ICC CODE TECHNOLOGY COMMITTEE
BALANCED FIRE PROTECTION
VERTICAL OPENINGS STUDY GROUP

Discussion Draft

(This document represents the consolidation of various research assignments of individual study group members and is intended to serve as base line for technical discussion purposes. It does not represent a study group recommendation or endorsement at this point in time.)

702.1 Definitions.

OPENING. A cavity, void or space in a building element or assembly, that where required to be protected, is enclosed by fire-resistance rated construction or protected by an opening protective assembly. (Keith)

OPENING. Passageways or breach in a floor, roof or wall system created for various purposes. (McHugh/Walke)

OPENING (Vertical). A discontinuity, a lineal joint, or a penetration in a horizontal building element or assembly. (Lovell)

PENETRATION. A cavity, void or space in, or between, a building element or assembly that, where required to be protected, is sealed to maintain the fire resistive integrity of the assembly or resist the free passage of flame and products of combustion in nonfire-resistance rated building elements. (Keith)

PENETRATION. An item that passes into or through an assembly or membrane. (McHugh/Walke)

ENCLOSURE.

BUILDING ELEMENT.

COMPONENT.

ASSEMBLY.

SHAFT. An enclosure for an opening that serves utility purposes such as accommodating electrical, mechanical. plumbing equipment and elevator hoistways. (Keith)

SHAFT. An enclosed space (Compartment) extending vertically or horizontally to or through one or more stories compartments or of a building, connecting openings in successive floors, or floors and roof, or walls. (McHugh/Walke)

EXIT ENCLOSURE. An enclosure for an opening that serves means of egress or human movement purposes such as stairways, ramps and escalators. (Keith)

EXIT ENCLOSURE. An exit component that is separated from other interior spaces of a building or structure by fire-resistance-rated compartmentation systems, and provides for a protected path of egress travel in a vertical or horizontal direction to the exit discharge or public way. (McHugh/Walke)

ATRIUM. An enclosure for an opening that serves functional or aesthetic purposes such as atria and air transfer openings. (Keith)

ATRIUM. Opening of any size in a story of a building. (McHugh/Walke)

AIR TRANSFER OPENING. An unducted opening designed to allow the movement of environmental air between two contiguous spaces. (Keith)

AIR TRANSFER OPENING. An opening designed to allow the movement of environmental air between two contiguous spaces. (McHugh/Walke)

FIRESTOP. A material, device or construction installed to maintain the fire-resistance rating of a building element, component or assembly. (Keith)

FIRESTOP. Assemblage of materials installed in or around an opening or penetration, to maintain the fire, smoke or other resistance rating of the compartmentation system. (McHugh/Walke)

FLAMESTOP. A material, device or construction installed to resist the free passage of flame and products of combustion in nonfire-resistance rated building elements. (Keith)

JOINT. The linear penetration in or between adjacent fire-resistance rated building elements or assemblies that is designed to allow for independent movement of the building in any plane caused by thermal, seismic, wind or any other loading. (Keith)

JOINT. The linear opening in or between adjacent fire-smoke, or other resistance-rated assemblies. (McHugh/Walke)

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

DRAFTSTOP. 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. (McHugh/Walke)

COMPARTMENT. A fire-resistance rated or nonfire-resistance rated envelope of building construction beyond which no atmospheric communication of fire or associated byproducts will occur. (Keith)

COMPARTMENT. Zone within the overall confines of a building created by fire, smoke, and other resistance rated wall, floor and roof systems, area building separations and egress corridors, with protected penetrations and openings suitable for the resistance required. (McHugh/Walke)

OPENING PROTECTIVE SYSTEM. Fire and Smoke Migration Study Chair, what are we going to call the opening protectives? We will need a definition for this, windows, doors?? (McHugh/Walke)

OPENING PROTECTIVE ASSEMBLY. A listed device installed in a building element or assembly that is designed to confine a fire for a prescribed period of time. Opening protective assemblies include fire door assemblies, fire shutter assemblies, fire window assemblies, fire-protection rated glazing, fire dampers, ceiling radiation dampers, smoke dampers and combination fire/smoke dampers. (Keith)

PENETRATION PROTECTIVE ASSEMBLY. A listed system installed in a building element or assembly that is designed to resist the spread of fire for a prescribed period of time. Penetration protective assemblies include membrane penetration firestops (systems?), through penetration firestop systems and fire-resistant joint systems. (Keith)

HEIRARCHY OF DEFINITIONS (Keith)

OPENING

SHAFT ENCLOSURE

SHAFT

EXIT ENCLOSURE

STAIRWAY

STAIR

RAMP

ATRIUM

OPENING PROTECTIVE ASSEMBLY

FIRE PROTECTION RATING

FIRE DOOR ASSEMBLY

FIRE DOOR

FLOOR FIRE DOOR ASSEMBLY

FIRE WINDOW ASSEMBLY

FIRE DAMPER

CEILING RADIATION DAMPER

SMOKE DAMPER

COMBINATION FIRE/SMOKE DAMPER

PENETRATION

PENETRATION PROTECTIVE ASSEMBLY

PENTRATION FIRESTOP

MEMBRANE PENETRATION FIRESTOP (SYSTEM)

MEMBRANE PENETRATION

T RATING

THROUGH PENETRATION FIRESTOP SYSTEM

THROUGH PENETRATION

F RATING

FIRE-RESISTANT JOINT SYSTEM

JOINT

SPLICE

ALTERNATE HEIRARCHY OF DEFINITIONS (Keith)

BUILDING ELEMENT

COMPONENT

ASSEMBLY

- **OPENING**
  - **ENCLOSURE**
  - **OPENING PROTECTIVE ASSEMBLY**
- **PENETRATION**
  - **FIRESTOP SYSTEM**
  - **JOINT SYSTEM**
  - **FLAMESTOP**

Chapter 7 organization (Clements/Keith)

Section 701 GENERAL

Section 702 DEFINITIONS

Section 703 FIRE-RESISTANCE RATINGS AND FIRE TESTS

Section 704 PRESCRIPTIVE FIRE RESISTANCE

Section 705 CALCULATED FIRE RESISTANCE

Section 706 EXTERIOR WALLS

Section 707 FIRE WALLS

Section 708 FIRE BARRIERS

Section 709 FIRE PARTITIONS

Section 710 SMOKE BARRIERS

Section 711 SMOKE PARTITIONS

Section 712 HORIZONTAL ASSEMBLIES

712.1 General.

712.2 Materials

712.3 Fire-resistance rating.

712.4 Opening protection. Openings in horizontal assemblies shall be protected in accordance with the provisions of Section 714.

712.5 Penetration protection. Penetrations in horizontal assemblies shall be protected in accordance with the provisions of Section 715.

Section 713 FIRE-RESISTANCE RATING OF STRUCTURAL MEMBERS

Section 714 OPENING PROTECTION FOR HORIZONTAL BUILDING ELEMENTS

BASIS OF TECHNICAL ASSUMPTION:

Consevative Base Line-

707.2 Shaft enclosure required. Openings through a floor/ceiling assembly shall be protected by a shaft enclosure complying with this section.

Exceptions:

7. In other than Groups I-2 and I-3, a shaft enclosure is not required for a floor opening that complies with the following:

7.1. ***Does not connect more than two stories.***

7.2. Is not part of the required means of egress system except as permitted in Section 1019.1.

7.3. Is not concealed within the building construction.

7.4. Is not open to a corridor in Group I and R occupancies.

7.5. Is not open to a corridor on nonsprinklered floors in any occupancy.

7.6. Is separated from floor openings serving other floors by construction

conforming to required shaft enclosures.

Liberal Extreme-

707.2 Shaft enclosure required. Openings through a floor/ceiling assembly shall be protected by a shaft enclosure complying with this section.

Exceptions:

2. A shaft enclosure is not required in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 for an escalator opening or stairway which is not a portion of the means of egress protected according to Item 2.1 or 2.2:

2.1. Where the area of the floor opening between stories does not exceed twice the horizontal projected area of the escalator or stairway and the opening is protected by a draft curtain and closely spaced sprinklers in accordance withNFPA13. ***In other than Groups B and M, this application is limited to openings that do not connect more than four stories.***

2.2. Where the opening is protected by approved power-operated automatic shutters at every floor penetrated. The shutters shall be of noncombustible construction and have a fire-resistance rating of not less than 1.5 hours. The shutter shall be so constructed as to close immediately upon the actuation of a smoke detector installed in accordance with Section 907.10 and shall completely shut off the well opening. Escalators shall cease operation when the shutter begins to close. The shutter shall operate at a speed of not more than 30 feet per minute (152.4 mm/s) and shall be equipped with a sensitive leading edge to arrest its progress where in contact with any obstacle, and to continue its progress on release therefrom.

COMPARISON OF MIGRATION LIMITS (Stories) Keith
(Proposed vs. 2006 IBC, exceptions notwithstanding) LR:14a/ER:15/MR:11

Occupancy	Type IIB, IIIB or VB Construction			Other than Type IIB, IIIB or VB Construction			Sprinklers			Mechanical Smoke Control		
	Prop	2006	Net	Prop	2006	Net	Prop	2006	Net	Prop	2006	Net
Group A	1	2	-1	2	2	=	+1	NA	+1a	+1b	NAb	+1a
Group B	1	2	-1	2	2	=	+1	NA	+1a	+1b	NAb	+1a
Group E	1	2	-1	2	2	=	+1	NA	+1a	+1b	NAb	+1a
Group F	1	2	-1	2	2	=	+1	NA	+1a	+1b	NAb	+1a
Group H	1	1	=	1	1	=	1	1	=	1	1	=
Group I	1	1	=	1	1	=	1	1	=	1	1	=
Group M	1	2	-1	2	2	=	+1	NA	+1a	+1b	NAb	+1a
Group R	1	2	-1	1	2	-1	1	NA	-1	1b	2b	-1
Group S	1	2	-1	2	2	=	+1	NA	+1a	+1b	NAb	+1a

Group U	1	2	-1	2	2	=	+1	NA	+1a	+1b	NAb	+1a

a. No increase in net for buildings of Type IIB, IIIB or VB construction.
b. Unlimited intercommunicating stories are permitted where buildings comply with atrium requirements.

714.1 General. Openings in horizontal building elements shall be protected in accordance with the provisions of this section.

714.2 Floor, floor/ceiling construction. Openings in both fire-resistance rated and nonfire-resistance rated floor/ceiling construction shall be enclosed in accordance with Sections 714.2.1 or protected with opening protective assemblies in accordance with Section 714.2.2. Stories, as used in this section, shall include basements, but not include balconies in Group A occupancies or mezzanines that comply with Section 505. (X-404.1.1, 707.4 and 1020.1) ~~A shaft enclosure is not required for floor openings between a mezzanine and the floor below.~~ (X-707.2, Exc 9) ~~A shaft enclosure is not required for penetrations by pipe,tube,conduit,wire,cable, and vents protected in accordance with Section 712.4.~~ (X-707.2, Exc 3) ~~A shaft enclosure is not required for penetrations by ducts protected in accordance with Section712.4. Grease ducts shall be protected in accordance with the *International Mechanical Code*.~~ (X-707.2, Exc 4) ~~In other than Group H occupancies, shaft enclosure is not required for floor openings complying with the provisions for covered malls or atriums.~~ (X-707.2, Exc 5) ~~In other than Groups I-2 and I-3, a shaft enclosure is not required for a floor opening or an air transfer opening that complies with the following:~~
~~7.1. Does not connect more than two stories.~~
~~7.2. Is not part of the required means of egress system except as permitted in Section 1019.1.~~
~~7.3. Is not concealed within the building construction.~~
~~7.4. Is not open to a corridor in Group I and R occupancies.~~
~~7.5. Is not open to a corridor on nonsprinklered floors in any occupancy.~~
~~7.6. Is separated from floor openings and air transfer openings serving other floors by construction conforming to required shaft enclosures.~~
~~7.7 Is limited to the same smoke compartment.~~ (X-707.2, Exc 7) ~~A shaft enclosure is not required for joints protected by a fire-resistant joint system in accordance with Section 713.~~ (X-707.2, Exc 10) ~~A shaft enclosure shall not be required for floor openings created by unenclosed stairs or ramps in accordance with Exception 8 or 9 in Section 1020.1.~~ (X-707.2, Exc 11) ~~Floor openings protected by floor fire doors in accordance with Section 711.8.~~ (X-707.2, Exc 12) ~~Where permitted by other sections of this code.~~ (X-707.2, Exc 13) ~~In all occupancies, other than Group H and I occupancies, a stairway is not required to be enclosed when the stairway serves an occupant load of less than 10 and the stairway complies with either Item 1.1 or 1.2. In all cases, the maximum number of connected stories shall not exceed two.,~~
~~The stairway is not open to not more than one story above story at the level of~~

exit discharge; or
1.2 The stairway is open to not more than one story below the story at the level of exit discharge. (X-1020.1, Exc 1) Stairways that are not a required means of egress element are not required to be enclosed where such stairways comply with Section 707.2. (X-1020.1, Exc 4) In other than occupancy Groups H and I, a maximum of 50 percent of egress stairways serving one adjacent floor are not required to be enclosed, provided at least two means of egress are provided from both floors served by the unenclosed stairways. Any two such interconnected floors shall not be open to other floors. Unenclosed exit stairways shall be remotely located as required in Section 1015.2. (X-1020.1, Exc 8) In other than occupancy Groups H and I, interior egress stairways serving only the first and second stories of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 are not required to be enclosed,provided at least two means of egress are provided from both floors served by the unenclosed stairways. Such interconnected stories shall not be open to other stories. Unenclosed exit stairways shall be remotely located as required in Section 1015.2. (X-1020.1, Exc 9)

Exceptions:

1. In other than underground buildings in accordance with Section 405, openings need not be protected between those communicating stories as permitted in Table 714.2.

2. Openings totally within an individual dwelling unit and connecting four stories or less. (X-707.2, Exc. 1,) **Exception:** A duct is permitted to penetrate three floors or less without a fire damper at each floor provided it meets all of the following requirements.
1. The duct shall be contained and located within the cavity of a wall and shall be constructed of steel not less than 0.019 inch (0.48 mm) (26 gage) in thickness.
2. The duct shall open into only one dwelling unit or sleeping unit and the duct system shall be continuous from the unit to the exterior of the building.
3. The duct shall not exceed 4-inch (102 mm) nominal diameter and the total area of such ducts shall not exceed100 square inches (0.065 m^2) in any 100 square feet (9.3 m^2) of floor area.
4. The annular space around the duct is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cottonwaste where subjected to ASTM E 119 time-temperature conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated
5. Grille openings located in a ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with a ceiling radiation damper in accordance with Section 716.6.2. (X- 716.6.1, Exception -- Group R only and therefore included in exception 2?) Stairways serving and contained within a single residential dwelling unit or sleeping unit in occupancies in Group R-1, R-2 or R-3 occupancies are not required to be enclosed. (X-1020.1, Exc 3)

3. Openings in Group S-2 open and enclosed parking garages that serve only the parking structure. (X-707.2, Exc. 8, X-1020.1, Exc 5)

4. Openings in Group A-5 occupancies which are essentially open to the outdoors. (X-1020.1, Exc. 2)

TABLE 714.2
ALLOWED NUMBER OF COMMUNICATING STORIES[a,b,c]

Occupancy	Type IIB, IIIB or VB Construction	Other than Type IIB, IIIB or VB Construction	NFPA 13	NFPA 13R	Mechanical Smoke Control
Group A, B, E, F, M, S or U	1	2[d]	+1	NA	+1[e]
Group H or I	1	1	1	NA	1
Group R	1	1	1	1	1

a. Openings that are not concealed within building construction and serve the indicated number of adjacent stories are not required to be enclosed or protected provided such interconnected stories do not atmospherically communicate with additional stories.

b. The total height of communicating stories shall not exceed 50 feet.

c. For escalators, see Section 714.2.3.4.

d. No increase permitted where Footnote e, Table 601 applies.

e. In other than Group H occupancies, unlimited intercommunicating stories are permitted where buildings comply with the provisions of Section 714.2.2.

714.2.1 Enclosures. Utility, egress and architectural openings in any floor or floor/ceiling assembly shall be enclosed in accordance with this section.

714.2.1.1 Utility openings. Except as permitted in Section 714.2, openings in floor/ceiling construction for elevators, dumbwaiters, or other hoistways; refuse and laundry chutes and plumbing, electrical, HVAC or other equipment shall be enclosed by a shaft enclosure constructed in accordance with this section. Elevator, dumbwaiter and other hoistway enclosures shall be also be constructed in accordance with Chapter 30. (X-707.14)

Exception: A shaft enclosure is not required for approved masonry chimneys, where annular space protection is provided at each floor level in accordance with Section 717.2.5. (X-707.2, Exc 6)

714.2.1.1.1 Materials. Shaft enclosures shall be constructed of materials consistent with those permitted for the type of construction of the building in accordance with Section 602.2-5.

714.2.1.1.2 Fire-resistance rating. Shaft enclosures shall have a fire-resistance rating of not less than 1 hour where connecting less than four stories and not less than 2 hours where connecting four stories or more. Shaft enclosures shall have a fire-resistance rating not less than the floor/ceiling assembly penetrated, but need not exceed 2 hours. (X-707.4)

714.2.1.1.3 Construction. Shaft enclosures shall be constructed as fire barriers in accordance with Section 708 or horizontal assemblies in accordance with Section 712, or both. (X-707.4)

714.2.1.1.4 Bottom enclosure. Shafts that do not extend to the bottom of the building or structure shall:
1. Be enclosed at the lowest level with construction of the same fire-resistance rating as the lowest floor through which the shaft passes, but not less than the rating required for the shaft enclosure;
2. Terminate in a room having a use related to the purpose of the shaft. The room shall be separated from the remainder of the building by construction having a fire-resistance rating and opening protectives at least equal to the protection required for the shaft enclosure; or
3. Be protected by ~~approved~~ fire dampers installed in accordance with their listing at the lowest floor level within the shaft enclosure.

Exceptions:

1. The fire-resistance-rated room separation is not required provided there are no openings in or penetrations of the shaft enclosure to the interior of the building except at the bottom. The bottom of the shaft shall be closed off around the penetrating items with materials permitted by Section 717.3.1 for draftstopping (flamestopping ?), or the room shall be provided with an approved automatic fire suppression system.
~~2. A shaft enclosure containing a refuse chute or laundry chute shall not be used for any other purpose and shall terminate in a room protected in accordance with Section 707.13.4.~~ (Addressed at Section 714.2.1.1.11.1)
3. The fire-resistance-rated room separation and the protection at the bottom of the shaft are not required provided there are no combustibles in the shaft and there are no openings or other penetrations through the shaft enclosure to the interior of the building. (X-707.11)

714.2.1.1.5 Top enclosure. A shaft enclosure that does not extend to the underside of the roof deck of the building shall be enclosed at the top with construction of the same fire-resistance rating as the topmost floor penetrated by the shaft, but not less than the fire-resistance rating required for the shaft enclosure. (X-707.12)

714.2.1.1.6 Openings. Openings in a shaft enclosure shall be protected in accordance with Section 715 ~~as required for fire barriers~~. Such openings shall be self-~~closing~~ or automatic-closing by smoke detection.

707.7.1 Prohibited openings. Openings other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures. (X-707.7)

714.2.1.1.7 Penetrations. Penetrations in a shaft enclosure shall be protected in accordance with Section 712 as required for fire barriers.

707.8.1 Prohibited penetrations. Penetrations other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures. ~~Ducts shall not penetrate exit shaft enclosures.~~

~~**Exception:** Duct penetrations as permitted in Section 1020.1.2.~~ (X-707.8)

714.2.1.1.8 Joints. Joints in a shaft enclosure shall comply with Section 713. (X-707.9)

714.2.1.1.9 Ducts and air transfer openings. Penetrations of a shaft enclosure by ducts and air transfer openings shall comply with Sections 712 and 716. (X-707.10) Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing.

Exceptions:

1. Fire dampers are not required at penetrations of shafts where:
1.1. Steel exhaust subducts are extended at least 22 inches (559 mm) vertically in exhaust shafts, provided there is a continuous airflow upward to the outside;
1.2. Penetrations are tested in accordance with ASTM E 119 as part of the rated assembly;
1.3. Ducts are used as part of an approved smoke control system designed and installed in accordance with Section 909, and where the fire damper will interfere with the operation of the smoke control system; or
1.4. The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
2. In Group B occupancies, equipped throughout with an automatic sprinkler

system in accordance with Section 903.3.1.1, smoke dampers are not required at penetrations of shafts where:
2.1. Bathroom and toilet room exhaust openings with steel exhaust subducts, having a wall thickness of at least 0.019 inches (0.48 mm) that extend at least 22 inches (559 mm) vertically and the exhaust fan at the upper terminus, powered continuously in accordance with the provisions of Section 909.11, maintains airflow upward to the outside; or
2.2. Ducts are used as part of an approved smoke control system, designed and installed in accordance with Section 909, and where the smoke damper will inter fere with the operation of the smoke control system.
3. Smoke dampers are not required at penetration of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction. (Section 716.5.3.1)

714.2.1.1.10 Smoke control. An enclosed elevator lobby shall be provided at each floor where an elevator shaft enclosure connects four stories or more. The lobby shall separate the elevator shaft enclosure doors from each floor by fire (smoke?) partitions equal to the fire-resistance rating of the corridor (? assumes a corridor) and the required opening protection. Alternatively, enclosed elevator lobbies are not required where the elevator hoistway is pressurized in accordance with Section 714.2.1.1.10.1. (X-707.14.1, Exc 6) Elevator lobbies shall have at least one means of egress complying with Chapter 10 and other provisions within this code.

Exceptions:

1. Elevators not required to be located in a shaft in accordance with Section 714.2 are not required to have enclosed elevator lobbies.
2. In other than Group I-3 occupancies, and in buildings having occupied floors located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, enclosed elevator lobbies are not required where the building is protected by an automatic sprinkler system installed throughout in accordance with Section 903.3.1.1 or 903.3.1.2.
3. Enclosed elevator lobbies are not required at the street floor, provided the entire street floor is equipped with an automatic sprinkler system in accordance with Section 903.3.1.1.
4. Where additional doors are provided in accordance with Section 3002.6. Such doors shall be tested in accordance with UL 1784 without an artificial bottom seal.
~~5. Smoke partitions shall be permitted in lieu of fire partitions to separate the elevator lobby at each floor where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.~~ (based on requirement for smoke partition at base provision)
~~6. Enclosed elevator lobbies are not required where the elevator hoistway is pressurized in accordance with Section 714.2.1.1.10.1.~~ (X-707.14.1)

714.2.1.1.10.1 Elevator hoistway pressurization. (X-707.14.2)

714.2.1.1.11 Refuse and laundry chutes. Refuse and laundry chutes, access and termination rooms and incinerator rooms shall meet the requirements of Sections 714.2.1.1.10.1 through 714.2.1.1.10.6.

Exception: Chutes serving and contained within a single dwelling unit.

714.2.1.1.11.1 Refuse and laundry chute enclosures. A shaft enclosure containing a refuse or laundry chute shall not be used for any other purpose ~~and shall be enclosed in accordance with Section 707.4~~. Openings into the shaft enclosure, including those from access rooms and termination rooms, shall be protected in accordance with this section and Section 715. Openings into chutes shall not be located in corridors. Doors shall be self- or automatic-closing upon the actuation of a smoke detector installed in accordance with Section 715.4.7.3, except that heat-activated closing devices shall be permitted between the shaft and the termination room.

~~**714.2.1.1.11.2 Materials.** A shaft enclosure containing a refuse or laundry chute shall be constructed of materials as permitted by the building type of construction.~~

714.2.1.1.11.3 Refuse and laundry chute access rooms. Access openings for refuse and laundry chutes shall be located in rooms or compartments enclosed by a fire barrier that has a fire-resistance rating of not less than 1 hour. Openings into the access rooms shall be protected by opening protectives having a fire protection rating of not less than ¾ hour. Doors shall be self- or automatic-closing upon the detection of smoke in accordance with Section 715.4.7.3.

714.2.1.1.11.4 Termination room. Refuse and laundry chutes shall discharge into an enclosed room separated from the remainder of the building by a fire barrier that has a fire-resistance rating of not less than1hour. Openings into the termination room shall be protected by opening protectives having a fire protection rating of not less than 3/4 hour. Doors shall be self- or automatic-closing upon the detection of smoke. Doors shall be self- or automatic-closing upon the detection of smoke in accordance with Section 715.4.7.3. Refuse chutes shall not terminate in an incinerator room. Refuse and laundry rooms that are not provided with chutes need only comply with Table 508.2.

714.2.1.1.11.5 Incinerator room. Incinerator rooms shall comply with Table 508.2.

714.2.1.1.11.6 Automatic sprinkler system. An approved automatic sprinkler system shall be installed in accordance with Section 903.2.10.2. (X-707.13)

714.2.1.2 Egress openings. Except as permitted in Section 714.2, openings in floor/ceiling construction for means of egress stairways and ramps shall be enclosed by an exit enclosure constructed in accordance with this section.

Exception: Means of egress stairways as required by Section 410.5.4 are not required to be enclosed.

714.2.1.2.1 Materials. Exit enclosures shall be constructed of materials consistent with those permitted for the type of construction of the building in accordance with Section 602.2-5.

714.2.1.2.2 Fire-resistance rating. Exit enclosures shall have a fire-resistance rating of not less than 1 hour where connecting less than four stories and not less than 2 hours where connecting four stories or more. Exit enclosures shall have a fire-resistance rating not less than the floor/ceiling assembly penetrated, but need not exceed 2 hours. (X-1020.1)

714.2.1.2.3 Construction. Exit enclosures shall be constructed as fire barriers in accordance with Section 708 or horizontal assemblies in accordance with Section 712, or both. (X-1020.1)

Exception: Stairways in occupancies in Group I-3 as provided for in Section 408.3. (X-1020.1, Exc. 6)

714.2.1.2.4 Exterior walls. Exterior walls of an exit enclosure shall comply with the requirements of Section 706 for exterior walls. Where nonrated walls or unprotected openings enclose the exterior of the stairway and the walls or openings are exposed by other parts of the building at an angle of less than 180 degrees (3.14 rad), the building exterior walls within 10 feet (3048 mm) horizontally of a nonrated wall or unprotected opening shall be constructed as required for a minimum 1-hour fire-resistance rating with 3/4-hour opening protectives. This construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the top most landing of the stairway or to the roof line, whichever is lower. (X-1020.1.4)

714.2.1.2.5 Openings. (Section 1020.1.1)

714.2.1.2.6 Penetrations. (Section 1020.1.1 and .2)

714.2.1.2.7 Joints. Exit enclosures

714.2.1.2.8 Ducts and air transfer openings. (Section 1020.1.3) ~~Ducts and air transfer openings shall not penetrate a shaft serving as an exit enclosure except as permitted by Section 1020.1.2.~~ (X-716.5.3)

Equipment and ductwork for exit enclosure ventilation as permitted by Section 1020.1.2 shall comply with one of the following items:

1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the exit enclosure by ductwork enclosed in construc
tion as required for shafts.

2. Where such equipment and ductwork is located within the exit enclosure, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.

3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts. In each case, openings into the fire-resistance-rated construction shall be limited to those needed for maintenance and operation and shall be protected by self-closing fire-~~resistance~~ protection rated devices in accordance with Chapter 7 for enclosure wall opening protectives. exit enclosure ventilation systems shall be independent of other building ventilation systems. (X-1020.1.3)

714.2.1.2.9 Smoke control. In buildings required to comply with Section 403 or 405, each of the exits of a building that serves stories where the floor surface is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access or more than 30 feet (9144 mm) below the level of exit discharge serving such floor levels shall be a smokeproof enclosure or pressurized stairway in accordance with Section 909.20.

714.2.1.2.9.1 Enclosure exit. A smokeproof enclosure or pressurized stairway shall exit into a public way or into an exit passageway, yard or open space having direct access to a public way. The exit passageway shall be without other openings and shall be separated from the remainder of the building by 2-hour fire-resistance-rated construction.

Exceptions:

1. Openings in the exit passageway serving a smokeproof enclosure are permitted where the exit passageway is protected and pressurized in the same manner as the smokeproof enclosure, and openings are protected as required for access from other floors.

2. Openings in the exit passageway serving a pressurized stairway are permitted where the exit passageway is protected and pressurized in the same manner as the pressurized stairway.

714.2.1.2.9.2 Enclosure access. Access to the stairway within a smokeproof enclosure shall be by way of a vestibule or an open exterior balcony.

Exception: Access is not required by way of a vestibule or exterior balcony for stairways using the pressurization alternative complying with Section 909.20.5. (X-1020.1.7)

714.2.1.3 Architectural openings. Except as permitted in Section 714.2, openings in floor/ceiling construction for aesthetic or functional purposes, to include escalators, shall be enclosed by an atrium enclosure constructed in accordance with this section. ~~In other than Group H occupancies, and where permitted by Exception 5 in Section 707.2, the provisions of this section shall apply to buildings or structures containing vertical openings defined herein as "Atriums."~~ (X-404.1)

~~**404.1.1 Definition.** The following word and term shall, for the purposes of this chapter and as used elsewhere in this code, have the meaning shown herein.~~

~~**ATRIUM.** An opening connecting two or more stories other than enclosed stairways, elevators, hoistways, escalators, plumbing, electrical, air-conditioning or other equipment, which is closed at the top and not defined as a mall. Stories, as used in this definition, do not include balconies within assembly groups or mezzanines that comply with Section 505.~~ (X-404.1.1)

Exceptions:

714.2.1.3.1 Materials. Atrium enclosures shall be constructed of materials consistent with those permitted for the type of construction of the building in accordance with Section 602.2-5.

714.2.1.3.2 Fire-resistance rating. Atrium spaces shall be separated from adjacent spaces by a 1-hour fire barrier wall.

(**Alternate**: Atrium enclosures shall have a fire-resistance rating of not less than 1 hour where connecting less than four stories and not less than 2 hours where connecting four stories or more.)

714.2.1.3.3 Construction. Atrium enclosures shall be constructed as fire barriers in accordance with Section 708 or horizontal assemblies in accordance with Section 712, or both.

Exceptions:

1. A glass wall forming a smoke partition where automatic sprinklers are spaced 6 feet (1829 mm) or less along both sides of the separation wall, or on the room side only if there is not a walkway on the atrium side, and between 4 inches and 12 inches (102 mm and 305 mm) away from the glass and so designed that the entire surface of the glass is wet upon activation of the sprinkler system without

obstruction. The glass shall be installed a gasketed frame so that the framing system deflects without breaking (loading) the glass before the sprinkler system operates.

2. A glass-block wall assembly in accordance with Section 2110 and having a 3/4-hour fire protection rating.

3. The adjacent spaces of any three floors of the atrium shall not be required to be separated from the atrium where such spaces are included in the design of the smoke control system. (X-404.5)

~~**Escalators.** In buildings required to comply with...(Section 707.2, Exception 2)~~

714.2.2 Unlimited height atrium enclosures. In other than Group H occupancies, there is no limit to the number of communicating stories within an atrium enclosure where such enclosures are constructed in accordance with this section.

714.2.2.1 Use. The floor of the atrium shall not be used for other than low fire hazard uses and only approved materials and decorations in accordance with the *International Fire Code* shall be used in the atrium space.

Exception: The atrium floor area is permitted to be used for any approved use where such specific ~~the individual~~ space is provided with an automatic sprinkler system in accordance with Section 903.3.1.1. (X-404.2)

714.2.2.2 Automatic sprinker system. An approved automatic sprinkler system shall be installed throughout the entire building.

Exceptions:

1. That area of a building adjacent to or above the atrium need not be sprinklered provided that portion of the building is separated from the atrium portion by not less than a 2-hour fire-resistance-rated fire barrier wall or horizontal assembly or both.

2. Where the ceiling of the atrium is more than 55 feet (16 764 mm) above the floor, sprinkler protection at the ceiling of the atrium is not required. (X-404.3)

714.2.2.3 Smoke control. A mechanical smoke control system shall be installed in accordance with Section 909.

~~**Exception:** Smoke control is not required for atriums that connect only two stories.~~ (X-404.4)

714.2.2.4 Standby power. Equipment required to provide smoke control shall be

connected to a standby power system in accordance with Section 909.11. (X-404.6)

714.2.2.5 Interior finish. The interior finish of walls and ceilings of the atrium shall not be less than Class B with no reduction in class for sprinkler protection. (X-404.7)

714.2.2.6 Travel distance. In other than the lowest level of the atrium, where the required means of egress is through the atrium space, the portion of exit access travel distance within the atrium space shall not exceed 200 feet (60 960 mm). (X-404.8)

714.2.3 Opening protective assemblies. Except as permitted in Section 714.2, ducted and unducted openings in any floor or floor/ceiling assembly shall be protected with approved opening protective assemblies installed in accordance with their listing.

Exception: Openings contained within an enclosure constructed in accordance with the provisions of Section 714.2.1.

Duct~~s and air transfer~~? openings shall be constructed of approved materials in accordance with the provisions of the *International Mechanical Code*. (X-716.6.2) Flexible ducts and air connectors shall not pass through any fire-resistance rated assembly. Flexible air connectors shall not pass through any floor or ceiling. (X-716.7)

714.2.2.1 Fire dampers. Ducted openings through floor/ceiling assemblies shall be protected with approved fire dampers installed in accordance with their listing. Fire dampers shall be installed in locations as specified in Section 714.6.1.6. (X-716.6)

Exceptions: (X-716.6.1)

714.2.2.1.1 Installation. (Section 716.2)

714.2.2.1.2 Access and identification. (Section 716.4)

714.2.2.1.3 Fire protection rating. (Section 716.3.1)

714.2.2.1.4 Fire damper actuating methods. (Section 716.3.1.1)

Smoke dampers. Generic charging language

Smoke damper rating. (Section 716..3.2)

Smoke damper actuating methods. (Section 716.3.2.1)

714.2.2.2 Ceiling radiation dampers. Ducts and grill openings located in the ceiling membrane of a ~~fire-resistance rated~~ floor/ceiling shall be protected with a listed ceiling radiation damper installed at the ceiling line. (X-716.6.1, Exc 5 and 716.6.2.1)

Exception: Ceiling radiation dampers are not required where either of the following applies.

1. Openings are tested in accordance with ASTM E 119 as part of the fire-resistance rated assembly.

2. (Section 716.6.2.1,2 ?)

Ceiling radiation dampers shall be tested in accordance with UL 555C and installed in accordance with the manufacturer's installation instructions and their listing. (X-716.6.2.1)

714.2.2.3 Floor fire door assemblies. Floor fire door assemblies used to protect openings in fire-resistance rated floors shall be tested in accordance with NFPA 288, and shall achieve a ~~fire-resistance~~ <u>fire protection</u> rating not less than <u>the fire-resistance rating of</u> the assembly in which it is located. Floor fire door assemblies shall be labeled by an approved agency. The label shall be permanently affixed and shall specify the manufacturer, the test standard and the ~~fire-resistance~~ <u>fire protection</u> rating. (X-711.8)

714.3 Roof, roof/ceiling construction. Openings in fire-resistance rated roof/ceiling construction shall be protected in accordance with the provisions of this section.

Section 715 PENETRATION PROTECTION FOR HORIZONTAL BUILDING ELEMENTS

715.1 General. Penetrations in horizontal building elements shall be protected in accordance with the provisions of this section.

715.2 Fire-resistance rated floor, floor/ceiling construction. Penetrations in fire-resistance rated floor/ceiling construction shall be protected with a listed firestop system in accordance with Section 715.2.1 or a fire resistant joint systems in accordance with Section 715.2.2.

Exception: Openings contained within an enclosure constructed in accordance with the provisions of Section 714.2.1.

715.2.1 Firestop systems. Penetrations

715.2.2 Fire resistant joint systems. Penetrations

715.3 Nonfire-resistance rated floor, floor/ceiling construction. Penetrations in nonfire-resistance rated floor/ceiling construction shall be protected with a flamestop in accordance with Section 715.3.1.

715.3.1 Flamestops. Penetrations

715.4 Roof, roof/ceiling construction. Penetrations in fire-resistance rated roof/ceiling construction shall be protected with a listed firestop system in accordance with Section 715.2.1 or a fire resistant joint systems in accordance with Section 715.2.2.

Exception: Openings contained within an enclosure constructed in accordance with the provisions of Section 714.2.1.

Section 716 OPENING PROTECTION FOR VERTICAL BUILDING ELEMENTS

716.1 General. Openings in vertical building elements shall be protected in accordance with the provisions of this section.

716.2 Wall construction. Openings in fire walls, fire barriers, fire partitions shall be protected with opening protective assemblies in accordance with Section 716.2.1.

716.2.1 Opening protective assemblies. Openings in any wall assembly shall be protected with approved opening protective assemblies installed in accordance with their listing.

716.2.1.1 Fire door and shutter assemblies. (Section 715.4)

716.2.1.2 Fire-protection rated glazing. (Section 715.5)

716.2.1.3 Fire and smoke dampers. (Section 716) Ducts and air transfer openings shall be protected in accordance with the provisions of this section. Where an assembly is required to have both fire dampers and smoke dampers, combination fire/smoke dampers or a fire damper and a smoke damper shall be required

716.2.2 Where required. Opening protective assemblies shall be provided at the locations prescribed in Sections 716.2.2.1 through 716.2.2.3.

716.2.2.1 Fire walls.

Ducts and air transfer openings permitted in fire walls in accordance with Section 707.11, Exception, shall be protected with approved fire dampers installed in accordance with their listing.

716.2.2.2 Fire barriers.

Ducts and air transfer openings in fire barriers shall be protected with approved fire dampers installed in accordance with their listing.

Exception: Fire dampers are not required at openings in fire barriers where any of the following conditions apply:

1. Openings are tested in accordance with ASTM E 119 as part of the fire-resistance rated assembly.

2. Openings are used as a part of an approved smoke control system in accordance with Section 909 and where the use of a fire damper would interfere with the operation of the smoke control system.

3. In other than Group H occupancies, ducted HVAC systems in fire barriers required to have a fire-resistance rating of 1 hour in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the building's HVAC system. Such a duct system shall be constructed of sheet steel not less than 26 gage in thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

Where an assembly is required to have both fire dampers and smoke dampers, combination fire/smoke dampers or a fire damper and a smoke damper shall be required

716.2.2.3 Fire partitions.

Ducts and air transfer openings in fire partitions shall be protected with approved fire dampers installed in accordance with their listing.

Exceptions:

1. Fire dampers are not required at openings in fire partitions where any of the following conditions apply:

1. Openings are tested in accordance with ASTM E 119 as part of the fire-resistance rated assembly.

2. Openings are part of an approved smoke control system in accordance with Section 909 and where the use of a fire damper would interfere with the operation of the smoke control system.

2. In other than Group H occupancies, fire dampers are not required at openings in fire partitions where any of the following conditions apply:

1. Ducted HVAC systems in fire partitions required to have a fire-resistance rating of 1 hour in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the building's HVAC system. Such a duct system shall be constructed of sheet steel not less than 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

(Section 716.5.4)

Smoke barriers.

Ducts and air transfer openings in smoke barriers shall be protected with approved smoke dampers installed in accordance with their listing.

Exceptions:

1. In buildings provided throughout with an approved smoke control system in accordance with Section 909 and smoke dampers are not necessary for the operation and control of the smoke control system.

2. Duct openings limited to a single smoke compartment and the ducts are constructed of sheet steel not less than 26 gage in thickness.

3. In corridors where the duct is constructed of sheet steel not less than 26 gage in thickness and there are no openings serving the corridor.

Smoke partitions. Air transfer openings in smoke partitions shall be protected with approved smoke dampers installed in accordance with their listing.

Exception: Where the installation of a smoke damper will interfere with the operation of a required smoke control system in accordance with Section 909, approved alternative protection shall be utilized.

Section 717 PENETRATION PROTECTION FOR VERTICAL BUILDING ELEMENTS

717.1 General. Penetrations in vertical building elements shall be protected in accordance with the provisions of this section.

717.2 Wall construction. Penetrations in fire walls, fire barriers, fire partitions shall be protected with a listed firestop system in accordance with Section 717.2.1 or a fire resistant joint systems in accordance with Section 717.2.2.

717.2.1 Firestop systems. Penetrations

717.2.2 Fire resistant joint systems. Penetrations

Section 718 CONCEALED SPACES

Section 719 FIRE-RESISTANCE REQUIREMENTS FOR PLASTER

Section 720 THERMAL-AND SOUND-INSULATING MATERIALS

Section 1017 CORRIDORS

1017.1 General. Corridors serving as an exit access component in a means of egress system shall comply with the requirements of this section.

1017.2 Materials. Corridors shall be constructed of materials consistent with those permitted for the type of construction of the building.

1017.3 Fire-resistance rating. Corridors shall have a fire-resistance rating in accordance with Table 1017.1.

1017.4 Construction. Corridors required to be fire-resistance rated shall be constructed as smoke barriers in accordance with Section 710.

Exceptions: (Section 1017.1)

1017.5 Width. ...

Section 1020 EXIT ENCLOSURES

1020.1 General. Exit enclosures serving as an exit component in a means of egress system shall comply with the requirements of this section. An exit enclosure shall not be used for any purpose other than as a means of egress.

1020.2 Construction. Exit enclosures shall be constructed in accordance with Section 714.2.1.2.

1020.3 Discharge identification barrier. A stairway in an exit enclosure shall not continue below the level of exit discharge unless an approved barrier is provided at the level of exit discharge to prevent persons from unintentionally continuing into levels below. Directional exit signs shall be provided as specified in Section 1011. (X-1020.1.5)

1020.4 Stairway floor number signs. A sign shall be provided at each floor landing in interior exit enclosures connecting more than three stories designating the floor level, the terminus of the top and bottom of the stair enclosure and the identification of the stair. The signage shall also state the story of, and the direction to the exit discharge and the availability of roof access from the stairway for the fire department. The sign shall be located 5 feet (1524 mm) above the floor landing in a position that is readily visible when the enclosures doors are in the open and closed positions. (X-1020.1.6)

Chapter 7 organization (Lovell)

BALANCED FIRE PROTECTION
Floor-to-Floor Fire and Smoke Migration Requirements

(V. Lovell Revisions 3.3.07)

PROBLEM: Develop a rational floor-to-floor fire and smoke migration strategy. Create consistency in supporting terminology and technical requirements.

ASSUMPTIONS:

Fire Migration:

> **Goal:** To minimize interior vertical fire migration to ensure the safe egress and protection of the occupants, the safety to emergency responders, to limit property damage, and to facilitate fire fighters to control or extinguish the fire.
>
> **Function:** The function of the code requirements is to confine fire to the floor of origin or to restrict fire to a limited area of a specific number of communicating floors. Methods for containing vertical fire migration to a limited area of a specific number of communicating floors is through the requirements for fire area, and the construction of fire walls, fire barriers, smoke barriers, and fire partitions on adjacent floors.

Performance: To maintain the structural integrity of the floor construction and the continuity of the fire rating of fire rated floor or floor/ceiling construction based on the building type of construction; and in non-rated construction, to limit the free passage of fire.

Smoke Migration:

Goal: To minimize interior vertical smoke migration to ensure a tenable environment for the safe egress and protection of the occupants, the safety to emergency responders, to limit property damage, and to facilitate fire fighters for search and rescue, and to control or extinguish the fire.

Function: The function of the code requirements is to control smoke migration through the construction of smoke compartments, the construction of smoke barriers and smoke partitions, passive and active smoke control systems, smoke protected means of egress, such as areas of refuge, smokeproof enclosures, pressurized stairways and elevator shafts and hoistways; and in non-rated construction, the limitation of the free passage of smoke.

Performance: To limit the spread of smoke to areas that are unacceptable and/or remote from the fire through openings and penetrations in floor construction; and in non-rated construction, to limit the free passage of smoke.

702.1 Definitions.

OPENING (Vertical). A discontinuity, a lineal joint, or a penetration in a horizontal building element or assembly.

Openings Types in Horizontal Assemblies:

CONVEYANCE: Conveyance of people or materials
- Elevators
- Escalators
- Ramps
- Convenience stairs
- Stairways
- Hoistways
- Belt conveyors
- Refuse and laundry chutes

UTILITY: Delivery of utility services to the building
- HVAC ducts or air transfer openings
- Plumbing

Electrical
Telecommunication

ARCHITECTURAL: Communicates spaces for aesthetic or function design purposes architectural features
Mezzanines
Atria
Malls

JOINTS: Linear openings to accommodate movement, thermal expansion or contraction, or building sway
Expansion joint
Perimeter joint
Construction joint (in floors?)

714.1 General. Openings shall be protected in horizontal horizontal in accordance with the provisions of this section in order to limit the migration of fire and or smoke from floor to floor or, where permitted by this section, to a specific number of floors.

Floor construction. Openings in floor/ceiling construction shall be enclosed or protected with opening protective assemblies in accordance with this section. Stories, as used in this section, shall include basements, but not include balconies in Group A occupancies or mezzanines that comply with Section 505.

Exceptions:

1. Opening permitted to be unprotected by other sections of the code.

2. Openings totally within an individual dwelling unit and connecting four stories or less.

3. Ducts connecting four stories or less (no shaft or damper??) (Section 716.6.1, Exception -- Group R only and therefore included in exception 2?) Must meet all requirements to take exception

TABLE 714xx
ALLOWED NUMBER OF COMMUNICATING STORIES[a]

- **NEEDS TO BE LIMITED TO WITHIN A SINGLE FIRE AREA OR SMOKE COMPARTMENT (LOVELL)**
- **NEEDS TO BE BASED ON TYPE OF OPENING (LOVELL)**
- **IS THIS FOR SMOKE AND FIRE??? MAYBE NEEDS TO BE TWO TABLES (LOVELL)**

- **IS THE OPENING CONCEALRED OR EXPOSED? (LOVELL)**
- **WHAT ABOUT WALL DERATING FOR NFPA 13 IN WALLS – DOUBLE TRADE-OFF? (LOVELL)**

Occupancy	**Type IIB, IIIB or VB Construction**	**Type I A and B, IIA, IIIA or VA Construction (Lovell)**	~~**NFPA 13**~~	~~**NFPA 13R**~~	**Mechanical Smoke Control**
Group A, B, E, F, M, S or U	1	2_b	~~+1~~	~~NA~~	$+1_c$
Group H or I	1	1	~~1~~	~~NA~~	1
Group R	1	1	~~1~~	~~1~~	1

a. Openings that are not concealed within building construction and serve the indicated number of adjacent stories are not required to be enclosed or protected provided such interconnected stories do not atmospherically communicate with additional stories.

b. No increase permitted where Footnote e, Table 601 applies. (need clarification that the permitted additional story may not be utilized when Footnote e is utilized for additional height, area, or sprinkler trade off.)

c. Unlimited intercommunicating stories are permitted where buildings comply with the provisions of Section 714.2.3.X (tall atrium provisions).

Utility openings. Openings in floors or floor/ceiling assemblies for penetrations by plumbing, electrical, HVAC, telecommunications, or other similar equipment shall be enclosed by a shaft enclosure constructed in accordance with this section, or shall be protected with a penetration protection system appropriate and approved for the type of penetrating item.

Conveyance openings. Openings in floor/ceiling construction for means of stairways, ramps, escalators, elevators, hoistways, belt conveyor, refuse and laundry chutes, shall be enclosed by an enclosure constructed in accordance with this section.

Architectural openings. Openings in floor/ceiling construction for malls, mezzanine or atria shall be enclosed, or otherwise protected, as required by this section.

Joints. Linear openings permitted by the code to accommodate building movement such as construction joints, expansion joints, perimeter joints in floors, or floor/ceiling construction shall be protected as required by this section.

Non fire-resistance rated floor construction.