Fireblocking, Draftstopping, & Firestopping

Department of
Licenses and Inspections
CITY OF PHILADELPHIA

Outline

1. Risks of fire spread
2. Mitigation methods to slow the spread of fire
3. Approved fireblocking material
4. Fireblocking requirements
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8. Dealing with penetrations
9. Summary

Risks of Fire Spread

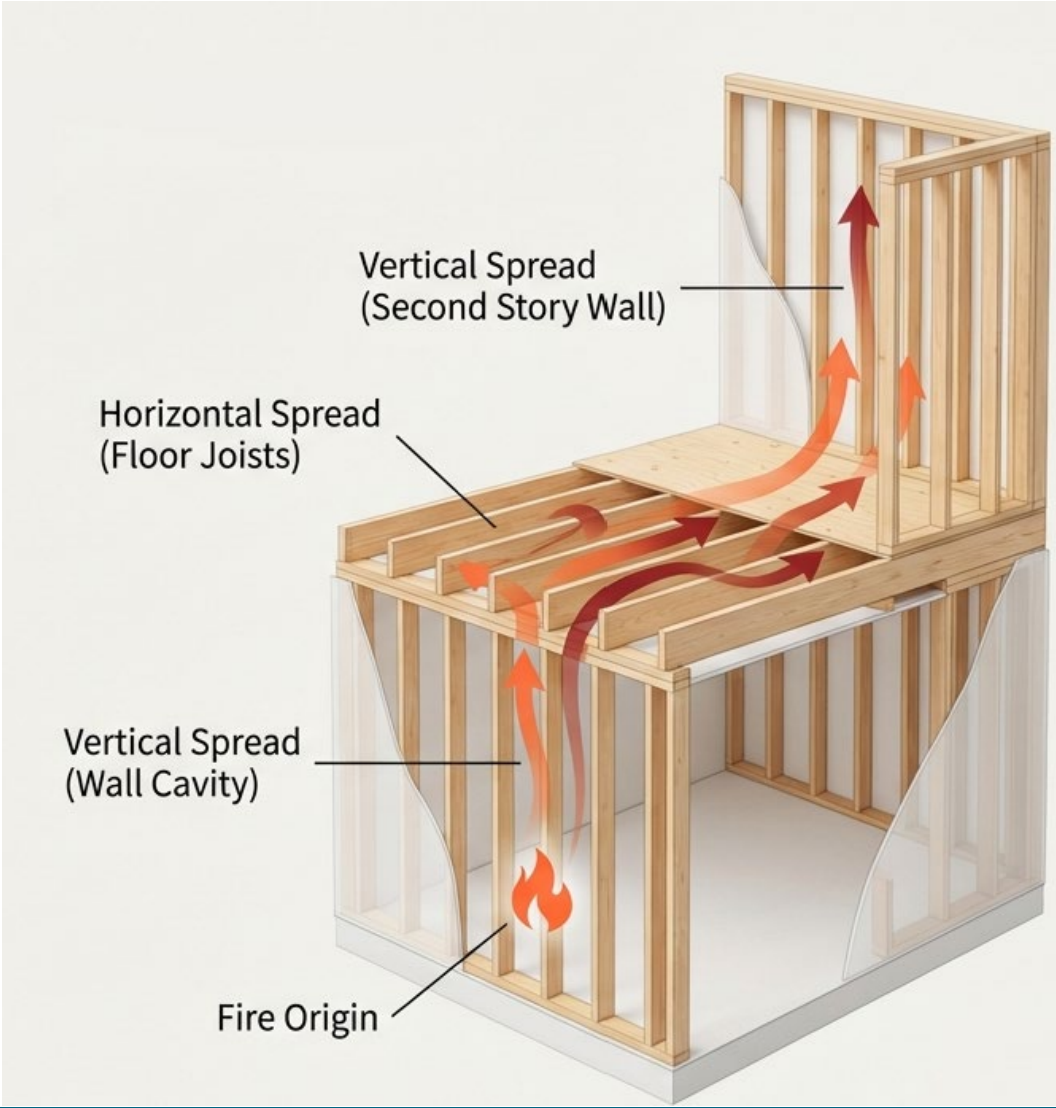
Fire can quickly spread throughout a building through concealed spaces if left unprotected.

Fires can spread through wall cavities, floor joist, ceiling assemblies, soffits, stairs and penetrations in wall and ceiling assemblies if not mitigated.

These spaces can act like a chimney during a fire and create pathways that accelerate the spread of flame, heat, smoke and gases throughout the structure.

Because these fires are hidden from view, they are difficult for occupants to detect and firefighters to access and suppress.

This problem compromises occupants' means of egress during a fire event and significantly increases the risk of injury or loss of life.



Mitigation Methods

Fireblock

- **Purpose:** To resist the free passage of flame & heat
- **Core Function:** Subdivides concealed spaces into smaller, sealed compartments to contain fire
- **Primary Application:** Manages both vertical & horizontal flame spread in smaller interconnected voids

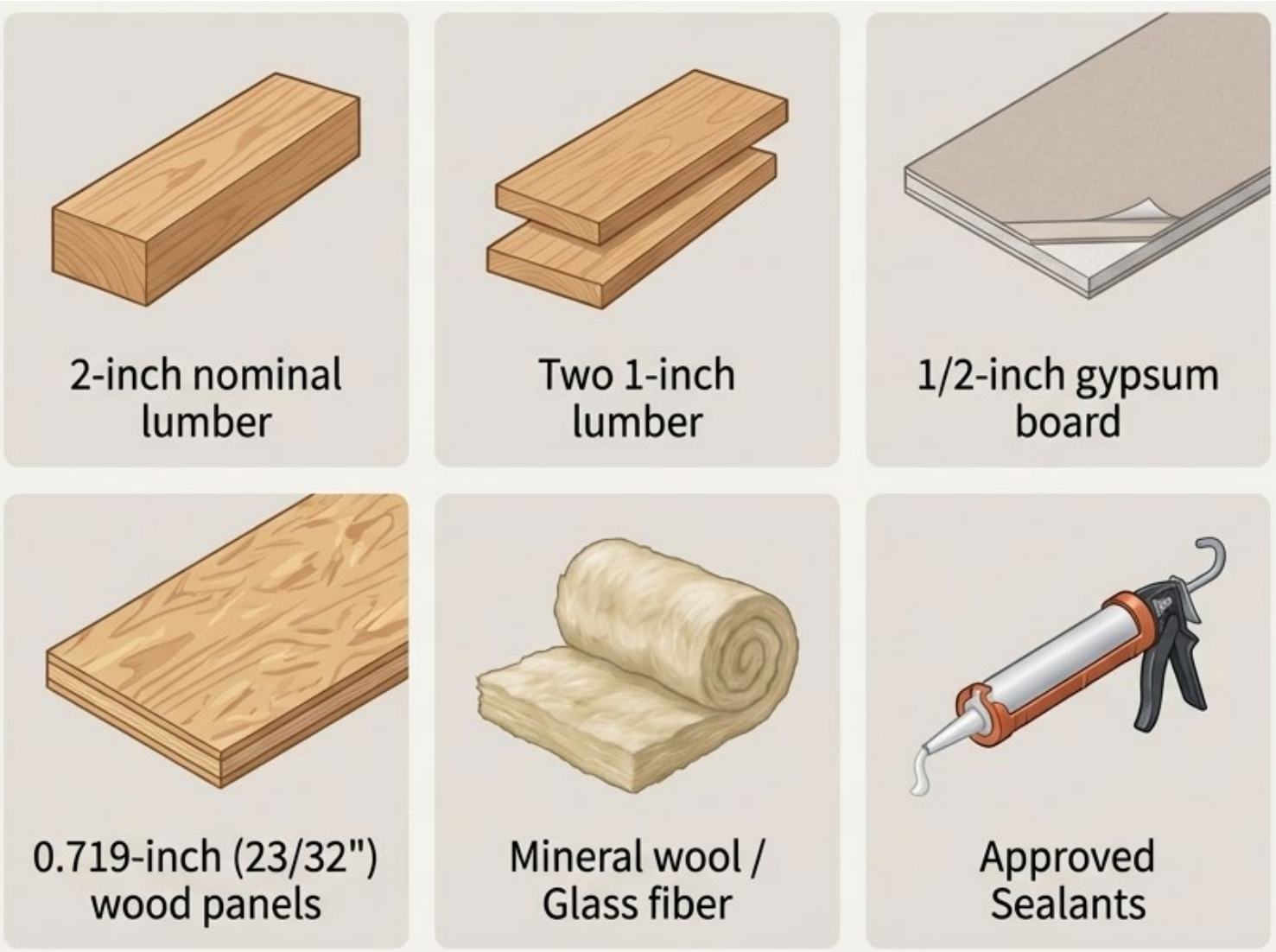
Draftstop

- **Purpose:** To restrict the movement of air, smoke, & gases
- **Core Function:** Divides large, open concealed spaces to limit the travel of combustion products & prevent rapid fire growth
- **Primary Application:** Manages horizontal spread over large open areas

Firestop

- **Purpose:** To restrict the movement of flame, heat, smoke, & combustion products
- **Core Function:** Restores rated assemblies hourly rating when penetrations are made
- **Primary Application:** Manages both horizontal and vertical penetrations to rated assemblies

Approved Fireblocking Materials



1. Two-inch nominal lumber.
2. Two thicknesses of 1-inch nominal lumber with broken lap joints.
3. One thickness of 23/32- inch wood structural panels with joints backed by 23/32-inch wood structural panels.
4. One thickness of 3/4-inch particleboard with joints backed by 3/4-inch particleboard.
5. One-half-inch gypsum board.
6. One-quarter-inch cement-based millboard.
7. Batts or blankets of mineral wool or glass fiber or other approved materials installed in such a manner as to be securely retained in place.
8. Cellulose insulation installed as tested in accordance with ASTM E119 or UL 263, for the specific application.

For Penetrations

The annular space around vents, pipes, ducts, & wires at ceiling and floor levels must be filled with an approved material to resist the free passage of flame & products of combustion

Fireblocking Requirements

What is fireblocking?

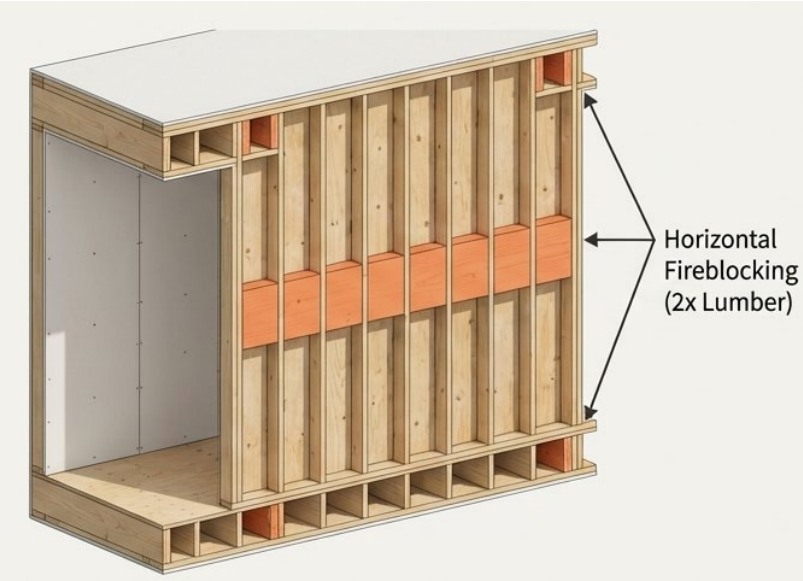
"Building Materials installed to resist the free passage of flame to other areas of the building through concealed spaces"

ICC definition

Code Requirement (IBC 718.2.2 / IRC R302.11)

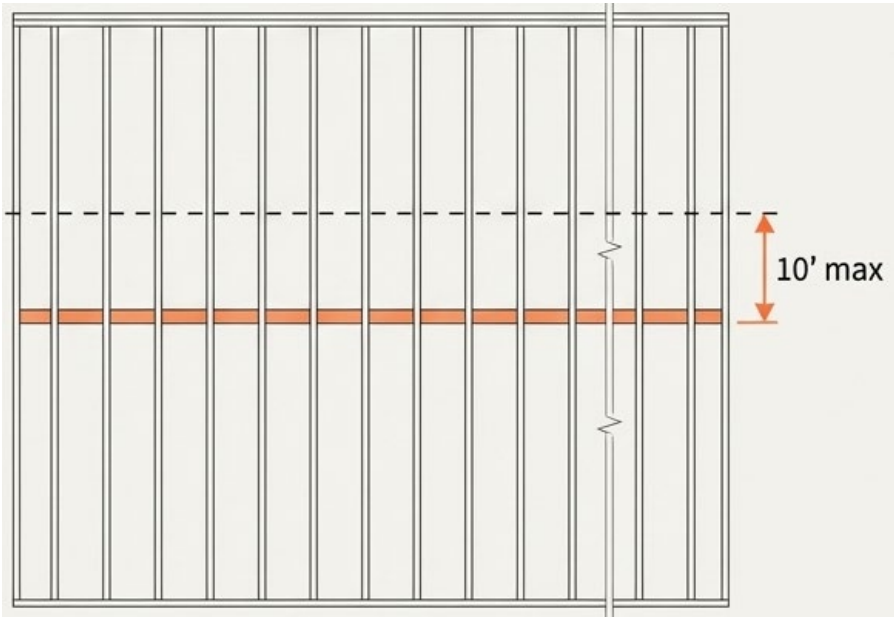
Fireblocking shall be provided in concealed spaces of stud and walls & partitions:

1. **Horizontally** at intervals
2. **Vertically** at ceiling & floor levels not exceeding 10 Ft



The Reason

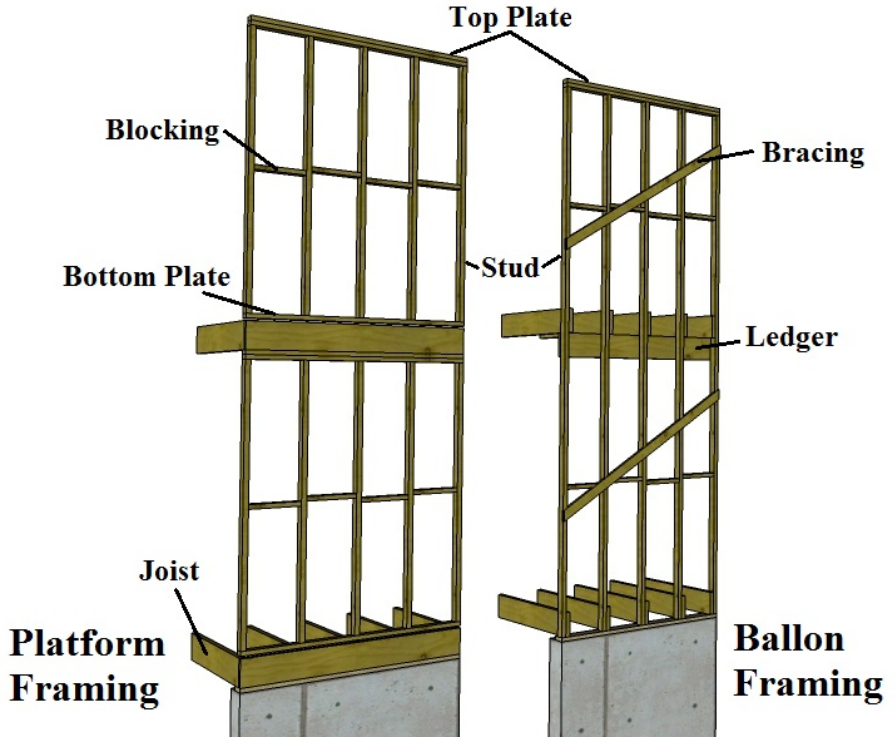
- Prevents fire from racing unimpeded up an entire story
- Limits the amount of fuel available to the fire
- Directly addresses fire spread risks seen in older balloon framing



Fireblocking Requirements

Design Implications

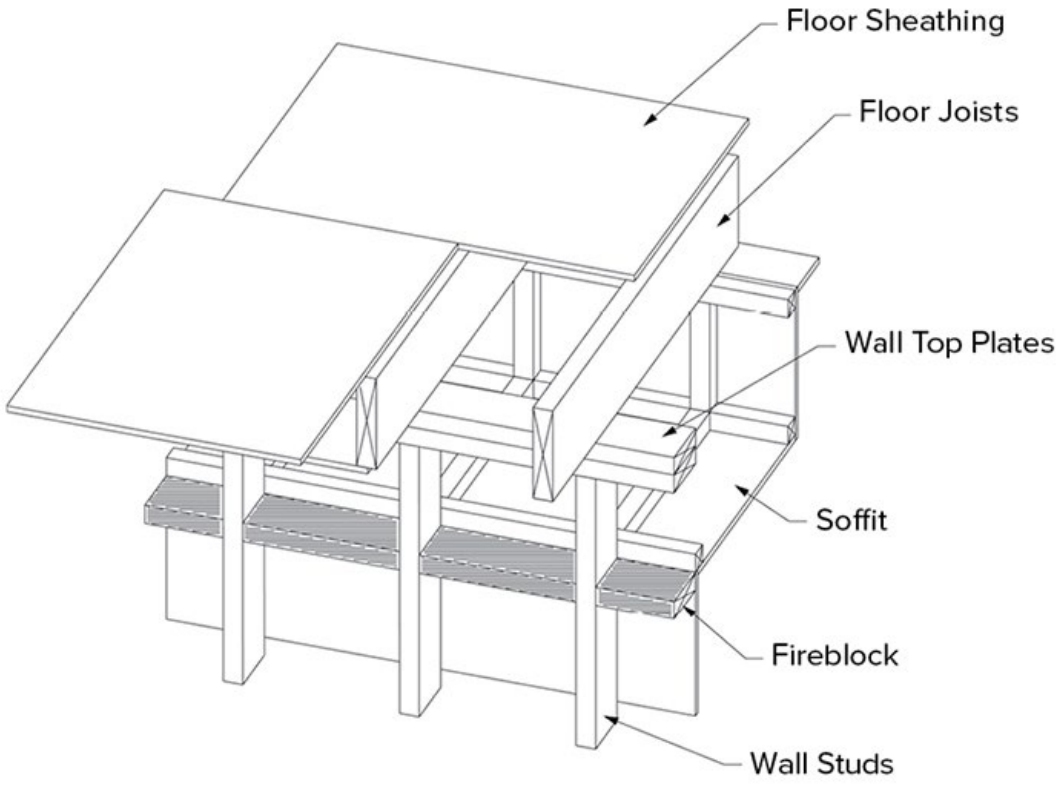
- Platform Framing: The top & bottom plates of a standard platform-framed wall typically serve as the required vertical fireblocking at floor and ceiling levels.
- Balloon Framing/Tall Walls: In older balloon-frame construction or modern spaces with walls taller than 10 Ft, horizontal blocking must be installed to break up the continuous vertical cavity.
- Insulation: Mineral or glass fiber insulation is only permitted for horizontal fireblocking applications.



Fireblocking Requirements

Interconnected Areas

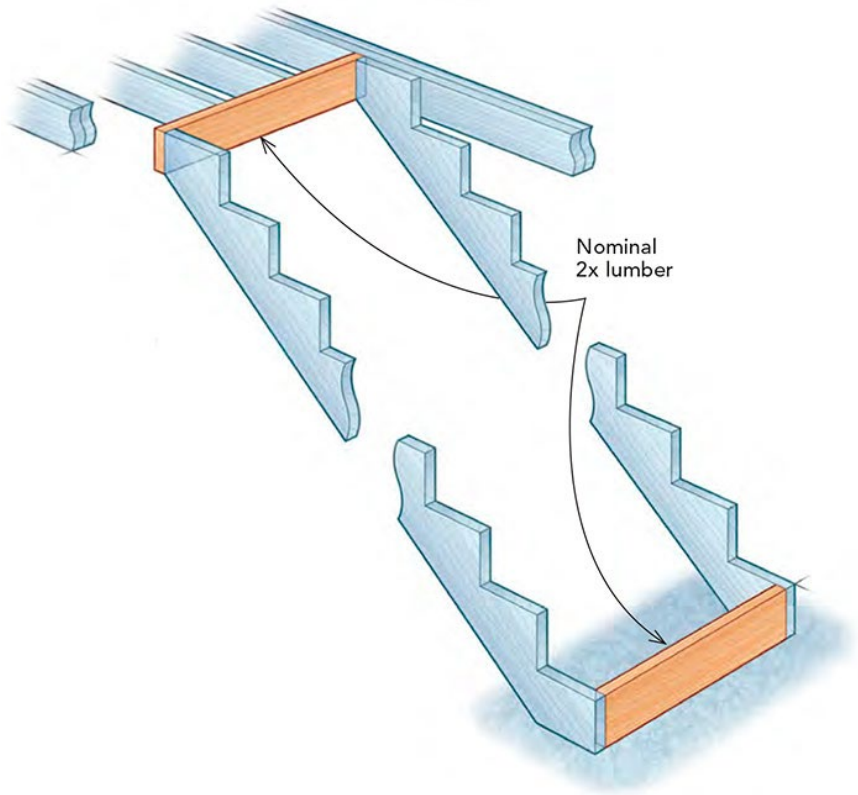
- Interconnections between concealed vertical & horizontal spaces (soffits, drop ceilings, coves)

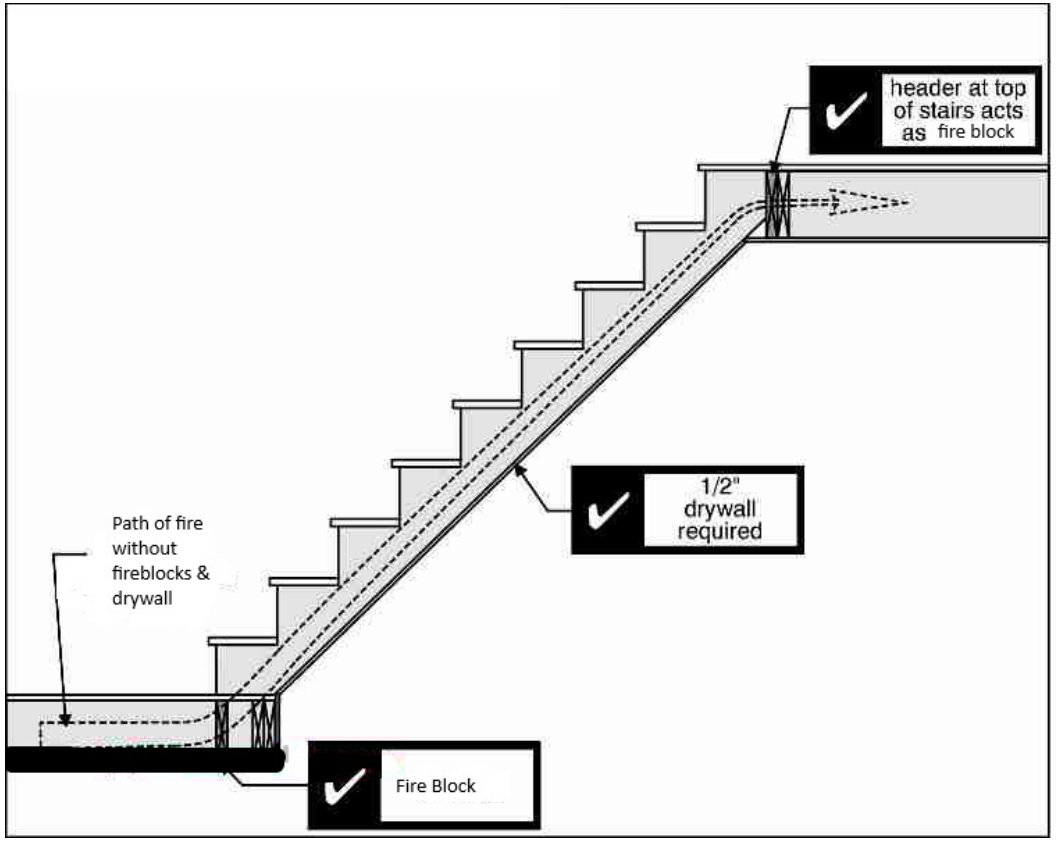


Fireblocking Requirements

Stair Stringers

- Concealed spaces between stair stringers at the top & bottom of the run



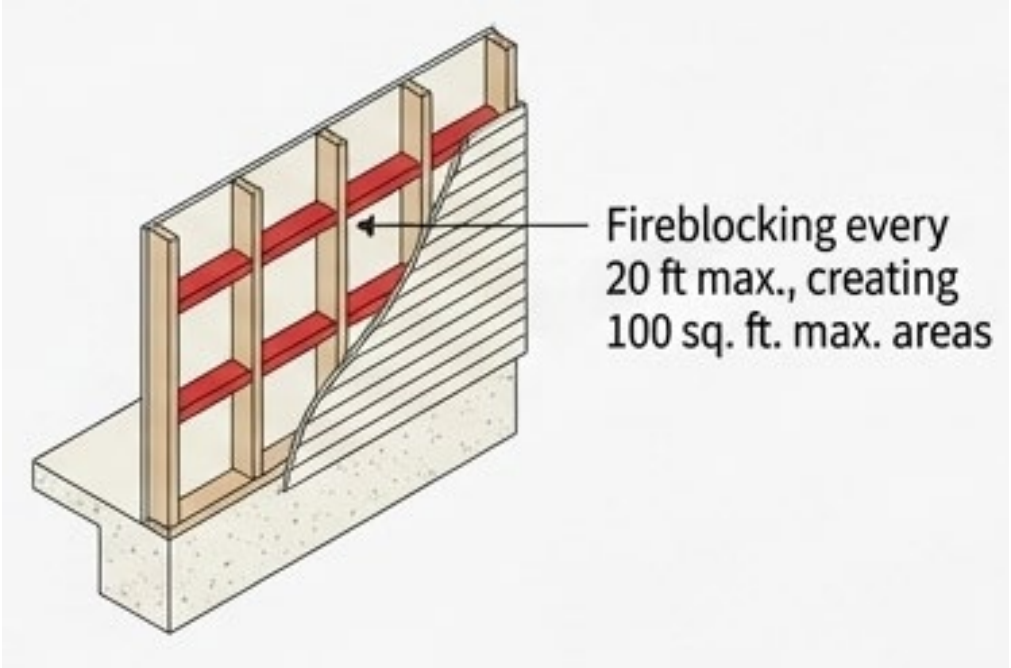


Fireblocking Requirements

Exterior Walls

Fireblocking shall be installed in concealed spaces of combustible exterior wall coverings.

- Maximum of 20 Ft intervals in either direction
- Must create no area larger than 100 SqFt
- Exception for cornices in SFD's (2-family dwellings only required at unit separation) when installed on non-combustible framing with a non-combustible interior face



Approved Draftstopping Materials

- 1/2-inch gypsum board
- 3/8-inch wood structural panel
- 3/8-inch particleboard
- 1-inch nominal lumber
- Cement fiber-board
- Batts or blankets of mineral wool or glass fiber

Draftstopping Requirements

What is Draftstopping?

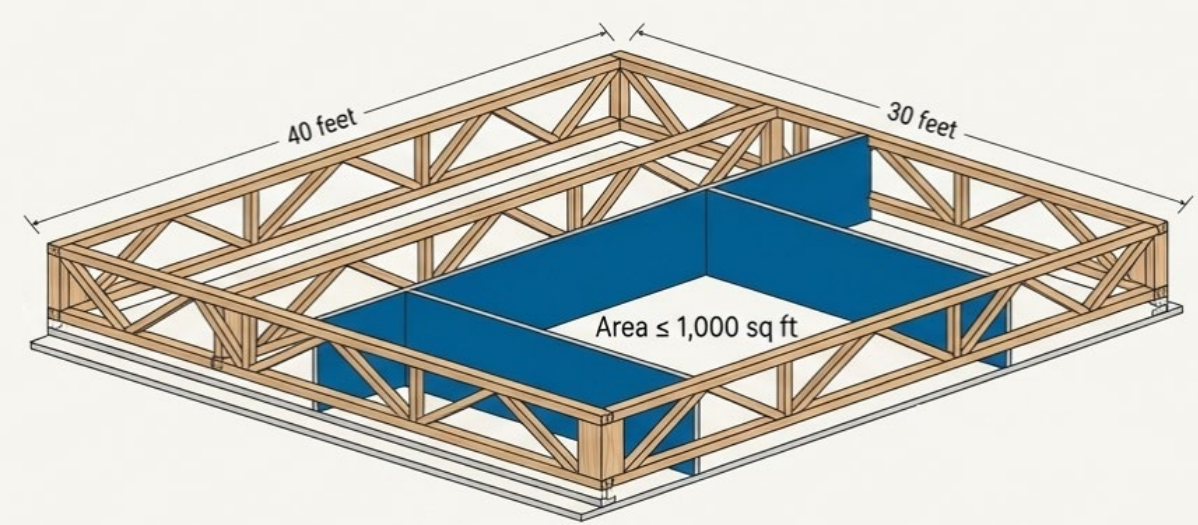
"A material, device or construction installed to restrict the movement of air within open spaces of concealed areas of building components such as crawl spaces, floor/ceiling assemblies, roof/ceiling assemblies and attics."

ICC definition

Draftstopping in Floors

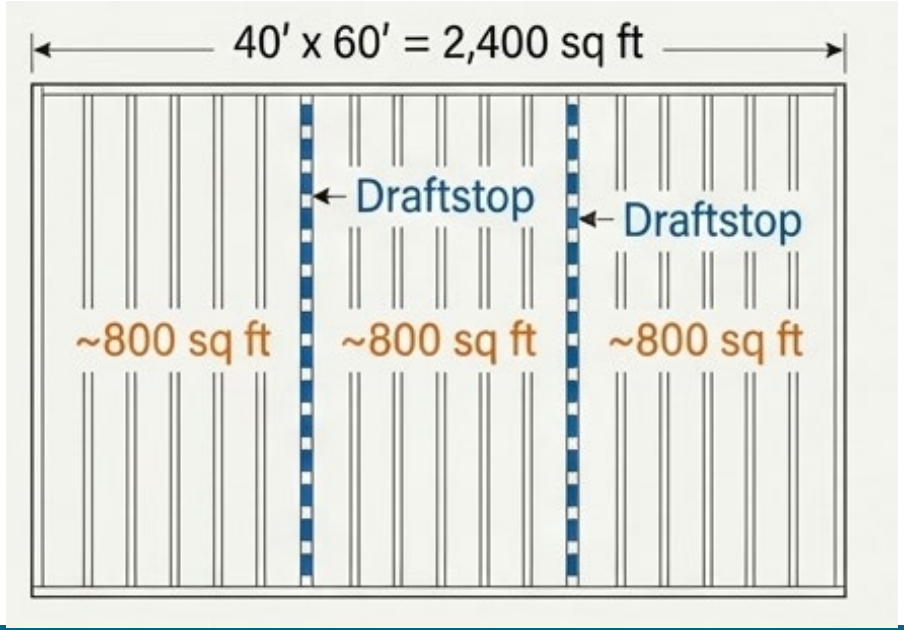
Draftstopping shall be provided in combustible floor/ceiling assemblies where there is usable space above & below the concealed space

- Ceiling is suspended under the floor framing or floor framing is constructed of truss, or open web
- Must divide the space into areas not exceeding 1,000 SqFt



The Reason

- Prevents smoke and gases from filling large concealed areas
- Limits the size of concealed cavities, making it easier for occupants to escape and for firefighters to control the fire

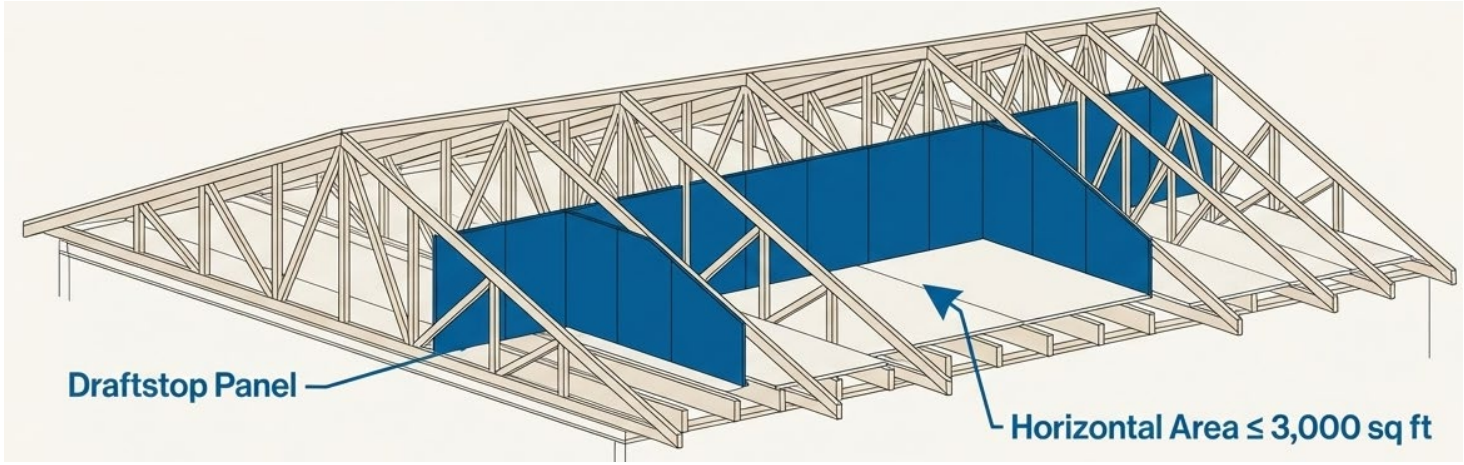


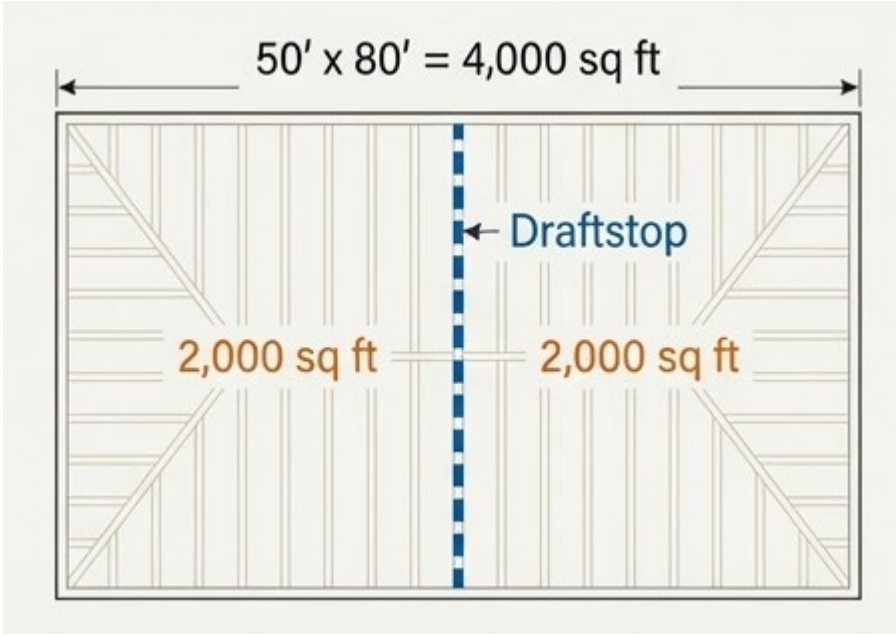
Draftstopping Requirements

Draftstopping in Attics

In combustible attic spaces & concealed roof spaces (other than R occupancies)

- Must divide the space so any horizontal area does not exceed 3,000 SqFt
- Ventilation of the concealed roof space must still be maintained





Draftstopping Requirements

Drafstopping Not Required

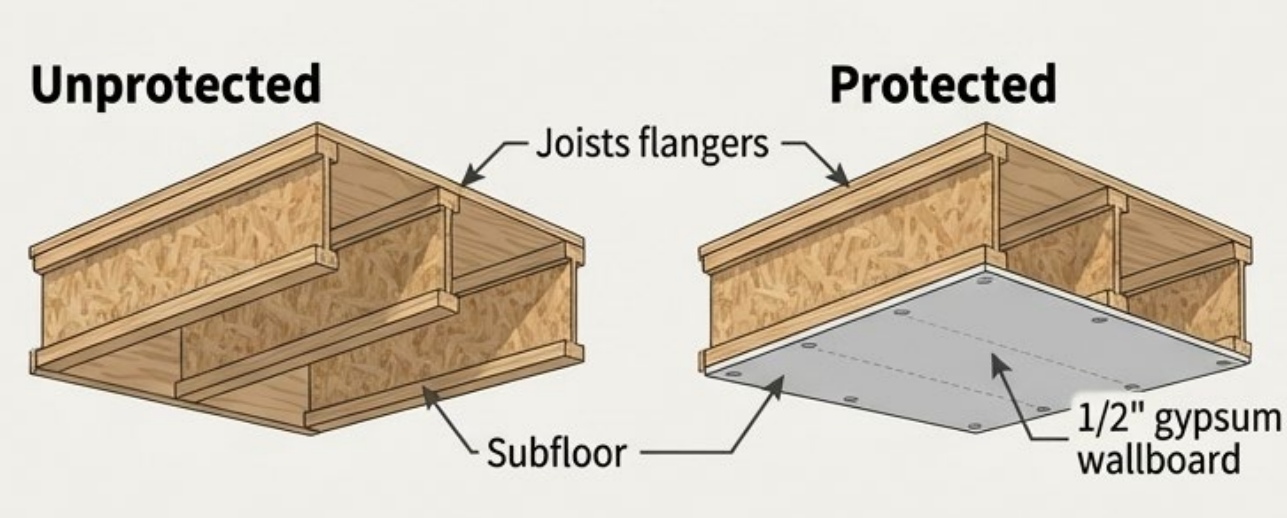
The presence of an automatic sprinkler system can alter draftstopping requirements.

Draftstopping is NOT required in combustible floor/ceiling or attic spaces in buildings equipped throughout with an automatic sprinkler system in accordance with NFPA 13

Exceptions

Protecting Lightweight Floor Assemblies

Requires a protective membrane on the underside of certain floor assemblies that are not otherwise fire-resistance rated



Key Exceptions:

- Floors directly over a space protected by an automatic sprinkler system (NFPA 13D).
- Floors over a crawl space not used for storage or fuel-fired appliances.
- Small aggregate unprotected areas (≤ 80 sq ft per story) with fireblocking around the perimeter.
- Floor assemblies using dimensional lumber ≥ 2x10 nominal.

Type I & Type II Buildings

Combustible materials are prohibited in concealed spaces of Type I & Type II construction. This is to prevent fire spread within building elements in structures that are otherwise highly fire-resistant.

There are several exceptions which permit the use of combustible materials in concealed spaces in these building types. Below is a list of the most common:

- Fire-retardant-treated wood for nonbearing partitions & some roof construction
- Combustible piping installed per code
- Millwork such as door and window frames
- Blocking for handrails and cabinets
- Insulation with flame spread index of <25

Penetrations

Firestopping is required for penetrations through:

Fire Walls, Fire Barriers, & Fire Partitions (IBC 714.4): Vertical assemblies separating occupancies, means of egress, or fire areas.

Smoke Barriers (IBC 714.5.4): Walls designed to limit the movement of smoke, which also require a specific air leakage rating (**L Rating**).

Horizontal Assemblies (IBC 714.5): Fire-resistance-rated floors and floor/ceiling assemblies.

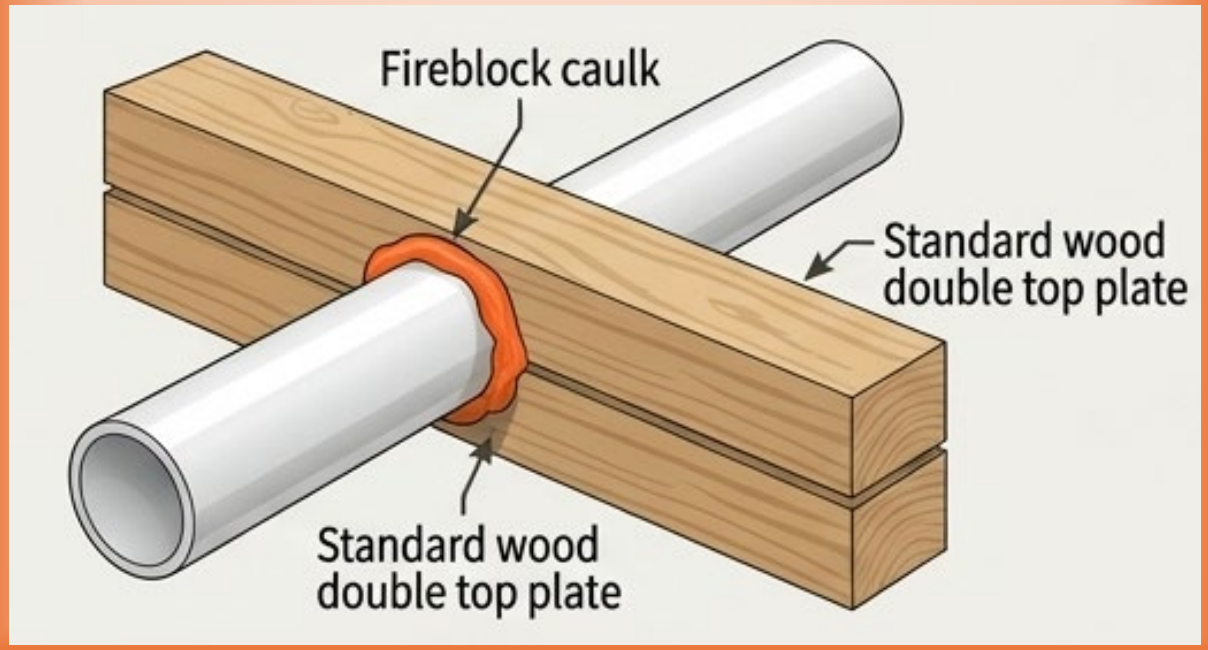
Shaft Enclosures: Walls protecting vertical openings like elevators and mechanical chases.

The trigger for firestopping is not the concealed space itself, but the act of penetrating a component that has a required hourly fire-resistance rating

Penetrations

Fireblocking Annular Spaces

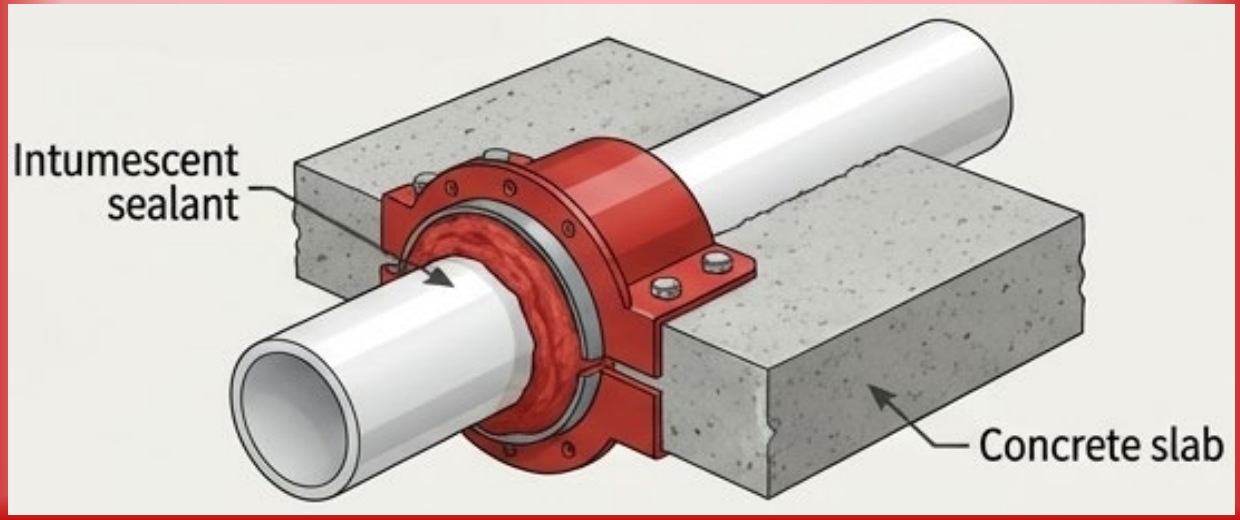
Applies To: Non-fire-resistance-rated assemblies
Requirement: Fill the gap around pipes, vents, wires, etc.. , with and approved material
System: No tested system required. Use basic materials like approved caulk or insulation



Through Penetration Firestop

Applies To: Penetrations through fire-resistance-rated walls, floors, & ceilings
Requirement: An engineered & tested system that maintains the assembly's fire rating
System: Has specific performance metrics

- **F-Rating:** Resists the passage of flame for the rated duration. Equal to the rating of the assembly
- **T-Rating:** Limits temperature rise on the opposite side



Penetrations

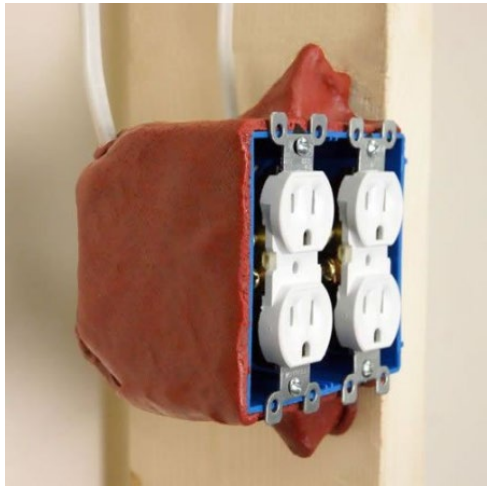
Membrane Penetrations

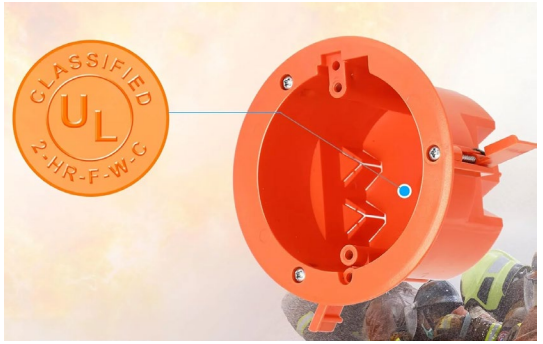
Applies To: An opening that breaches only one side of a rated assembly

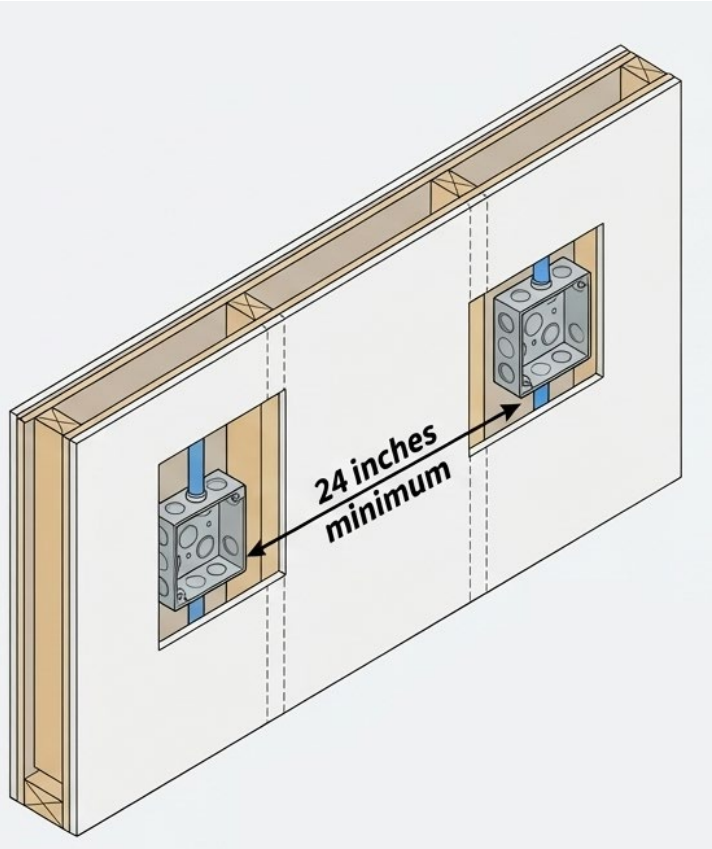
Requirement: Must restore the assemblies fire-resistance rating

System: Multiple solutions:

- Separate boxes on opposite sides by at least 24 inches
- Install solid fireblocking in the stud cavity between boxes
- Protect boxes with listed putty pads
- Use listed electrical boxes specifically tested for use in fire-rated assemblies







Summary

3 Steps to protecting Concealed Spaces

1. Block the Cavities.

Within combustible framing, subdivide every concealed path. Think vertically between floors and horizontally in tall walls.

Use common materials to block the chimney effect.

2. Divide the Voids.

In large, open concealed spaces (truss floors, attics), limit the area. The triggers are 1,000 sq ft for floors and 3,000 sq ft for attics.

Remember that sprinklers are a powerful design alternative.

3. Seal the Breaches.

Any time you penetrate a fire-resistance-rated assembly, you must restore its rating. This requires a tested, listed firestop system—not just stuffing insulation in the hole.

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Philadelphia, PA Laws. (2021). American Legal Publishing. https://codelibrary.amlegal.com/codes/philadelphia/latest/overview

2018 IRC - https://codes.iccsafe.org/content/IRC2018P7

2018 IBC - https://codes.iccsafe.org/content/IBC2018P6

Questions?