

# Comparison of the life safety elements of the 1997 UBC and the IBC 2000.

## Introduction

The Building Performance Research Institute's mission is primarily one of education on building safety and performance. This comparison of life safety elements of the UBC and IBC has been produced to let states and local jurisdictions see the differences between the building types and sizes permitted and some of the fire safety measures contained in each code.

It is difficult to justify adopting a lower level of safety in a community. In order to warrant changing a state's building codes, the adopting body must, at minimum, conclude that the old and new codes will provide equivalent levels of protection. The differences presented herein must be weighed as a UBC state considers adoption of a new building code.

The Building Performance Research Institute is not an advocate of any particular building code. However, we do advocate comparing the existing level of safety with that of any proposed new requirement for construction.

## Specific Areas of Concern

- The UBC uses automatic fire sprinklers in conjunction with passive interior fire protection systems such as walls and doors. The IBC supports the use of sprinklers by eliminating most interior passive fire protection systems.
- The IBC permits significantly larger buildings than are currently allowed under the UBC.
- The IBC permits occupancies in building types that are prohibited by the UBC.
- The IBC permits sprinklers to increase both the height and area of a building. This is prohibited by the UBC.
- The IBC permits sprinklers to reduce interior protection in areas where sprinkler tradeoffs are specifically prohibited by the UBC:
  1. Occupancy separations
  2. Exterior wall protection due to proximity of property lines
  3. Dwelling unit separations
  4. Shaft enclosures
  5. Corridors
  6. Stair enclosures
  7. Exit passageways
  8. Boiler, central heating plant or hot-water supply boiler room enclosures
- The IBC eliminates smoke evacuation systems in high-rise buildings.

- The IBC eliminates smoke control in most buildings regardless of height.

## Performance Record

The NFPA has compiled national fire loss data for the Smoke Safety Council, which analyzed the data and provided the following results:

<b>Building Performance against Fire</b> (per million people)			
	<b>West UBC</b>	<b>National Average</b>	<b>Northeast BOCA</b>
<b>Civilian Deaths</b>	0.4	2.8	4.5
<b>Civilian Injuries</b>	8.5	22.1	34.9
<b>Property Damage</b>	\$1.9	\$4.4	\$6.5

Results are for multi-story buildings taller than 2 stories, other than 1 & 2 family dwellings. The data was compiled for years 1988 - 1997.

The Uniform Building Code is the top-performing code in the country. Since 1927 the Uniform Building Code, used extensively throughout the Western United States, has evolved a conservative approach to public safety, property protection, and fire fighters' safety within the constructed environment.

There are many factors that could influence these numbers: age of building, demographics, etc. However, it is evident that, for whatever reason, the west has a significantly better performance record against the effects of fire than the northeast.

## Height and Area

We've compared the height and areas allowed in both the 1997 Edition of the Uniform Building Code (UBC) and the 2000 Edition of the International Building Code (IBC). The IBC permits larger base allowable areas for every occupancy group and construction type. The IBC also permits taller buildings in almost every category.

<b>Allowable Height and Area</b> Maximum Base Area				
	<b>Height (Floors)</b>		<b>Area (Square Feet)</b>	
	UBC	IBC	UBC	IBC
<b>A3</b>				
Type II 1-hour	2	3	13,500	15,500
Type II non-rated	1	2	9,100	9,500
Type III 1-hour	2	3	13,500	14,000
Type III non-rated	1	2	9,100	9,500
Type IV	2	3	13,500	15,000
Type V 1-hour	2	2	10,500	11,500
Type V non-rated	1	1	6,000	6,000

<b>B</b>				
Type II 1-hour	4	5	18,000	37,500
Type II non-rated	2	4	12,000	23,000
Type III 1-hour	4	5	18,000	28,500
Type III non-rated	2	4	12,000	19,000
Type IV	4	5	18,000	36,000
Type V 1-hour	3	3	14,000	18,000
Type V non-rated	2	2	8,000	9,000
<b>E</b>				
Type II 1-hour	2	3	20,200	26,500
Type II non-rated	1	2	13,500	14,500
Type III 1-hour	2	3	20,200	23,500
Type III non-rated	1	2	13,500	14,500
Type IV	2	3	20,200	25,500
Type V 1-hour	2	1	15,700	18,500
Type V non-rated	1	1	9,100	9,500
<b>I.1 (Note: IBC I.1 = UBC I.2)</b>				
Type II 1-hour	2	4	6,800	19,000
Type II non-rated	NP	3	NP	10,000
Type III 1-hour	2	4	6,800	16,500
Type III non-rated	NP	3	NP	10,000
Type IV	2	4	6,800	18,000
Type V 1-hour	2	3	5,200	10,500
Type V non-rated	NP	2	NP	4,500
<b>I.2 (Note: IBC I.2 = UBC I.1)</b>				
Type II 1-hour	1	2	6,800	15,000
Type II non-rated	NP	1	NP	11,000
Type III 1-hour	1	1	6,800	12,000
Type III non-rated	NP	NP	NP	NP
Type IV	1	1	6,800	12,000
Type V 1-hour	1	1	5,200	9,500
Type V non-rated	NP	NP	NP	NP
<b>R.1</b>				

Type II 1-hour	4	4	13,500	24,000
Type II non-rated	2	4	9,100	16,000
Type III 1-hour	4	4	13,500	24,000
Type III non-rated	2	4	9,100	16,000
Type IV	4	4	13,500	20,500
Type V 1-hour	3	4	10,500	12,000
Type V non-rated	2	3	6,000	7,000

Table compares occupancy types that are common to both the UBC and the IBC.

## Area Increases for non-sprinklered buildings

These allowable height/area differences are dramatic when the allowable increases are applied for multi-story buildings.

The UBC allows the area in the table to be doubled for multi-story buildings (UBC Section 504.2). The IBC (Section 503.3) allows the area in the table for every floor in a multi-story building up to a total of three floors to be doubled.

The use of automatic sprinklers again doubles the allowable area in both UBC and IBC. However, the IBC allows an additional floor to be added prior to doubling the allowable area.

These allowable heights and areas have a direct effect on firefighters and their primary mission, saving lives.

### Example 1.

*Maximum size of a multi-story non-sprinklered B occupancy in a Type III non-rated building with only one separated yard.*

The UBC permits a 24,000-sf building two stories in height. The IBC permits a 57,000-sf building four stories in height. To calculate the occupant load of these buildings, divide the area by 100 sf per occupant (UBC Table 10-A line 23). The UBC building is allowed 240 occupants, while the same building built under the IBC is allowed 570 occupants. 330 more people.

### Example 2.

*Maximum size of a multi-story non-sprinklered I.2 occupancy under the UBC for ambulatory patient nursing homes and homes for children over the age of 6 (equivalent to an I.1 occupancy under the IBC). An occupancy of this type in a Type III one-hour rated building with only one separated yard.*

The UBC permits a 17,600-sf building two stories in height. The IBC permits a 49,500-sf building four stories in height. To calculate the occupant load of these buildings, divide the area by 80 sf per occupant (UBC Table 10-A line 6). The UBC building is allowed 220 occupants while the same building built under the IBC is allowed 619 occupants. Almost triple.

## Non-Sprinklered Buildings

Maximum Area of a Non-Sprinklered Multi-Story Building (square feet)			
	UBC	IBC	Increase from UBC
<b>A.3</b>			
Type II 1-hour	27,000	46,500	72%
Type II non-rated	9,100	19,000	109%
Type III 1-hour	27,000	42,000	56%
Type III non-rated	9,100	19,000	109%
Type IV	27,000	45,000	67%
Type V 1-hour	21,000	23,000	10%
Type V non-rated	6,000	6,000	no change
<b>B</b>			
Type II 1-hour	36,000	112,500	213%
Type II non-rated	24,000	69,000	188%
Type III 1-hour	36,000	85,500	138%
Type III non-rated	24,000	57,000	138%
Type IV	36,000	108,000	200%
Type V 1-hour	28,000	54,000	93%
Type V non-rated	16,000	18,000	13%
<b>E</b>			
Type II 1-hour	40,400	79,500	97%
Type II non-rated	13,500	29,000	115%
Type III 1-hour	40,400	70,500	75%
Type III non-rated	13,500	29,000	115%
Type IV	40,400	76,500	89%
Type V 1-hour	31,400	18,500	-41%
Type V non-rated	9,100	9,500	4%
<b>I.1 (Note: IBC I.1 = UBC I.2)</b>			
Type II 1-hour	13,600	57,000	319%
Type II non-rated	NP	30,000	X
Type III 1-hour	13,600	49,500	264%
Type III non-rated	NP	30,000	X
Type IV	13,600	54,000	297%
Type V 1-hour	10,400	31,500	203%
Type V non-rated	NP	4,500	X

<b>I.2</b> (Note: IBC I.2 = UBC I.1)			
Type II 1-hour	6,800	30,000	341%
Type II non-rated	NP	11,000	X
Type III 1-hour	6,800	12,000	76%
Type III non-rated	NP	NP	X
Type IV	6,800	12,000	76%
Type V 1-hour	5,200	9,500	83%
Type V non-rated	NP	NP	X
<b>R.1</b>			
Type II 1-hour	27,000	72,000	167%
Type II non-rated	18,200	48,000	164%
Type III 1-hour	27,000	72,000	167%
Type III non-rated	18,200	48,000	164%
Type IV	27,000	61,500	128%
Type V 1-hour	21,000	36,000	71%
Type V non-rated	12,000	21,000	75%
Table compares occupancy types that are common to both the UBC and the IBC.			

## Increases for Sprinklered Buildings

While both codes allow size increases for sprinklers, the UBC only allows an increase in either the height or the area, not both.

This is not the case in the IBC. Under these new regulations, sprinklers permit a simultaneous increase in the height and in the area.

As a comparison of allowable height increases, refer to both UBC Section 506 and IBC Section 504. The UBC permits one additional floor to be added only if the automatic sprinkler system is not also used to increase the area of the building, or as a substitute for one-hour fire-resistive construction. The additional floor allowance is also not permitted in atria, many H occupancies, and Group I, Divisions I.1 and I.2

The IBC, on the other hand, permits all buildings to be increased in height by one floor of up to 20 feet if they are sprinklered in addition to the area increase with the exception of I-2's in particular types of construction and most H occupancies.

The IBC also permits significant reductions in fire resistive construction when sprinklers are used (see next section).

**Example 1.** from above with sprinklers

*Maximum size of a multi-story sprinklered B occupancy in a Type III non-rated building with only one separated yard.*

The UBC permits a 48,000 sf building two stories in height or a total of 480 occupants. The IBC permits a 114,000 sf building 5 stories in height or a total of 1,140 occupants. 660 more people.

**Example 2.** from above with sprinklers

*Maximum size of a multi-story sprinklered UBC I.2 occupancy (IBC I.1 occupancy equivalent) in a Type III one-hour rated building with only one separated yard.*

The UBC permits a 27,200 sf building two stories in height with a total occupant load of 340. The IBC permits a 99,000 sf building 5 stories in height with a total occupant load of 1,238. 898 more people.

## UBC Prohibited vs. IBC Permitted

*Note that certain occupancy groups that are prohibited by the UBC in buildings of a specified construction type are permitted under the IBC.*

UBC I.2 occupancies are not permitted in Type II non-rated construction. The IBC permits I.1 (equivalent occupancy group) up to three stories of 30,000 sf in a non-sprinklered building or a four-story 60,000-sf building with sprinklers.

UBC I.2 occupancies are not permitted in Type III non-rated construction. The IBC permits I.1 (equivalent occupancy group) up to three stories of 30,000 sf in a non-sprinklered building, or a four-story 60,000-sf building with sprinklers.

UBC I.2 occupancies are not permitted in Type V non-rated construction. The IBC permits I.1 (equivalent occupancy group) up to two stories of 4,500 sf in a non-sprinklered building, or a three-story 27,000-sf building with sprinklers.

UBC I.1 occupancies are not permitted in Type II non-rated construction. The IBC permits I.2 (equivalent occupancy group) up to one story of 11,000 sf in a non-sprinklered building, or a two-story 44,000-sf building with sprinklers.

## Separate Buildings

UBC 504.6.1 permits area separation walls to create separate buildings. These walls are 4-hour rated in Types I, II-FR, III and IV buildings. Walls in Types II are 1-hour; II-N, and V buildings may be 2-hour.

IBC 503.1 also permits firewalls to create separate buildings. These walls are 3-hour rated in Occupancy Groups A, E, B, F-1, H-3, H-4, H-5, I, M, R-1, R-2, S-1, and U.

<b>Sprinklered Buildings</b>			
Maximum Area of a Sprinklered Multi-Story Building (square feet)			
	<b>UBC</b>	<b>IBC</b>	<b>Increase from UBC</b>
<b>A.3</b>			

Type II 1-hour	54,000	93,000	72%
Type II non-rated	18,200	57,000	213%
Type III 1-hour	54,000	84,000	56%
Type III non-rated	18,200	57,000	213%
Type IV	54,000	90,000	67%
Type V 1-hour	42,000	69,000	64%
Type V non-rated	12,000	24,000	100%

**B**

Type II 1-hour	72,000	225,000	213%
Type II non-rated	48,000	138,000	188%
Type III 1-hour	72,000	171,000	138%
Type III non-rated	48,000	114,000	138%
Type IV	72,000	216,000	200%
Type V 1-hour	56,000	108,000	93%
Type V non-rated	32,000	54,000	69%

**E**

Type II 1-hour	80,800	159,000	97%
Type II non-rated	27,000	87,000	222%
Type III 1-hour	80,800	141,000	75%
Type III non-rated	27,000	87,000	222%
Type IV	80,800	153,000	89%
Type V 1-hour	62,800	74,000	18%
Type V non-rated	8,200	38,000	109%

**I.1** (Note: IBC I.1 = UBC I.2)

Type II 1-hour	27,200	114,000	319%
Type II non-rated	NP	60,000	X
Type III 1-hour	27,200	99,000	264%
Type III non-rated	NP	60,000	X
Type IV	27,200	108,000	297%
Type V 1-hour	20,800	63,000	203%
Type V non-rated	NP	27,000	X

**I.2** (Note: IBC I.2 = UBC I.1)

Type II 1-hour	13,600	90,000	562%
Type II non-rated	NP	44,000	X



Type III 1-hour	27,200	48,000	76%
Type III non-rated	NP	NP	X
Type IV	13,600	48,000	253%
Type V 1-hour	10,400	38,000	263%
Type V non-rated	NP	NP	X
<b>R.1</b>			
Type II 1-hour	54,000	144,000	167%
Type II non-rated	36,400	96,000	164%
Type III 1-hour	54,000	144,000	167%
Type III non-rated	36,400	96,000	164%
Type IV	54,000	123,000	128%
Type V 1-hour	42,000	72,000	71%
Type V non-rated	24,000	42,000	75%
Table compares occupancy types that are common to both the UBC and the IBC.			

<b>Sprinklered Buildings</b>		
Maximum Height of a Multi-Story Building		
	<b>UBC</b>	<b>IBC</b>
<b>A.3</b>		
Type II 1-hour	2	4
Type II non-rated	1	3
Type III 1-hour	2	4
Type III non-rated	1	3
Type IV	2	4
Type V 1-hour	2	3
Type V non-rated	1	2
<b>B</b>		
Type II 1-hour	4	6
Type II non-rated	2	5
Type III 1-hour	4	6
Type III non-rated	2	5
Type IV	4	6
Type V 1-hour	3	4
Type V non-rated	2	3

<b>E</b>		
Type II 1-hour	2	4
Type II non-rated	1	3
Type III 1-hour	2	4
Type III non-rated	1	3
Type IV	2	4
Type V 1-hour	2	2
Type V non-rated	1	2
<b>I.1 (Note: IBC I.1 = UBC I.2)</b>		
Type II 1-hour	2	5
Type II non-rated	NP	4
Type III 1-hour	2	5
Type III non-rated	NP	4
Type IV	2	5
Type V 1-hour	2	4
Type V non-rated	NP	3
<b>I.2 (Note: IBC I.2 = UBC I.1)</b>		
Type II 1-hour	1	3
Type II non-rated	NP	2
Type III 1-hour	1	2
Type III non-rated	NP	NP
Type IV	1	2
Type V 1-hour	1	2
Type V non-rated	NP	NP
<b>R.1</b>		
Type II 1-hour	4	5
Type II non-rated	2	5
Type III 1-hour	4	5
Type III non-rated	2	5
Type IV	4	5
Type V 1-hour	3	5
Type V non-rated	2	4
Table compares occupancy types that are common to both the UBC and the IBC.		

## **Sprinklers used with Fire Resistive Construction**

The International Building Code (IBC) and the 1997 Edition of the Uniform Building Code (UBC) have a vastly different approach to fire-rated substitutions permitted with the use of an automatic sprinkler system.

UBC Section 508 allows sprinklers to substitute for the one-hour fire-resistive construction requirements in Type II One-hour, Type III One-hour, and Type V One-hour only when the sprinkler system is not required by another section of the code or when used for either area or height increases.

The IBC permits substitutions in all construction types.

Under the UBC, the following situations must maintain the one-hour fire-resistive construction requirements of the building code even when sprinklers are provided. This is not the case in the IBC.

### **All Occupancies**

Section 904.2.2 Basements and stories in all buildings except Group R, Division 3 and Group U occupancies not provided at least 20 sf of opening entirely above the adjoining ground level in each 50 linear feet of exterior.

### **Group A Occupancies**

Section 904.2.3.1 Drinking establishments greater than 5,000 sf

Section 904.2.3.2 Basements greater than 1,500 sf

Section 904.2.3.3 Exhibition and display rooms greater than 12,000 sf

Section 904.2.3.4 Stairways in Division 2, 2.1, 3, and 4

Section 904.2.3.5 Multitheater complexes

Section 904.2.3.6 Amusement buildings

Section 904.2.3.7 Stages less than 1,000 sf and 50 feet in height where curtains and scenery are not vertically retractable, all dressing rooms, workshops, storerooms, and accessory spaces contiguous to the stage

Section 904.2.3.4 Smoke-protected assembly seating

### **Group E, Division 1 Occupancies**

Section 904.2.4.1 Without an exterior exit door or without a two-hour fire-resistive area separation wall dividing the area into spaces less than 20,000 sf

Section 904.2.4.2 Basements

Section 904.2.4.3 Stairs

### **Group F Occupancies**

Section 904.2.5.1 Woodworking areas over 2,500 sf

#### **Group H Occupancies**

Section 904.2.6.1 All Division 1, 2, 3, 6, and 7 occupancies

Section 904.2.6.2 Division 4 occupancies greater than 3,000 sf

#### **Group I Occupancies**

Section 904.2.7 All Division I.1 and I.2 occupancies, which include all hospitals, nursing homes, nurseries, and health-care facilities.

#### **Group M Occupancies**

Section 904.2.8 Rooms greater than 12,000 sf including mezzanines

#### **Group R, Division 1 Occupancies**

Section 904.2.9 Every apartment house three or more stories in height containing 16 or more dwelling units, every residence three or more stories in height having an occupant greater than 20, and all hotel three or more stories in height containing 20 or more guest rooms.

## **Elimination of Fire Rated Construction in Sprinklered Buildings**

The International Building Code actively supports the use of automatic sprinkler systems. When compared to the 1997 Edition of the Uniform Building Code, however, it is apparent that fire separations have been eliminated in many critical areas.

UBC Section 508 does not allow sprinklers to substitute for or reduce the fire-resistive construction requirements of critical areas.

1. Occupancy separations
2. Exterior wall protection due to proximity of property lines
3. Area separations
4. Dwelling unit separations
5. Shaft enclosures
6. Corridors
7. Stair enclosures
8. Exit passageways
9. Type of construction separation
10. Boiler, central heating plant or hot-water supply boiler room enclosures.

Note that the IBC permits sprinklers to increase both the height and areas of buildings, as well as substitute for fire-resistive construction. This is not allowed in the UBC.

A complete list of sprinkler tradeoffs allowed by the IBC is found on the Smoke Safety Council website: [www.smokesafety.org](http://www.smokesafety.org)

## **IBC Sprinkler Tradeoffs Not Permitted by UBC in 10 Critical Areas**

## 1. Occupancy separations

IBC Section 302.3.3 Separated Uses The fire-resistance rating of the required occupancy separation shall be reduced by 1 hour but not less than 1 hour in Group A, B, E, I.1, I.3, M, R, S, and U occupancies.

IBC Note 2 to Table 302.3.3

Sprinklers delete occupancy separation for incidental storage areas within Use Group B if the area is less than 3,000 square feet

## 2. Exterior wall protection due to proximity of property lines

IBC 704.8.1 Exterior Wall openings

Sprinklers allow the maximum allowable area of unprotected openings to be the same as protected openings in exterior walls in A, B, E, F, H-4, I, M, R, S, and U occupancies

IBC 704.12 Opening Protection

Sprinklers delete protection of all openings in an exterior wall where buildings equipped with sprinklers and water curtains are installed on the exterior.

IBC 2603.4.1.4 Exterior walls, one-story buildings

Sprinklers allow one-story buildings of to contain foam plastic without thermal barriers in or on exterior walls

IBC 2607.45 Light-transmitting plastic wall panels

Sprinklers allow an increase in the maximum percentage area of Class CC1 plastic to be used on an exterior wall from 10% to 20 % with a fire separation distance of between 6 to 11 ft.

Sprinklers allow an increase in the maximum percentage area of Class CC1 plastic to be used on an exterior wall from 25% to 50 % with a fire separation distance of between 11 to 30 ft.

Sprinklers allow an increase in the maximum percentage area of Class CC1 plastic to be used on an exterior wall from 50% to 100 % with a fire separation distance of over 30 ft.

Sprinklers allow an increase in the maximum percentage area of Class CC2 plastic to be used on an exterior wall from 15% to 30 % with a fire separation distance of between 6 to 11 ft.

Sprinklers allow an increase in the maximum percentage area of Class CC2 plastic to be used on an exterior wall from 50% to 100 % with a fire separation distance of over 30 ft.

## 3. Area separations

The IBC does not specifically define area separations.

## 4. Dwelling unit separations

IBC 710.3 Fire Resistance rating

Sprinklers allow fire resistance ratings of dwelling unit and guestroom separation floor and roof assemblies, in buildings of Types II B construction, be reduced from 1 hour rated to 1/2 hour.

Sprinklers allow fire resistance ratings of dwelling unit and guestroom separation floor and roof assemblies, in buildings of Types III B construction, be reduced from 1 hour rated to 1/2 hour.

Sprinklers allow fire resistance ratings of dwelling unit and guestroom separation floor and roof assemblies, in buildings of Types V B construction, be reduced from 1 hour rated to 1/2 hour.

## **5. Shaft enclosures**

IBC 403.3 Reduction in fire-reduction rating.

Sprinklers reduce the fire resistance rating of the fire barrier walls enclosing vertical shafts, other than exit enclosures and elevator hoistway enclosures, from 2 hour fire resistive to 1 hour

IBC 707.2 Shaft enclosure required

Sprinklers eliminate shaft enclosures for stairs or escalators not part of the means of egress with a water curtain or rated shutter

Sprinklers eliminate shaft enclosures for escalator openings or stairways which are not a portion of the means of egress in Use Group A, E, F, H, I, M, R, S, and U occupancies less than 4 stories.

Sprinklers eliminate shaft enclosures for escalator openings or stairways that are not a portion of the means of egress in Use Group B.

IBC 707.10 Shaft enclosure

Sprinklers allow the bottom of a shaft to be open.

IBC Table 1004.3.2.1 Corridor Fire Resistance Rating.

Sprinklers delete fire resistance of corridors in Use Group A, B, E, F, I-2, M, S, and U occupancies thereby eliminating the requirement to provide smoke resistance between the elevator shaft and occupied areas.

## **6. Corridors**

IBC 407.2 Corridors in I-2 occupancies

Quick response sprinklers delete the requirement that corridors in Use Group I-2 occupancy waiting areas and similar spaces be continuous to the exits

IBC 715.5.2 Fire dampers in fire barriers

Sprinklers delete required fire dampers at duct penetrations of partitions that are tenant separation and corridor walls in A, B, E, F, I, M, R, S, and U Occupancies.

Sprinklers delete required fire dampers at duct penetrations of partitions that are tenant separation and corridor walls in all Occupancies.

IBC 804.4.1 Minimum critical radiant flux.

Sprinklers reduce the requirements for floor finishes in vertical exits, exit passageways, and exit access corridors in Use Group A, B, E, H, I-4, M, R-1, R-2, and S from 0.22 W/cm<sup>2</sup> to the DOC FF-1 "pill test".

Sprinklers reduce the requirements for floor finishes in vertical exits, exit passageways, and exit access corridors in Use Group I-2 and I-3 from 0.45 W/cm<sup>2</sup> to 0.22 W/cm<sup>2</sup>.

IBC 1003.3.6 Open ended corridors.

Sprinklers delete exterior stairway protection for exterior exit stairways connected to the open end of a corridor.

IBC Table 1004.3.2.1 Corridor Fire Resistance Rating.

Sprinklers delete fire resistance of corridors in Use Group A, B, E, F, I-2, M, S, and U occupancies.

IBC 1004.3.2.3 Corridor width

Sprinklers allow reduction of corridor width

IBC Table 1003.2.3.1 Egress Width.

Sprinklers reduce required other egress component widths in H occupancies from 0.4 inches per occupant to 0.2 inches per occupant

Sprinklers reduce required other egress component widths in all occupancies other occupancies except I-2 from 0.2 inches per occupant to 0.15 inches per occupant

IBC 1004.3.2.4 Dead ends.

Sprinklers increases the permissible length of dead-end corridors or passageways from 20 to 50 feet in Group I-3 occupancies.

Sprinklers increases the permissible length of dead-end corridors or passageways from 20 to 50 feet in Group B occupancies.

Sprinklers increases the permissible length of dead-end corridors or passageways from 20 to 50 feet in Group F occupancies.

IBC 1004.3.2.5 Air movement in corridors.

Sprinklers allow the space between the corridor ceiling and the floor or roof structure above corridors to serve as supply, return, exhaust, relief or ventilation air ducts or plenums where the air handling system serving the corridor is shut down upon detection of sprinkler.

IBC 2603.4.1.7 Doors without a fire rating

Sprinklers allow foam plastic insulated doors in Group A, B, E, F, I-2, M, S, and U occupancy corridors.

## **7. Stair enclosures**

IBC 408.3.6 Exit stairways Group 1-3

Sprinklers permit glazing in doors and interior walls at each landing in one exit stairway per building.

IBC 909.20.5 Stair pressurization  
Sprinklers eliminate stair vestibules in pressurized shafts.

IBC Table 1003.2.3.1 Egress Width.  
Sprinklers reduce required stairway widths in I-2 occupancies from 0.4 inches per occupant to 0.3 inches per occupant

Sprinklers reduce required stairway widths in H occupancies from 0.7 inches per occupant to 0.3 inches per occupant

Sprinklers reduce required stairway widths in all other occupancies from 0.3 inches per occupant to 0.2 inches per occupant

IBC 1003.2.13.2 Enclosed stairways.  
Sprinklers delete accessibility requirements for 48" egress stair width and for area of refuge within the stairway.

IBC 1003.3.3.1 Stairway Width  
Sprinklers permit a reduction in the minimum stairway width.

IBC 1003.3.6 Open ended corridors.  
Sprinklers delete exterior stairway protection for exterior exit stairways connected to the open end of a corridor.

IBC 2606.7 Light-diffusing systems.  
Sprinklers allow light-diffusing systems to be installed in Group A with an occupant load of 1000 or more; Theaters with a stage and proscenium opening and an occupant load of 700 or more; Group 1-2, Group 1-3; Exit stairways and exit passageways.

## **8. Exit passageways**

IBC 405.10 General  
Sprinklers allow parking garages to be below 30 ft. below the lowest level of exit discharge.

IBC 407.2 Corridors in I-2 occupancies  
Quick response sprinklers delete the requirement that corridors in Use Group I-2 occupancy waiting areas and similar spaces be continuous to the exits

IBC 714.2.3 Doors in exit enclosures  
Sprinklers delete the maximum transmitted temperature end point of not more than 450 degrees F. (250 degrees C.) above ambient at the end of 30 minutes of standard fire test exposure.

IBC 804.4.1 Minimum critical radiant flux.  
Sprinklers reduce the requirements for floor finishes in vertical exits, exit passageways, and exit access corridors in Use Group A, B, E, H, I-4, M, R-1, R-2, and S from 0.22 W/cm<sup>2</sup> to the DOC FF-1 "pill test".

Sprinklers reduce the requirements for floor finishes in vertical exits, exit passageways, and exit access corridors in Use Group I-2 and I-3 from 0.45



W/cm<sup>2</sup> to 0.22 W/cm<sup>2</sup>.

The UBC (904.2.3) requires sprinklers in Exhibition and Display areas > 12,000 sf, stairs in Group A Occupancies, Amusement Buildings, Stages and Smoke Protected Assembly Seating areas. These provisions are not found in the IBC.

IBC 1003.2.13.1.1 Buildings With Four Or More Stories.

Sprinklers delete the accessibility requirement that elevators be accessed from either an area of refuge or horizontal exit.

Sprinklers eliminate elevator access to a floor with a ramp.

IBC 1003.2.13.3 Elevators

Sprinklers delete accessibility requirement that elevators be accessed from either an area of refuge or a horizontal exit.

IBC 1004.2.2 Exit or exit access doorway arrangement

Sprinklers reduce egress separation distance from 1/2 overall diagonal dimension to 1/3 diagonal.

IBC 1005.2.2 Buildings with one exit.

Sprinklers allow Group R-2 buildings with only one exit to increase the allowable number of stories from 2 stories to 3 stories.

Sprinklers allow Group B buildings with only one exit to increase the maximum travel distance of from 75 ft to 100 feet.

IBC 1005.3.4 Exit passageway and vertical exit enclosure opening protectives.

Sprinklers eliminate the maximum transmitted fire door temperature requirement for 450° F for exit passageways in vertical exit enclosure openings.

IBC 1006.1 Exits shall discharge directly to the exterior of the building.

Sprinklers allow 50 percent of the number and capacity of the exit enclosures to egress through areas on the level of discharge.

IBC 1008.6 Travel distance in A occupancies

Sprinklers allow exit and aisle travel distance to an exit door to increase from 200 ft to 250 feet.

IBC 2606.7 Light-diffusing systems.

Sprinklers allow light-diffusing systems to be installed in Group A with an occupant load of 1000 or more; Theaters with a stage and proscenium opening and an occupant load of 700 or more; Group 1-2, Group 1-3; Exit stairways and exit passageways.

IBC 3104.9 Exit access travel

Sprinklers allow exit access travel distance to increase from 200 ft to 250 feet on a pedestrian walkway

Sprinklers allow exit access travel distance to be increased from 200 ft to 400 feet on a pedestrian walkway constructed with both sides at least 50 percent open.

## **9. Type of construction separation**

IBC does not define construction separations.

## **10. Boiler, central heating plant or hot-water supply boiler room enclosures.**

### IBC TABLE 302.1.1 INCIDENTAL USE AREAS

Sprinklers delete 1-hour furnace room fire barrier separation where the largest piece of equipment is over 400,000 BTUH input.

Sprinklers delete 1-hour boiler room fire barrier separation > 15 psi and 10 hp.

Sprinklers delete 1-hour refrigerant machinery room fire barrier separation.

## **Smoke Control**

High-rise buildings are not required in the IBC to have smoke control systems. There was little justification to delete these requirements other than to say that the fire department doesn't know how to use them and usually turns them off.

The UBC requires many levels of passive smoke control other than an active smoke exhaust system. Sealing of vertical penetrations, restricting smoke movement through openings in vertical shafts as well as rated corridors all serve to limit smoke spread throughout the building. Most of these systems, which provide a level of safety to the building occupants and fire fighters, are eliminated with the use of an automatic sprinkler system in the IBC.

## **Vertical Shafts**

The UBC requires all elevators that open onto a rated corridor to resist the passage of smoke with an enclosed lobby, additional door or listed gasket system.

The IBC requires an enclosed lobby or additional door in unsprinklered buildings and where the elevators open onto a rated corridor. However, the IBC deletes the requirement for rated corridors in all but H occupancies and R occupancies, assisted living and detention centers taller than four stories, when sprinklers are used. The provision eliminates the smoke protection requirement of the elevator shaft in these occupancy groups. This sprinkler reduction is not allowed in the UBC.

## **Corridors**

IBC Section 1004.3.2.1 deletes the requirement for rated corridors in sprinklered buildings for all A, E, B, F, M, S, U, I-2 (UBC I-1) and I-4 occupancies regardless of construction type, height or occupant load. UBC Section 508.6 expressly prohibits the reduction of a rated corridor, even in a sprinklered building.

## **Fire Alarm Systems**

Fire alarm systems in commercial buildings serve as an early warning to building occupants and the fire department. The 1997 Edition of the Uniform Building Code (UBC) requires a

fire alarm system in many occupancy groups. The UBC (305.9) requires a fire alarm system in A Occupancies >50, Amusement Buildings, H, I, and R-1 occupancies. These provisions are not found in the IBC.

The following reductions are found in the IBC and are not permitted in the UBC:

#### IBC 903.3.4 Sprinkler alarms

Sprinklers are not required to have an audible device with < 20 heads.

#### IBC 903.4 Monitoring and alarms

Sprinklers serving < 20 heads do not have to have electrically supervised valves.

#### IBC 907.2 Heat Detectors

Sprinklers delete heat detectors in new buildings

#### IBC 907.2.1 Manual fire alarm

Sprinklers delete the manual fire alarm system if notification appliances are activated with water flow in new Group A, B, and F occupancies.

#### IBC 907.2.6.2.3 Smoke detectors

Sprinklers eliminate smoke detectors in sleeping rooms with < 4 occupants in Group I-3 occupancies.

#### IBC 907.2.7 Manual fire alarm

Sprinklers eliminate the manual fire alarm system if notification appliances are activated with water flow in new Group M occupancies.

Sprinklers eliminate the manual fire alarm system if equipped with local alarms to notify all occupants in Group R-1 and R-2 occupancies.

#### IBC 907.4.1 Manual Pull box location

Sprinklers eliminate the manual pull box in Group B occupancies below 75 ft to the highest occupied floor.

## **Building Performance Research Institute**

The Building Performance Research Institute is a 501(c) (3) non-profit corporation founded to research the performance of the constructed environment. There is currently no monitoring process for building code requirements in the United States. The National Fire Incident Reporting System gathers statistical data on fires, but not on buildings.

### **Our mission**

Develop research methodology, conduct research, assemble documentation, and offer education to enhance building performance.

### **Current Projects:**

- Developing concepts for fighting single story fires, even if the fire is on the 15th floor.
- Building Performance adjunct to the NFIRS database. In cooperation with the American Institute of Architects, and the National Fire Protection Association, BPRI is developing a data collection system to identify and study building performance

relative to the effects of fire and smoke. The Boston Fire Department and the Boston Society of Architects have volunteered as initial partners in the pilot program.

- Building code education of architects. BPRI is enlisting sponsorship from building product manufacturers to support an educational workshop on the new International Building Code. When available, additional workshops will be conducted on the NFPA 5000 code.
- Research on Phase III emergency evacuation operation of elevator systems during a building fire. Current building codes do not encourage the use of elevators as a means of emergency egress for building tenants or as a reliable means of access to the fire area by the fire department. Development of standards for emergency operation will allow non-ambulatory building occupants to use the elevator to escape a fire.

**Contact Us:**

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