Learning Objective

- Discuss the type of rated assembly requirements in the International Building Code.
- Review resources to find wood frame rated assemblies
- Discuss requirements for fire blocking and draftstopping in the International Building Code

Presentation Overview

- Typical Challenges Wood Frame Detailing?
- IBC requirements for rated assemblies
- Common Fire Rated Assemblies
- Available Publications
- Fireblocking and draftstopping
  - Materials Allowed
  - Placement
- NFPA 13
- Common Architectural Detailing
  - Tenant Separations
  - Vertical Stacks – Elevators
  - Rated Floors
  - Rated Walls
  - Corridors
  - Exterior Walls
Detailing Challenges?

- Lack of Familiarity
- Fireblocking and Draftstopping
- For the same $$ or less you get:
  - Building Code Compliance
  - Better Adaptability

How is your building relationship

- Has your building been taking advantage of you with price increases, and lack of adaptability.
- With the slowdown more and more people are getting the chance to relook at wood and where it can be utilized.
- Switching building materials is a lot easier than getting divorced.

No alimony!
No arguing over who gets what
Like that wagon wheel coffee table

WoodWorks is here for counseling

IBC Fire Protection Requirements
Interior Finishes

Flame Spread

- 803.1 Interior wall and ceiling finishes shall be classified in accordance with ASTM E 84. Such interior finish materials shall be grouped in the following classes in accordance with their flame spread and smoke-developed indexes.
  - Class A: Flame spread 0-25; smoke-developed 0-450.
  - Class B: Flame spread 26-75; smoke-developed 0-450.
  - Class C: Flame spread 76-200; smoke-developed 0-450.

DCA 1 Flame Spread for Typ. Materials

- Flame spread requirement is dependent on use group and location in the structure.
Flame Spread

- Most wood products have a flame spread < 200.
- Some wood products are between 25-75.
- Fire Retardant products reduce flame spread.

<table>
<thead>
<tr>
<th>Material</th>
<th>ASTM E 84 Flame Spread</th>
<th>Source</th>
<th>Material</th>
<th>ASTM E 84 Flame Spread</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerrar Laminated</td>
<td>60</td>
<td>BPFA</td>
<td>Cerrad 2 1/2&quot;</td>
<td>115</td>
<td>BPFA</td>
</tr>
<tr>
<td>Cerrad 2 1/2&quot;</td>
<td>60</td>
<td>BPFA</td>
<td>Cerrad 2 1/2&quot;</td>
<td>115</td>
<td>BPFA</td>
</tr>
<tr>
<td>Copper</td>
<td>15</td>
<td>BPFA</td>
<td>Cerrad 2 1/2&quot;</td>
<td>115</td>
<td>BPFA</td>
</tr>
<tr>
<td>Copper</td>
<td>15</td>
<td>BPFA</td>
<td>Cerrad 2 1/2&quot;</td>
<td>115</td>
<td>BPFA</td>
</tr>
</tbody>
</table>
| Exterior Rated Walls

- Basic assumption is that fires begin at the interior and rated wall assemblies are not required for the exterior.

- When proximity to other buildings decreases fire protection is needed on the building exterior.

- Lot Line
To determine the amount of fire resistance needed we must consider:
- Protected or Unprotected Structural Members
- Are structural members potentially exposed to flames.
- Building Type I-V
- Are the structural members considered Non-Combustible or Combustible
- Tenant Separations
- Even in unprotected construction we may need rated assemblies where multiple tenant separations occur.

Table 602 establishes requirements for structures separated by 10'-30' they are typically 0 or 1 hour rated.

<p>| FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCEa, e |
|--------------------------------------------------|--------------------------------------------------|</p>
<table>
<thead>
<tr>
<th>DISTANCE = X (feet)</th>
<th>TYPE OF CONSTRUCTION</th>
<th>OCCUPANCY GROUP</th>
<th>OCCUPANCY GROUP</th>
<th>EXTERIORb</th>
<th>INTERIORc</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5 ft</td>
<td>IA</td>
<td>H</td>
<td>L, M, S-1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5 - 10 ft</td>
<td>IB</td>
<td>H</td>
<td>L, M, S-1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10 - 30 ft</td>
<td>IA, IB</td>
<td>H</td>
<td>L, M, S-1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

For SI: 1 foot = 304.8 mm.

b. For special requirements for Group U occupancies see Section 406.2.

c. Certain special conditions for Group I-III occupancies are covered in Section 602.4.6.

d. Rated in accordance with Table 602-1 and the applicable fire resistance of the exterior wall.

e. Where multiple tenant separations occur.

Table 603 establishes requirements for bearing elements.

<table>
<thead>
<tr>
<th>TABLE 603</th>
<th>FIRE-RESISTANCE RATING REQUIREMENTS FOR BEARING ELEMENTS (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING ELEMENT</td>
<td>TYPE I</td>
</tr>
<tr>
<td>Bearing walls</td>
<td>A</td>
</tr>
<tr>
<td>Exteriorb</td>
<td>3</td>
</tr>
<tr>
<td>Interior</td>
<td>N</td>
</tr>
<tr>
<td>Non-bearing walls and partitions Exterior</td>
<td>See Table 602</td>
</tr>
<tr>
<td>Non-bearing walls and partitions Interior</td>
<td>See Table 602</td>
</tr>
<tr>
<td>Other interior elements</td>
<td>0</td>
</tr>
<tr>
<td>Non-bearing walls and partitioning</td>
<td>0</td>
</tr>
<tr>
<td>Non-bearing walls and partitions, Including supporting beams</td>
<td>0</td>
</tr>
</tbody>
</table>

Given a building type we can determine the level of protection needed.
Resources for Fire Rated Assemblies

Tested Assemblies – DCA3 and W305

• Testing Agencies
• American Wood Council publication DCA3.
  • www.awc.org
• APA has publication W305.
  • www.apawood.org

Typical Floor Assembly Attributes

Example: To achieve a one hour rating from the bottom side.
- I-Joists at 24” o.c.
- Two layers 1/2” Gypsum Wallboard,
- 1-1/4” Type S screws at 12” o.c.,
- See WIJ-1.6 for complete information.
**Typical Wall Assembly Attributes**

Example: To achieve a one hour rating from one side DCA 3 Assembly WS6-1.5
- 2x6@16'' o.c.,
- R-19 Fiberglass-insulation,
- 5/8'' Type X Gypsum Wallboard,
- 2-1/4'' Type S screws at 12'' o.c.

**Typical Floor Assembly Attributes**

- For plated floor trusses Wood Truss Council has details available.
- www.sbcindustry.com

**Other Resources-Details**

1. USG Design Studio
   - www.usgdesignstudio.com
2. Other?
IBC has multiple assemblies that are included directly in the code.
• This includes wall, floor, and roof assemblies
• Detailed descriptions are available in Tables 720.1(1), 720.1(2), and 720.1(3)

Example: 2x4 Interior one hour wall with 5/8” Type X Gypsum.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>ITEM NUMBER</th>
<th>CONSTRUCTION</th>
<th>MINIMUM FINISHED THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studs—interior partition with gypsum wallboard each side</td>
<td>14-1.3</td>
<td>2” x 4” wood studs FR with 10” Type X gypsum wallboard applied vertically or horizontally nailed with 6d common or wallboard nails at 7” on center with end joints on nailing members. Stagger joints each side.</td>
<td>6-1/8”</td>
</tr>
</tbody>
</table>

Fireblocking and Draftstopping
10

Fire Blocking – Where is it needed?

- 717.2 of the IBC requires that in combustible construction, fireblocking shall be installed to cut off concealed draft openings (both vertical and horizontal) and shall form an effective barrier between floors, between a top story and a roof or attic space.
- Fire blocking will slow the spread of not only smoke but flames.

Fire Blocking

- Some areas that will be discussed include:
- Concealed wall spaces
- Stairs
- Connections between floors and walls.
- Double Stud Walls

Fire Blocking – Concealed wall spaces

- Fireblocking shall be provided in concealed spaces of stud walls and partitions, including furred spaces, and parallel rows of studs or staggered studs, as follows:
  - Vertically at the ceiling and floor levels.
  - Horizontally at intervals not exceeding 10 feet
Vertically at the ceiling and floor levels

FIRE BLOCKING AT FLOOR/CEILING SPACES
Rated Floor Ceiling
FIRE BLOCKING AT VERTICAL SPACES
Rated Wall

Typical Fire Blocking

- Nominal 2" Lumber (1-1/2" actual width)
- 2 layers nominal 1 x lumber
- 23/32" Wood Structural Panels or 3/4" Particleboard lapped at seams
- 1/2" gypsum
- Mineral Wool or Fiberglass Insulation
- Other (some engineered rim boards)

Fireblocking - Multi Story

- Typically 2x plates act as fireblock at floor/ceiling interface and provide 10' break.
For balloon framed walls, vertical fire blocking is required in addition to horizontal fire blocking to resist fire intrusion into the floor or wall cavity.

Concealed wall spaces

- At dropped ceilings, fire blocking required horizontally between studs.

Concealed wall spaces
Concealed wall spaces

• Where penetrations occur a fire stop is required;
• Plumbing, electrical, HVAC

Ceilings and Openings in Floors

• Fire stop provided at masonry fireplace projecting through floor.

Fire Blocking - Stairs

• Fire blocking is required at top and bottom of
Double Stud Wall – Tenant Separation

• Why do a double stud wall?
  • Sound
  • Plumbing at bathroom wall
  • Insulation
  • Wood Structural Panel
    • Causes flanking transmission
    • Provides diaphragm continuity

Draft Stopping – Where is it needed?

• In combustible construction, draftstopping shall be installed to subdivide floor/ceiling assemblies in the locations prescribed in Sections 717.3.2 through 717.3.3.
  • Draftstopping is intended to restrict the flow of air.

Draft Stopping – What can be used?

• 717.3.1 Draftstopping materials shall not be less than:
  • 0.5-inch (12.7 mm) gypsum board,
  • 0.375-inch (9.5 mm) wood structural panel,
  • 0.375-inch (9.5 mm) particleboard,
  • 1-inch (25-mm) nominal lumber,
  • cement fiberboard, batts or blankets of mineral wool or glass fiber, or other approved materials adequately supported.
Draft Stopping – 1000sf limit

- Draftstopping shall be installed so that horizontal floor areas do not exceed 1,000 square feet.

Any issues with this detail?

May be a challenge for sound performance.

Draft Stopping – Dropped Ceiling

Draft Stopping – Plated Floor Trusses
Draft Stopping – Roof Framing

- Draftstopping in attics shall limit concealed spaces to 3,000sf or less.
- In groups R-1 and R-2 tenant and sleeping area separations are typically required.

Sprinkler Requirements

- Addition of sprinklers will have additional considerations.

NFPA 13 Requirements

- When sprinklered construction is assumed concealed spaces are typically sprinklered.
  - Unless floor cavity is 160 cubic feet or less in volume
  - Attics are typically sprinklered
**NFPA 13 Requirements**

- For example a 20’ long joist, 2’ spacing, 14” deep has a volume of 47ft³

**Common Assemblies**

**Protection Needed**

A. Tenant Separation Wall
B. Floor to Wall
C. Floor to Wall
D. Shaft Wall
E. Shaft Wall
Detail A Considerations

- Is it a tenant Separation?
- Does the building type require it is rated?
- What about sound?
- Is it a shearwall?

Tenant Separation - Walls

- 708.1 Fire Partitions - The following wall assemblies shall comply with this section:
  - Walls separating dwelling units in the same building.
  - Walls separating sleeping units in occupancies in Group R-1 hotel, R-2 and I-1 occupancies.
- 708.3 Fire partitions shall have a fire-resistance rating of not less than 1 hour.
  - ½ hour for Type IIIB and VB with NFPA 13 sprinkler
- **ONE HOUR RATED WALLS TYPICALLY REQ'D RATED ASSEMBLY REQUIRED**

Sound Requirements -2006 IBC

- 1207.2 Air-borne sound. Walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50.
Common Assemblies

- Available at www.gypsum.org

Tenant Separation – Sample

- Fire Assemblies
  - 2x wall – GA WP# 3242
  - STC 50-54
  - Reference UL U305

- 2x wall – GA WP# 3242
  - STC 50-54
  - Shearwall

Fire Assemblies

- Staggered Wall
  - Assembly U340
  - Share plates

- Double Wall
  - 2 hour wall
  - 2x wall – GA 3820
  - STC 55-59
USG Shaft Wall at Tenant Separation

- No need for protecting the outlets.

Floor Cavity – Detail B and C

- Do we have a tenant separation?
- Is the wall loadbearing?
- Is the wall a shearwall?
- What about flanking sound?
- What about joist bearing length requirements?

Tenant Separation

- Draftstopping required above tenant separations.
  - 717.3.1 Draftstopping materials shall not be less than:
    - 0.5-inch (12.7 mm) gypsum board,
    - 0.375-inch (9.5 mm) wood structural panel,
    - See IBC for more options

- If we need a shearwall or load capacity structural member required.
  - Solid Sawn Lumber or Engineered Rim
  - I-Joist
Tenant Separation

- Floor framing perpendicular to tenant separation wall
  - Joist Bearing
    - I-Joist 1.75” + 1.75” + 1” = 4.5”
    - > 2x4 wall (3.5”)
    - 2x6 (5.5”) wall may be needed
  - Flanking Transmission can reduce STC and IIC by 10 points
    - Flanking is difficult since joists always bear on two walls.
    - Often shorter span results in bearing on tenant separations.

Joist Orientation w/ Double Stud Walls

- Best practice is for floor joists to run parallel with single stud walls
- Reduces flanking transmission for vertical and horizontally separated rooms

Shaft Wall Details

- 707.3 Materials.
  - The shaft enclosure shall be of materials permitted by the building type of construction.
- Rating Requirement – 707.4
  - Minimum 1 hour
  - Minimum 2 hour if ≥ 4 stories
  - ≥ floor rating requirement
Elevator Shaft – 1 hour wood frame

- One hour typically required for 3 story Type VA or VB building.

![Diagram of Elevator Shaft – 1 hour wood frame](image)

- Rated wall and floor both 1 hour

- Continuous Sheathing On inside of Shaft Wall

Elevator Shaft – 2 hour wood frame

- When two hour rated shafts are required we have some options.

  - 1 hour floor tied directly to 2 hour shaft wall.
  - Masonry Wall
  - Double Stud Wall

![Diagram of Elevator Shaft – 2 hour wood frame](image)

Elevator Shaft – Stairway

- 1009.5 Stairway construction. All stairways shall be built of materials consistent with the types permitted for the type of construction.
**Protection Needed R-2 occupancies**

1. Corridor Floor
2. Corridor Floor
3. Floor Ceiling
4. Exterior Wall

**Corridor Detailing**

- Per IBC Table 1017.1
- ½ hour minimum + sprinkler for R occupancy
- At corridors it is common to use solid sawn framing.

**Corridor Detailing**

- Another option is a plated floor truss.
Detail 3 Considerations

- Is it a tenant Separation?
- Does the building type require it is rated?
- What about sound?

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Tenant Separation - Floors

- 711.3 Floor assemblies separating dwelling units or sleeping units in Group R-1, hotel occupancies, R-2 shall be a minimum of 1-hour fire-resistance-rated construction.
  - Exception: Dwelling unit and sleeping unit separations in buildings types IIIB, and VB construction shall have fire-resistance ratings ½ hour with an NFPA 13 sprinkler in accordance with Section 903.3.1.1.

**TYPICALLY ONE HOUR REQUIRED**
**EVEN WITH SPRINKLERS REQ'D RATED ASSEMBLY NEEDED.**

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Common Floor Assembly

- Joists
- Gypsum
- Sheathing
- Topping – ¾” Min.
- Resilient Channels
- Insulation
- Topping Isolation
- PAC Clips
Common Floor Assembly

Exterior Bearing Wall

- What level of fire protection do we need?
- Does the exterior need to be rated?
- Type III interface

Exterior Bearing Walls – 1 Hour

- Fire Assemblies
  - Exterior Wall – U356
    - Int. Side – (1) 5/8” Type X Gypsum
    - R-19 Insulation
    - 2x stud
    - Ext. Side – ½” Wood Structural Panel
  - 2x wall – GA WP# 3514 or U305
Given a building type we can determine the level of protection needed.

<table>
<thead>
<tr>
<th>Building Element</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing walls</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Exterior</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>U371</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2 Hr Wall</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

One solution subject to Authority Having Jurisdiction.
Has been used in Atlanta.

Unintended Wood

1 Hour Floor
2 Hour Wall

Fire Retardant Treated Wood

While the code does not explicitly require fire walls in some cases it may be utilized to expand the allowed size of a building.

Section 705.3 requires that fire walls shall be of any approved noncombustible materials.

Exception: Buildings of Type V construction.

Common example is in multi-family
Fire Walls

- Depending on the Group type the rating for fire walls shall be impacted.
- In many cases 2 hour walls are acceptable for Type V construction with untreated wood.

### Fire Wall Fire-Resistance Ratings

<table>
<thead>
<tr>
<th>GROUP</th>
<th>FIRE-RESISTANCE RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, E, H-4, I, R-2, U</td>
<td>3</td>
</tr>
<tr>
<td>F-1, H-3b, H-5, M, S-1</td>
<td>3</td>
</tr>
<tr>
<td>H-1, H-2</td>
<td>4</td>
</tr>
<tr>
<td>F-2, S-2, R-3, R-4</td>
<td>2</td>
</tr>
</tbody>
</table>

*Walls shall be not less than 2-hour fire-resistance rated where separating buildings of Type II or V construction.*

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Fire Walls – Continuous to roof

- 705.6 Vertical continuity - Fire walls shall extend from the foundation to a termination point at least 30 inches (762 mm) above both adjacent roofs.
- 4. In Type III, IV and V walls shall be permitted to terminate at the underside of combustible roof sheathing or decks provided:
  - The roof sheathing or deck is constructed of fire-retardant-treated wood for a distance of 4 feet.

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Fire Walls – Vertical Continuity

- **Fire Retardant Treated Plywood**

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Fire Walls – Continuous to ext. walls

- 705.5 Horizontal continuity.
- Fire walls shall be continuous from exterior wall to exterior wall and shall extend 18" beyond the exterior surface of exterior walls.
- Exceptions: Permitted to terminate at the interior surface of combustible exterior sheathing provided the exterior wall has a 1 hour rating for a horizontal distance of at least 4 ft on both sides of the fire wall.

Fire Walls – Horizontal Continuity

Presentation Recap

- IBC requirements for rated assemblies
- Common Fire Rated Assemblies
  - Available Publications
- Fire blocking and draftstopping
  - Materials Allowed
  - Placement
  - NFPA 13
- Common Architectural Detailing
  - Tenant Separations
  - Shafts – Elevators
  - Rated Floors
  - Rated Walls
  - Corridors
  - Exterior Walls
Technical Support & Education

• Local lunch and learns
• One-on-one assistance
• Educational events
• Help desks, CAD details and more via woodworks.org
• Wood Solutions Fairs
• Seminars and workshops
• Awards

Contract Field Teams
South East Region, NC, SC, GA

Scott Lockyear, P.E.
Pat Schlesman, P.E.
Bruce Lindsey
Fritz Mertins

Contract Field Teams
California Region

Lisa Podesto, PE
Bryan Schuyler
Scott Holman
Michelle Kam-Biron, PE, SE
Contract Field Teams
North-central Region, MN, IL, WI

Thank you!!!
QUESTIONS???
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