, SHGC 0.23

Example: 365 Railway

Trade-off: add insulation in some areas and decrease in other areas



120min Fire-Resistive
Assembly

Thank You!

This concludes the AIA portion

Questions?

Have feedback
about this
course? Scan this
QR code and tell
us!

