International Building Code - Fire Resistance Rated Construction

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Chapter 7: Fire-Resistance-Rated Construction, General Requirements, Definitions, Fire Tests, and Exterior Walls

Learning Objectives

By the end of this section, you will be able to:

1. **Identify** the purpose and scope of fire-resistance-rated construction requirements.
2. **Interpret** key fire-resistance, firestopping, damper, shaft, smoke control, and opening-protective terminology.
3. **Evaluate** acceptable methods for determining fire-resistance ratings and noncombustibility.
4. **Apply** exterior wall fire-resistance, projection, opening, vertical exposure, parapet, joint, and duct penetration requirements.

Executive Summary

Executive Summary: Fire-resistance-rated construction is intended to limit the spread of fire, smoke, hot gases, and excessive heat within buildings and between adjacent buildings. For professional practice, the critical engineering task is not only selecting rated assemblies, but also preserving the rating at openings, joints, projections, penetrations, exterior wall interfaces, and concealed spaces.

701 General

701.1 Scope

This section establishes the basic purpose of fire-resistance-rated construction requirements. The requirements apply to the materials and assemblies used to provide structural fire resistance and to separate adjacent spaces with fire-resistance-rated construction.

The underlying engineering objective is to safeguard occupants, property, and adjacent structures by limiting:

- The spread of fire within a building.
- The spread of smoke within a building.

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- The spread of fire to or from other buildings.
- The loss of structural performance during fire exposure.

For design and review, this means that a fire-resistance-rated assembly should not be evaluated only as an isolated wall, floor, roof, column, beam, shaft, or enclosure. The engineer must also evaluate how that assembly performs after real-world construction features are added, including doors, windows, ducts, pipe penetrations, joints, dampers, concealed spaces, and curtain wall interfaces.

💡 Design Tip: A common fire-resistance design error is treating the rated assembly as complete once the wall or floor type is selected. In practice, the rating must be maintained at every discontinuity, including openings, joints, and penetrations.

702 Definitions

702.1 Definitions

The following definitions establish the terminology used throughout fire-resistance-rated construction design and review. These terms are not interchangeable. For example, a fire wall, fire barrier, fire partition, smoke barrier, and smoke partition each performs a different function and is subject to different continuity, opening, and penetration requirements.

Term	Course-ready definition and engineering significance
Annular Space	The opening around a penetrating item. This space is critical in penetration firestop design because the firestop system must address the geometry around the pipe, conduit, cable, duct, or similar item.
Ceiling Radiation Damper	A listed device installed in the ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly. Its function is to automatically limit radiative heat transfer through an air inlet or outlet opening.
Combination Fire/Smoke Damper	A listed device installed in ducts and air transfer openings. It closes automatically when heat is detected and also resists passage of air and smoke. It operates automatically, is controlled by a smoke detection system, and where required, can be positioned from a remote command station.

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Concealed Spaces	Enclosed spaces within partitions, walls, floors, roofs, stairs, furring, pipe chases, column enclosures, and similar locations. These spaces require careful attention because they can allow hidden fire, smoke, and hot gas movement.
Damper	A general term that refers to ceiling radiation dampers, combination fire/smoke dampers, fire dampers, and smoke dampers. The specific damper type matters because each device has a different listing, function, and triggering method.
Draft Stop	A material, device, or construction installed to restrict air movement within open spaces of concealed areas of building components, including crawl spaces, floor/ceiling assemblies, roof/ceiling assemblies, and attics.
F Rating	The time period that a through-penetration firestop system limits the spread of fire through the penetration when tested in accordance with ASTM E 814.
Fire Area	The aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls, or fire-resistance-rated horizontal assemblies.
Fire Barrier	A fire-resistance-rated vertical or horizontal assembly of materials complying with Section 706. It is designed to restrict fire spread, and its openings must be protected.
Fire Damper	A listed device installed in ducts and air transfer openings of an air distribution system or smoke control system. It closes automatically when heat is detected, interrupts migratory airflow, and restricts passage of flame. Fire dampers are classified for use in either static systems, which shut down during a fire, or dynamic systems, which continue operating during a fire. A dynamic fire damper is tested and rated for closure under airflow.
Fire Door	The door component of a fire door assembly.
Fire Door Assembly	A combination of fire door, frame, hardware, and accessories that together provide a specific degree of fire protection to an opening.

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Fire Partition	A vertical assembly complying with Section 708. It is designed to restrict fire spread and has protected openings.
Fire Protection Rating	The time period that an opening protective assembly maintains its ability to confine a fire, as determined by the prescribed tests. Ratings are stated in hours or minutes.
Fire Resistance	The property of a material or assembly that prevents or retards the passage of excessive heat, hot gases, or flames under conditions of use.
Fire-Resistance Rating	The period of time a building element, component, or assembly maintains the ability to withstand fire exposure, continue performing a structural function, or both, as determined by prescribed tests or methods based on those tests.
Fire-Resistant Joint System	An assemblage of specific materials or products designed, tested, and fire-resistance rated in accordance with ASTM E 1966 or UL 2079. Its purpose is to resist fire passage through joints made in or between fire-resistance-rated assemblies for a prescribed time.
Fire Separation Distance	The distance measured from the building face to the closest interior tax lot line, to the centerline of a street or other public space, or to an imaginary line between two buildings on the same tax lot. The distance is measured at right angles from the face of the wall.
Fire Wall	A fire-resistance-rated smoke-tight wall with protected openings. It restricts fire spread and extends continuously from the foundation to or through the roof. It must have sufficient structural stability under fire conditions to permit collapse of construction on either side without collapse of the wall.
Fire Window Assembly	A window used as an opening protective, constructed and glazed to protect against the passage of fire, smoke, and hot gases.
Fireblocking	A building material or assembly, with or without a fire-resistance rating, installed to resist the free passage of flame or hot gases through concealed spaces to other areas of the building.
Firestopping	A through-penetration firestop or membrane penetration firestop.

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Floor Fire Door Assembly	A fire door, frame, hardware, and accessories installed as an opening protective in a horizontal plane. Together, the assembly provides a specific degree of fire protection to a through opening in a fire-resistance-rated floor.
Membrane Penetration	An opening made through one side of an assembly, such as one wall, floor, or ceiling membrane.
Membrane Penetration Firestop	A material, device, or assemblage of materials or products designed, tested, and fire-resistance rated to resist passage of flame and heat through openings in a protective membrane for a prescribed period. These openings accommodate items such as cables, cable trays, conduit, tubing, pipes, or similar penetrants.
Penetration Firestop	A through-penetration firestop or membrane penetration firestop.
Self-Closing	For a fire door or other opening, equipped with an approved device that ensures the opening closes after being opened.
Shaft	An enclosed space extending through one or more stories of a building and connecting vertical openings in successive floors, or floors and roof.
Shaft Enclosure	The walls or construction forming the boundaries of a shaft.
Smoke Barrier	A continuous vertical or horizontal membrane, such as a wall, floor, or ceiling assembly, designed and constructed in accordance with Section 709 to restrict smoke movement.
Smoke Compartment	A space within a building enclosed on all sides, including top and bottom, by smoke barriers.
Smoke Damper	A listed device installed in ducts and air transfer openings to resist passage of air and smoke. It operates automatically, is controlled by a smoke detection system, and where required, can be positioned from a remote command station.

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