Description
• This course provides an overview of the 2021 IBC Section 705 provisions for the application of the code requirements addressing exterior wall and opening protection.
  • Other code provisions applicable to an understanding of exterior wall and opening protection will also be addressed.
• In addition, the provisions regulating combustible materials in exterior walls required to be noncombustible will be addressed.

Goal
• This seminar is designed to familiarize and assist code officials in locating, describing and applying applicable code requirements of the IBC regarding exterior wall and opening protection.
Objectives

- Upon completion, participants will be better able to:
  - Understand differing concepts regarding fire protection requirements for exterior walls and openings.
  - Identify conditions under which exterior walls and openings in such walls must be protected.
  - Determine appropriate fire-resistance ratings and/or fire-protection ratings based on various conditions.
  - Apply the provisions regulating combustible materials in walls required to be of noncombustible construction.

Course Overview

Module 1: Roles of Fire-resistance-rated Exterior Wall Protection
Module 2: Fire-resistance-rated vs. Fire-protection-rated Elements
Module 3: Common Conditions under which Exterior Walls are to be Protected
Module 4: Projections and Parapets
Module 5: Miscellaneous Conditions and Elements Related to Exterior Wall and Opening Protection
Module 6: Combustible Materials in Exterior Walls Required to be Noncombustible
Exterior Wall Protection

• The required fire-resistance rating of exterior walls can be based on a variety of factors:
  • Structural integrity during a fire event
  • Radiant heat exposure to adjacent buildings and lots
  • Protection of exit paths
  • Miscellaneous protection purposes

Structural Integrity

• Exterior walls are regulated differently depending on their contribution to the structural integrity of the building.
• Bearing walls must be fire-resistance-rated in buildings of Types I, IIA, III, IV and VA construction.
  • Degree of fire-resistance established in Table 601.
• Nonbearing walls require no fire-resistance when solely addressing structural protection.

Radiant Heat Exposure

• Fire-resistance of exterior walls is required where a building's location on the lot creates concerns of radiant heat exposure to:
  • Adjacent lots
  • Other buildings on the same lot.
• Spatial separation can be substituted for fire-resistance as a means of protection based on distances established in Table 705.5.
Protection of Exit Paths

- Exterior walls sometimes require fire-resistance in order to protect exterior exit paths in:
  - Egress courts
  - Exterior exit stairways
  - Interior exit stairways
  - Exterior areas of assisted rescue.

Miscellaneous Protection

- Exterior wall protection is required for a variety of other purposes throughout the code
  - Continuity of fire wall separation
  - Vertical separation of openings
  - Special provisions for special building types:
    - Group H occupancies
    - Aircraft hangars
    - Unlimited area buildings
    - Opening parking garages
    - Penthouses

Openings in Exterior Walls

- Based on the protective role the wall plays, openings in exterior walls are regulated differently.
  - Bearing walls (opening protection not required)
  - Location on lot (opening protection may be required)
  - Protection of exitways (opening protection always required)
  - Miscellaneous locations (opening protection varies based on each specific condition)
Additional Exterior Wall Protection

- Joints in or between exterior walls are required by Section 705 to be fire-resistance rated to comply with Section 715.
- Exceptions for walls permitted to have unprotected openings.
- Penetration by an air duct or air transfer opening in fire-resistance-rated exterior wall is to be provided with a fire damper where the wall is required to have protected openings.

Fire-resistance-rated vs. Fire-protection-rated Elements

Module 2

Ratings for Exterior Walls and Openings

Fire protection of exterior walls and openings are typically based on the procedures set forth in:
- ASTM E119 or UL 263 for wall assemblies, including glazed wall assemblies
- NFPA 252 or UL 10C for swinging fire door assemblies, including glazing in doors
- NFPA 257 or UL 9 for fire window assemblies
Fire-resistance Ratings
Section 703.2

The fire-resistance ratings of building elements shall be determined in accordance with:
• The procedures set forth in ASTM E119 (Test Methods of Fire Tests for Building Construction and Materials, or UL 263 (Standard for Fire Test of Building Construction and Materials), or
• Analytical methods listed in Section 703.2.2
• The alternative methods for determining fire resistance as established by Section 104.11.

Wall Assembly Fire Test

ASTM E119 Fire Test for Wall Assemblies

Assembly must:
• Sustain an applied load.
• Have no passage of flame or gas hot enough to ignite cotton waste.
• Have an average temperature rise on unexposed surface not more than 250°F (121°C) above initial temperature or more than 325°F (163°C) at any point.
• Allow no water to pass through during hose stream test.

Fire-resistance Ratings
Section 705.5

Exterior walls are required to be rated for exposure to fire from:
• Both sides where the separation distance is 10 feet or less.
• Only the inside where the fire separation distance exceeds 10 feet.
Fire-resistance Ratings
Section 705.5

Key Points
• Provisions of Section 705.5 are to be applied regardless of the reason that the exterior wall requires a fire-resistance rating.
• An exterior wall rated for exposure to fire from the inside only must be tested as a complete wall assembly.

Nonsymmetrical Wall Construction
Section 703.2.1
Calculation of Exterior Wall Ratings
Section 722.6.2.3
- Calculation of fire-resistance ratings for wood-framed exterior walls permitted under the provisions of Section 722.6.2.3.
- Limited to 1-hour assemblies
- Applicable to “Fire Side”-only assemblies as well as full assemblies

Fire-resistance-rated Glazing
Section 703.4
- Fire-resistance-rated glazing permitted for use where:
  - Tested in accordance with ASTM E119 or UL 263
  - Permanently labeled or identified per Table 716.1(1)
  - Installed in accordance with listing
Fire Door Assemblies
Section 716.2

• Side-hinged or pivoting doors must comply with NFPA 252 or UL 10C.
• Fire-protection rating must comply with Table 716.1(2).
• Glazing in door assembly and/or adjacent to door assembly shall be further regulated.

Fire Window Assemblies
Section 716.3

• Fire-protection-rated glazing for fire window assemblies shall meet acceptance criteria of NFPA 257 or UL 9.
• Protected openings may be required in nonfire-resistance-rated exterior walls under the provisions of Sections 705.8.5 and 705.8.6.
  • Vertical separation of openings
  • Vertical exposure
• A minimum fire-protection rating of 45 minutes shall be required for such openings.

Common Conditions under which Exterior Walls are to be Protected
Module 3
Where Regulated

Exterior walls are to be regulated under the following conditions:
• Type of construction (bearing walls)
• Location on lot (radiant heat transfer)
• Multiple buildings on the same lot
• Protection of exitways

Type of Construction
Chapter 6

• Bearing walls regulated for fire-resistance because of structural integrity conditions are addressed by Chapter 6 and Table 601.
• Nonbearing walls are not regulated for type of construction purposes
• Fire-resistance shall be required because of its:
  • Contribution to structural stability/integrity
  • Types I, IIA, III, IV and VA
  • Perimeter containment/resistance under fire conditions
  • Types IIIA, IIIB and IV
Openings in Bearing Walls
Section 602.1

- Openings in exterior walls require no fire-resistance-rated or fire-protection-rated protection where wall rating only required per Table 601.
- Opening protection may be required by other provisions of the code, such as Table 705.5 regulating its location on the lot.
- Most restrictive provisions apply

Lot Line Concept

- Use of the lot line as controlling factor based on the concern that control is only possible on own lot
- Lot line concept is used as means of protecting one building from another as far as exposure is concerned
  - Exposure is deemed as a potential for heat to be transmitted from one building to another during fire conditions
  - Radiation is considered a primary means of heat transfer
- Lot line concept is also utilized where multiple buildings are located on the same lot
Exterior Wall Ratings
Section 705.5

- Section 705.5 and Table 705.5 regulate fire resistance of exterior walls because of proximity to adjacent lot lines or other buildings on the same lot.
- Fire separation distance is determined to be "distance measured from building face to closest interior lot line, to centerline of street, alley or public way, or to imaginary line between two buildings on lot. Distance to be measured at right angles from face of wall"
Fire Ratings of Exterior Walls Example

Group B
Type IIB Construction

Lot Line

Lot Line

Centerline of Public Way

Lot Line

Minimum
1-hour
required

No rating required

Lot Line

Lot Line

Lot Line

Structural Frame Members
Section 704.10

• Structural frame members in exterior walls shall be provided with highest fire-resistance rating in accordance with:
  • Table 601 Structural Frame
  • Table 601 Exterior Bearing Wall
  • Table 602 for Fire Separation Distance
Structural Frame Members

Example

<table>
<thead>
<tr>
<th>Group A-2 occupancy</th>
<th>Structural Frame Members</th>
<th>Nonbearing Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot Line</td>
<td>Table 601</td>
<td>2 hours</td>
</tr>
<tr>
<td>Nonbearing exterior wall</td>
<td>Table 601</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Structural column</td>
<td>Table 602</td>
<td>1 hour</td>
</tr>
</tbody>
</table>

Therefore, columns and other primary structural frame members shall be minimum 2-hour fire-resistance-rated. Nonbearing exterior wall to be minimum 1-hour fire-resistance-rated because of FSD.

Openings in Exterior Walls

Section 705.8.1

- Area of protected and unprotected openings permitted in exterior wall in any story are limited by Table 705.8
- Openings prohibited where limited or no fire separation distance is provided
- As fire separation distance increases, openings are permitted in increasing amounts

Maximum Area of Exterior Openings

Table 705.8

- Maximum area of exterior wall openings based on fire separation distance and degree of opening protection
- Table provides degrees of opening protection and maximum area permitted for various fire separation distances
Openings in Exterior Walls
Section 705.8.1, Exception 2

- Buildings whose exterior wall, exterior nonbearing wall and exterior structural frame are not required to be fire-resistance rated (by Tables 601 and 602) are permitted to have unlimited unprotected openings.
Openings in Exterior Walls

Example

Given: A Type II Group II building with no separation from the separation distance of 10 feet.

Determine: The type and amount of permitted openings.

Solution: Per Table 601, for Type IIB, no rating is required for the exterior wall.

Per Table 705.5 with a fire separation distance of 18 feet, no rating is required for the exterior wall.

Therefore, there is no limit to the amount of openings permitted in the wall and the openings are not required to have a fire protection rating.

Openings in Exterior Walls

Example #1

Lot Line

Lot Line

Lot Line

Centerline of Public Way

Group B

Type IIIB Construction

Non-sprinklered

Minimum 1-hour

Minimum 1-hour

Minimum 1-hour

No rating required

10% UP or 25% PR

70% UP or UL if PR

25% UP or 75% PR

Unlimited

Unprotected

A

C

D

B

Exterior Opening Protection

Table 705.8

Example: Group M

Type II A

Fully Sprinklered

Openings in this portion of 1-hour exterior wall limited to 25% of wall surface area

Unlimited openings permitted

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Openings in Exterior Walls
Section 705.8.1, Exception 1

- In other than Group H, unlimited unprotected openings are permitted in the first story of exterior walls facing:
  - A street with fire separation distance > 15 feet
  - An unoccupied space > 30 feet in width and accessible from a street by a posted fire lane
  - Unoccupied space to be located on same lot or dedicated for public use

Mixed Openings in Exterior Walls
Section 705.8.4

- Where both protected and unprotected openings are located in an exterior wall in any story, total area of openings shall comply with the following formula (only applicable to nonsprinklered buildings):

\[
\left(\frac{A_p}{a_p}\right) + \left(\frac{A_u}{a_u}\right) \leq 1.0
\]

- where:
  - \(A_p\) = actual area of protected openings
  - \(a_p\) = allowable area of protected openings
  - \(A_u\) = actual area of unprotected openings
  - \(a_u\) = allowable area of unprotected openings
Mixed Openings in Exterior Walls

Example

Given: A nonsprinklered Group S-1 building of Type IIIB construction. The exterior wall shown is located 12 feet from an interior lot line.

Determine: The maximum area permitted for unprotected openings.

Solution:

\[
\frac{A_p}{A_{fp}} + \frac{A_o}{A_{fo}} < 1.0
\]

\[
\frac{83}{1/3}(18\times40) + \frac{15\times18\times40}{1.0} = 1.0
\]

\[
\frac{83}{324} + \frac{A_o}{108} = 1.0
\]

\[
0.25 + \frac{81}{108} = 1.0
\]

Up to 81 sf of unprotected openings are permitted.

Protected Openings

Section 705.8.2

- Where openings are required to be protected, fire doors, fire shutters and fire windows to comply with Section 716.
- Opening protective not required where:
  - Building is provided with sprinkler system throughout, and
  - Exterior openings are protected by water curtain.
- Allowance applicable where provisions require protected openings, such as:
  - Exterior exit stairway protection
  - Egress courts
  - Exterior areas of assisted rescue
- Use of exception not applicable to Table 705.8
- Based on sprinklered condition, protected openings not required to gain maximum percentage of openings.

Unprotected Openings

Section 705.8.3

- Where unprotected openings are permitted, windows and doors shall be constructed of any approved materials.
- Glazing shall conform with Chapters 24 and 26
Fire Door Assemblies
Section 716.2

- Table 716.1(2) identifies minimum fire door and fire shutter assembly ratings based on
  - Type of wall assembly where the door/shutter is located
  - Required wall assembly rating
- Table also identifies:
  - Door vision panel size
  - Fire-rated glazing marking of door vision panels
  - Minimum sidelight/transom assembly rating
  - Fire-rated glazing marking of sidelight/transom panel

Fire Door Assemblies
Table 716.1(2)

<table>
<thead>
<tr>
<th>Type of Wall Assembly</th>
<th>Required Wall Assembly Rating</th>
<th>Door Vision Panel Size</th>
<th>Fire-Rated Glazing Marking of Door Vision Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td></td>
<td>3/4 sq. ft.</td>
<td>PN4000</td>
</tr>
<tr>
<td>Table 2</td>
<td></td>
<td>1 sq. ft.</td>
<td>PN5000</td>
</tr>
<tr>
<td>Table 3</td>
<td></td>
<td>2 sq. ft.</td>
<td>PN6000</td>
</tr>
</tbody>
</table>

Fire Window Assemblies
Table 716.1(3)

- Table 716.1(3) identifies minimum fire window assembly ratings based on
  - Type of wall assembly where door/shutter located
  - Required wall assembly rating
- Table also identifies:
  - Fire-rated glazing marking of fire windows
Section 705.3
Buildings on the Same Lot

• For purposes of required wall/opening protection and projections, buildings on the same lot shall be assumed to have an imaginary line between them.
Buildings on the Same Lot
Section 705.3

- Where a new building is erected on the same lot as an existing building, the location of the assumed imaginary line with relation to the existing building to be such that the exterior wall and opening protection of the existing building comply.

Buildings on the Same Lot
Section 705.3, Exception 1

- As an alternative, multiple buildings on the same lot are permitted to be considered as portions of a single building if the aggregate area of such buildings are within limits specified in Chapter 5 for single building.

- Where buildings contain different occupancy groups or are of different types of construction, areas shall be that allowed for the most restrictive occupancy or construction.

- Provisions of the IBC applicable to aggregate building shall be applicable to each building (Section 503.1.2).
Buildings on the Same Lot
Section 705.3

Buildings 1 and 2 regulated as portions of a single building

Buildings on the Same Lot
Option #2

Building 1a

Building 1b

Buildings 1 and 2 regulated as portions of a single building

Buildings on the Same Lot
Section 705.3, Exception 2

- Special provisions for exterior wall openings are available for a Type I or IIA Group S-2 parking garage on the same lot as a Group R-2 building.
- Adjoining exterior walls between buildings are permitted to have occupant use openings in accordance with Section 706.8.
Buildings on the Same Lot
Section 705.3, Exception 2

Interior Exit Stairways Exterior Walls
Section 1023.7

• Exterior walls of interior exit stairways and ramps shall comply with Section 705.
• Where nonrated walls or unprotected openings enclose the exterior of the stairway, protection shall be provided at adjacent walls and openings where exposed at less than 180 degrees.

Interior Exit Stairways Exterior Walls
Section 1023.7
Exterior Stairway Protection

Section 1027.6

- Exterior stairways and ramps shall be separated from the interior of the building per Section 1023.2.
- Openings limited to those necessary for egress from normally occupied spaces.
- Exceptions include where:
  - Stairway serves two stories maximum (not R-1 or R-2)
  - Access to 2nd exit is provided
  - Complying open-ended corridors are provided
  - Group R-3 not more than 4 stories in height

- Separation to be:
  - Minimum 1-hour where a stairway/ramp serves three or fewer stories
  - Minimum 2-hour where a stairway/ramp serves four or more stories

- In addition to protection required in an exterior wall common to an exterior stairway/ramp, additional projection is required in walls adjacent to a stairway.
Open-ended Corridors
Section 1027.6, Exception 3

- Separation from the interior of building is not required where exterior stairways/ramps are connected to open-ended corridors, provided:
  - Building is fully sprinklered
  - Open-ended corridors comply with Section 1020
  - Open-ended corridors connect to complying exterior exit stairways/ramps
  - Exterior walls and openings adjacent to an exterior stairway/ramp comply with Section 1023.7
  - Changes in direction of open-ended corridors are provided with clear openings to minimize accumulation of smoke and toxic gases

Egress Courts
Section 1029.3

- Egress court less than 10 feet in width to be separated from building with:
  - Walls with minimum 1-hour fire-resistance-rated construction to a minimum height of 10 feet
  - Openings protected a minimum ¾-hour
  - Exceptions for egress courts serving:
    - Occupant load of less than 10, or
    - Group R-3 occupancies
### Egress Courts
#### Section 1029.3

![Diagram showing Egress Courts]

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### Inaccessible Exit Discharge
#### Section 1009.7.2

- If exit discharge is not accessible, one of the following components must be provided:
  - Interior area of refuge, or
  - Exterior area of rescue assistance.

- Required fire separation at exterior wall creates ‘protect-in-place’ condition.

- Fire-resistance rating and opening protectives not required where building is sprinklered throughout.

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### Exterior Area of Assisted Rescue
#### Section 1009.7.2

![Diagram showing Exterior Area of Assisted Rescue]

* Exterior wall and opening protection not required if building is fully sprinklered.
Fire Wall Horizontal Continuity
Section 706.5
• Fire walls shall extend a minimum of 18 inches beyond the exterior surface of exterior walls.
• Several exceptions allow for an alternative means of protection.

Fire Wall Horizontal Continuity
Section 706.5, Exception 1

Fire Wall Horizontal Continuity
Section 706.5, Exception 2

For SI: 1 inch = 25.4 mm.
For SI: 1 foot = 304.8 mm.
Fire Walls at Exterior Walls
Section 706.5.1
• Where a fire wall intersects exterior walls and an angle of less than 180 degrees is formed, fire-resistance rating and opening protection of exterior walls shall meet one of two conditions:
  • Protection of wall and openings for distance on each side of intersection, or
  • Assumption of imaginary lot line at fire wall and extending beyond the exterior of the fire wall
    • Regulated in similar manner to that used for two or more buildings on the same lot
Fire Walls at Exterior Walls
Section 706.5.1

Horizontal Projecting Elements
Section 706.5.2

• Fire walls to extend to outer edge of horizontal projecting elements that are within 4 feet of fire wall
• Intent is to restrict fire spread around the fire wall at exterior wall surface
• Three exceptions establish alternative means of protection
Projections and Parapets

Sections 705.2 and 705.11

• While projections are only regulated where they are provided at exterior walls, parapets may be required based on varying conditions.

• Projections are regulated to the increased hazard they may pose because of their proximity to a lot line or another building on the same lot.

• Parapets are mandated in those cases where roof protection is required because of proximity to a lot line or another building on the same lot.

Projections

Section 705.2

• Cornices, eave overhangs, exterior balconies and similar projections extending beyond the floor area shall conform to the requirements of Section 705.2.
**Projection Limits at Exterior Walls**

**Section 705.2**

- Table 705.2 sets forth the limitations regarding the permitted extent of projections.
- Assuming a projection adjacent to an interior lot line, no projection beyond the building’s exterior wall is permitted where the exterior wall is less than 2 feet from the lot line.

**TABLE 705.2 MINIMUM DISTANCE OF PROJECTION**

<table>
<thead>
<tr>
<th>FIRE SEPARATION DISTANCE (FSD)</th>
<th>MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to less than 2</td>
<td>Projections not permitted</td>
</tr>
<tr>
<td>2 to less than 3</td>
<td>24 inches</td>
</tr>
<tr>
<td>5 to less than 5</td>
<td>Two-thirds of FSD</td>
</tr>
<tr>
<td>5 or greater</td>
<td>40 inches</td>
</tr>
</tbody>
</table>

For No. 1 feet = 304.8 mm; 1 inch = 25.4 mm

*Note: This table provides minimum distances for projections based on fire separation distances.*

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**Projections Section 705.2**

- Projections from walls of Type I or II construction shall be of noncombustible materials or combustible materials where allowed by Sections 705.2.3.1 and 705.2.4
- Projections from walls of Type III, IV or V construction shall be of any approved material
- Combustible projections extending to within 5 feet of fire separation distance line shall be:
  - 1-hour fire-resistance-rated construction, or
  - heavy-timber construction, or
  - fire-retardant-treated wood, or
  - as permitted by Section 705.2.3.1
Combustible Projections
Section 705.2.3

Combustible projection to be:
• Minimum 1-hour construction, or
• Heavy timber construction, or
• Fire-retardant-treated wood, or
• As permitted by Section 705.2.3.1

Protection of Projections vs. Roof Construction

For 1 ft = 30.5 cm.
Balconies and Similar Projections
Sections 705.2.3.1, 705.2.4

- Section 705.2.3.1 regulates combustible projections on the exterior side of exterior walls, including balconies and similar elements such as porches, decks and exterior stairways.
- Combustible balconies and similar projections to be of FRT wood, Type IV materials, or fire-resistance rated per Table 601 for floor construction (with exceptions).
- Section 705.4 deals with combustible bay and oriel windows.

Parapets
Section 705.11

- Parapet wall is defined as “a part of any wall completely above the roof line.”
- As a base requirement, parapets shall be provided on all exterior walls unless specifically exempted.
- Multiple exceptions eliminate the mandate for parapets.
- Where one or more exceptions are met, the provisions of Section 705.11 do not apply.

Parapet Exceptions
Section 705.11 – Exceptions 1-3

- Parapets need not be provided on exterior walls of buildings where any of the following conditions exist:
  1. The wall is not required to be fire-resistance rated in accordance with Table 705.5 because of fire separation distance.
  2. The building has an area of not more than 1,000 square feet (93 m²) on any floor.
  3. Walls that terminate at roofs of not less than 2-hour fire-resistance-rated construction or where the roof, including the deck and supporting construction, is constructed entirely of noncombustible materials.
Parapet Exceptions
Section 705.11, Exception 4
• Parapets are not required on one-hour exterior walls that terminate at underside of roof sheathing, deck or slab, where:
  • Roof has minimum Class B roof covering, are
  • Openings in roof do not occur within 10 feet of exterior wall (5 feet in Groups R and U), and
  • Where roof/ceiling framing elements are of minimum 1-hour construction for minimum:
    • 10 feet (4 feet in Groups R and U) where framing is parallel to exterior wall
    • Full span where framing not parallel to exterior wall

Parapet Exceptions
Section 705.11, Exception 5
• Parapets to be provided on exterior walls of Group R-2 and R-3 buildings, except where:
  • Roof has minimum Class C roof covering;
  • Walls terminate at roof deck, and
  • Building is of Type III, IV or V construction; and
  • Roof deck is of noncombustible materials or fire-retardant-treated wood, for a distance of 4 feet; or
  • Roof protected with 5/8-inch Type X gypsum board directly beneath underside of deck, for a distance of 4 feet.
Parapet Exceptions
Section 705.11, Exception 6
Where the wall is permitted to have at least 25 percent unprotected openings based on fire separation distance in accordance with Table 705.8

- For fully sprinklered buildings, this distance would be 5 feet (1524 mm) or greater.
- For nonsprinklered buildings, this distance would be 15 feet (4572 mm) or greater.

Parapet Construction
Section 705.11.1
- Parapets shall have the same fire-resistance rating as required for supporting wall.
- Noncombustible faces for the uppermost 18 inches.
- Minimum height of 30 inches.

Additional parapet height may be required for roofs sloping toward the parapet at a slope greater than 2:12.
Miscellaneous Conditions and Elements Related to Exterior Wall and Opening Protection

Module 5

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**Miscellaneous Conditions**

- Vertical separation of openings
- Vertical exposure
- Group H occupancies
- Aircraft hangars
- Unlimited area buildings, covered mall buildings
- Open parking garages
- Penthouses

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**Vertical Separation of Openings**

**Section 705.8.5**

- Openings in adjacent stories to be separated vertically to restrict exterior fire spread from story to story
- Applies where:
  - openings are within 5 feet of each other horizontally, and
  - opening in lower story does not have a minimum ¾-hour fire protection rating
Vertical Separation of Openings
Section 705.8.5

- Two methods available to restrict the spread of fire:
  - Vertical separation of 3 feet minimum with spandrel construction of at least 1-hour construction (rated for exposure from both sides), or
  - Horizontal flame barriers of at least 1-hour construction that extend a minimum of 30 inches beyond exterior wall.
- Vertical separation not required for:
  - Buildings no more than three stories in height above grade plane
  - Fully-sprinklered buildings
  - Open parking garages.

Vertical Separation of Openings
Section 705.8.5

- For buildings of different roof heights located on the same lot, minimum ¾-hour fire protection rating, opening shall be for openings in exterior wall of building adjacent to a lower building where the:
  - Openings in the taller wall are less than 15 feet above roof of the lower building
  - Fire separation distance is less than 15 feet.
Vertical Exposure
Section 705.8.6

- Requirements do not apply where:
  - Buildings are regulated as portions of a single building per Section 705.3, or where
  - Roof assembly of the lower building has a minimum 1-hour fire-resistance rating.

Group H Occupancies
Section 415.6.4

- Regardless of any other provisions, buildings containing Group H occupancies shall be set back a minimum fire separation as set forth in Sections 415.6.4.1 through 415.6.4.4.
  - Group H-1 75 feet minimum
  - Group H-2 30 feet minimum (where Group H-2 exceeds 1000 sf
    50 feet if a detached building*
  - Group H-3 50 feet if a detached building*

*no wall and opening protection required based on fire separation distance (Section 415.6.5.1)
Group H Occupancies
Section 415.6.4

Aircraft Hangars
Section 412.3.1

• Exterior walls shall have a minimum 2-hour fire-resistance rating where located less than 30 feet from lot lines or a public way
  • Measurement not necessarily related to fire separation distance
  • Provision not applicable to opposing walls of hangars where two or more hangars occur on same lot.
  • IBC Sections 503.1.2 and 705.3 address multiple hangars on the same lot
  • Measurement taken to nearest public way, not its center line

Unlimited Area Buildings
Section 507.2.1

• Reduction in the required open space surrounding the perimeter of unlimited area buildings is permitted provided:
  • Exterior walls have a minimum 3-hour fire-resistance rating, and
  • Openings in exterior walls have a minimum 3-hour fire-resistance rating.
  • The base requirement of a minimum of 60 feet of open space may be reduced to not less than 40 feet for a maximum of 75 percent of the perimeter.
Unlimited Area Buildings
Section 507.2.1

- Reduced open space permitted:
  - Up to 75% of building perimeter
  - Where exterior wall has reduced open space
  - Minimum 3-hour fire-resistance rating
  - Openings in such walls are protected for minimum 3 hours

Covered and Open Mall Buildings
Section 402.2, Exception

- Reduction in required open space also permitted in a similar manner for covered mall buildings and open mall buildings

Open Parking Garages
Section 406.5.6

- Based on Note c to Table 705.5, exterior walls of open parking garages are not required to have a fire-resistance rating based on fire separation where such distance is 10 feet or more.
- Unlimited unprotected openings are permitted where fire separation distance is at least 10 feet.
- Provisions are applicable to all construction types.
Open Parking Garages
Table 705.5, Note c

Unprotected exterior wall and unlimited unprotected openings permitted

Penthouses
Section 151.2.4

- General provisions require penthouse exterior walls to be constructed consistent with the type of construction of the building
- Exceptions address three conditions:
  - Type I buildings
  - Type I buildings no more than two stories in height and all Type II buildings
  - Type III, IV and V buildings
- Exceptions only need be applied where other provisions mandate a higher degree of protection
Combustible Materials in/on Exterior Walls

- As a general rule, exterior walls of buildings of Type I, II, III and IV construction are to be noncombustible.
- Selectively, combustible materials are permitted in such buildings based on specified limitations, including allowances for:
  - Type I and II construction
  - Type III construction
  - Type IV-A, IV-B and IV-C construction
  - Type IV-HT construction
  - Water-resistive barriers
  - Exterior wall coverings
  - Metal composite materials
  - Foam plastics

Type I and II Buildings
Section 603.1, #1.2

- Combustible materials are permitted in exterior walls of Type I and II buildings where all of the three following conditions are met:
  - Combustible materials are limited to fire-retardant-treated wood
  - Allowance is limited only to nonbearing exterior walls
  - Exterior walls are not required to be of fire-resistance-rated construction
Type III Buildings
Section 602.3

- Combustible materials are permitted in exterior walls of Type III buildings where both of the following conditions are met:
  - Combustible materials are limited to fire-retardant-treated wood framing and sheathing
  - Exterior walls have a fire-resistance-rating of two hours or less

Type IV-A, IV-B and IV-C Buildings
Section 602.4.1.1, 602.4.2.1, 602.4.3.1

- Mass timber is permitted in exterior walls of Type IV-A, IV-B and IV-C buildings where both of the following conditions are met:
  - The outside face is protected with noncombustible protection with a minimum assigned time of 40 minutes.
  - Components of the exterior wall covering shall be noncombustible, except:
    - Combustible water-resistant barriers are permitted where required conditions for heat release, flame spread and smoke development

Type IV-HT Buildings
Sections 602.4.4.1, 602.4.4.2

- Combustible materials are permitted in exterior walls of Type III buildings where both of the following conditions are met:
  - Combustible materials are limited to fire-retardant-treated wood framing and sheathing, or minimum 4-inch-thick cross-laminated timber (CLT)
  - Exterior walls have a fire-resistance-rating of two hours or less
  - Exterior walls may also comply with allowances established for such walls of Type IV-A and IV-B buildings.
Water-Resistive Barriers in Exterior Walls
Section 1402.5

- Exterior walls of Type I, II, III and IV buildings that are greater than 40 feet in height above grade plane and contain a combustible water-resistive barrier to be tested and comply with acceptance criteria of NFPA 285, except:
  - Where a water-resistive barrier is the only combustible component in the exterior wall, and:
    - There is a wall covering of brick, concrete, stone, terra cotta, stucco or steel, or
    - The barrier has complying heat release rates, a flame spread index ≤ 25, a smoke-developed index ≤ 450, and a complying heat release rate.

Combustible Materials on the Exterior Side of Exterior Walls
Section 1405.1.1

- Section 1405.1.1 permits combustible wall coverings on the exterior side of exterior walls of buildings of Type I, II, III and IV where limited to:
  - 10% of the wall surface where fire separation distance is less than 5 feet, and
  - 40 feet in height above grade plane regardless of fire separation distance
  - No limit on surface area and allowed to 60 feet in height where of fire-retardant-treated wood.

Combustible Materials on the Exterior Side of Exterior Walls
Sections 1405.1.1, 1404.5

- Wood veneers may also be installed on the exterior side of exterior walls of Type I, II, III and IV buildings provided:
  - Veneer is limited in thickness as specified in Section 1404.5
  - Veneer is limited to 40 feet in height above grade
  - 60 feet where FRT wood is used
  - Veneer is attached to, or furred from, a noncombustible backing
  - Where open or space wood veneers (without concealed spaces) are used, they shall project no more than 24 inches.
Metal Composite Materials (MCM) Section 1406.10

- Metal composite material is a factory-manufactured panel consisting of metal skins bonded to both faces of a solid plastic core.
- In buildings of Types I, II, III and IV construction, MCMs to comply with:
  - Flame spread index of 25 or less, and
  - Smoke-developed index of 450 or less, and
  - Separation from interior of building by an approved thermal barrier consisting of ½” gypsum wallboard
    - Alternate membrane permitted where in compliance with both Temperature Fire Test and Integrity Fire Test of NFPA 275

Further regulation is established where MCMs are installed more than 40 feet above grade plane on buildings of Type I, II, III or IV construction.

In addition to the general mandate regulating flame spread, smoke development and thermal barrier protection, such MCM systems are to be tested and comply with acceptance criteria of NFPA 285.

Testing to be performed with the MCM in the maximum thickness intended for use.

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Foam Plastics in Exterior Walls Section 2603.5

- Where foam plastic insulation is located within an exterior wall assembly of a Type I, II, III or IV building, the walls shall be regulated for:
  - Fire-resistance rating
  - Thermal barrier*
  - Potential heat*
  - Flame spread index
  - Smoke-developed index
  - Vertical and lateral fire propagation*
  - Labeling
  - Ignition

*Not required for one-story buildings complying with Section 2603.4.1.4
Fire Propagation
Section 2603.5.5
• Where foam plastic insulation is located within an exterior wall assembly of a Type I, II, III or IV building, the wall assembly shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.
  • Exceptions for complying one-story buildings and those buildings with wall assemblies where the foam plastic insulation is covered on each face by not less than 1-inch thickness of masonry or concrete.

Conclusion
• This concludes the presentation addressing exterior wall and opening protection.
• The fire-resistance requirements are intended to address a variety of hazards and concerns, including:
  • Structural integrity
  • Radiant heat transfer to adjoining lots and buildings
  • Protection of exitways
  • Miscellaneous conditions

Final Reflection
This slide will help the learner to reflect on the day and what they will take back to the job and apply.
• What? What happened and what was observed in the training?
• So what? What did you learn? What difference did this training make?
• Now what? How will you do things differently back on the job as a result of this training?
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