CTC Area of study – Balanced fire protection

2007/2008 Code Changes

Code changes submitted by CTC Features SG:

Code changes submitted by others:

Proponent: CTC Features SG

Revise Table 503 as follows (these are actually 5 separate code changes):

Group	**Type of Construction**								
	Type I		**Type II**		**Type III**		**Type IV**	**Type V**	
	A	B	A	B	A	B	HT	A	B
B	UL UL	11 UL	5 37,500	3 23,000	5 28,500	3 19,000	5 36,000	3 18,000	2 9,000

Group	**Type of Construction**								
	Type I		**Type II**		**Type III**		**Type IV**	**Type V**	
	A	B	A	B	A	B	HT	A	B
M	UL UL	11 UL	4 21,500	2 18,500	4 12,500	2 12,500	4 20,500	3 14,000	1 9,000

Group	**Type of Construction**								
	Type I		**Type II**		**Type III**		**Type IV**	**Type V**	
	A	B	A	B	A	B	HT	A	B
R-1	UL UL	11 UL	4 24,000	3 16,000	4 24,000	3 16,000	4 20,500	3 12,000	2 7,000
R-2	UL UL	11 UL	4 24,000	3 16,000	4 24,000	3 16,000	4 20,500	3 12,000	2 7,000
R-4	UL UL	11 UL	4 24,000	3 16,000	4 24,000	3 16,000	4 20,500	3 12,000	2 7,000

Group	**Type of Construction**								
	Type I		**Type II**		**Type III**		**Type IV**	**Type V**	
	A	B	A	B	A	B	HT	A	B
S-1	UL UL	11 48,000	4 26,000	2 17,500	3 26,000	2 17,500	4 25,500	3 14,000	1 9,000

Group	**Type of Construction**								
	Type I		**Type II**		**Type III**		**Type IV**	**Type V**	
	A	B	A	B	A	B	HT	A	B
S-2	UL UL	11 79,000	5 39,000	3 26,000	4 39,000	3 26,000	5 38,500	4 21,000	2 13,500

One area of concern identified for study by the Height and Area Task Group was 4 and 5 story buildings of unrated construction. The table below shows the occupancies in the IBC where that condition exists for sprinklered construction. In addition, the table shows the sprinklered height allowances for these occupancies in the legacy codes.

Type IIB, Type IIIB (Unprotected Construction)
Story Comparison (w/ NFPA 13 Sprinklers)

	SBC	NBC	UBC	2006 IBC
B	5	4	2	**5**
F-2	4	4	2	**4**
M	5	3	2	**5**
S-1	4	3	2	**4**
S-2	4	4	2	**5**
R* (13)	5	4	4	**5**
R*(13R)	4	4	3	**4**

NA- Not Applicable NP- Not Permitted
* - Applies for R-1, R-2 and R-3 Use Groups

The study group noted that for Use Group B, M, S-1, and R buildings of Type IIB or Type IIIB construction, the allowance for 4 or 5 stories in the IBC was premised on the story heights allowed in the SBC. In all these instances, the SBC sprinklered height allowance for these Use Groups relied on a multiple story sprinkler increase. For example, for Use Group B, the SBC allowed 2 stories for unsprinklered construction and 5 stories for sprinklered construction. This exceeds the consistent one story sprinkler height increase incorporated in the IBC height and area provisions. Based on this review, the study group identified two anomalies from what was permitted by the legacy codes. First, the story height allowance for S-2 use groups is not based on any of the legacy code allowances. Second, for Use Group B, M, S-1, and R (Type IIB and IIIB construction), the IBC story height allowance for unsprinklered construction exceeds what was allowed by any of the legacy codes. For example, the maximum height for an unsprinklered Type IIB office building in any of the legacy codes was the NBC allowance for 3 stories. Currently, the IBC allows 4 stories for this condition. Rather than modify the sprinkler increase in the IBC, the study group suggested the following recommended story height changes:

Unsprinklered IBC Table 503 Values

Use Group	IIB	IIIB
B	3	3
M	2	2
S-1	2	2
S-2	3	3
R* (13)	3	3

* - Applies for R-1, R-2 and R-3 Use Groups

In essence, these reductions would eliminate the anomalies created by the multi-story SBC sprinkler increase and drop the IBC value back to the next least restrictive legacy code (in these cases, the NBC).

The study group noted that the motivation for these recommendations was to address anomalies associated with unsprinklered 4 and 5 story buildings of nonrated construction. No evidence was submitted to suggest that the existing sprinklered height allowances for these buildings in either the IBC or the legacy codes had created an unsafe condition that requires correction.

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Proponent: CTC Features SG

CHAPTER 5
GENERAL BUILDING COMPARTMENTATION AND HEIGHT

SECTION 501
GENERAL
501.1 Scope.
The provisions of this chapter control the height and the type and number of fire compartments within all structures hereafter erected and additions to existing structures.

[F] 501.2 Address numbers.
Buildings shall have approved address numbers, building numbers or approved building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Address numbers shall be Arabic numerals or alphabetical letters. Numbers shall be a minimum of 4 inches (102 mm) high with a minimum stroke width of 0.5 inch (12.7 mm).

SECTION 502
DEFINITIONS
502.1 Definitions.

The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

AREA, FIRE COMPARTMENT. The area included within surrounding exterior walls, compartment walls (or exterior walls and fire walls) exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the fire compartment area if such areas are included within the horizontal projection of the roof or floor above.

EQUIPMENT PLATFORM. An unoccupied, elevated platform used exclusively for mechanical systems or industrial process equipment, including the associated elevated walkways, stairs and ladders necessary to access the platform (see Section 505.5).

FIRE COMPARTMENT. An area enclosed and bounded by fire walls, fire barrier walls, exterior walls, or fire-resistance-rated horizontal assemblies of a building.

GRADE PLANE. A reference plane representing the average of finished ground level adjoining the building at exterior walls. Where the finished ground level slopes away from the exterior walls, the reference plane shall be established by the lowest points within the area between the building and the lot line or, where the lot line is more than 6 feet (1829 mm) from the building, between the building and a point 6 feet (1829 mm) from the building.

HEIGHT, BUILDING. The vertical distance from grade plane to the average height of the highest roof surface.

HEIGHT, STORY. The vertical distance from top to top of two successive finished floor surfaces; and, for the topmost story, from the top of the floor finish to the top of the ceiling joists or, where there is not a ceiling, to the top of the roof rafters.**MEZZANINE.** An intermediate level or levels between the floor and ceiling of any story and in accordance with Section 505.

SECTION 503
GENERAL HEIGHT AND FIRE COMPARTMENT AREA LIMITATIONS
503.1 General.
The height and maximum area of any fire compartment and the number of fire compartments in buildings of different construction types shall be governed by the intended use of the building and shall not exceed the limits in Table 503.1(1), 503.1(2), 503.1(3) and 503(4) except as modified hereafter. Each part of a building included within the exterior walls or the exterior walls and fire walls where provided shall be permitted to be a separate building.

DELETE TABLE 503 AND SUBSTITUTE AS FOLLOWS

TABLES 503.1(1), 503.1(2) and 503.1(3)

ALLOWABLE HEIGHT AND FIRE COMPARTMENT AREAS[a]

Height limitations shown as stories and feet above grade plane.

Table 503.1(1)
MAXIMUM BUILDING HEIGHT (Feet and Stories)

Occupancy	Type IA	Type IB	Type IIA	Type IIB	Type IIIA	Type VA	Type IV	Type IIIB	Type VB
Feet	UL	160	65	55	65	50	65	55	40
A-5	UL	UL	UL	UL	UL	UL	UL	UL	UL
S-2	UL	11	5	4	4	5	5	4	2
F-2	UL	11	5	3	4	3	5	3	2
B	UL	11	5	4	5	3	5	4	2
R-1, R-2, R-4	UL	11	4	4	4	3	4	4	2
R-3	UL	11	4	4	4	3	4	4	3
M	UL	11	4	4	4	3	4	4	1
F-1	UL	11	4	2	3	2	4	2	1
S-1	UL	11	4	3	3	3	4	3	1
A-3, A-4	UL	11	3	2	3	2	3	2	1
M	UL	11	4	4	4	2	4	4	1
A-2	UL	11	3	2	3	2	3	2	1
I-1	UL	9	4	3	4	3	4	3	2
H-4	UL	7	5	3	5	3	5	3	2
H-3	UL	6	4	2	4	2	4	2	1
U	UL	5	4	2	3	2	4	2	1
A-1	UL	5	3	2	3	2	3	2	1
I-4	UL	5	3	2	3	1	2	3	1
E	UL	5	3	2	3	1	3	2	1
H-5	4	4	3	3	3	3	3	3	2
I-2	UL	4	2	1	1	1	1	NP	NP
I-3	UL	4	2	1	2	2	2	1	1
H-2	UL	3	2	1	2	1	2	1	1
H–1	1	1	1	1	1	1	1	1	NP

UL = unlimited in height
NP = not permitted

Table 503.1(2) MAXIMUM AREA PER FIRE COMPARTMENT - WITHOUT SPRINKLERS[a, b]						
Occupancy	Type IA/IB	Type IIA	Type IIIA	Type IV and VA	Type IIB and IIIB	Type VB
S-2, F-2	30,267	16,933	16,933	10,933	7,867	4,800
A-3, A-4, B, I S-2, R, E	26,706	14,941	14,941	9,647	6,941	4,235
A-1, A-2, M	22,700	12,700	12,700	8,200	5,900	3,600
F-1, S-1, H-5	19,739	11,043	11,043	7,130	5,130	3,130
H–1, H-2, H-3	NP	NP	NP	NP	NP	NP

a - One or more fire compartment in the building does not have an automatic fire suppression system installed per Section 903.
b - A-5 Assembly uses intended for participation in or viewing outdoor activities may be unlimited in area.
NP = not permitted

Table 503.1(3) MAXIMUM AREA PER FIRE COMPARTMENT (sf) - WITH SPRINKLERS[a, b]						
Occupancy	Type IA/IB	Type IIA	Type IIIA	Type IV and VA	Type IIB and IIIB	Type VB
S-2, F-2	722,400	290,667	290,667	172,000	130,667	82,667
A-3, A-4, B, I S-2, R, E	637,412	256,471	256,471	151,765	115,294	72,941
A-1, A-2, M	387,000	109,000	109,000	64,500	49,000	31,000
F-1, S-1, H-5	168,261	70,139	70,139	41,504	31,530	19,948
H–1, H-2, H-3	30,960	17,440	17,440	10,320	7,840	4,960

a - All fire compartments in the building have an automatic fire suppression system installed per Section 903.
b - A-5 Assembly uses intended for participation in or viewing outdoor activities may be unlimited in area.

Table 503.1(4) Gross Area Factor									
Actual Building Height, Stories	Number of Stories Permitted								
	1	2	3	4	5	6	7	8	9
1	4	8	12	16	20	24	28	32	36
2	-	6	9	12	15	18	21	24	27
3	-	-	6	8	10	12	14	16	18

ADD SECTION 503.2 AND RENUMBER THE REMAINING SECTIONS

503.2 Building area. The maximum allowable building area shall not exceed the maximum area of fire compartments per in Tables 503.1(2) or 503.1(3) multiplied by the number in Table 503.2. A building shall be considered one fire compartment except where subdivided by compartment fire barriers conforming with this section.

503.2.1 Enclosure. Each fire compartment shall be enclosed by exterior walls, roof, or fire rated horizontal assemblies, and/or fire compartment barrier walls. If a building has more than one fire compartment, each fire compartment shall be separated by horizontal and/or vertical compartment barrier having a fire resistance rating determined by Table 503.2.1.

503.2.2 Fire compartment barriers. Fire compartment barriers separating a building into fire compartments shall comply with Sections 503.2.2.1 and 503.2.2.2 and Table 503.2.2.

Table 503.2.2
FIRE COMPARTMENT FIRE RESISTANCE (hrs)

	Sprinklered	Non-sprinklered
Assembly		
A-1	1	2
A-2	1	2
A-3	1	2
A-4	1	2
A-5		
Business		
B	1	2
Educational		
E	1	2
Factory and Industry		
F-1	2	3
F-2	1	2
Hazardous		
H-1	3	4
H-2	3	4
H-3	2	3
H-4	1	2
H-5	1	2
Institutional		
I-1	1	2
I-2	1	2
I-3	1	2
I-4	1	2

M	1	2
Residential		
R-1	1	2
R-2	1	2
R-3	1	2
R-4	1	2
Storage		
S-1	2	3
S-2	1	2
Utility		
U	½	1

503.2.2.1 Horizontal fire compartment barriers. Horizontal fire compartment barriers shall comply with Section 711.

503.2.2.2 Vertical fire barriers. Vertical fire compartment barriers shall extend from the top of the floor/ceiling assembly below to the underside of the floor or roof slab or deck above and shall be securely attached thereto. Such fire barriers shall be continuous through concealed spaces, such as the space above a suspended ceiling.

503.2.2.2.1 Vertical continuity. Fire compartment barriers shall extend from the foundation to the underside of the roof deck.

Exceptions:

1. Two-hour fire-resistance-rated walls shall be permitted to terminate at the underside of the roof sheathing, deck or slab provided:
   1.1. The lower roof assembly within 4 feet (1220 mm) of the wall has not less than a 1-hour fire-resistance rating and the entire length and span of supporting elements for the rated roof assembly has a fire-resistance rating of not less than 1 hour.
   1.2. Openings in the roof shall not be located within 4 feet (1220 mm) of the fire wall.
   1.3. Each building shall be provided with not less than a Class B roof covering.
2. Walls shall be permitted to terminate at the underside of noncombustible roof sheathing, deck, or slabs where both buildings are provided with not less than a Class B roof covering. Openings in the roof shall not be located within 4 feet (1220 mm) of the fire compartment barrier.
3. In buildings of Type III, IV and V construction, walls shall be permitted to terminate at the underside of combustible roof sheathing or decks provided:
   3.1. There are no openings in the roof within 4 feet (1220 mm) of the fire wall,
   3.2. The roof is covered with a minimum Class B roof covering, and
   3.3. The roof sheathing or deck is constructed of fire-retardant-treated wood for a distance of 4 feet (1220 mm) on both sides of the wall or the roof is protected with 5/8 inch (15.9 mm) Type X gypsum board directly beneath the underside of the roof sheathing or deck, supported by a minimum of 2-inch (51 mm) nominal ledgers attached to the sides of the roof framing members for a minimum distance of 4 feet (1220 mm) on both sides of the fire wall.

4. Buildings located above a parking garage designed in accordance with Section 509.2 shall be permitted to have the fire compartment barriers for the buildings located above the parking garage extend from the horizontal separation between the parking garage and the buildings.

503.2.2.2.2 Supporting construction. The supporting construction for fire compartment barrier walls shall be protected to afford the required fire-resistance rating of the fire compartment barrier supported.

Exceptions:

1. The supporting construction for a 1 hr. fire compartment barrier wall in buildings of Type IIB, IIIB and VB construction, not protected throughout by sprinklers in accordance with Section 903, shall be supported by structure having a layer of 20 minute finish protection.
2. The supporting construction for a 1 hr. fire compartment barriers in buildings of Type IIB, IIIB and VB construction that are protected by sprinklers throughout in accordance with Section 903 shall not be required to be protected.

503.2.2.3 Glazed openings. Glazed openings in fire compartment barriers shall be limited to those in fire doors complying with 715.4.

503.2.2.4 Fire compartment doors. Doors in fire compartment barriers shall have a fire protection rating of at least 1 hour per Table 503.2.2.4.

Table 503.2.2.4
Fire Resistance of Doors in Fire Compartment Barriers (hrs)

Fire Compartment Barrier	Door in Fire Compartment Barrier
1 hr.	1 hr.
2 hr.	1½ hr.
3 hr.	2 hr

Doors in fire compartment barriers shall limit temperature rise to 450°F (250°C) when tested in accordance with NFPA 252.

503.2.2.5 Other openings fire compartment barriers. Openings in 1-hour fire compartment barriers for air-handling shall be protected with fire dampers having a fire protection rating of 1 hour.

503.3 Smoke Management for Adjacent Fire Compartments. Where adjacent fire compartments share a common fire compartment wall or horizontal assembly, or both, for the purpose of creating separate fire compartments, a method of smoke management shall be provided in accordance with Section 503.3.1 for such fire compartments that meet any of the following conditions:

1. The fire compartment is not protected with an automatic sprinkler system in accordance with Section 903.3.1 and contains one or more stories located more than one story above grade plane or

2. The fire compartment contains one or more stories located more than two stories above grade plane having any of the following occupancies:

   2.1 Group A occupancy with an occupant load of 300 or more persons;
   2.2 Group I-1 occupancy; and or
   2.3 Group I-2 occupancy.

503.4 Smoke Management Methods. Smoke management as required by Section 503.3 shall comply with any one or a combination of any of the following methods as applicable:

1. Door openings, joints and penetrations in fire compartment separation walls and horizontal assemblies shall be protected as required for smoke barriers in accordance with the following:

   1.1 Door openings shall comply with Section 715.4.3.1.
   1.2 Penetrations shall comply with Section 712.5.

1.3 Joints shall comply with Section 713.6.
1.4 Ducts and air transfer openings shall comply with Section 716.5.5.

2. Openings in fire compartment separation horizontal assemblies shall be protected by shaft enclosures in accordance with Section 707. For the purpose of smoke management at fire compartment separations, Section 707.2 shall not apply.

3. Exit stair enclosures penetrating a fire compartment separation horizontal assembly shall be protected as for smokeproof enclosures in accordance with Section 909.20.

4, One or more of the following mechanical methods are permitted to be used for smoke management in lieu of Items 1 and 2 above:

4.1 The pressurization method in accordance with Section 909.6

4.2 The air flow design method in accordance with Section 909.7 for buildings protected by an automatic sprinkler system in accordance with Section 903.3.1

4.3 The exhaust method in accordance with Section 909.8 for buildings protected by an automatic sprinkler system in accordance with Section 903.3.1

REMAINDER OF CHAPTER 5 COORDINATED WITH THE COMPARTMENTALIZATION PHILOSPOHY BY:

- Changing the phrase "area of building" **to** "maximum number of fire compartments"
- Changing the term "building area" to fire compartment area"
- Deleting Section 506 Area modifications
- Allowing unlimited size fire compartments where the code previously address unlimited area buildings

REASON STATEMENT:

At the Orlando 2006 Code Development Hearing, the Height and Area Study Group (now renamed the CTC Balanced Fire Protection Features Study Group) was formed for the purpose of examining the contentious Height and Area code proposals in a more comprehensive way than the code hearing itself could provide.

We started with a review of the legacy code consolidation and IBC development. The foundation of that process was the concept that as the IBC began to be adopted across the previous regional boundaries the new code would not generally create non-conforming buildings in entire legacy code regions. The starting point was that for each occupancy and construction type, the largest maximum allowable area in any one of the codes should be the prevailing value. Once that area was determined, then the Table 503 tabular values could be reverse-calculated to meet the non-conforming objective.

The Study Group debated this approach and reconstructed Table 503 independently. At the conclusion of that effort, we discovered that 48 of the 225 cells in Table 503 did not meet the "largest maximum area" statement in that the building areas were larger than any legacy code, while 10 cells were smaller than any of the legacy codes.

We then asked ourselves: "Is the best way to address this issue and the others on our list to work at revising the table and modifiers, or to look at the bigger question of building safety in a more comprehensive way?"

We concluded that the better approach for us to develop and present to the membership was the latter, and we changed gears from a historically-focused approach focused strictly on height and area to a forward-looking one that asked "What can we do to improve building safety using the concepts of balanced fire protection?"

To address building safety holistically and to efficiently incorporate changing technology, we are better served to make a significant shift in Chapter 5 (Height and Area) and incorporate a conceptual approach that meets the following goals:

- Create buildings that meet an acceptable level of safety for communities, occupants and emergency responders.
- Describe methods, materials, and systems that are flexible enough to adapt to a differing community conditions, changing materials and methodologies, and individual building needs.

- Design a building code that is simple, straightforward, and understandable.

Supporting Concepts

"Building Safety" is defined as the aggregate features in a building that are provided to protect structures, occupants and emergency responders, and property from losses associated with anticipated hazards, primarily from fire and collapse.

The goal of building safety is best achieved through the interaction of all the hazard mitigation processes (Active and Passive and Emergency Response) to produce an/the acceptable level of risk (level of safety). Building safety success can be defined as meeting the goals of life and property loss that are acceptable and economically supportable. This is the core concept of acceptable risk.

Acceptable building safety risk is that level of loss that each entity impacted can accept if a hazardous event occurs. It is created by aggregating the hazards and adjusting mitigations to create the agreed upon risk level. It can be measured as a quantitative value, qualitative value, or both. On a national scale and state scale, this loss is currently represented by national death and property loss figures. On a community scale, this is usually represented by the community loss goals and economic "scale" measured against the cost of providing an emergency prevention and response system. On an individual level, acceptable risk is a often a contractual condition between a building owner/occupant and an insurance provider.

Compartmentation Approach

The ICC CTC BFP Study Group debated the origins and basis of the height and area tables in the legacy codes, as well as the current IBC, attempting to identify some rational basis and evolution related to the stated goals of the codes. The lengthy exercise proved informative yet futile in meeting this objective, although the disparity in positions related to the current table's interpretation and application became more obvious and focused. This also resulted in some short term fixes being proposed to address concerns expressed about the table and identified the need to develop a long term resolution of the issue.

As a result, the Study Group looked for an alternate approach that is both rational and can stand the test of time in terms of flexibility to accommodate the code development process, as well as meet defined goals of life safety, firefighter safety, property protection, and social and environmental demands (community disruption, loss of jobs, homelessness, tax base erosion, business interruption, environmental needs, etc.).

The discussion shifted from overall building size to what is necessary to meet the above goals and specific building elements/systems having a significant impact on the stated goals were identified and agreed upon:

- compartmentation
- exiting
- smoke management
- automatic sprinklers
- fire-resistive construction
- structural integrity
- improved inspection and maintenance programs

Compartmentation became the basis of this effort with the other elements/ systems influencing the compartment's characteristics. This approach was chosen as it is based on a rational analysis of fire containment which takes into consideration the ability of the responding fire department to control and extinguish a fire within the compartment while performing search and rescue and evacuation assistance operations. We believe it is supportable when considered from a rational assessment perspective that includes such factors as technical soundness, appropriate and valid fire data, scientific basis, field experience, cost effectiveness, and the needs of stakeholders. Specifically, the compartment is intended to keep a fire to a manageable size for the responding fire department, with or without fire sprinkler protection, limit the spread of smoke, and provide a level of redundancy to help limit loss potential.

FIRE FLOW

The CTC Features Study Group developed the shortened table of allowable compartment areas based on assumptions about available fire flow, fire ignition and development hazards of specific occupancies, and the allowable range of area increases for fire sprinkler protection area related to the impact of reductions in required fire flow.

The base table values for occupancy compartment size without fire sprinkler protection are based on the minimum fire flow for total building area tabulated in Appendix B of the International Fire Code for commercial structures (1,500 gpm). It should

also be noted that 1,500 gpm is the basic fire flow used in the Insurance Services Office (ISO) rating system. The use of 1,500 is predicated on an assumption that a first alarm complement of fire apparatus and firefighters from most mid-size and larger cities and towns are capable of deploying this flow via a combination of hand-lines and master streams (ground monitors or aerial streams). The fire flow table is independent of occupancy. Therefore the base areas from Table B105.1 were then adjusted up or down based on the occupancy hazard factors from the ISO process.

For the areas of compartments within buildings protected by fire sprinklers, the Study Group believed it prudent to encourage sprinkler protection by starting with a base area allowed for a larger fire flow. Sprinkler protection should allow for the extended time necessary to assemble the resources to develop a larger fire flow. As with buildings without sprinkler protection, the base area was adjusted using the occupancy hazard factors from the ISO process. The last adjustment for the proposed table was for sprinkler protection. The IFC allows the required fire flow to be reduced by up to 75%. An evaluation of Table B105.1 values will demonstrate that a 50% reduction in required fire flow will permit a ~3.7 times area increase. A 60% reduction in required fire flow would result in a ~5 times area increase. A 70% decrease in required fire flow would result in a ~10 times area increase. Finally a 75% reduction in required fire flow would result in a ~14 times area increase. The entire range of increases was used based on construction type (contribution to fuel load) and occupancy hazard. No sprinkler related increases were proposed for H1, H2, and H3 occupancies.

SMOKE COMPARTMENTATION

An important component of providing safety for occupants in a building is to limit the spread of smoke from a fire to other portions of the building. While the BFP Features Study Group felt fire barrier construction would be sufficient to limit the spread of smoke in most cases, we recognized there are some cases where the occupants are more vulnerable and need extra protection, either because they are expected to be defended in place, or because more time is needed to evacuate.

Addressing the specific provisions:

1. These requirements only apply where fire compartments abut each other, not to walls or floors within the fire compartment. (See charging paragraph in Section 503.3.) Smoke migration within the compartment is addressed by other current code requirements.
2. Buildings with non-sprinklered two-story compartments will require smoke management, since there is nothing to slow the fire from producing more smoke. However, single story compartments that are located at the first story are exempt, since the occupants are able to readily escape. (See Section 503.3, Item 1 and Item 2.)
3. Where a Group A occupancy with 300 or more occupants, a Group I-1, or a Group I-2 occupancy is located on the 3rd story above grade plane or higher, smoke management will be required. This recognizes that occupancies with more vulnerable populations should be better protected from smoke and the increased risk of being above grade. Three stories was chosen as the threshold in recognition that the code generally allows two stories to be open to each other, allowing smoke migration between the stories. (See Section 503.3, Item 2, Item 2.)
4. Section 503.4.1 lays out what constitutes "smoke management." It is recognized that rated floor and wall construction generally provides adequate protection for the passage of smoke. The goal of this proposal is to limit smoke migration through openings in the fire-resistance rated assemblies that define the fire compartment. However, the section allows several essentially equivalent methods to accomplish the goal.
5. Section 503.4, Item 1 requires door openings, penetrations, joints, and duct and air transfer openings to be protected as for smoke barriers. Doors will be required to be smoke- and draft-control assemblies. Penetration and joint systems will need to carry a leakage rating (with an "L" label). Smoke dampers will be required for duct and air transfer openings.
6. Section 503.4, Item 2 requires shaft construction for openings in floors between compartments (for openings other than for exit stair enclosures). In this case, because an unprotected opening would allow smoke migration between compartments, none of the exceptions to shaft construction in Section 707.2 are allowed to be used.
7. Section 503.4, Item 3 allows a smokeproof enclosure to serve as one of the options to limit smoke migration through exit stairs that connect adjacent fire compartments. This could be used in lieu of providing the smoke gaskets for the doors as referred to in Section 503.4, Item 1.1. A smokeproof stair not only prevents smoke from migrating between the compartments, but also provides added protection for occupants who may be using the stairs to evacuate.
8. 1.Section 503.4, Item 4 specifies the mechanical methods that are allowed to be used as an alternative to providing the physical barriers in Items 1 and 2. A system that utilizes pressure differentials between the compartment where the fire is burning and adjacent compartments could be designed to adequately limit smoke migration. While the air flow or exhaust methods could also be designed to limit smoke migration, they are predicated on removing smoke being produced by a sprinklered fire, and are not adequate to deal with smoke migration from a non-sprinklered fire. That being the case, they are limited in this proposal to those buildings that are sprinklered.

The Features Study Group will continue work on this subject and many of the other elements of the I-Codes that affect the height and area of buildings. Further study is planned on the thresholds for fire suppression as currently determined in Chapter 9, the integration of the compartment approach to the provisions for high rise buildings will be further investigated along with other specific subjects not yet identified.

It is often difficult to isolate a groups thought on a single approach to a subject. Compartmentation as a solution has been the focus for a significant change to this subject by this group. Much of the basis for what is shown in this code change is attributable to the appendix of the IFC and the ISO fire flow calculation method. Integrating those approaches with the occupancy base in the IBC a system for determining the maximum area of a building was derived.

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Proponent: CTC Features SG

501.1 Scope. The provisions of this chapter control the height and area of structures hereafter erected and additions to existing structures.

Exception: For exceptions for additions to existing structures see Chapter 34.

3403.1 Existing buildings or structures. Additions or alterations to any building or structure shall comply with the requirements of ~~the~~ this code for new construction. Additions or alterations shall not be made to an existing building or structure that will cause the existing building or structure to be in violation of any provisions of this code. An existing building plus any additions shall comply with the height and area provisions of Chapter 5.

Exception: An existing building plus any additions shall not be required to comply with the height and area provisions of Chapter 5 provided the existing building plus additions comply with the height and area provisions of the code under which the existing building was issued a certificate of occupancy.

Portions of the structure not altered and not affected by the alteration are not required to comply with the code requirements for a new structure.

3406.1 Conformance. No change shall be made in the use or occupancy of any building that would place the building in a different division of the same group of occupancy or in a different group of occupancies, unless such building is made to comply with the requirements of this code for such division or group of occupancy.

Exceptions:

1.Subject to the approval of the building official, the use or occupancy of existing buildings shall be permitted to be changed and the building is allowed to be occupied for purposes in other groups without conforming to all the requirements of this code for those groups, provided the new or proposed use is less hazardous, based on life and fire risk, than the existing use.

2.The existing building shall not be required to comply with the height and area provisions of Chapter 5 provided the new occupancy of the existing building complies with the height and area provisions of the code under which the existing building was issued a certificate of occupancy.

3410.2.3 Additions. Additions to existing buildings shall comply with the requirements of this code for new construction. ~~The combined height and area of the~~ An existing building plus any ~~and the new~~ additions shall ~~not exceed~~ comply with the height and area provisions of ~~allowed by~~ Chapter 5. ~~Where a fire wall that complies with Section 705 is provided between the addition and the existing building, the addition shall be considered a separate building.~~

Exception: An existing building plus additions shall not be required to comply with the height and area provisions of Chapter 5 provided the existing building plus additions comply with the height and area provisions of the code under which the existing building was issued a certificate of occupancy.

Reason:

Since the current height and area provisions of the International Building Code (IBC) theoretically are generally as large or larger than any of the legacy model codes, there should be no significant concern about grandfathering existing buildings with their heights and areas based upon the legacy codes. Those heights and areas, in general, should seldom exceed those currently allowed by the IBC. Therefore, grandfathering in such existing buildings is not a problem from a fire/life safety perspective in

regard to enforcement of the newest edition of the IBC. In these suggested code changes, the exceptions for existing buildings heights and areas when the building area is increased or the use of the building is changed to a different occupancy allows the application of the legacy code height and area provisions that were used when the building was originally occupied and approved under that edition of the legacy code.

This "grandfathering" will also give our Study Group some flexibility in what we may decide to do to ratchet down any of the current provisions for heights and areas in Chapter 5 as an interim solution to the long term project of substituting a new concept of compartmentation using a balanced fire protection design concept, without being concerned about impacting the existing building stock throughout the country.

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Proponent: The Boeing Company

Part 1: Revise as follows:

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 HORIZONTAL ASSEMBLIES
Section 711 HORIZONTAL BARRIERS
Section 712 FIRE-RESISTANCE RATING OF STRUCTURAL MEMBERS
Section 713 PROTECTION OF OPENINGS
Section 714 CONCEALED SPACES
Section 715 FIRE-RESISTANCE REQUIREMENTS FOR PLASTER
Section 716 THERMAL-AND SOUND-INSULATING MATERIALS
Section 910 SMOKE BARRIERS
Section 911 SMOKE PARTITIONS

Part 2: Delete and substitute as follows:

Delete Sections 404, 707, 712, 713, 715 and 716 in their entirety and substitute with proposed Section 713.

SECTION 713
PROTECTION OF OPENINGS

713.1 General. Openings in building assemblies shall be protected in accordance with the provisions of this section.

713.1.1 Unconcealed openings. Where required to be protected, openings that are not concealed within building construction shall be enclosed by fire-resistance rated construction or protected by an opening protective assembly.

Exceptions:
1. Openings totally within an individual dwelling unit and connecting four stories or less.
2. Openings in Group S-2 open and enclosed parking garages that serve only the parking structure.
3. Openings in Group A-5 occupancies that are essentially open to the outdoors.

713.1.2 Concealed openings. Openings that are concealed within building construction shall be protected in accordance with Section 714.

Exception: Openings within enclosures constructed in accordance with Section 713.8.

713.2 Fire zones. Fire zones shall include those contiguous building areas not separated by fire walls, fire barriers or horizontal

barriers. Areas so separated shall be considered separate fire zones. Enclosures in accordance with Section 713.8 and exit passageways in accordance with Section 1021 shall not be considered separate fire zones; however, the protection of openings shall be required between such areas and the fire zones in which they are located. Areas isolated by fire partitions shall not be considered separate fire zones; however, the protection of openings shall be required between such areas and the fire zones in which they are located.

Fire zones shall be permitted to extend vertically and include intercommunicating stories in accordance with Table 713.2. 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 communicate with additional stories, other fire zones or tenant spaces in a fire event.

Exception: Fire zones more than two stories above grade plane shall be served by at least one exit enclosure that extends to the exterior of the building or all points of the fire zone shall be within 300 feet (91,440 mm) of an exit enclosure. The primary purpose of such exit enclosure is to provide protected fire department access to upper building levels. Exit enclosures provided to satisfy means of egress design requirements shall also qualify as fire department access enclosures.

The total height of communicating stories within a given fire zone shall not exceed 50 feet. Stories, as used in this section, shall include basements, but not include balconies in Group A occupancies or mezzanines that comply with Section 505.

TABLE 713.2
ALLOWED NUMBER OF INTERCOMMUNICATING
STORIES WITHIN FIRE ZONES

Occupancy	Number of Stories	Sprinkler System	Mechanical Smoke Control[a]
Group A, B, E, F, M, R, S or U	2	3[b]	4[c]
Group H or I	1	1	1

a. In other than Group H occupancies, unlimited intercommunicating stories are permitted where buildings comply with the provisions of Section 713.8.3.6.
b. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 and a mechanical smoke control system in accordance with Section 909 within the applicable fire zone.

713.3 Floor, floor/ceiling construction. Openings in floors or floor/ceiling construction shall be protected in accordance with the provisions of this section. Structural members supporting floor, floor/ceiling construction that is a portion of a fire zone shall be protected consistent with the supported construction. Flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any floor.

713.3.1 Building assemblies. Openings in nonfire-resistance rated floor/ceiling construction that is not a portion of a fire zone envelope shall not require protection unless required by other provisions of this code. Openings in nonfire-resistance rated floor/ceiling construction that is a portion of a fire zone envelope shall be protected in accordance with Section 713.7 or enclosed in accordance with Section 713.8.

713.3.2 Horizontal assemblies. Openings in horizontal assemblies that are not a portion of a fire zone envelope shall not require protection other than as necessary to maintain the integrity of the assembly itself unless required by other provisions of this code. Openings in horizontal assemblies that are a portion of a fire zone envelope shall be protected with opening protective assemblies in accordance with Sections 713.6.1 through 713.6.6 or enclosed in accordance with Sections 713.8.

713.3.3 Horizontal barriers. Openings in horizontal barriers shall be protected with opening protective assemblies in accordance with Sections 713.6.1 through 713.6.6 or enclosed in accordance with Section 713.8.

713.4 Roof, roof/ceiling construction. Openings in roofs or roof/ceiling construction shall be protected in accordance with the provisions of this section. Flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any ceiling.

Skylights and other penetrations through a fire-resistance-rated roof deck or slab are permitted to be unprotected, provided that the structural integrity of the fire-resistance-rated roof construction is maintained. Unprotected skylights shall not be permitted in roof construction required to be fire-resistance rated in accordance with Section 704.10.

713.5 Wall construction. Openings in fire-resistance rated wall construction shall comply with the provisions of this section. Flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any wall.

713.5.1 Exterior walls. Openings in bearing and nonbearing exterior walls shall be protected in accordance with Section 706.8.

713.5.2 Interior walls. Openings in bearing and nonbearing interior walls shall be protected in accordance with the provisions of this section.

713.5.2.1 Building assemblies. Openings in interior bearing walls required to have a fire-resistance rating by Table 601 shall not require protection other than as necessary to maintain the integrity of the assembly itself unless required by other provisions of this code.

713.5.2.2 Fire walls, fire barriers and fire partitions. Openings in fire walls, fire barriers and fire partitions shall be protected in accordance with the provisions this section.

713.5.2.2.1 Doors. Door openings shall be protected in accordance with Section 713.6.1.

713.5.2.2.2 Windows. Window openings shall be protected in accordance with Section 713.6.2. Window openings in fire walls shall not be permitted.

Exceptions:

1. Fire-resistance-rated glazing tested as part of a fire-resistance-rated wall assembly in accordance with ASTM E 119 or UL 263 and labeled in accordance with Section 703.5 shall be permitted in fire doors and fire window assemblies in accordance with their listings.
2. Glazing protected by fire door assemblies.

713.5.2.2.3 Ducts. Duct openings shall be protected in accordance with Sections 713.6.3, 713.6.4 and 713.6.5.

Exceptions:

1. In other than Group H occupancies, fire dampers are not required in fire barriers where any of the following apply:

    1. In other than Group H occupancies, in ducted HVAC systems where fire barriers have a required fire-resistance rating of 1 hour or less and are 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 structure'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.
2. In other than Group H occupancies, fire dampers are not required in fire partitions where any of the following apply:

    1. The fire partitions are tenant separation or corridor walls in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and the duct is protected as a through penetration in accordance with Section 713.6.5.
    2. Tenant partitions in covered mall buildings where the fire partitions are not required to extend to the underside of the floor or roof deck above by other provisions of this code.
    3. The duct system is constructed of approved materials in accordance with the *International Mechanical Code* and the duct penetrating the fire partition complies with all of the following requirements:
        3.1. The duct shall not exceed 100 square inches (0.06 m2).
        3.2. The duct shall be constructed of steel a minimum of 0.0217 inch (0.55 mm) in thickness.
        3.3. The duct shall not have openings that communicate between the corridor and adjacent spaces or rooms.

3.4. The duct shall be installed above a ceiling.
3.5. The duct shall not terminate at a wall register in the fire-resistance-rated wall.
3.6. A minimum 12-inch-long (305 mm) by 0.060-inch-thick (1.52 mm) steel sleeve shall be centered in each duct opening. The sleeve shall be secured to both sides of the wall and all four sides of the sleeve with minimum 1½-inch by 1½-inch by 0.060-inch (38 mm by 38 mm by 1.52 mm) steel retaining angles. The retaining angles shall be secured to the sleeve and the wall with No. 10 (M5) screws. The annular space between the steel sleeve and the wall opening shall be filled with mineral wool batting on all sides.

713.5.2.2.4 Penetrations. Through-penetrations and membrane-penetrations shall be protected in accordance with Section 713.6.5.

713.5.2.2.5 Joints. Joints in shall be protected in accordance with Section 713.6.6.

713.6 Opening protective assemblies. Opening protective assemblies required by other provisions of this code shall comply with the provisions of this section.

The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in NFPA 252,
NFPA 257 or UL 9. The required fire resistance of an opening protective shall be permitted to be established by any of the following methods or procedures:

1. Designs documented in approved sources.
2. Calculations performed in an approved manner.
3. Engineering analysis based on a comparison of opening protective designs having fire-protection ratings as determined by the test procedures set forth in NFPA 252, NFPA 257 or UL 9.
4. Alternative protection methods as allowed by Section 104.11.

The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in referenced test standards.

713.6.1 Fire door assemblies. Fire door assemblies shall comply with the provisions of this section. Fire door assemblies shall be constructed of any material or assembly of materials that conforms to the test requirements of Section 713.6.1.1, 1-3. Fire shutters shall comply with the provisions for fire doors.

Exceptions:

1. Labeled fire door assemblies that conform to the requirements of this section or UL10A, UL14B and UL 14C for tin-clad fire door assemblies.
2. Floor fire door assemblies in accordance with this section.

713.6.1.1 Fire protection rating. Fire door assemblies shall have the fire protection rating indicated in Table 713.6.1.

Exceptions:

1. Corridor door assemblies in Group I-2 occupancies shall be in accordance with Section 407.3.1.
2. Unprotected openings shall be permitted for corridors in multitheater complexes where each motion picture auditorium has at least one-half of its required exit or exit access doorways opening directly to the exterior or into an exit passageway.
3. Floor fire door assemblies used to protect openings in horizontal assemblies and horizontal barriers shall have a fire-resistance rating not less than the assembly being penetrated.

TABLE 713.6.1
FIRE DOOR FIRE PROTECTION RATINGS

(Contents of table to remain unchanged)

713.6.1.2 Testing. Fire door assemblies shall be tested in accordance with NFPA 252, UL 10B or UL 10C, as specified below.

Fire door assemblies with side-hinged and pivoted swinging doors shall be tested in accordance with NFPA 252 or UL 10C. After 5 minutes into the NFPA 252 test, the neutral pressure level in the furnace shall be established at 40 inches (1016 mm) or less above the sill.

Fire door assemblies with other types of doors, including swinging elevator doors and fire shutter assemblies, shall be tested in accordance with NFPA 252 or UL 10B. The pressure in the furnace shall be maintained as nearly equal to the atmospheric pressure as possible. Once established, the pressure shall be maintained during the entire test period.

Fire door assemblies in exit enclosures and exit passageways shall have a maximum transmitted temperature end point of not more than 450°F (250° C) above ambient at the end of 30 minutes of standard fire test exposure.

> **Exception:** The maximum transmitted temperature rise is not required in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

Fire door assemblies located in corridor walls or smoke-barrier walls and required to have a minimum fire protection rating of 20 minutes in accordance with Table 713.6.1 shall be tested in accordance with NFPA 252 or UL 10C without the hose stream test. Such smoke and draft control assemblies shall also be tested in accordance with UL 1784. Louvers are prohibited.

> **Exception:** View ports that require a hole not larger than 1 inch (25 mm) in diameter through the door, have at least a 0.25-inch-thick (6.4 mm) glass disc and the holder is of metal that will not melt out where subject to temperatures of 1,700°F (927°C) shall be permitted.

Floor fire door assemblies used to protect openings in fire-resistance-rated floors shall be tested in accordance with NFPA 288.

713.6.1.3 Labeling. Fire door assemblies shall be labeled by an approved agency. The labels shall comply with NFPA 80 and shall be permanently affixed to the door or frame. The label shall be applied at the factory or location where fabrication and assembly are performed. Fire door labels shall include the name of the manufacturer, the name of the third-party inspection agency, the fire protection rating, and where required for fire doors used in exit enclosures and exit passageways, the maximum transmitted temperature end point. Fire door frames shall be labeled showing the name of the manufacturer or other identification readily traceable back to the manufacturer and the name or trademark of the third-party inspection agency, the fire protection rating and, where required for fire doors in exit enclosures and exit passageways by Section 713.6.1.2, the maximum transmitted temperature end point.

Smoke and draft control assemblies complying with UL 1784 shall be labeled and shall show the letter "S" on the fire protection rating label of the door. This marking shall indicate that the door and frame assembly are in compliance when listed or labeled gasketing is also installed.

Oversized fire door assemblies shall bear an oversized fire door label by an approved agency or shall be provided with a certificate of inspection furnished by an approved testing agency. When a certificate of inspection is furnished by an approved testing agency, the certificate shall state that the door conforms to the requirements of design, materials and construction, but has not been subjected to the fire test.

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 rating.

713.6.1.4 Installation. Fire door assemblies shall be installed in accordance in accordance with NFPA 80. Smoke and draft control assemblies shall be installed in accordance with NFPA 105.

713.6.1.5 Closing. Fire door assemblies shall be self- or automatic-closing in accordance with this section.

Exceptions:

1. Fire door assemblies located in walls separating sleeping units in Group R-1 occupancies shall be permitted without self- or automatic-closing devices.
2. The elevator car doors and the associated hoistway enclosure doors at the floor level designated for recall in accordance with Section 3003.2 shall be permitted to remain open during Phase I emergency recall operation.

Unless otherwise permitted, single fire door assemblies and both leaves of pairs of side-hinged swinging fire door assemblies shall be provided with an active latch bolt that will secure the door when it is closed.

713.6.1.5.1 Smoke-activated doors. Automatic-closing doors installed in the following locations shall be automatic-closing by the actuation of smoke detectors installed in accordance with Section 907.10 or by loss of power to the smoke detector or hold-open device. Doors that are automatic-closing by smoke detection shall not have more than a 10-second delay before the door starts to close after the smoke detector is actuated:

1. Doors installed across a corridor.
2. Doors that protect openings in exits or corridors required to be of fire-resistance-rated construction.
3. Doors that protect openings in walls that are capable of resisting the passage of smoke in accordance with Section 508.2.2.1.
4. Doors installed in smoke barriers in accordance with Section 910.5.
5. Doors installed in fire partitions in accordance with Section 709.6.
6. Doors installed in a fire wall in accordance with Section 707.8.
7. Doors installed in shaft enclosures in accordance with Section 713.8.1.
8. Doors installed in refuse and laundry chutes and access and termination rooms in accordance with Section 713.8.1.2.3.
9. Doors installed in the walls for compartmentation of underground buildings in accordance with Section 405.4.2.
10. Doors installed in the elevator lobby walls of underground buildings in accordance with Section 405.4.3.
11. Doors installed in smoke partitions in accordance with Section 911.5.

713.6.1.5.2 Fire shutters and steel fire doors. Vertical sliding or vertical rolling steel fire door assemblies in openings through which pedestrians travel shall be heat activated or activated by smoke detectors with alarm verification.

Where fire shutters of the rolling type are installed, such shutters shall include approved automatic-closing devices.

Where fire shutters of the swinging type are installed in exterior openings, not less than one row in every three vertical rows shall be arranged to be readily opened from the outside, and shall be identified by distinguishing marks or letters not less than 6 inches (152 mm) high.

713.6.1.6 Glazing. Fire-protection-rated glazing shall be permitted in fire door assemblies in accordance with NFPA 80.

Fire-protection-rated glazing in fire door assemblies located in fire walls are prohibited.

> **Exception:** Where serving as a horizontal exit, a self-closing swinging fire door assembly shall be permitted to have a vision panel of not more than 100 square inches (0.065 m^2) without a dimension exceeding 10 inches (254 mm).

Fire-protection-rated glazing shall not be installed in fire door assemblies having a 1½-hour fire protection rating intended for installation in fire barriers.

> **Exception:** Glazing not more than 100 square inches (0.065 m^2) in area.

Fire-protection-rated glazing in excess of 100 square inches (0.065 m2) shall be permitted in fire door assemblies when tested as components of the door assemblies and not as glass lights, and shall have a maximum transmitted temperature rise of 450◦F (250◦C) in accordance with Section 713.6.1.2.

> **Exception:** The maximum transmitted temperature end point is not required in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

Fire-protection-rated glazing in smoke and draft control assemblies shall have a minimum fire-protection rating of 20 minutes and shall be exempt from the hose stream test. Glazing material in any other part of the door assembly, including transom lites and sidelites, shall be tested in accordance with NFPA 257 and UL 9, including the hose stream test, in accordance with Section 713.6.2.

713.6.1.6.1 Labeling. Fire-protection-rated glazing in fire door assemblies shall be labeled by an approved agency. The labels shall comply with NFPA 80 and shall be permanently affixed to the glazing. The label shall be applied at the factory or location where fabrication and assembly are performed. For fire-protection-rated glazing, the label shall include the name of

the manufacturer, the test standard and shall bear the following four-part identification: "D – H or NH – T or NT – XXX." "D" indicates that the glazing shall be used in fire door assemblies and that the glazing meets the fire containment requirements of the NFPA 257 and UL 9. "H" shall indicate that the glazing meets the hose stream requirements of the test standard. "NH" shall indicate that the glazing does not meet the hose stream requirements of the test. "T" shall indicate that the glazing meets the temperature requirements of Section 713.6.1.2. "NT" shall indicate that the glazing does not meet the temperature requirements of Section 713.6.1.2. The placeholder "XXX" shall specify the fire-protection-rating period, in minutes, as tested.

713.6.1.6.1 Installation. Wired glass used in fire door assemblies shall comply with Table 713.6.2.1. Other fire-protection-rated glazing shall comply with the size limitations of NFPA 80.

Approved fire-protection-rated glazing used in fire door assemblies in elevator and exit enclosures shall be so located as to furnish clear vision of the passageway or approach to the elevator, ramp or stairway.

Fire-protection-rated glazing installed in fire door assemblies or fire window assemblies in areas subject to human impact in hazardous locations shall comply with Chapter 24.

713.6.2 Fire window assemblies. Fire window assemblies shall comply with the provisions of this section.

Exception: Glazing tested as part of a fire-resistance-rated wall assembly in accordance with ASTM E 119.

Fire window assemblies shall be limited to fire partitions in accordance with Section 708 and fire barriers utilized in the applications set forth in Sections 706.3.6 and 706.3.8 where the fire-resistance rating does not exceed 1 hour.

Glazing installed in fire door assemblies shall comply with Section 713.6.1.6.

713.6.2.1 Fire protection rating. Fire window assemblies shall have the fire protection rating indicated in Table 713.6.2. Metal mullions that exceed a nominal height of 12 feet (3658 mm) shall be protected with materials to afford the same fire-resistance rating as required for the wall construction in which the fire window assembly is located.

Exceptions:

1. Steel window frame assemblies of 0.125-inch (3.2 mm) minimum solid section or of not less than nominal 0.048-inch-thick (1.2 mm) formed sheet steel members fabricated by pressing, mitering, riveting, interlocking or welding and having provision for glazing with ¼-inch (6.4 mm) wired glass where securely installed in the building construction and glazed with ¼-inch (6.4 mm) labeled wired glass shall be deemed to meet the requirements for a ¾-hour fire window assembly. Wired glass panels shall conform to the size limitations set forth in Table 713.6.2.1.
2. Fire window assemblies in 0.5-hour fire-resistance-rated partitions are permitted to have a 20 minute fire protection rating.

TABLE 713.6.2
FIRE WINDOW ASSEMBLY FIRE PROTECTION RATINGS
(Contents of table to remain unchanged, except add new footnote)

Exterior walls[b]

b. Openings in nonfire-resistance-rated exterior wall assemblies that require protection in accordance with Section 706.3, 706.8.2, 706.8.5 or 706.8.6 shall have a fire-protection rating of not less than ¾ hour.

TABLE 713.6.2.1
LIMITING SIZES OF WIRED GLASS PANELS
(Contents of table to remain unchanged)

713.6.2.2 Testing. Fire window assemblies shall be tested in accordance with NFPA 257 and UL 9.

NFPA 257 AND UL 9 shall evaluate fire window assemblies under positive pressure. Within the first 10 minutes of a test, the pressure in the furnace shall be adjusted so at least two-thirds of the test specimen is above the neutral pressure plane, and the neutral pressure plane shall be maintained at that height for the balance of the test.

Nonsymmetrical glazing systems in fire partitions, fire barriers or in exterior walls with a fire separation distance of 5 feet (1524 mm) or less in accordance with Section 704 shall be tested with both faces exposed to the furnace, and the assigned fire protection rating shall be the shortest duration obtained from the two tests conducted in compliance with NFPA 257 AND UL 9.

713.6.2.3 Labeling. Fire windows shall be labeled by an approved agency. The labels shall comply with NFPA 80 and shall be permanently affixed to the glazing. The label shall be applied at the factory or location where fabrication and assembly are performed. Fire window labels shall include the name of the manufacturer, the test standard and shall bear the following two-part identification: "OH – XXX." "OH" indicates that the glazing meets both the fire containment and the hose-stream requirements of NFPA 257 and UL 9. "XXX" represents the fire-protection rating period, in minutes, as tested.

713.6.2.4 Installation. Fire window assemblies shall be installed in approved frames in a fixed position or be automatic-closing.

713.6.3 Fire dampers. Fire dampers shall comply with the provisions of this section.

Exceptions:

1. Openings included as part of a fire-resistance-rated wall assembly tested in accordance with ASTM E 119.
2. Where ducts are used as 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 a smoke control system.

Where a building 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.

Fire dampers for hazardous exhaust duct systems shall comply with the *International Mechanical Code*.

713.6.3.1 Fire protection rating. Fire dampers shall have the fire protection rating indicated in Table 713.6.3.

TABLE 713.6.3
FIRE DAMPER FIRE PROTECTION RATINGS
(Contents of table to remain unchanged)

713.6.3.2 Testing. Fire dampers shall be tested in accordance with UL 555. Combination fire/smoke dampers shall be tested in accordance with both UL 555 and UL 555S.

713.6.3.3 Labeling. Fire dampers shall be labeled by an approved agency.

Only fire dampers labeled for use in dynamic systems shall be installed in heating, ventilation and air-conditioning systems designed to operate with fans on during a fire event.

713.6.3.4 Installation. The fire damper actuating device shall meet one of the following requirements:

1. The operating temperature shall be approximately 50°F (10°C) above the normal temperature within the duct system, but not less than 160°F (71°C).
2. The operating temperature shall be not more than 286°F (141°C) where located in a smoke control system complying with Section 909.
3. Where a combination fire/smoke damper is located in a smoke control system complying with Section 909, the operating temperature rating shall be approximately 50°F (10°C) above the maximum smoke control system designed operating temperature, or a maximum temperature of 350°F (177°C). The temperature shall not exceed the UL 555S degradation test temperature rating for a combination fire/smoke damper.

Fire dampers shall be provided with an approved means of access, which is large enough to permit inspection and maintenance of the damper and its operating parts. The access openings shall not reduce the fire-resistance rating of the building assembly.

Access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch (12.7 mm) in height reading: FIRE DAMPER or FIRE/SMOKE DAMPER. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

Fire dampers and combination fire/smoke dampers located within air distribution and smoke control systems shall be installed in accordance with the requirements of this section, the manufacturer's installation instructions and the dampers' listing.

713.6.4 Ceiling radiation dampers. Ceiling radiation dampers shall comply with the provisions of this section and the applicable provisions of Section 713.6.3.

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

1. Where tests in accordance with ASTM E 119 have shown that ceiling radiation dampers are not necessary in order to maintain the fire-resistance rating of the assembly.
2. Where exhaust duct penetrations are protected in accordance with Section 713.6.5, are located within the cavity of a wall and do not pass through another dwelling unit or tenant space.

713.6.4.1 Fire protection rating. Ceiling radiation dampers shall be installed in accordance with their listing.

713.6.4.2 Testing. Ceiling radiation dampers shall be tested in accordance with UL 555C. Ceiling radiation dampers shall be tested in accordance with UL 555C and installed in accordance with the manufacturer's installation instructions and listing.

713.6.4.3 Labeling. Ceiling radiation dampers shall be labeled by an approved agency.

713.6.4.4 Installation. Ceiling radiation dampers located within air distribution and smoke control systems shall be installed in accordance with the requirements of this section, the manufacturer's installation instructions and the dampers' listing.

713.6.5 Smoke dampers. Smoke dampers shall comply with the provisions of this section. Where a building 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.

713.6.5.1 Leakage rating. Smoke damper leakage ratings shall not be less than Class II. Elevated temperature ratings shall not be less than 250°F (121°C).

713.6.5.2 Testing. Smoke dampers shall comply with the requirements of UL 555S. Combination fire/smoke dampers shall comply with the requirements of both UL 555 and UL 555S.

713.6.5.3 Labeling. Smoke dampers shall be listed and bear the label of an approved testing agency indicating compliance with the referenced standards in this section.

713.6.5.4 Installation. Smoke dampers and combination fire/smoke dampers located within air distribution and smoke control systems shall be installed in accordance with the requirements of this section, the manufacturer's installation instructions and the dampers' listing.

Smoke dampers shall close upon actuation of a listed smoke detector or detectors installed in accordance with Section 907.10 and one of the following methods, as applicable:

1. Where a smoke damper is installed within a duct, a smoke detector shall be installed in the duct within 5 feet (1524 mm) of the smoke damper with no air outlets or inlets between the detector and the damper. The smoke detector shall be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, smoke dampers shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.
2. Where a smoke damper is installed above doors in a smoke barrier, a spot-type detector listed for releasing service shall be installed on either side of the smoke barrier door opening.
3. Where a smoke damper is installed within an unducted opening in a wall, a spot-type detector listed for releasing service shall be installed within 5 feet (1524 mm) horizontally of the smoke damper.
4. Where a smoke damper is installed in a corridor wall or ceiling, the damper shall be permitted to be controlled by a smoke detection system installed in the corridor.

5. Where a smoke damper is installed within areas served by a heating, ventilation and air-conditioning (HVAC) system and a total-coverage smoke detector system is provided, smoke dampers shall be permitted to be controlled by the smoke detection system.

Smoke dampers shall be provided with an approved means of access, which is large enough to permit inspection and maintenance of the damper and its operating parts. The access openings shall not reduce the fire-resistance rating of the building assembly. The access shall not affect the integrity of fire-resistance-rated building assemblies. Access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch (12.7 mm) in height reading: SMOKE DAMPER or FIRE/SMOKE DAMPER. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a corridor enclosure required to have smoke and draft control doors in accordance with Section 713.6.1.2.

Exceptions:

1. Smoke dampers are not required where the building is equipped 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 system.
2. Smoke dampers are not required in corridor penetrations where the duct is constructed of steel not less than 0.019 inch (0.48 mm) in thickness and there are no openings serving the corridor.

713.6.5 Through-penetration fire stops. Through-penetration or membrane- penetration fire stops shall comply with the provisions of this section. Through-penetrations or membrane-penetrations in fire-resistance rated building assemblies, that are not smoke barriers, shall be shall tested in accordance with ASTM E 814 or UL 1479 with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water, or shall comply with any of the alternative methods listed in Sections 713.6.5.1 through 713.6.5.9. The tested system shall have a minimum one hour F-rating or a rating equal to the required rating of the building assembly penetrated if such assembly has a fire resistance rating greater than one hour. Penetration protection of smoke barriers shall comply with Section 910.6.

Exceptions:

1. Penetrations of nonfire resistance rated horizontal fire zone envelope assemblies are permitted to comply with the provisions of this section or section 713.7.1.
2. Penetrations tested as part of a fire-resistance-rated wall assembly in accordance with ASTM E 119.
3. Floor penetrations contained and located within the cavity of a wall do not require a T- rating.

713.6.5.1 Single concrete floor penetrations (metal pipe or tube). Penetrations in a single concrete floor by steel, ferrous or copper conduits, pipes, tubes or vents with a maximum 6-inch (152 mm) nominal diameter, provided the concrete, grout or mortar is installed the full thickness of the floor or the thickness required to maintain the fire-resistance rating. The penetrating items shall not be limited to the penetration of a single concrete floor, provided the area of the opening through each floor does not exceed 144 square inches (92 900 mm^2).

713.6.5.2 Single fire-resistance rated floor penetrations (metal pipe or tube). Penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete or masonry items through a single fire-resistance-rated floor assembly where the annular space is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire 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. Penetrating items with a maximum 6-inch (152 mm) nominal diameter shall not be limited to the penetration of a single fire-resistance-rated floor assembly, provided the aggregate area of the openings through the assembly does not exceed 144 square inches (92 900 mm2) in any 100 square feet (9.3 m^2) of floor area.

713.6.5.3 Fire-resistance rated wall penetrations (metal pipe or tube). Penetrations by steel, ferrous or copper pipes, tubes or conduits, are permitted provided the annular space between the penetrating item and the fire-resistance-rated wall is protected as follows:

1. In concrete or masonry walls where the penetrating item is a maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929 m^2), concrete, grout or mortar is

permitted where it is installed the full thickness of the wall or the thickness required to maintain the fire-resistance rating; or

2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire 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.

713.6.5.4 Floor assembly membrane penetrations (metal pipe or tube). Membrane-penetrations of a maximum 2-hour fire-resistance-rated horizontal assembly or horizontal barrier by steel, ferrous or copper conduits, pipes, tubes or vents, or concrete or masonry items where the annular space is protected to prevent the free passage of flame and the products of combustion. The aggregate area of the openings through the membrane shall not exceed 100 square inches (64 500 mm^2) in any 100 square feet (9.3 m^2) of ceiling area in assemblies tested without penetrations.

713.6.5.5 Listed electrical box penetrations. Penetrations by listed electrical boxes of any material provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the ceiling membrane and the box shall not exceed 1/8 inch (3.1 mm) unless listed otherwise.

713.6.5.6 Listed electrical box membrane penetrations. Membrane-penetrations of a fire-resistance rated assembly membrane by listed electrical boxes of any material are permitted provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm) unless listed otherwise. Such boxes on opposite sides of the wall or partition shall be separated as follows:

1. By a horizontal distance of not less than 24 inches (610 mm);
2. By solid fireblocking in accordance with Section 717.2.1;
3. By protecting both boxes with listed putty pads; or
4. By other listed materials and methods.
5. The annular space created by the penetration of a fire sprinkler, provided it is covered by a metal escutcheon plate.

713.6.5.7 Steel electrical box membrane floor penetrations. Ceiling membrane penetrations of maximum 2-hour fire-resistance-rated horizontal assemblies or horizontal barriers by steel electrical boxes that do not exceed 16 square inches (10 323 mm^2) in area, provided the aggregate area of such penetrations does not exceed 100 square inches (44 500 mm^2) in any 100 square feet (9.29 m^2) of ceiling area, and the annular space between the ceiling membrane and the box does not exceed 1/8 inch (3.12 mm).

713.6.5.8 Steel electrical box membrane wall penetrations. Membrane-penetrations of an assembly membrane of maximum two-hour fire-resistance-rated walls and partitions are permitted by steel electrical boxes that do not exceed 16 square inches (0.0103 m^2) in area, provided the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m^2) in any 100 square feet (9.29 m^2) of wall area. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm). Such boxes on opposite sides of the wall or partition shall be separated by one of the following:

1. By a horizontal distance of not less than 24 inches (610 mm);
2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation;
3. By solid fireblocking in accordance with Section 717.2.1;
4. By protecting both outlet boxes with listed putty pads; or
5. By other listed materials and methods.

713.6.5.9 Sprinkler head penetrations. The annular space created by the penetration of a fire sprinkler head is permitted to be protected by a metal escutcheon plate that completely covers the annular space.

713.6.5.10 Installation. Noncombustible penetrating items shall not connect to combustible items beyond the point of firestopping unless it can be demonstrated that the integrity of the fire-resistance rated building assembly is maintained.

Where sleeves are used, they shall be securely fastened to the building assembly penetrated. The space between the item contained in the sleeve and the sleeve itself and any space between the sleeve and the assembly penetrated shall be protected in

accordance with the applicable provisions of Section 713.6.5. Insulation and coverings on or in the penetrating item shall not penetrate the building assembly unless the specific material used has been tested as part of the assembly in accordance with this section.

713.6.6 Fire-resistant joint systems. Fire-resistant joint systems shall comply with the provisions of this section. Joints in or between fire-resistance-rated building assemblies shall be protected by a fire-resistant joint system.

Exception: Fire-resistant joint systems shall not be required for joints in the following locations:

1. Floors within a single dwelling unit.
2. Floors within malls.
3. Mezzanine floors.
4. Walls that are permitted to have unprotected openings.
5. Roofs where openings are permitted.
6. Joints not exceeding a maximum width of 0.625 inch (15.9 mm) and tested in accordance with ASTM E 119.

713.6.6.1 Fire protection rating. Fire-resistant joint systems shall be designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the building assembly in or between which it is installed.

713.6.6.2 Testing. Fire-resistant joint systems shall be tested in accordance with the requirements of either ASTM E 1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned fire-resistance rating shall be the shortest duration obtained from the two tests. Where evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to approval by the building official, the wall need not be subjected to tests from the opposite side.

Exception: For exterior walls with a horizontal fire separation distance greater than 5 feet (1524 mm), the joint system shall be required to be tested for interior fire exposure only.

713.6.6.3 Installation. Fire-resistant joint systems shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of flame and hot gases.

713.6.6.4 Exterior curtain wall/floor intersection. Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved material or system to prevent the interior spread of fire. Such material or systems shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected either to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) or installed as tested in accordance with ASTM E 2307 for the time period at least equal to the fire-resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 706.9.

713.7 Nonfire-resistance-rated fire zone opening protection. Openings in nonfire-resistance rated floor/ceiling construction that is a portion of a fire zone envelope shall be protected in accordance with this section or enclosed in accordance with Sections 713.8.

713.7.1 Penetrating items. Through-membrane or membrane-penetrations in or between floor or floor/ceiling building assemblies shall be protected by an approved flamestop or a listed through-penetration firestop system.

713.7.2 Construction joints. Joints installed in or between floor or floor/ceiling building assemblies shall be protected by an approved flamestop or a listed fire-resistant joint system.

713.7.3 Ducts. Ducts shall be constructed of sheet steel not less than 0.019 inch (0.48 mm) (26 gage) in thickness. The annular space around the duct shall not exceed 1/8 inch (3.1 mm) and shall be filled with cellulose loose-fill, rockwool or slag mineral wool insulation or other approved material. Or, ducts shall be protected with a listed fire damper.

713.7.4 Flamestops. Where required by other provisions of this code, flamestops shall be protected with materials that prevent the passage of flame and hot gases; however, need not comply to ASTM E 119 time-temperature fire conditions.

713.8 Enclosures. Shaft enclosures, exit enclosures and atrium enclosures required by other provisions of this code shall comply with the provisions of this section.

713.8.1 Utility openings. Except as permitted in Section 713.2, 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.

> **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.

A shaft enclosure containing a refuse chute or laundry chute shall not be used for any other purpose and shall originate and terminate in rooms in accordance with Section 713.8.1.2.3.

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

Refuse chutes shall not terminate in an incinerator room.

713.8.1.1 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.

713.8.1.2 Construction. Shaft enclosures shall be constructed as fire barriers in accordance with Section 708 or horizontal barriers in accordance with Section 711, or both.

713.8.1.2.1 Bottom enclosure. Shaft enclosures that do not extend to the bottom of the building or structure shall comply with one of the following:

1. They shall be enclosed at the lowest level with construction of the same fire-resistance rating as the lowest floor through which the enclosure passes, but not less than the rating required for the shaft enclosure.
2. They shall terminate in a room having a use related to the purpose of the utility opening. The room shall be separated from the remainder of the building by fire barriers constructed in accordance with Section 708 or horizontal assemblies constructed in accordance with Section 711, or both. The fire-resistance rating and protectives shall be at least equal to the protection required for the shaft enclosure.
3. They shall be protected by approved fire dampers installed in accordance with their listing at the lowest floor level within the shaft enclosure.

> **Exceptions:**
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> 1. The fire-resistance-rated room separation is not required, provided there are no openings in the shaft enclosure to the interior of the building except at the bottom. The bottom of the shaft enclosure shall be closed off around the penetrating items with materials permitted by Section 714.3.1 for draftstopping, 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 713.8.1.2.3.
> 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.

713.8.1.2.2 Top enclosure. Shaft enclosures that do not extend to the underside of the roof sheathing, slab or deck of the building shall be enclosed at the top with a horizontal barrier having the same fire-resistance rating as the topmost floor through which the shaft enclosure passes, but not less than the fire-resistance rating required for the shaft enclosure.

Openings in a horizontal barrier at the top of a shaft enclosure shall be protected with opening protective assemblies in accordance with Sections 713.6.3 through 713.6.6

713.8.1.2.3 Access and termination rooms. Access and termination rooms shall comply with the provisions of this section. Where applicable, termination rooms shall also comply with the provisions of Section 508.2. Access and termination rooms shall be constructed as fire barriers in accordance with Section 708 or horizontal barriers in accordance with Section 711, or

both and shall have a fire-resistance ratings of not less 1 hour. Access and termination rooms shall be equipped with an automatic sprinkler system installed in accordance with Section 903.2.10.2.

713.8.1.2.4 Elevator lobbies. An enclosed elevator lobby shall be provided at each floor where an elevator shaft enclosure connects more than three stories. The lobby shall separate the elevator shaft enclosure doors from each floor by fire partitions equal to the fire-resistance rating of the corridor and the required opening protection. Elevator lobbies shall have at least one means of egress complying with Chapter 10 and other provisions within this code.

Exceptions:

1. 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.
2. Elevators not required to be located in a shaft enclosure in accordance with Section 713.2 are not required to have enclosed elevator lobbies.
3. Where additional doors are provided at the hoistway opening in accordance with Section 3002.6. Such doors shall be tested in accordance with UL 1784 without an artificial bottom seal.
4. In other than Group I-2 and I-3 occupancies, and 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 in accordance with Section 903.3.1.1 or 903.3.1.2.
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.
6. Enclosed elevator lobbies are not required where the elevator hoistway is pressurized in accordance with Section 713.8.1.3.4.1.

713.8.1.2.4.1 Pressurization alternative. Shaft enclosure pressurization is permitted to be provided in lieu of required elevator lobbies. The pressurization system shall comply with this section.

Elevator hoistways shall be pressurized to maintain a minimum positive pressure of 0.04 inches of water (9.96 Pa) and a maximum positive pressure of 0.06 inches of water (14.94 Pa) with respect to adjacent occupied space on all floors. This pressure shall be measured at the midpoint of each hoistway door, with all elevator cars at the floor of recall and all hoistway doors on the floor of recall open and all other hoistway doors closed. The opening and closing of hoistway doors at each level must be demonstrated during this test. The supply air intake shall be from an outside, uncontaminated source located a minimum distance of 20 feet (6096 mm) from any air exhaust system or outlet.

Fan systems located within the building and duct systems that are part of the pressurization system shall be protected with the same fire-resistance rating as required for the elevator shaft enclosure. The fan system shall be equipped with a smoke detector that will automatically shut down the fan system when smoke is detected within the system. A separate fan system shall be used for each elevator hoistway. The supply air intake shall be from an outside, uncontaminated source located a minimum distance of 20 feet (6096 mm) from any air exhaust system or outlet. The supply fan shall either be adjustable with a capacity of at least 1,000 cfm (.4719 m^3/s) per door, or that specified by a registered design professional to meet the requirements of a designed pressurization system. The pressurization system shall be provided with standby power from the same source as other required emergency systems for the building. The shaft enclosure pressurization system shall be activated upon activation of the building fire alarm system or upon activation of the elevator lobby smoke detectors.

713.8.1.3 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.

Exception: Where exterior walls serve as a part of a shaft enclosure, such walls shall comply with the requirements of Section 706 for exterior walls and the fire-resistance-rated shaft enclosure requirements shall not apply.

713.8.1.4 Openings. Openings in shaft enclosures shall be protected with opening protective assemblies in accordance with Section 713.5.2.2 for fire barriers.

Exceptions:

1. Fire dampers are not required in 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; or
1.2. 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 and R occupancies equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, smoke dampers are not required in shafts where:
2.1. Kitchen, clothes dryer, bathroom and toilet room exhaust openings are installed with steel exhaust subducts, having a wall thickness of at least 0.019 inch (0.48 mm); and
2.2. Subducts extend at least 22 inches (559 mm) vertically; and
2.3. An exhaust fan is installed at the upper terminus of the shaft that is, powered continuously in accordance with Section 909.11, so as to maintain a continuous upward airflow to the outside.
3. Smoke dampers are not required in exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
4. Smoke dampers are not required in shafts where ducts are used as part of an approved mechanical smoke control system designed in accordance with Section 909 and where the smoke damper will interfere with the operation of the smoke control system.

Openings other than those necessary for the utility purpose of the shaft shall not be permitted in shaft enclosures.

Openings into refuse or laundry chutes shall not be located in means of egress corridors. Heat-activated closing devices shall be permitted between refuse or laundry chutes and their termination rooms.

713.8.2 Egress openings. Except as permitted in Section 713.2, openings in floor/ceiling construction for interior means of egress stairways and ramps shall be enclosed by an exit enclosure constructed in accordance with this section.

Exceptions:

1. Means of egress stairways as required by Section 410.5.4 are not required to be enclosed.
2. Stairways in Group I-3 occupancies, as provided for in Section 408.3.6, are not required to be enclosed.

713.8.2.1 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.

713.8.2.2 Construction. Exit enclosures shall be constructed as fire barriers in accordance with Section 708 or horizontal barriers in accordance with Section 711, or both.

Exterior walls of an exit enclosure shall comply with the requirements of Section 706. 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 have a fire-resistance rating of not less than 1 hour. Openings within such exterior walls shall be protected by opening protectives having a fire protection rating of not less than 3/4 hour. This construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the topmost landing of the stairway or to the roof line, whichever is lower.

713.8.2.3 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.

713.8.2.4 Openings. Openings in exit enclosures shall be protected with opening protective assemblies in accordance with Section 713.5.2.2 for fire barriers.

Openings in exit enclosures shall be limited to those necessary for exit access to the enclosure from normally occupied spaces and for egress from the exit enclosure.

Exceptions:

1. Unprotected exterior openings as permitted in Section 706.8.
2. Service areas as permitted in Section 402.4.6.

Openings into or through an exit enclosure are prohibited except for required exit doors, equipment and ductwork necessary for independent pressurization, sprinkler piping, standpipes, electrical raceways for fire department communication systems and electrical raceways serving the exit enclosure and terminating at a steel box not exceeding 16 square inches (0.010 m^2). Such openings shall be protected in accordance with Section 713.6.5. There shall be no penetrations or communication openings, whether protected or not, between adjacent exit enclosures.

Equipment and ductwork for exit enclosure ventilation 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 construction 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 necessary for maintenance and operation and shall be protected by opening protective assemblies in accordance with Section 713.8.1.4 for shaft enclosures.

Exit enclosure ventilation systems shall be independent of other building ventilation systems.

Elevators shall not open into an exit enclosure.

Fire door assemblies in exit enclosures shall comply with Section 713.6.1.2.

713.8.3 Architectural openings. Except as permitted in Section 713.2, 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.

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 the individual space is provided with an automatic sprinkler system in accordance with Section 903.3.1.1.

713.8.3.1 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.

713.8.3.2 Construction. Atrium enclosures shall be constructed as fire barriers in accordance with Section 708 or horizontal barriers in accordance with Section 711, or both.

713.8.3.3 Fire-resistance rating. Atrium enclosures shall have a fire-resistance rating of not less than 1 hour.

> **Exceptions:**
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> 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 designed so that the entire surface of the glass is wet upon activation of the sprinkler system without obstruction. The glass shall be installed in 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 ¾-hour fire protection rating.

713.8.3.4 Openings. Openings in atrium enclosures shall be protected with opening protective assemblies in accordance with Section 713.5.2.2 for fire barriers.

> **Exception:** Fire window assemblies permitted in atrium enclosure walls shall not be limited to a maximum aggregate width of 25 percent of length of the wall.

713.8.3.5 Escalators. An 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 that 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 with NFPA 13. 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 penetrated floor. The shutters shall be of noncombustible construction and have a fire-resistance rating of not less than 1 1/2 hours. The shutter shall be so constructed as to close immediately upon the actuation of a smoke detector installed in accordance with Section 907.11 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.

713.8.3.6 Unlimited height in stories. An atrium is permitted to be of unlimited height in stories based on the building type of construction when complying with the provisions of this section.

713.8.3.6.1 Automatic sprinkler 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 barriers constructed in accordance with Section 708 or horizontal barriers constructed in accordance with Section 711, 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.

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

713.8.3.6.3 Standby power. Equipment required to provide smoke control shall be connected to a standby power system in accordance with Section 909.11.

713.8.3.6.4 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.

713.8.3.6.5 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 means of egress travel distance within the atrium space shall not exceed 200 feet (60 960 mm).

Part 3: Revise as follows:

702.1 Definitions. (Definitions not shown to remain unchanged.)

OPENING. A breach in a building assembly that is necessary for utility, egress or architectural purposes.

BUILDING ASSEMBLY. An element of building construction as indicated in Table 601. Building assemblies are comprised of one or more construction components.

~~**BUILDING ELEMENT.** A fundamental component of building construction, listed in Table 601, which may or may not be of fire-resistance-rated construction and is constructed of materials based on the building type of construction.~~

FIRE-RESISTANCE RATING. The period of time that a building ~~element, component or~~ assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.

HORIZONTAL ASSEMBLY. A fire-resistance-rated floor or roof building assembly based on building type of construction requirements and which is designed to perform a given structural function ~~of materials designed to restrict the spread of fire in which continuity is maintained~~.

HORIZONTAL BARRIER. A fire-resistance-rated floor building assembly wherein openings are protected and which is designed to maintain the ability to confine a fire and to perform a given structural function.

SHAFT ENCLOSURE. An enclosure for an opening that serves utility purposes such as, accommodating electrical, mechanical. plumbing equipment and elevator hoistways ~~The walls or construction forming the boundaries of a shaft.~~

EXIT ENCLOSURE. An enclosure for an opening that serves means of egress or human movement purposes such as stairways and ramps. An exit component that is separated from other interior spaces of a building or structure by fire-resistance rated construction and opening protectives, and provides for a protected path of egress travel in a vertical or horizontal direction to the exit discharge or the public way.

~~**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.~~

ATRIUM ENCLOSURE. An enclosure for an opening that serves functional or aesthetic purposes such as atria, escalators and air transfer openings.

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

FIRESTOP. A material, device or construction installed to maintain the fire-resistance rating required for a building assembly.

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

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

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

FIRE AREA. The aggregate floor area enclosed and bounded by fire walls, fire barriers, horizontal barriers or exterior walls ~~or fire-resistance-rated horizontal assemblies~~ of a building.

FIRE ZONE. A fire-resistance rated or nonfire-resistance rated envelope of building construction intended to restrict the spread of fire or flame, and in which, continuity is maintained.

OPENING PROTECTIVE ASSEMBLY. A listed device installed in a building assembly that is designed to confine a fire or to resist the spread of fire for a prescribed period of time. Opening protective assemblies include fire door assemblies, fire window assemblies, fire dampers, ceiling dampers, smoke dampers, through-penetration fire stops and fire-resistant joint systems.

Part 4: Revise as follows:

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ~~ELEMENTS~~ ASSEMBLIES BASED ON TYPE OF CONSTRUCTION

BUILDING ~~ELEMENT~~ ASSEMBLY (Remainder of table to remain unchanged)

Part 5: Revise as follows:

705.8 Openings. Each opening through a fire wall shall be protected in accordance with Section ~~715.4~~ 713.5.2.2 and shall not exceed 156 square feet (15 m^2). The aggregate width of openings at any floor level shall not exceed 25 percent of the length of the wall.

Exceptions:

1. Openings are not permitted in party walls constructed in accordance with Section 705.1.1.
2. Openings shall not be limited to 156 square feet (15 m^2) where both buildings are equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

Also: Delete the following sections in their entirety.

~~**705.9 Penetrations.**~~
~~**705.10 Joints.**~~
~~**705.11 Ducts and air transfer openings.**~~

Part 6: Revise as follows:

706.7 Openings. Openings in a fire barrier shall be protected in accordance with Section ~~715~~ 713.5.2.2.

Fire door assembly and fire window assembly openings in a fire barrier shall be protected in accordance with Section ~~715~~ 713.5.2.2. Openings shall be limited to a maximum aggregate width of 25 percent of the length of the wall, and the maximum area of any single opening shall not exceed 156 square feet (15 m2). ~~Openings in exit enclosures and exit passageways shall also comply with Sections 1020.1.1 and 1021.4, respectively.~~

Exceptions:

1. Openings shall not be limited to 156 square feet (15 m2) where adjoining floor areas are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Openings shall not be limited to 156 square feet (15 m2) or an aggregate width of 25 percent of the length of the wall where the opening protective is a fire door serving an exit enclosure.
3. Openings shall not be limited to 156 square feet (15 m2) or an aggregate width of 25 percent of the length of the wall where the opening protective assembly has been tested in accordance with ASTM E 119 or UL 263 and has a minimum fire-resistance rating not less than the fire-resistance rating of the wall.
4. Fire window assemblies permitted in atrium separation walls shall not be limited to a maximum aggregate width of 25 percent of length of the wall.

A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a fire barrier that serves as a horizontal exit.

Also: Delete the following sections in their entirety.

~~**706.7 Penetrations.**~~
~~**706.8 Joints.**~~
~~**708.9 Ducts and air transfer openings.**~~

Part 7: Revise as follows:

708.6 Openings. Openings in a fire partition shall be protected in accordance with Section ~~715~~ 713.5.2.2.

Also: Delete the following sections in their entirety.

~~**708.7 Penetrations.**~~
~~**708.8 Joints.**~~

~~**708.9 Ducts and air transfer openings.**~~

Part 8: Revise as follows:

711.3 Fire-resistance rating. Horizontal assemblies shall have a ~~The~~ fire-resistance rating ~~of floor and roof assemblies shall~~ not be less than that required by Table 601 based on the building type of construction. ~~Where the floor assembly separates mixed occupancies, the assembly shall have a fire-resistance rating of not less than that required by Section 508.3.3 based on the occupancies being separated. Where the floor assembly separates a single occupancy into different fire areas, the assembly shall have a fire-resistance rating of not less than that required by Section 706.3.9. Horizontal assemblies separating dwelling units in the same building and horizontal assemblies separating sleeping units in the same building shall be a minimum of 1-hour fire-resistance-rated construction.~~

~~**Exception:** Dwelling unit and sleeping unit separations in buildings of Types IIB, IIIB, and VB construction shall have fire-resistance ratings of not less than 1/2 hour in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.~~

711.4 ~~Continuity~~ Openings. Openings in horizontal assemblies shall be protected in accordance with Section 713.3.2. ~~Assemblies shall be continuous without openings, penetrations or joints except as permitted by this section and Sections 707.2, 712.4, 713 and 1020.1.~~ Skylights and other penetrations through a fire-resistance-rated roof deck or slab are permitted to be unprotected, provided that the structural integrity of the fire-resistance-rated roof construction is maintained. Unprotected skylights shall not be permitted in roof construction required to be fire-resistance rated in accordance with Section 704.10. The supporting construction shall be protected to afford the required fire-resistance rating of the horizontal assembly supported.

Exception: In buildings of Type IIB, IIIB or VB construction, the construction supporting the horizontal assembly is not required to be fire-resistance-rated at the following:

1. Horizontal assemblies at the separations of incidental uses as specified by Table 508.2, provided the required fire-resistance rating does not exceed 1-hour.
2. Horizontal assemblies at the separations of dwelling units and sleeping units as required by Section 419.3.
3. Horizontal assemblies at smoke barriers constructed in accordance with Section 910.

Also: Delete the following sections in their entirety.

~~**711.5 Penetrations.**~~
~~**711.6 Joints.**~~
~~**711.7 Ducts and air transfer openings**~~
~~**711.8 Floor fire door assemblies.**~~

Part 9: Add new text as follows:

SECTION 711
HORIZONTAL BARRIERS

711.1 General. Where required by other provisions of this code, horizontal barriers shall comply with this section.

711.2 Materials. Horizontal barriers shall be constructed of materials consistent with those permitted for the type of construction of the building in accordance with Section 602.2-5.

711.3 Fire-resistance rating. Horizontal barriers shall have a fire-resistance rating not less than that required by Table 601 based on the building type of construction and as required elsewhere in this code. Construction supporting a horizontal barrier shall be protected so as to provide the required fire-resistance rating of such horizontal barrier.

Horizontal barriers separating dwelling units in the same building and horizontal barriers separating sleeping units in the same building shall be a minimum of 1-hour fire-resistance-rated construction.

Exception: Dwelling unit and sleeping unit separations in buildings of Types IIB, IIIB, and VB construction shall have fire-resistance ratings of not less than 1/2 hour in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

711.4 Openings. Openings in horizontal barriers shall be protected in accordance with Section 713.3.3.

Part 10: Delete and substitute as follows:

SECTION 1020
EXIT ENCLOSURES

1020.1 General. Exit enclosures serving as a means of egress component in a means of egress system shall comply with the provisions of this section. An exit enclosure shall not be used for any purpose other than means of egress. An exit enclosure shall discharge directly to the exterior of a building or into an exit passageway that discharges directly to the exterior of the building.

> **Exception:** An exit enclosure shall be permitted to egress through areas on the level of discharge or vestibules as permitted by Section 1024.

1020.2 Construction. Exit enclosures shall be constructed in accordance with Section 713.8.2.

1020.3 Discharge 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.

1020.4 Story level identification 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 exit enclosure and the identification of the stair or ramp. The signage shall also state the story of, and the direction to the exit discharge and the availability of roof access from the enclosure 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 doors are in the open and closed positions. Story level identification signs in tactile characters complying with ICC A117.1, shall be located at each story level landing adjacent to the door leading from the enclosure into the corridor to identify the floor level.

1020.4.1 Signage requirements. Story level identification signs shall comply with all of the following requirements:

1. The signs shall be a minimum size of 18 inches (457 mm) by 12 inches (305 mm).
2. The letters designating the identification of the stair enclosure shall be a minimum of 1 1/2 inches (38 mm) in height.
3. The number designating the floor level shall be a minimum of 5 inches (127 mm) in height and located in the center of the sign.
4. All other lettering and numbers shall be a minimum of 1 inch (22 mm) in height.
5. Characters and their background shall have a nonglare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.

1020.5 Smokeproof enclosures. In buildings required to comply with Section 403 or 405, each of the exit enclosures 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.

1020.5.1 Enclosure access. Access to the stairway within a smokeproof enclosure shall be by way of a vestibule or an open exterior egress balcony.

> **Exception:** Pressurized stairways complying with the provisions of Section 909.20.5.

Part 11: Revise as follows:

1021.4 Openings ~~and penetrations~~. ~~Exit passageway opening protectives shall be in accordance with the requirements of Section 715.~~ Except as permitted in Section 402.4.6, openings in exit passageways other than unexposed exterior openings shall be imited to those necessary for exit access to the exit passageway form normally occupied spaces and for egress from the exit passageway.

~~1021.5 Penetrations.~~ ~~Penetrations into and~~ Openings <u>into or</u> through an exit passageway are prohibited except for required exit doors, equipment and ductwork necessary for independent pressurization, sprinkler piping, standpipes, electrical raceway<u>s</u>

for fire department communication and electrical raceways serving the exit passageway and terminating at a steel box not exceeding 16 square inches (0.010 m^2). Such ~~penetrations~~ openings shall be protected in accordance with Section ~~712~~ 713.6. There shall be no ~~penetrations or~~ intercommunicating openings, whether protected or not, between adjacent exit passageways.

Where interior exit enclosures are extended to the exterior of a building by an exit passageway, the door assembly from the exit enclosure to the exit passageway shall be protected by a ~~fire door~~ smoke and draft control assembly conforming to the requirements ~~in~~ of Section ~~715.4~~ 713.6.1. Fire door assemblies in exit passageways shall comply with Section 715.4.4.

Elevators shall not open into an exit passageway.

Part 12: Revise as follows:

1022.3 Openings ~~protectives.~~ Fire doors in horizontal exits shall be self-closing or automatic-closing when activated by a smoke detector in accordance with Section ~~715.4.7.3~~ 713.6.1.5.1. Doors, where located in a cross-corridor condition, shall be automatic-closing by activation of a smoke detector installed in accordance with Section ~~715.4.7.3~~ 713.6.1.5.1.

Reason: Please do not be intimidated by the length of this proposal. It represents a broad based initiative to improve the *International Building Code* in a very important area: the protection of openings intended to restrict the vertical movement of fire. Prior to technical discussions, I would like to provide a brief history as regards this proposal. Late last year, The Boeing Company approached the ICC Code Technology Committee and shared a concern about how opening and penetration requirements for horizontal assemblies were inconsistent and difficult for users to properly determine. To illustrate the point, it was noted that Section 713.1 would require that joints installed in a fire-resistance rated floor/ceiling assembly be protected with an approved fire-resistant joint system, while Section 1020.1 would permit an open convenience stairway within the same floor/ceiling assembly. It was suggested that there needs to be a vertical migration strategy and that technical requirements should support that strategy in concert as opposed to being a collection of abstract requirements that perhaps achieves no practical end. The CTC agreed with the concern and appointed a Vertical Openings Study Group to research the matter. The Study Group was constituted of diverse members from the public and private sectors. The Study Group met only twice; however, produced a "clean sheet" discussion draft that completely overhauled many Chapter 7 definitions and technical provisions. It also developed a fire and flame migration strategy that included a compartmentation concept. Current opening protective technical requirements were examined and reorganized in an effort to be more understandable by designers and code enforcement officials alike. A consistent format was created throughout the document to enhance user friendliness. Although a considerable amount of quality work had been accomplished in a relatively short period of time, the Study Group members could not achieve accord on acceptable migration limits. Some Study Group members felt that in light of arguably liberal allowable areas—especially in sprinklered buildings—that more conservative and complete compartmentation was necessary to compensate for current allowable areas. The Study Group decided to slow down and validate the strategy assumptions based on current exceptions to opening protection requirements. Unfortunately, this detailed study would sufficiently delay the project to where it would not be completed prior to the 2007/2008 code development submittal deadline.

Meanwhile, another CTC Study Group (BFP Features) was investigating the subject of allowable heights and areas. That group had met on numerous occasions and appeared to be mired in a comparison of the current IBC allowable heights and areas to those permitted in the legacy or former model codes. At a recent Features meeting in Chicago (August 1-3, 2007), that Study Group decided to take a "clean sheet" approach to the issue and developed a fire flow driven allowable area determination procedure based on a compartmentation concept. There were two primary premises with their approach. First, have low fire flow and allowable area thresholds to as to encourage the installation of an automatic sprinkler system early in design development. Secondly, create some necessary passive redundancy to the active fire protection features by establishing a number of relatively small fire compartments—especially in the so-called "lesser types of construction." By way of example, current IBC provisions would allow for up to approximately 174,000 square feet of gross Group F-1 area in a sprinklered building of Type IIB construction. Given the lack of inherent fire-resistance rated construction, the only compartmentation is achieved by way of fragmented vertical openings provisions. In comparison, the Type IIB, sprinklered, Group F-1 maximum compartment size would be approximately 32,000 square feet according to the progressive Features' approach. A major difference from current allowable area determination methods is that the "fire compartment" is an amorphous space that can include any number of stories as may be permitted based on the occupancy classification and type of construction under consideration. Under this system, the story-by-story determination of total allowable building area is a thing of the past. During the Features Study Group discussion it was emphasized that there were three volumetric entities: Buildings, fire compartments and fire zones. Buildings define the total allowable area. Fire compartments are generally limited as to individual area. Fire zones are subcompartments within fire compartments and serve to define the vertical migration limits within a given fire compartment. On numerous occasions, the Features Study Group referenced the Vertical Openings Study Group's thinking as completely compatible with their evolving concept and did not attempt to influence the Vertical Openings

Group in any way. The BFP Features Study Group intends to submit their progressive allowable area proposal in this code development cycle. Given the close philosophical and technical relationship between the Features' proposal and the Vertical Openings discussion draft, it is imperative that the draft be submitted during the same code development cycle. It is somewhat likely that some of the reservations expressed by the Vertical Openings Study Group members concerning the proposed migration limits might be lessened given the Features group's fairly conservative approach to allowable area determination. It should be noted that although the two proposals would greatly complement each other, they are mutually exclusive can individually stand on their own merit.

As previously mentioned, this proposal is a "clean sheet" document intended to fairly completely overhaul IBC opening protection provisions. There are three major features to the proposal. First, it directly states a fire and flame migration strategy in its Table 713.2. Secondly, it provides a logical format to organize applicable technical provisions that will enhance usability by code practitioners. Lastly, specific technical requirements were reviewed for applicability and compatibility with the migration strategy and each other.

As regards the stated fire and flame migration strategy, this proposal takes a different tack than current IBC. Presently, the fundamental IBC premise with respect to the protection of openings in floor/ceiling assemblies—be they fire-resistance rated or nonfire-resistance rated—is that no unprotected openings are permitted. The reality is, however, that there are numerous exceptions that permit unprotected openings in floor/ceiling assemblies based on any one of a number of variables. The point being that these exceptions, become the rule and collectively define an implied vertical migration strategy. This proposal provides for an incremental migration strategy based on the collective intent of the multitude of current exceptions. The stated strategy is that for other than Group H and I occupancies, a two-story migration of fire and flame is acceptable. Current Sections 707.2, Exception 7 and 1020.1, Exceptions 1, 8 and 9, among others, serve as the precedent for this approach. It should be noted that the basic fire zone philosophy is that fire zone boundaries (both vertical and horizontal) have complete protection of openings. Within fire zones, the only protection of openings required for floor/ceiling assemblies would be those necessary to maintain the fire resistive integrity of a rated horizontal assembly. The lack of coordination between current opening protective requirements results in a "Swiss cheese" migration strategy. This proposal promotes an "all or nothing" philosophy that provides for a logical, predicable and dependable migration boundary.

It must also be understood that fire zones intended to restrict the upward movement of fire or flame, can occur in buildings of both rated and nonrated construction types. While the fire compartment provides for a fire-resistance rated boundary, regardless of the type of construction, fire zones within fire compartments are constructed with building assemblies that are consistent with the building type of construction. As previously mentioned, the fire zone achieves its integrity through the protection of openings consistent with the inherent fire-resistance rating requirements for the building floor/ceiling assemblies. In fire-resistance rated construction, fire zone horizontal boundaries are protected by rated enclosures and/or listed opening protective assemblies. Within a fire zone in a rated building, no enclosures would be required and the only openings required to be protected would be those necessary to maintain the fire resistive integrity of the horizontal assembly itself. In buildings of nonrated construction, the fire zone horizontal boundaries would continue to be nonfire-resistance rated; however, openings would be required to be protected by rated enclosures and/or generic flamestopping methods. Within a fire zone in a nonrated building, there are no opening protection requirements.

The two-story migration limit is extended to three stories where the building is equipped throughout with an automatic sprinkler system. Numerous sprinkler progressions and current Section 707.2, Exception 2 serve as a precedent for this provision. It should be noted that although no inherent opening protection is required for the two floor/ceiling assemblies within a three story envelope—to include exit enclosures—each fire zone having a level more than two stories above grade plane is required to have at least one exit enclosure leading to the exterior of the building or all points of the fire zone have to be within 300 feet of an exit enclosure for fire department access and staging purposes. An exit enclosure is a unique building feature. It can actually serve three distinct purposes: One, it can serve to isolate one story from another for fire migration purposes. Hence, the term, "stair shaft." Two, it can serve as an exit component which provides for a protected, and potentially unlimited length path of travel. Three, an exit enclosure can serve as a protected area for fire department access and operations. During the first Vertical Openings Study Group meeting, it was decided that all openings and penetrations should be treated equally because, "a hole in the floor is a hole in the floor." Therefore, for fire migration purposes, an exit enclosure (as well as a shaft or atrium enclosure) would be required only at fire zone boundaries. From a means of egress perspective, an exit enclosure is an exit component similar to an exit passageway or horizontal exit. That is, they are incorporated into the building design as necessary to satisfy one or more means of egress design requirements—more than likely, travel distance limitations. Since a number of intercommunicating floors are unacceptable from a fire fighting perspective, an exit enclosure is mandated for fire zones above the second story.

Other than Group H or I occupancies are permitted to have four intercommunicating floor levels provided the building is

provided with a sprinkler system and the fire zone is protected by a mechanical smoke control system. Section 404 atrium provisions serve as the precedent for this migration limit.

As previously suggested, the fire and flame migration limits established in this proposal are founded on current migration provisions and are positively stated in a single table and represent a logical progression of passive and active building fire protection features.

Once a migration strategy was developed, an editorial format was created to organize various technical provisions so as to support the adopted philosophy. Given the "hole is a hole—opening is an opening" methodology, it was determined that a single section (Section 713) would contain all opening protection provisions. Accordingly, Sections 404 and 707 have been deleted in their entirety and applicable provisions incorporated in context into proposed Section 713. Exit enclosure construction requirements have been relocated from Section 1020 to Section 713. All enclosure protection requirements have been consolidated in a single location. It is interesting to note that of the 22 exceptions formerly contained in Sections 707 and 1020, 21 were eliminated due to the formal establishment of migration limits as prescribed in proposed Table 713.2.

Also, a number of key definitions were created or modified to support this system. Perhaps the most important is that the term "opening" is defined for the first time. It simply states that any breach for virtually any purpose is treated as an opening. Where the current IBC differentiates between openings and penetrations, the proposed section does not (a hole is an opening). The fundamental premise is that where openings are required to be protected, they will be either enclosed by physical construction or protected by an opening protective assembly in rated construction or enclosed or flamestopped (another new definition) in nonrated construction.

With respect to opening protective assemblies, only seven are recognized as those seven are the only formally tested protectives. They are: fire door assemblies, fire window assemblies, fire dampers, ceiling dampers, smoke dampers, through-penetration fire stops and fire-resistant joint systems. Accordingly, opening protection goes to remedy. If the "hole" in a fire zone boundary can be mitigated by a listed opening protective assembly, migration requirements are satisfied. If not, the "hole" needs to be enclosed in accordance with Section 713.8. Additionally, each of the opening protective assembly sections has been subdivided with a consistent format: fire protection rating, testing, labeling and installation. All applicable technical requirements have been properly located within this editorial structure. This typical format allows for the objective comparison of various opening protective assembly requirements.

Another new definition worth noting is, "horizontal barrier." Currently, there are a number of vertical assemblies intended to address various structural or confinement requirements. On the horizontal plane, the "horizontal assembly" is presently the only fire-resistance rated assembly of choice. The proposed horizontal barrier is comparable to the fire barrier with openings required to be protected while the horizontal assembly is more based on type of construction requirements than fire confinement concerns. The two types of fire-resistance rated horizontal construction simplify opening protection requirement determination.

Specific technical requirements for the various enclosure and opening protective assembly options are very similar to current provisions. To account for all detailed technical provisions would take a number of pages. If one is concerned with a specific provision, it is suggested that it be copied from the current code and then entered as a search or find function in the proposed text. With this "clean sheet" document, there are countless changes made for the sake of editorial and technical continuity and user accommodation. It would be virtually impossible to address each and every change. The major points have been addressed. Hopefully, the more subtle details will appeal to common sense.

In summary, it is recognized that this is a very lengthy and comprehensive proposal submitted in a process that lends itself to incremental improvement. If the *International Building Code* is to be significantly and functionally improved, it is necessary to be more ambitious in the scrutiny of major subject areas. This proposal is the result of input by a number of nationally recognized code experts, although those individuals do not necessarily endorse this proposal at this time. Almost all concerned recognize that the current opening protective requirements are technically inconsistent and, in total, probably support no rational fire migration strategy. Opening protective technical requirements are presently difficult to determine and result in varying interpretations and applications. Similar to current code provisions, this proposal is certainly an imperfect document; however, it represents a significant improvement over those current code provisions and will serve as a foundation for subsequent revisions that will necessarily be in context. This proposal in combination with the BFP Features Study Group's similarly progressive allowable area determination proposal will significantly improve the schematic provisions of the International Building Code. Please view these proposals objectively and offer constructive vs. destructive criticism. The implementation of these concepts will greatly improve the effectiveness and usability of the IBC.