ICC CODE TECHNOLOGY COMMITTEE
AREA OF STUDY – BALANCED FIRE PROTECTION
HEIGHT AND AREA STUDY GROUP

2006/2007 HEIGHT AND AREA RELATED CODE CHANGES SUBMITTED TO THE IBC

Included in this document are the following code changes:

G10-06/07, G95-06/07, G98-06/07 through G123-06/07 AND G223-06/07

G10–06/07
506.1.1, 109.3.3, 412.2.2, [F]415.4, 202, 502.1

Proponent: Philip Brazil, PE, Reid Middleton, Inc., representing himself

Revise as follows:

506.1.1 Basements. A single basement that is not a story above grade plane need not be included in the total allowable building area, provided such basement does not exceed the area permitted for a building with no more than one story above grade plane.

> **Exception**: In buildings of Type I, IIA, IIIA, IV or VA construction, the basements below the first story above grade plane need not be included in the total allowable building area provided each such basement does not exceed the area permitted for a building with no more than one story above grade plane.

109.3.3 Lowest floor elevation. In flood hazard areas, upon placement of the lowest floor, including the basements, and prior to further vertical construction, the elevation certification required in Section 1612.5 shall be submitted to the building official.

412.2.2 Basements. Where hangars have basements, the floor over the basement shall be of Type IA construction and shall be made tight against seepage of water, oil or vapors. There shall be no opening or communication between the basements and the hangar. Access to the basements shall be from outside only.

[F] 415.4 Special provisions for Group H-1 occupancies. Group H-1 occupancies shall be in buildings used for no other purpose, shall not exceed one story in height and be without a basements, crawl spaces or other under-floor spaces. Roofs shall be of lightweight construction with suitable thermal insulation to prevent sensitive material from reaching its decomposition temperature. Group H-1 occupancies containing materials which are in themselves both physical and health hazards in quantities exceeding the maximum allowable quantities per control area in Table 307.1.(2) shall comply with requirements for both Group H-1 and H-4 occupancies.

SECTION 202
DEFINITIONS

STORY. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above, including basements (also see "Mezzanine" and Section 502.1). It is measured as the vertical distance from top to top of two successive tiers of beams or 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.

STORY ABOVE GRADE PLANE. Any story having its finished floor surface entirely above grade plane, except that a basement shall be considered as a story above grade plane where the finished surface of the floor or roof next above the basement is:

1. More than 6 feet (1829 mm) above grade plane; or
2. More than 12 feet (3658 mm) above the finished ground level at any point.

502.1 Definitions.

BASEMENT. ~~That portion of a building~~ A story that is partly or completely below grade plane (see "Story above grade plane" in Section 202). A basement shall be considered as a story above grade plane where the finished surface of the floor or roof next above the basement is:

1. More than 6 feet (1829 mm) above grade plane; or
2. More than 12 feet (3658 mm) above the finished ground level at any point.

Reason: Currently, the IBC does not refer to the basement in a consistent manner. At times, the IBC considers it to be all floor levels "partly or completely below grade plane" (see definition of "basement" in Section 502.1). At other times, the IBC considers it to be a single floor level partly or completely below grade plane. The purpose of this proposal is to refer to a basement in a consistent manner throughout the IBC. The method chosen is to consider it as a single floor level partly or completely below grade plane.

The IBC currently defines "story" as "that portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above" (see Section 502.1). Thus, each portion of a building between floor levels and between a floor level and a roof is a story, including basements. While "floor level" implies a horizontal surface, "story" is a vertical space. The proposed modification to the definition of "basement" in Section 502.1 aligns it with the current definition of "story." Thus, it becomes a story that is partly or completely below grade plane.

The phrase "floor above" is changed to "floor or roof next above" in the definitions of "story above grade plane" and "basement." This addresses the possibility of a basement that is sufficiently above grade plane to qualify as a story above grade plane. If it is the topmost story in a building, however, it would not currently qualify as a story above grade plane since there would not be a finished surface of a floor above to measure from. The change from "above" to "next above" is for consistency with similar language in the current definition of "story."

The proposed revisions are similar to those contained in code change proposals G107-04/05 and G108-04/05. During the code development hearings in Cincinnati, the Committee raised concerns that the proposed revision to Section 506.1.1 would be inconsistent with the expressed intent of the Committee during the 2003/2004 code development cycle. This is likely a reference to code change proposal G98-03/04, which proposed deletion of Section 503.1.1 and was approved as submitted. The stated reason was that the "general provisions of Section 503.1.1 are currently duplicated in Section 506.1.1." Sections 503.1.1 and 506.1.1 in the 2003 IBC, however, are not identical. Section 503.1.1 states that "basements need not be included in the total allowable area provided they do not exceed the area permitted for a one-story building." Section 506.1.1 is similar except it exempts a "single basement" from being included. I believe the inconsistency is not between this proposal and Proposal G98-03/04 but with the manner in which a "basement" is currently treated in the IBC. The proposed modifications will make the provisions of the IBC related to basements consistent.

Consider the following example. Imagine a building that is eight stories in height. Grade plane is located at the upper surface of the floor at Story #5, which also places it at the upper surface of the floor above Story #4. Thus, there are four stories above grade plane (Stories #5 through #8) and four stories below grade plane (Stories #1 through #4). Stories #1 through #4 are completely below grade plane, which means that they are also basements. If a "single basement" is one story in height, the current language of Section 506.1.1 would exempt Story #1 from the total allowable area. The building would still have four stories above grade plane but the uppermost seven stories would be included in the determination of allowable building area. If a "single basement" includes all stories below the first story above grade plane that are also partly or completely below grade plane, the building would have four stories above grade plane but the uppermost four (not seven) stories would be included in the determination of allowable building area. I believe the second part of the example illustrates the basic intent of the IBC. The proposed modifications accomplish what the second part of the example illustrates. See the accompanying diagram for further information.

During debate on code change proposals G107-04/05 and G108-04/05 at the final action hearings in Detroit, it was suggested that Section 506.1.1 is derived from a report by the CABO Board for the Coordination of the Model Codes (BCMC) on building heights and areas, dated February 9, 1988. It is correct that the current language in IBC Section 506.1 is similar to Section 4.1.2 of the BCMC report but the recommendations in the report were not fully adopted by any of the model code organizations, whose provisions on building areas and heights also differed substantially. Note that the recommendations in the report were published 18 years ago. There has been substantial development in building code provisions for building heights and areas since then.

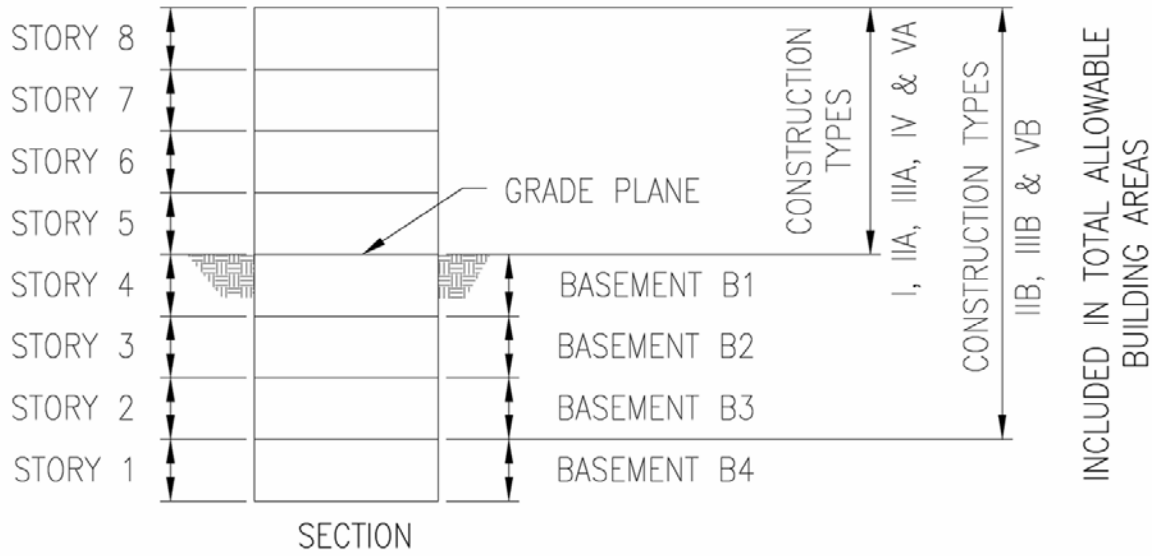
The building code places limitations on building area, building height and number of stories because (1) a building's occupants need to escape during an emergency, and (2) fire fighters and other emergency responders need to rescue occupants who are unable to escape and suppress the cause of the emergency (i.e., building fire). Occupants typically escape from a building at grade (level of exit discharge). Emergency responders typically approach a building for rescue and fire fighting purposes at grade. The larger the building area, the higher the building height or the greater the number of stories, the more difficult it is for occupants to escape and emergency responders to perform rescue and fire fighting operations. The limitations on building area, building height and number of stories should be determined from grade because the consequences to occupants and emergency responders are largely due to their quantities measured from grade.

An exception to this, however, is the fuel load in a building, which increases with the number of stories above the foundation rather than above grade. But multistory buildings are typically constructed with fire-resistance-rated horizontal assemblies supported by fire-resistance-rated structural frames (e.g., columns, beams, bearing walls, etc.), which typically form separate fire areas at each story. This occurs at buildings of Type I, IIA, IIIA, IV or VA construction. The fuel load of an individual story rather than the entire building typically impacts egress and emergency response and is affected by the location of the story above or below grade. There are also other mitigating factors affecting the impact of fire load, notably automatic fire sprinkler systems, which are typically required at stories below grade due to a lack of fire access openings and other factors.

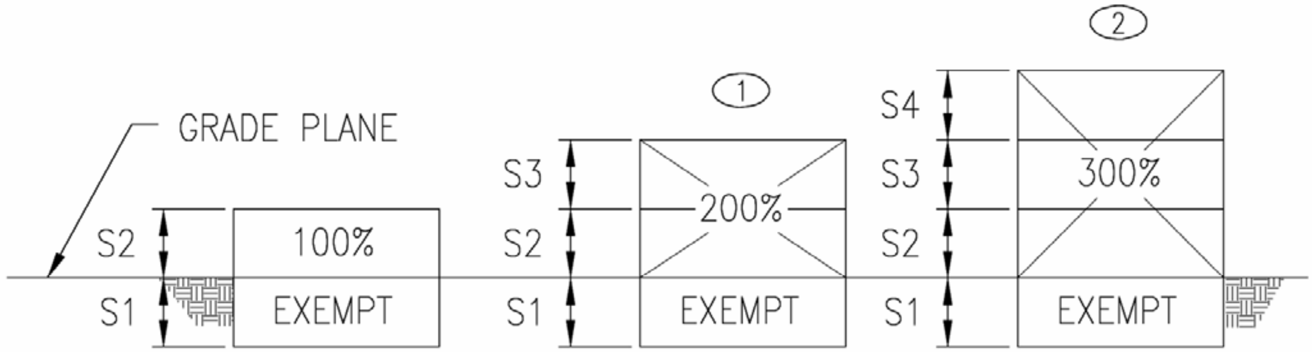
Multistory buildings, however, are not always of Type I, IIA, IIIA, IV or VA construction. A building of Type IIB, IIIB or VB construction is typically nonrated except for specific areas separate or enclosed by fire containment assemblies (e.g., horizontal exits, shaft enclosures, exit enclosures, etc.). There is typically a single fire area in the building extending from the foundation to the roof, encompassing all areas of the building not otherwise separated or enclosed. The fuel load affecting occupants and emergency responders is not necessarily limited to a single story but can potentially extend to all areas of the building. The installation of an automatic fire sprinkler system at the stories below grade is an effective method of fire protection but it lacks redundancy. There is no means of limiting the fire area to a single story as there is for a building of Type I, IIA, IIIA, IV or VA construction.

This proposal does not revise the exemption for a single basement that is not a story above grade plane from being included in the allowable building area. But it does establish an exception for buildings of I, IIA, IIIA, IV or VA construction permitting all basements below the first story above grade plane from being included in the allowable building area. This is due principally to the establishment of separate fire areas at each story.

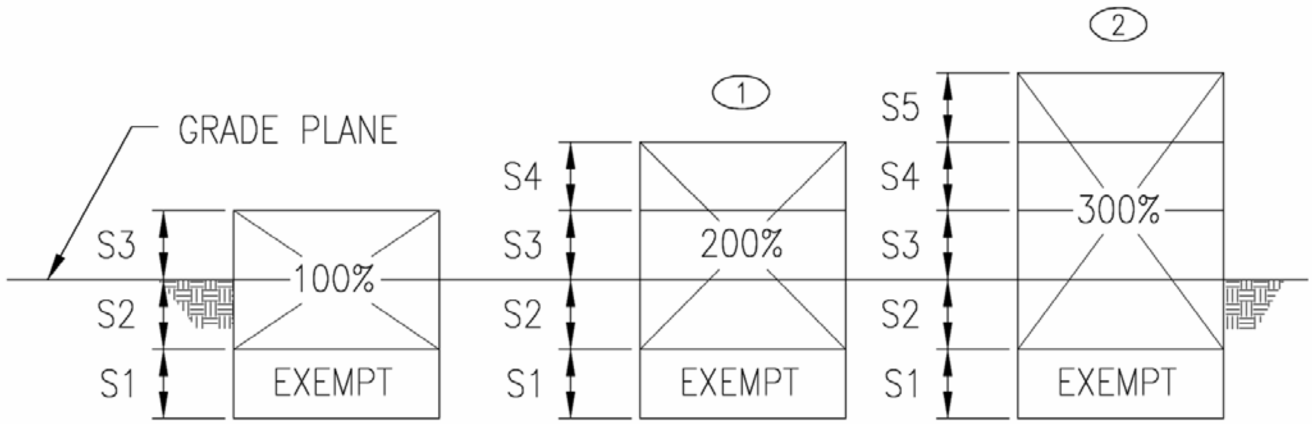
Three diagrams accompany this proposal. The first diagram illustrates the locations of the stories and basements described in the example above. It also specifies which basements would be included in the total allowable building area if the proposal is approved. The second and third diagrams illustrate how the determination of the maximum area of a building with more than one story above grade plane (Section 506.4) would be affected by the proposal. One diagram illustrates the affect on buildings of Type IIB, IIIB or VB construction. The other diagram illustrates the affect on buildings of Type I, IIA, IIIA, IV or VA construction.



BASEMENTS INCLUDED IN TOTAL ALLOWABLE BUILDING AREA



SECTION

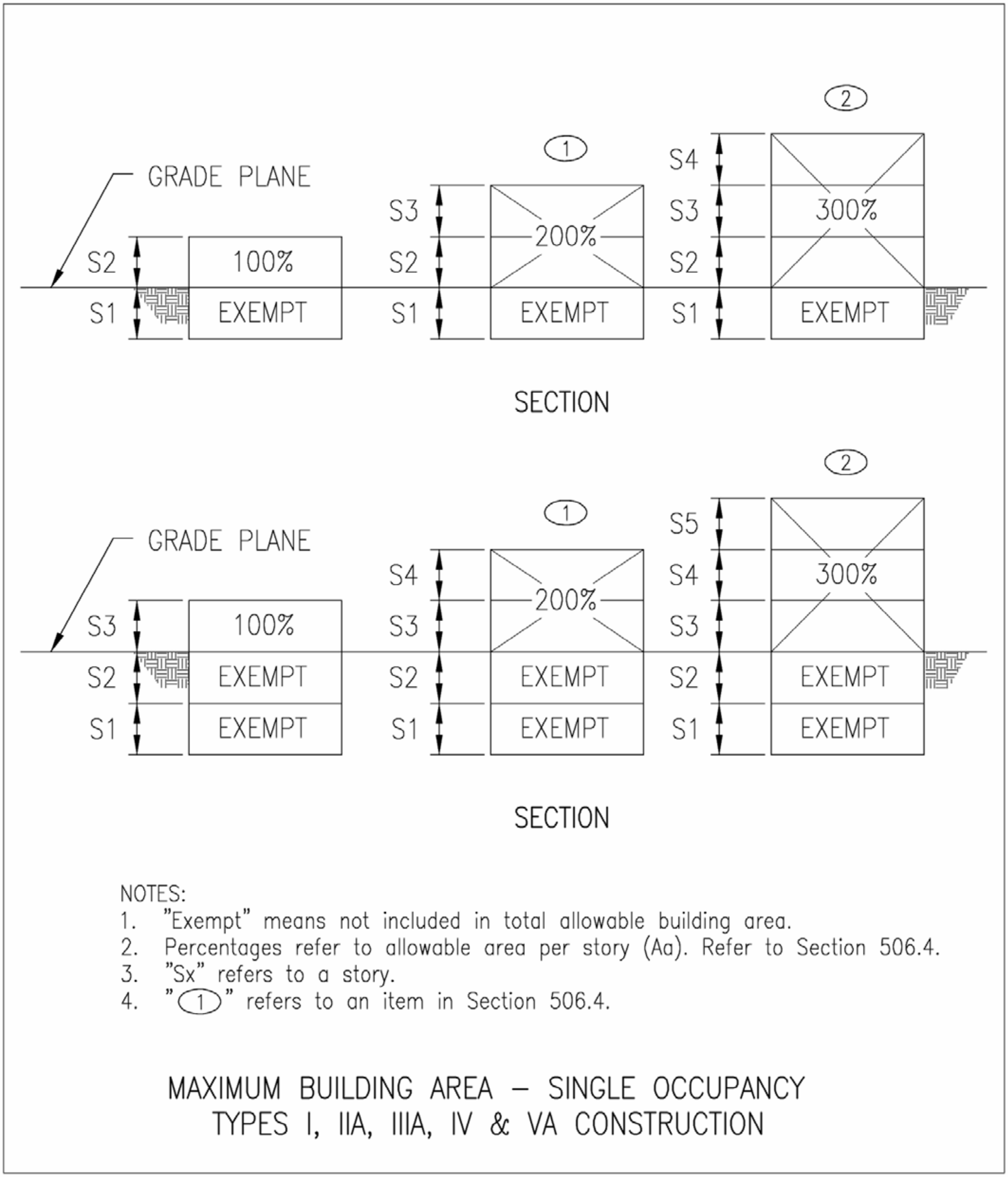


SECTION

NOTES:

1. "Exempt" means not included in total allowable building area.
2. Percentages refer to allowable area per story (Aa). Refer to Section 506.4.
3. "Sx" refers to a story.
4. "(1)" refers to an item in Section 506.4.

MAXIMUM BUILDING AREA – SINGLE OCCUPANCY
TYPES IIB, IIIB & VB CONSTRUCTION



Cost Impact: The code change proposal will not increase the cost of construction.

Analysis. While some sections listed are typically the purview of other committees, for consistency, the General Committee will make the determination for entire proposal.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G95–06/07
Chapter 5

Proponent: David S. Collins, FAIA, The Preview Group, Inc., representing the American Institute of Architects

DELETE CURRENT CHAPTER 5 IN ITS ENTIRETY AND SUBSTITUTE AS FOLLOWS:

CHAPTER 5
GENERAL BUILDING HEIGHTS AND AREAS

SECTION 501
GENERAL

501.1 Scope. The provisions of this chapter control the height of 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, BUILDING. The area included within surrounding Exterior walls (or exterior walls and firewalls) exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

BASEMENT. That portion of a building that is partly or completely below grade plane (see “Story above grade plane” in Section 202). A basement shall be considered as a story above grade plane where the finished surface of the floor above the basement is:

1. More than 6 feet (1829 mm) above grade plane; or
2. More than 12 feet (3658 mm) above the finished ground level at any point.

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 504.5).

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 LIMITATIONS

503.1 General. The height for buildings of different construction types shall be governed by the limits in Table 503 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.

503.1.1 Special industrial occupancies. Buildings and structures designed to house special industrial processes that require unusual heights to accommodate craneways or special machinery and equipment, including, among others, rolling mills; structural metal fabrication shops and foundries; or the production and distribution of electric, gas or steam power, shall be exempt from the height limitations of Table 503.

TABLE 503
BUILDING HEIGHT LIMITS

	TYPE IA	TYPE IB	TYPE IIA	TYPE IIB	TYPE IIIA	TYPE IIIB	TYPE IV	TYPE VA	TYPE VB
Height	UL	160	65	55	65	55	65	50	40

SECTION 504
MEZZANINES

504.1 General. A mezzanine or mezzanines in compliance with Section 504 shall be considered a portion of the story below. The area of the mezzanine shall be included in determining the fire area defined in Section 702. The clear height above and below the mezzanine floor construction shall not be less than 7 feet (2134 mm).

504.2 Area limitation. The aggregate area of a mezzanine or mezzanines within a room shall not exceed one-third of the floor area of that room or space in which they are located. The enclosed portion of a room shall not be included in a determination of the floor area of the room in which the mezzanine is located. In determining the allowable mezzanine area, the area of the mezzanine shall not be included in the floor area of the room.

Exceptions:

1. The aggregate area of mezzanines in buildings and structures of Type I or II construction for special industrial occupancies in accordance with Section 503.1.1 shall not exceed two-thirds of the area of the room.
2. The aggregate area of mezzanines in buildings and structures of Type I or II construction shall not exceed one-half of the area of the room in buildings and structures equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 and an approved emergency voice/alarm communication system in accordance with Section 907.2.12.2.

504.3 Egress. Each occupant of a mezzanine shall have access to at least two independent means of egress where the common path of egress travel exceeds the limitations of Section 1014.3. Where a stairway provides a means of exit access from a mezzanine, the maximum travel distance includes the distance traveled on the stairway measured in the plane of the tread nosing. Accessible means of egress shall be provided in accordance with Section 1007.

Exception: A single means of egress shall be permitted in accordance with Section 1015.1.

504.4 Openness. A mezzanine shall be open and unobstructed to the room in which such mezzanine is located except for walls not more than 42 inches (1067 mm) high, columns and posts.

Exceptions:

1. Mezzanines or portions thereof are not required to be open to the room in which the mezzanines are located, provided that the occupant load of the aggregate area of the enclosed space does not exceed 10.
2. A mezzanine having two or more means of egress is not required to be open to the room in which the mezzanine is located if at least one of the means of egress provides direct access to an exit from the mezzanine level.
3. Mezzanines or portions thereof are not required to be open to the room in which the mezzanines are located, provided that the aggregate floor area of the enclosed space does not exceed 10 percent of the mezzanine area.
4. In industrial facilities, mezzanines used for control equipment are permitted to be glazed on all sides.
5. In other than Groups H and I occupancies no more than two stories in height above grade plane and equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, a mezzanine having two or more means of egress shall not be required to be open to the room in which the mezzanine is located.

504.5 Equipment platforms. Equipment platforms in buildings shall not be considered as a portion of the floor below. Such equipment platforms shall not contribute to the number of stories as regulated by Section 503.1. The area of the equipment platform shall not be included in determining the fire area. Equipment platforms shall not be a part of any mezzanine and such platforms and the walkways, stairs and ladders providing access to an equipment platform shall not serve as a part of the means of egress from the building.

504.5.1 Area limitations. The aggregate area of all equipment platforms within a room shall not exceed two-thirds of the area of the room in which they are located. Where an equipment platform is located in the same room as a mezzanine, the area of the mezzanine shall be determined by Section 504.2 and the combined aggregate area of the equipment platforms and mezzanines shall not exceed two-thirds of the room in which they are located.

[F] 504.5.2 Fire suppression. Where located in a building that is required to be protected by an automatic sprinkler system, equipment platforms shall be fully protected by sprinklers above and below the platform, where required by the standards referenced in Section 903.3.

504.5.3 Guards. Equipment platforms shall have guards where required by Section 1013.1.

Reason: Building areas have historically been included in model building codes but were never included in the life safety codes. The wide disparity among the codes as to what limits were appropriate and the huge number of exceptions that are included for virtually every occupancy raises serious doubts as to the appropriateness of such regulation.

NFPA established a task group to examine the appropriateness of height and area limits when it decided to create a building code. A concerted effort by a large number of experts examining a large volume of data could not determine that there was any relationship between the area limits for construction and the life safety of persons in a building. Model codes have instituted various limits for the most critical elements of life safety which not only assure building occupants of a safe environment, but also assure their ability to escape any probable danger. Some of these features are:

Fire area limits requiring fire suppression;
Fire department vehicle access;
Number of floors requiring standpipes;
Area limits for alarm devices; and
Travel distance limits.

Each of these in their own way control the configuration of a building.

The definitions for Height, Story and Mezzanine, as well as the criteria for mezzanines remain in the code because so many criteria are based on the number of stories and the need to understand that a mezzanine is to be included as part of a fire area. (I have been toying with the idea of moving this to Chapter 4 as a special design condition, not an height and area condition). The reference to area limitations throughout the code should be editorially removed since there are no area limits as proposed in this rewrite of Chapter 5.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G98–06/07
502.1

Proponent: Maureen Traxler, City of Seattle, WA, epresenting the Washington Association of Building Officials

Delete definition without substitution:

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.

~~**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.~~

Reason: The purpose of this code change proposal is to delete an unnecessary definition. The definition of “story” contains the same information as the definition of “story height”. Furthermore, the term “story height” is used only once in the 2006 IBC. It is used in Section 2106.5.2 in the context of design of masonry shear walls in high Seismic Design Categories. If this definition is needed, it should be moved to Chapter 21.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G99–06/07
Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet) / Hst(S)	**TYPE OF CONSTRUCTION**								
		TYPE I		**TYPE II**		**TYPE III**		**TYPE IV**	**TYPE V**	
		A	**B**	**A**	**B**	**A**	**B**	**HT**	**A**	**B**
		UL	**160**	**65**	**55**	**65**	**55**	**65**	**50**	**40**
A-1	**S** **A**	UL UL	~~5~~ 4 ~~UL~~ 29,900	~~3~~ 2 ~~15,500~~ 13,500	~~2~~ NP ~~8,500~~ NP	~~3~~ 2 ~~14,000~~ 13,500	~~2~~ NP ~~8,500~~ NP	~~3~~ 2 ~~15,000~~ 13,500	2 ~~11,500~~ 10,500	~~1~~ NP ~~5,500~~ NP

(Portions of table not shown do not change)

Reason: Our society tends to address fire safety after tragedies occur. Chicago's Iroquois Theater Fire claimed 602 lives on December 30, 1903. Ironically, the Iroquois was billed as a "fire proof" theater. It was the worst single-building fire in U.S. history, and even though it was more than a century ago, the lessons learned in that fire have motivated generations of public safety officials to be mindful of the extraordinary loss of life that is possible in Group A-1 occupancies.[1]

The fact that we have not had a second Iroquois Theater fire is testimony to the fact that we stopped believing in slogans like "fire proof" and have continuously adopted more effective fire safety requirements, as we better understand how fires ignite and spread in the real world. No single fire safety technology is sufficiently effective and reliable. If so, fire resistant stage curtains would have solved the problem following the Iroquois fire.

Moreover, Group A-1 occupancies are, by definition, places utilized by large numbers of persons. Firefighters have little choice but to initiate rescue operations in the event of significant fires. The decision by the International Building Code (IBC) to allow taller, larger buildings with less fire protection means that responders must climb higher and travel further into hostile conditions, yet are given less time to do so before risking structural collapse. The well-tested fire protection requirements contained in the three Legacy Codes were a critical part of a strategy that has helped protect the patrons and staff of theater and other Group A-1 occupancies for a long time. *In reducing and modifying those well-tested requirements, the IBC proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group A-1 of Table 503 to those in the Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger Group A-1 occupancies with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group A-1 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive, than comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

A-1 **Base Tabular Values** **Table 503**		
	Type III	
	A	**B**
IBC 2003	S 3 A 14,000	2 8,500
BOCA 1999	S 3 A 11,550	2 8,400
SBC 1997	S 1 A 10,000	1 6,000
UBC 1997	S 2 A 13,500	NP NP

NP = Not Permitted

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group A-1 tabular values in Table 503 are the starting point for a design process that moves through many other steps some of which are the subject of other code proposals. But, the Group A-1 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In Group A-1 occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

1. *"Rapid deflection occurred and imminent collapse became apparent between 1,000 °F and 1,200°F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.
2. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]
3. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

   In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

   More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines. According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]
4. *In Group A-1 occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the patrons and staff they hope to rescue increases exponentially.*

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at Group A-1 occupancies.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often assembly occupancies. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: In the event of significant fires in Group A-1 occupancies, large numbers of persons are likely to require rescues. Since 1988, the number of screens in movie theaters has risen from 23,129 to 37,185, a 61 percent increase, according to the National Association of Theater Owners (NATO). At the same time, theater admissions rose 36 percent to 1.47 billion from 1.08 billion. NATO doesn't track the number of seats per theater, according to a spokesman. But, if you assume 225 seats per screen and four showings per day, there are 12.2 billion total available seats in theaters nationwide. Clearly, many movies do not pack theaters, but some do. A significant fire at a multiple-screen theater could affect more than 1,500 persons.[10]

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group A-1 occupancies but may not be sufficient for extended outages. Emergency energy is not required for all A-1 facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group A-1 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland. Obviously, a Group A-1 occupancy without electricity will not be in a position to offer entertainment, but A-1 occupancies are often used to shelter persons in storms.
- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[11] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[12] Recalled heads have been found in Group A-1 occupancies. In spite of a significant effort to replace defective heads in all occupancies, no one knows how many more recalled heads remain

to be discovered in those facilities that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads which remain formally listed and therefore technically in compliance with the Model Codes.13 Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new theater, arena and other Group A-1 occupancy constructed in compliance with the Group A-1 tabular values in Table 503 is an experiment in safety. According to industry sources, we have fewer theaters today but they are individually much larger. In 1995, the NATO reported that there were 7,151 theaters with a total of 26,995 screens attracting 1.26 billion patrons. For 2004, NATO reported that there were 5,629 theaters with 36,012 screens serving 1.53 billion patrons. We can have confidence in the safety of the A-1 occupancies built in compliance with the Legacy Codes, but every theater constructed to the IBC relies on the unknown. Restoration of the Group A-1 tabular values of the UBC in this cycle is critical.[14]

Endnotes and Bibliography:

[1] *Iroquois Theater Fire.* (1904). Retrieved from: http://en.wikipedia.org/wiki/Iroquois_Theater

[2] Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464.* American Society for Testing and Materials. pp 106-126.

[3] *Report of the Technical Investigation of The Station Nightclub Fire*, June 2005. NIST NCSTAR 2, pp 4-36. Retrieved from: http://fire.nist.gov/bfrlpubs/fire05/PDF/f05032.pdf

[4] *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm

[5] *Effective Fire Protection: A National Concern*. (2004). ISO. Retrieved from: http://www.iso.com/studies_analyses/fireProtection/docs/FireProtectionBrochure.pdf

[6] "Preventing Injuries and Deaths of Fire Fighters Due to Truss System Failures" NIOSH Publication No. 2005-132, May 2005. Retrieved from: http://www.cdc.gov/niosh/docs/2005-132/#sum

[7] *Firefighters*. (2005, February 1). United States Fire Administration. Retrieved from: http://www.usfa.fema.gov/statistics/firefighters/

[8] *Law Enforcement Statistics*. (2005, October 17). Bureau of Justice Statistics. Retrieved from: http://www.ojp.usdoj.gov/bjs/lawenf.htm.

[9] *Emergency Medical Technicians and Paramedics*. (2004). Bureau of Labor Statistics. Retrieved from: http://www.bls.gov/oco/ocos101.htm.

[10] Ackman, D. (2001 March, 2). "Movie Theaters of the Absurd." *Forbes.com.* Retrieved from: http://www.forbes.com/2001/03/02/0302movies.html

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[12] Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from: http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm

[13] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

[14] *Number of US Cinema Sites.* National Association of Theater Owners. Retrieved from: http://www.natoonline.org/statisticssites.htm

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G100–06/07

Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	Hst(S)	UL	160	65	55	65	55	65	50	40
A-2	S	UL	~~11~~ 12	~~3~~ 2	~~2~~ 1	~~3~~ 2	~~2~~ 1	~~3~~ 2	2	1
	A	UL	~~UL~~ 29,900	~~15,500~~ 13,500	~~9,500~~ 9,100	~~14,000~~ 13,500	~~9,500~~ 9,100	~~15,000~~ 13,500	~~11,500~~ 10,500	6,000

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most Group A-2 occupancies that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group A-2 of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger Group A-2 occupancies with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group A-2 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with – and certainly no less restrictive than – comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

A-2 Base Tabular Values Table 503		
	Type III	
	A	B
IBC 2003	S 3 A 14,000	2 9,500
BOCA 1999	S 2 A 3,300	1 2,400
SBC 1997	S 2 A 12,000	2 8,000
UBC 1997	S 2 A 13,500	1 9,100

NP = Not Permitted

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group A-2 tabular values in Table 503 are the starting point for a design process that moves through many other steps, some of which are the subject of other code proposals. But, the Group A-2 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In Group A-2 occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

1. *"Rapid deflection occurred and imminent collapse became apparent between 1,000°F and 1,200°F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.
2 *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]
3. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.
   In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.
   More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.
   According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection."[5]
4. *In Group A-2 occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance earlier in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the customers and staff that they hope to rescue increases exponentially.*
   In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at restaurants and nightclubs and other Group A-2 occupancies nationwide. Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often assembly occupancies. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: Serious restaurant and nightclub fires are rare. But when they occur, large numbers of persons are likely to require rescues. In its Topical Research Series, the United States Fire Administration (USFA) concisely stated the challenge with Group A-2 occupancies. In its report on nightclub fires, USFA wrote, "Among all structure fires, nightclub fires in the U.S. are proportionately few in number (0.03 percent). However, maximum or over-capacity crowds at popular nightclubs create the potential for high numbers of casualties in the event of a fire." USFA observes that, "Patrons who have been drinking alcohol during the evening may not be able to respond quickly or be able to recognize the safest exit from the building." USFA also notes that incendiary fires are twice as likely in nightclubs as in other occupancies. In its report on restaurant fires, the USFA concisely described the challenge by stating, "Restaurants pose unique risks in that they gather a potentially large number of customers at one time while engaging in cooking activities that inherently pose a risk of fire." [10]

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group A-2 occupancies may not be sufficient for extended outages. Emergency energy is not required for all Group A-2 facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group A-2 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland.
- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[11] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[12] Recalled heads have been found in Group A-2 occupancies. In spite of a significant effort to replace defective heads in all occupancies, no one knows how many more recalled heads remain to be discovered in those restaurants, nightclubs and other Group A-2 occupancies that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads, which remain formally listed and, therefore, technically in compliance with the Model Codes.[13] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new restaurant and nightclub constructed in compliance with the Group A-2 tabular values in Table 503 is an experiment in safety. Adoption in this cycle is critical.

Endnotes and Bibliography:

[1] LeBlanc, P. and Fahy, R. (2005, June). *Firefighter Fatalities in the United States – 2004.*National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf

[2] Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464,* American Society for Testing and Materials. pp 106-126.

[3] *Report of the Technical Investigation of The Station Nightclub Fire*, June 2005. NIST NCSTAR 2, pp 4-36. Retrieved from: http://fire.nist.gov/bfrlpubs/fire05/PDF/f05032.pdf

[4] *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm

[5] *Effective Fire Protection: A National Concern*. (2004). ISO. Retrieved from: http://www.iso.com/studies_analyses/fireProtection/docs/FireProtectionBrochure.pdf

[6] "Preventing Injuries and Deaths of Fire Fighters Due to Truss System Failures" NIOSH Publication No. 2005-132, May 2005. Retrieved from: http://www.cdc.gov/niosh/docs/2005-132/#sum

[7] *Firefighters*. (2005, February 1). United States Fire Administration. Retrieved from: http://www.usfa.fema.gov/statistics/firefighters/

[8] *Law Enforcement Statistics*. (2005, October 17). Bureau of Justice Statistics. Retrieved from: http://www.ojp.usdoj.gov/bjs/lawenf.htm.

[9] *Emergency Medical Technicians and Paramedics*. (2004). Bureau of Labor Statistics. Retrieved from: http://www.bls.gov/oco/ocos101.htm.

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[13] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G101–06/07

Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	TYPE OF CONSTRUCTION								
		TYPE I		**TYPE II**		**TYPE III**		**TYPE IV**	**TYPE V**	
		A	**B**	**A**	**B**	**A**	**B**	**HT**	**A**	**B**
	Hst(S)	**UL**	**160**	**65**	**55**	**65**	**55**	**65**	**50**	**40**
A-3	**S**	UL	~~11~~ 12	~~3~~ 2	~~2~~ 1	~~3~~ 2	~~2~~ 1	~~3~~ 2	2	1
	A	UL	~~UL~~ 29,900	~~15,500~~ 13,500	~~9,500~~ 9,100	~~14,000~~ 13,500	~~9,500~~ 9,100	~~15,000~~ 13,500	~~11,500~~ 10,500	6,000

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most churches, synagogues, mosques and other Group A-3 occupancies that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group A-3 of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

NASFM is fully committed to the safety of all A-3 occupancies but, through this proposal, asks the IBC to give special consideration to the safety of people at worship, and the many others who rely on churches, synagogues and mosques for day care, education, feeding programs and temporary shelter for the economically disadvantaged.

Justification 1: The IBC currently allows construction of taller, larger Group A-3 occupancies with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group A-3 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

A-3 Base Tabular Values Table 503		
	Type III	
	A	**B**
IBC 2003	S 3 A 14,000	2 9,500
BOCA 1999	S 3 A 11,550	2 8,400
SBC 1997	S 1 A 12,000	1 8,000
UBC 1997	S 2 A 13,500	1 9,100

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group A-3 tabular values in Table 503 are the starting point for a design process that moves through many other steps, some of which are the subject of other code proposals. But, the Group A-3 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In churches, synagogues, mosques and other A-3 occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

1. *"Rapid deflection occurred and imminent collapse became apparent between 1,000 °F and 1,200°F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.
2. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]
3. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

   In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

   More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

   According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]
4. *Because of the nature of Group A-3 occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the worshippers and other persons they hope to rescue increases exponentially.*

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at churches, synagogues, mosques and other A-3 occupancies

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often religious places of assembly. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: In spite of significant progress with arson prevention, fires in churches, synagogues, mosques and other religious institutions continue to be a significant concern, costing congregations an estimated $96.3 million annually. According to the NFPA, between 1999 and 2002, an estimated average of 1,760 religious and funeral property structures fires were reported to U.S. fire departments per year – all but 4 percent in religious occupancies. The fires caused an annual average of one civilian death, 20 civilian injuries and $96.3 million in direct property damage. Intentional fires in religious and funeral properties fell 82 percent from 1,320 in 1980 to 240 in 2001 and 2002. Except for a 27 percent jump from 1995 to 1996, intentional fires have generally been declining.[10] The accidental fire trends in places of worship remain troubling, especially given the heavy, on-going use being made of these occupancies for child and adult day care.

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect.
Automatic sprinkler systems are certainly the first line of defense. Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group A-3 occupancies may not be sufficient for extended outages. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group A-3 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland. In fact, places of worship and other Group A-3 occupancies are used as shelters in major storms. According to *Baptist Press* in the days preceding Hurricane Katrina, "Baptist churches and association buildings across the region were being opened as shelters for those fleeing the storm, including Parkway Baptist Church in Natchez, Miss., which is housing about 350 people, mostly from the New Orleans area."[11] According to Internet postings following the storm from Natchez, "We lost electricity from Monday to Thursday night and lost water part of that time." [12]
- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[13] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[14] In spite of a significant effort to replace

defective heads in all occupancies, no one knows how many more recalled heads remain to be discovered in those Group A-3 facilities that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads, which remain formally listed and, therefore, technically in compliance with the Model Codes.[15] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new church, synagogue, mosque and other A-3 occupancy constructed in compliance with the Group A-3 tabular values in Table 503 is an experiment in safety.

Places of worship alone account for more than $8 billion per year in construction, which is increasingly in compliance with the IBC. Because of high land costs, churches in the most densely populated regions of the United States are being built taller to accommodate day care facilities, classrooms, meeting halls, offices and sanctuaries. In its *Construction Outlook 2006*, Associated Builders and Contractors issued the following projection,

> *As the U.S. population continues to grow, so does the demand for places of worship. FMI forecasts that $8.2 billion in religious facility construction was put-in-place in 2005, a 2 percent rise over 2004. As the home-building frenzy continues, expect religious facility construction to follow suit on a smaller basis. FMI expects $8.4 billion will be spent nationally on religious construction in 2006, followed by a 2 percent increase in 2007. As metropolitan areas become increasingly built-out, suburban and rural locales across the county will witness the most dramatic construction activity.*
>
> *Regionally, the South leads all U.S. regions in church construction. This trend mirrors the overall population growth experienced in the region, which includes four of the top five fastest-growing states in the country (Florida, Texas, Georgia, and North Carolina, respectively). By 2015, each of these states is predicted to grow an average of 20 percent.*
>
> *Regional trends are evident in church construction. For example, typically in the South, churches are built "out" not "up." The chief explanation for this is more land is available. In more densely populated areas of the country, such as New England and the Mid-Atlantic, building "out" is not an option. Land costs in these areas are excessive, and as such, limit congregations to building vertically.*[16]

Adoption in this cycle is critical.

Endnotes and Bibliography:

[1] LeBlanc, P. and Fahy, R. (2005, June). *Firefighter Fatalities in the United States – 2004.* National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf

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[14] Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from: http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm

[15] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

[16] *2006 Construction Outlook*. Associated Builders and Contractors. Retrieved from: http://www.abc.org/wmspage.cfm?parm1=2760

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G102–06/07
Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	Hst(S)	UL	160	65	55	65	55	65	50	40
B	S A	UL UL	~~11~~ 12 ~~UL~~ 39,900	~~5~~ 4 ~~37,500~~ 18,000	~~4~~ 2 ~~23,000~~ 12,000	~~5~~ 4 ~~28,500~~ 18,000	~~4~~ 2 ~~19,000~~ 12,000	~~5~~ 4 ~~36,000~~ 18,000	3 ~~18,000~~ 14,000	2 ~~9,000~~ 8,000

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most Group B occupancies that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group B of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger office buildings with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group B occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

B Base Tabular Values Table 503		
	Type III	
	A	B
IBC 2003	S 5 A 28,500	4 19,000
BOCA 1999	S 4 A 19,800	3 14,400
SBC 1997	S 5 A 21,000	2 14,000
UBC 1997	S 4 A 18,000	2 12,000

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group B tabular values in Table 503 are the starting point for a design process that moves through many other steps, some of which are the subject of other code proposals. But, the Group B tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In Group B occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

1. *"Rapid deflection occurred and imminent collapse became apparent between 1,000°F and 1,200°F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.

2. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]

3. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires, but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]

4. *In Group B occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the workers they hope to rescue increases exponentially.*

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at any of the tens of thousands of multi-story office buildings nationwide.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often business occupancies. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: In the event of significant fires in Group B occupancies, large numbers of persons are likely to require rescues. More than 17 million non-institutionalized adults between the ages of 16 and 64 possess a sensory, physical or mental disability.[10] Of these, about 36 percent – or about 6.1 million – are employed[11] and would be likely to require rescues in the event of significant fires.

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group B occupancies may not be sufficient for extended outages. Emergency energy is not required for all office buildings. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including many Group B occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland.
- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[12] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[13] Recalled heads have been found in Group B occupancies. In spite of a significant effort to replace defective heads in Group B occupancies, no one knows how many more recalled heads remain to be discovered in those office buildings that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the

replacement of recalled sprinkler heads, which remain formally listed and, therefore, technically in compliance with the Model Codes.[14] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new office building constructed in compliance with the Group B tabular values in Table 503 is an experiment in safety. In 2004, office construction resumed the annual rate of growth disrupted for three years by the events of September 11, 2001, and the number of buildings over 25 stories doubled from 3 percent of all office construction in 2000 to 6 percent in 2004.[15] Taller, larger office buildings – and the workers who use them – will be more challenging to protect from fire. Adoption in this cycle is critical.

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[4] *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm
[5] *Effective Fire Protection: A National Concern*. (2004). ISO. Retrieved from: http://www.iso.com/studies_analyses/fireProtection/docs/FireProtectionBrochure.pdf
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[14] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.
[15] Young, N. W. (2005, May). *Office Construction Analysis.* Construction Industry Intelligence Report. Retrieved from: http://dodge.construction.com/Analytics/CIIR/CIIR_May2005.pdf

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G103–06/07
Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	Hst(S)	UL	160	65	55	65	55	65	50	40
E	S	UL	~~5~~ 4	~~3~~ 2	~~2~~ 1	~~3~~ 2	~~2~~ 1	~~3~~ 2	~~1~~ 2	1
	A	UL	~~UL~~ 45,200	~~26,500~~ 20,200	~~14,500~~ 13,500	~~23,500~~ 20,200	~~14,500~~ 13,500	~~25,500~~ 20,200	~~18,500~~ 15,700	~~9,500~~ 9,100

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most schools that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group E of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger schools with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group E occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

E Base Tabular Values Table 503			
		Type III	
		A	**B**
IBC 2003	S	3	2
	A	23,500	14,500
BOCA 1999	S	3	2
	A	19,800	14,400
SBC 1997	S	2	1
	A	18,000	12,000
UBC 1997	S	2	1
	A	20,200	13,500

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group E tabular values in Table 503 are the starting point for a design process that moves through many other steps, some of which are the subject of other code proposals. But, the Group E tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In Group E occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

5. "Rapid deflection occurred and imminent collapse became apparent between 1,000°F and 1,200°F."[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.

6. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]

7. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]

8. In Group E occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance earlier in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the students, faculty members and visitors that they hope to rescue increases exponentially.

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at schools and other Group E occupancies nationwide.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often educational occupancies. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: School fires are common. When fires occur in Group E occupancies, large numbers of persons are likely to require rescues. In 2002, some 14,300 fires at non-adult schools were reported to fire departments. About 6,000 were structural fires. Reported property damage was in excess of $103 million. There were no deaths, but with 122 injuries, the rate of injuries per 1,000 school fires is relatively high with 22 per 1,000 school fires versus 14.4 for other non-residential occupancies.[10]

An estimated 72 million children attended U.S. schools in 2005, and of those, 31.6 million were enrolled in elementary and middle schools – populations most likely to require some level of rescue in the event of fires.[11]

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group E occupancies, may not be sufficient for extended outages. Emergency energy is not required for all educational facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group E occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland.
- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[12] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[13] Recalled heads have been found in schools. In spite of a significant effort to replace defective heads in Group E occupancies, no one knows how many more recalled heads remain to be discovered in those school buildings that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads, which remain formally listed and, therefore, technically in compliance with the Model Codes.[14] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new school constructed in compliance with the Group E tabular values in Table 503 is an experiment in safety. Billions of dollars are being spent to construct new schools, increasingly in compliance with the fire protection measures in the IBC's current Table 503. According to industry sources**,** $12.7 billion in new school projects were completed in 2005, $12.4 billion are projected for completion in 2006 and another $11.8 billion in new school construction will begin in 2006.[15] Adoption in this cycle is critical.

Endnotes and Bibliography:

1 LeBlanc, P. and Fahy, R. (2005, June). *Firefighter Fatalities in the United States – 2004.* National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf

2 Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464,* American Society for Testing and Materials. pp 106-126.

3 *Report of the Technical Investigation of The Station Nightclub Fire*, June 2005. NIST NCSTAR 2, pp 4-36. Retrieved from: http://fire.nist.gov/bfrlpubs/fire05/PDF/f05032.pdf

4 *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm

5 *Effective Fire Protection: A National Concern*. (2004). ISO. Retrieved from: http://www.iso.com/studies_analyses/fireProtection/docs/FireProtectionBrochure.pdf

6 "Preventing Injuries and Deaths of Fire Fighters Due to Truss System Failures" NIOSH Publication No. 2005-132, May 2005. Retrieved from: http://www.cdc.gov/niosh/docs/2005-132/#sum

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10 United States Fire Administration. (2004, December). *School Fires*. Topical Fire Research Series, 4. Retrieved from: http://www.usfa.fema.gov/downloads/pdf/tfrs/v4i6.pdf

11 U.S. Department of Education. (2004). Digest of Education Statistics 2004. Table 2.

12 *NFPA 25: Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. (2002). National Fire Protection Association. Retrieved from: http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=25&cookie%5Ftest=1

13 Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from: http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm

14 The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

15 Table 1, p C-3, Abranson, P. (2006). *Annual Construction Report: 2006* (Rep. No. 11th). School Planning and Management. Retrieved from: http://www.peterli.com/global/pdfs/SPMConstruction2006.pdf

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G104–06/07
Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals, Washington, DC

Revise as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	Hst(S)	UL	160	65	55	65	55	65	50	40
I-1	S A	UL UL	~~9~~ 3 ~~55,000~~ 15,100	~~4~~ 2 ~~19,000~~ 6,800	~~3~~ NP ~~10,000~~ NP	~~4~~ 2 ~~16,500~~ 6,800	~~3~~ NP ~~10,000~~ NP	~~4~~ 2 ~~18,000~~ 6,800	~~3~~ 2 ~~10,500~~ 5,200	~~2~~ NP ~~4,500~~ NP

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most assisted living, convalescent and other Group I-1 occupancies that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group I-1 of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger Group I-1 occupancies with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group I-1 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

I-1 Base Tabular Values Table 503		
Type III		
	A	**B**
IBC 2003	S 4 A 16,500	3 10,000
BOCA 1999	S 4 A 11,550	3 8,400
SBC 1997	S N/A A	N/A

UBC 1997	S 2 A 6,800	NP NP

NP = Not Permitted

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group I-1 tabular values in Table 503 are the starting point for a design process that moves through many other steps, some of which are the subject of other code proposals. But, the Group I-1 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In assisted living, convalescent and other Group I-1 occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

9. *"Rapid deflection occurred and imminent collapse became apparent between 1,000 °F and 1,200°F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.

10. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]

11. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires, but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]

12. *More than with almost any other occupancy, with assisted living and convalescent facilities, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification,, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the residents and staff that they hope to rescue increases exponentially.*

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at Group I-1 occupancies.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often supervised institutional care facilities. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: In the event of significant fires in Group I-1 occupancies, large numbers of persons are likely to require rescues. Slightly over 5 percent of the United States' 65+ population – approximately 1.5 million persons[10] – occupy an estimated 16,032 nursing homes, congregate care and board and care homes.[11] In addition, more than 600,000 older Americans live in an estimated 28,000 assisted-living facilities.[12] Another 600,000 reside in hospices.[13] The NFPA reports about 3,000 fires annually in these occupancies.[14] Many persons in this category are physically or mentally challenged, and are unable to escape without assistance.

In its September 2005 analysis of "Day Care/Adult Care/Assisted Living," the ICC's Code Technology Council raised numerous questions about the safety of Group I-1 occupancies, including the worrisome findings of "poorly trained and overworked staff," and lack of standardized approaches to supervision.[15] These conditions add to the risk and complexity of rescues in Group I-1 occupancies.

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group I-1 occupancies but may not be sufficient for extended outages. Emergency energy is not required for all personal care facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group I-1 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland. At U.S. Senate hearings on the aftermath of Katrina, witnesses told of "patients (who) sat in hospitals and nursing homes for days without electricity, fuel, air-conditioning or sufficient food." [16]

- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[17] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[18] Recalled heads have been found in Group I-1 occupancies. In spite of a significant effort to replace defective heads in all occupancies, no one knows how many more recalled heads remain to be discovered in those assisted living, convalescent and other Group I-1 occupancies that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads, which remain formally listed and, therefore, technically in compliance with the Model Codes.[19] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new assisted living, convalescent and other I-1 occupancy constructed in compliance with the Group I-1 tabular values in Table 503 is an experiment in safety. In May 2005, the Construction Industry Intelligence Report[20] cited 13,000 active projects and speaks of "remarkable stability" in health care construction in spite of increased costs of steel and energy. The report also noted the construction "opportunity" created by a rapidly aging population. Adoption of this proposal in this cycle is critical to the safety of the residents of Group I-1 occupancies that will be built in the next few years.

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[1] LeBlanc, P. and Fahy, R. (2005, June). *Firefighter Fatalities in the United States – 2004.* National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf

[2] Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464,* American Society for Testing and Materials. pp 106-126.

[3] *Report of the Technical Investigation of The Station Nightclub Fire*, June 2005. NIST NCSTAR 2, pp 4-36. Retrieved from: http://fire.nist.gov/bfrlpubs/fire05/PDF/f05032.pdf

[4] *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm

[5] *Effective Fire Protection: A National Concern*. (2004). ISO. Retrieved from: http://www.iso.com/studies_analyses/fireProtection/docs/FireProtectionBrochure.pdf

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[11] *Nursing Facility Control (CMS OSCAR Form 671:F10, F13)*. (June 2005). American Nursing Association. Retrieved from: www.ahca.org.

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[13] Bernell, S and Gregory, S. (2000, December). *Paying for Hospice Care, Fact Sheet*. American Association of Retired Persons. Retrieved from: http://www.aarp.org.

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[16] Lipton, E. (2006, February 1). Committee Focuses on Failure to Aid New Orleans's Infirm. *New York Times*, Retrieved from: http://www.nytimes.com/2006/02/01/national/nationalspecial/01katrina.html?ex=1296450000&en=33ea15902481b29e&ei=5088&partner=rssnyt&emc=rss

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[18] Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from : http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm

[19] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

[20] Young, N. W. (2005, May). *A Look at Health Care Design and Construction Activity.* Construction Industry Intelligence Report. Retrieved from: http://dodge.construction.com/Analytics/CIIR/CIIR_May2005.pdf

Cost Impact: This code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G105–06/07
Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals, Washington, DC

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	**TYPE OF CONSTRUCTION**								
		TYPE I		**TYPE II**		**TYPE III**		**TYPE IV**	**TYPE V**	
		A	**B**	**A**	**B**	**A**	**B**	**HT**	**A**	**B**
	Hst(S)	**UL**	**160**	**65**	**55**	**65**	**55**	**65**	**50**	**40**
I-2	**S**	UL	~~4~~ 3	~~2~~ 1	~~1~~ NP	1	NP	1	1	NP
	A	UL	~~UL~~ 15,100	~~15,000~~ 6,800	~~11,000~~ NP	~~12,000~~ 6,800	NP	~~12,000~~ 6,800	~~9,500~~ 5,200	NP

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most hospitals, nursing homes and mental health facilities that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group I-2 of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger hospitals, nursing homes and mental health facilities with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group I-2 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

I-2 Base Tabular Values Table 503		
Type III		
	A	**B**
IBC 2003	S 1 A 12,000	NP NP
BOCA 1999	S 1 A 9,900	NP NP
SBC 1997	S 1 A 31,500**	NP NP
UBC 1997	S 1 A 6,800	NP NP

** = This number is increased to show sprinkler allowances

NP = Not Permitted
For accurate comparisons sprinkler increase allowances must be applied to IBC values

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group I-2 tabular values in Table 503 are the starting point for a design process that moves through many other steps, some of which are the subject of other code proposals. But, the Group I-2 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In Group I-2 occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

13. *"Rapid deflection occurred and imminent collapse became apparent between 1,000 °F and 1,200°F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.

14. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]

15. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]

16. *In Group I-2 occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the patients and staff that they hope to rescue increases exponentially.*

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at any of the healthcare facilities nationwide.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often hospitals and other Group I2 occupancies. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: In the event of significant fires in Group I-2 occupancies, large numbers of persons are likely to require rescues. Slightly over 5 percent of the United States' 65+ population – approximately 1.5 million persons[10] – occupy an estimated 16,032 nursing homes, congregate care and board and care homes.[11] In addition, more than 600,000 older Americans live in an estimated 28,000 assisted-living facilities.[12] Another 600,000 reside in hospices.[13] NFPA reports about 3,000 fires annually in these occupancies.[14] Many persons in this category are physically or mentally challenged and are unable to escape without assistance.

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group I-2 occupancies may not be sufficient for extended outages. Emergency energy is not required for all health care facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group I-2 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland.
- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[15] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.

- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[16] Recalled heads have been found in health care facilities. In fact, Veterans Affairs Medical Center officials reported the earliest recorded failures of the recalled heads in 1995. In spite of a significant effort to replace defective heads in Group I-2 occupancies, no one knows how many more recalled heads remain to be discovered in those health care facilities that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads, which remain formally listed and, therefore, technically in compliance with the Model Codes.[17] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new hospital, nursing home and mental health facility constructed in compliance with the Group I-2 tabular values in Table 503 is an experiment in safety. I-2 occupancies now are being built at a record rate – increasingly to the fire protection measures permitted in the IBC's current Table 503. $100 billion in inflation-adjusted dollars have been spent in the past five years on new health care facilities, up 47 percent from the previous five years, according to the U.S. Census Bureau. Industry sources believe spending on I-2 construction was likely to reach a record $23.7 billion in 2005. Adoption in this cycle is critical.

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[1] LeBlanc, P. and Fahy, R. (2005, June). *Firefighter Fatalities in the United States – 2004.* National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf
[2] Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464,* American Society for Testing and Materials. pp 106-126.
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[16] Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from: http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm
[17] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G106–06/07
Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	Hst(S)	UL	160	65	55	65	55	65	50	40
I-4	S A	UL UL	~~5~~ 4 ~~60,500~~	~~3~~ 2 ~~26,500~~	~~2~~ 1 ~~13,000~~	~~3~~ 2 ~~23,500~~	~~2~~ 1 ~~13,000~~	~~3~~ 2 ~~25,500~~	~~1~~ 2 ~~18,500~~	1 ~~9,000~~

			45,200	20,200	13,500	20,200	13,500	20,200	15,700	9,100

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most day care centers that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group I-4 of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger Group I-4 occupancies with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group I-4 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

I-4 Base Tabular Values Table 503		
	Type III	
	A	**B**
IBC 2003	S 2 A 23,500	2 13,000
BOCA 1999	S N/A A	N/A
SBC 1997	S N/A A	N/A
UBC 1997	S N/A A	N/A
Proposed	S 2 A 20,200	1 13,500

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group I-4 tabular values in Table 503 are the starting point for a design process that moves through many other steps some of which are the subject of other code proposals. But, the Group I-4 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In Group I-4 occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

17. *"Rapid deflection occurred and imminent collapse became apparent between 1,000 °F and 1,200°F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.

18. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]

19. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]

20. In Group I-4 occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the young children, older persons and staff that they hope to rescue increases exponentially.

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7]700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at any of the nation's day care facilities.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: In the event of significant fires in Group I-4 occupancies, large numbers of persons are likely to require rescues. 150,000 older persons attend an estimated 3,500, registered adult day care centers.[10] Many persons in this category are physically or mentally challenged and may be unable to escape without assistance. In addition, almost 2 million children under the age of 5 years attend an estimated 113,000 licensed day care centers, and about 33.4 million children attend elementary schools.[11] Of those elementary school-aged children, about one-fifth attend day care centers before and after school.[12] On average, there are about 600 fires in day cares and preschools with one civilian death per year, and 1,400 fires annually in elementary schools.[13] Firefighters assume that all young children will require help in safely exiting a fire.

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect.

Automatic sprinkler systems are certainly the first line of defense. Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group I-4 occupancies may not be sufficient for extended outages. Emergency energy is not required for all day care facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including I-4 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland.
- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[14] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[15] In spite of a significant effort to replace defective heads in all occupancies, no one knows how many more recalled heads remain to be discovered in Group I-4 facilities that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads, which remain formally listed and, therefore, technically in compliance with the Model Codes.[16] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new Group I-4 occupancy constructed in compliance with the Group I-4 tabular values in Table 503 is an experiment in safety. Adoption in this cycle is critical.

Endnotes and Bibliography:

[1] LeBlanc, P. and Fahy, R. (June 2005). *Firefighter Fatalities in the United States – 2004.* National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf

[2] Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464.* American Society for Testing and Materials. pp 106-126.

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[4] *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm

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[6] "Preventing Injuries and Deaths of Fire Fighters Due to Truss System Failures" NIOSH Publication No. 2005-132, May 2005. Retrieved from: http://www.cdc.gov/niosh/docs/2005-132/#sum

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[15] Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from: http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm
[16] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G107–06/07
Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
Group	Hgt(feet)	A	B	A	B	A	B	HT	A	B
	Hst(S)	UL	160	65	55	65	55	65	50	40
R-1	**S** **A**	UL UL	~~11~~ 12 ~~UL~~ 29,900	4 ~~24,000~~ 13,500	~~4~~ 2 ~~16,000~~ 9,100	4 ~~24,000~~ 13,500	~~4~~ 2 ~~16,000~~ 9,100	4 ~~20,500~~ 13,500	3 ~~12,000~~ 10,500	2 ~~7,000~~ 6,000

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most Group R-1occupancies that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group R-1of Table 503 to those in the 1997 Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: The IBC currently allows construction of taller, larger hotels and other transient residential occupancies with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group R-1 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

R-1 Base Tabular Values Table 503		
	Type III	
	A	**B**
IBC 2003	S 4 A 24,000	4 16,000
BOCA 1999	S 4 A 13,200	3 9,600

SBC 1997	S 5 A 36,000	5 24,000
UBC 1997	S 4 A 13,500	2 9,100

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group R-1 tabular values in Table 503 are the starting point for a design process that moves through many other steps some of which are the subject of other code proposals. But, the Group R-1 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 2: In hotels and other transient residential occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

1. *"Rapid deflection occurred and imminent collapse became apparent between 1,000 ^{o}F and 1,200^{o}F."*[2] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.

2. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050^{o}F at six minutes and 1,220^{o}F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100^{o}F and 1,380^{o}F in less than 1 1/2 minutes,[3] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[4]

3. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect 50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection." [5]

4. *In Group R-1 occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the guests and staff members that they hope to rescue increases exponentially.*

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[6] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[7] 700,000 law enforcement officials[8] and almost 180,000 emergency medical technicians[9] must be prepared to initiate rescue operations in the event of a fire at any of the nation's hotels and other transient residential occupancies.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often hotel and motel facilities. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 3: One would think that after the many serious hotel fires in the past 50 years, the problem would be solved. But one would be wrong. In mid January 2006, a fire at an unsprinklered Holiday Inn in Marietta, Georgia, left one person dead and 20 injured. The fire required more than 100 firefighters using ladder trucks to control the fire and initiate rescues – a level of response not possible in many communities.[10]

Justification 4: At the Marietta hotel fire, automatic fire sprinklers might have changed the outcome. But sprinklers are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group R-1 occupancies may not be sufficient for extended outages. Emergency energy is not required for all Group R-1facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group R-1 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland.

- *Sprinkler systems are shut off during maintenance and repair.* NFPA standards allow for the deactivation of sprinkler systems for several hours during maintenance and repair.[11] In the real world, repairs and maintenance may consume more than a typical workday, and systems often remain inactive well beyond the prescribed limit until work is complete.
- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[12] Recalled heads have been found in Group R-1 occupancies including many in Marriott properties renowned for high levels of fire protection. In spite of a significant effort to replace defective heads in all occupancies, no one knows how many more recalled heads remain to be discovered in hotels. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads which remain formally listed and therefore technically in compliance with the Model Codes.[13] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new hotel and other transient residential occupancy constructed in compliance with the Group R-1 tabular values in Table 503 is an experiment in safety. Adoption in this cycle is critical.

Endnotes and Bibliography:

[1] LeBlanc, P. and Fahy, R. (2005, June). *Firefighter Fatalities in the United States – 2004.* National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf
[2] Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464*. American Society for Testing and Materials. pp 106-126.
[3] *Report of the Technical Investigation of The Station Nightclub Fire*, June 2005. NIST NCSTAR 2, pp 4-36. Retrieved from: http://fire.nist.gov/bfrlpubs/fire05/PDF/f05032.pdf
[4] *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm
[5] *Effective Fire Protection: A National Concern*. (2004). ISO. Retrieved from: http://www.iso.com/studies_analyses/fireProtection/docs/FireProtectionBrochure.pdf
[6] "Preventing Injuries and Deaths of Fire Fighters Due to Truss System Failures" NIOSH Publication No. 2005-132, May 2005. Retrieved from: http://www.cdc.gov/niosh/docs/2005-132/#sum
[7] *Firefighters*. (2005, February 1). United States Fire Administration. Retrieved from: http://www.usfa.fema.gov/statistics/firefighters/
[8] *Law Enforcement Statistics*. (2005, October 17). Bureau of Justice Statistics. Retrieved from: http://www.ojp.usdoj.gov/bjs/lawenf.htm.
[9] *Emergency Medical Technicians and Paramedics*. (2004). Bureau of Labor Statistics. Retrieved from: http://www.bls.gov/oco/ocos101.htm.
[10] Plummer, D. and Ridder, K. (2006, January 17). "Holiday Inn in Marietta, Ga. Temporarily Closes Following Fatal Fire; 30 Year Old Hotel Did Not Have Sprinklers." Atlanta Journal-Constitution and Tribune Business News. Retrieved from: http://www.hotel-online.com/News/PR2006_1st/Jan06_MariettaFire.html
[11] *NFPA 25: Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.* (2002). National Fire Protection Association. Retrieved from: http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=25&cookie%5Ftest=1
[12] Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from: http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm
[13] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G108–06/07

Table 503

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise table as follows:

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building", per story

Group	Hgt(feet)	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	Hst(S)	UL	160	65	55	65	55	65	50	40
R-2[a]	S A	UL UL	~~11~~ 12 ~~UL~~	4 ~~24,000~~	~~4~~ 2 ~~16,000~~	4 ~~24,000~~	~~4~~ 2 ~~16,000~~	4 ~~20,500~~	3 ~~12,000~~	2 ~~7,000~~

			29,900	13,500	9,100	13,500	9,100	13,500	10,500	6,000

(Portions of table not shown do not change)

Reason: A firefighter is more likely to die in a traffic accident on the way to a fire than crushed by a structural collapse caused by that fire.[1] This extraordinary building safety record is due in large part to the Legacy Codes' fire protection requirements, which governed the construction of most apartment buildings, fraternity and sorority houses and other Group R-2 occupancies that exist today. *In reducing and modifying those well-tested requirements, the International Building Code (IBC) proceeded from what we know to be safe to something unproven.*

Therefore, the National Association of State Fire Marshals (NASFM) respectfully requests the IBC to restore the tabular values in Group R-2 of Table 503 to those in the Uniform Building Code (UBC). We selected the UBC because it was the most widely adopted of the three Legacy Codes.

Justification 1: We have made enormous strides in reducing the loss of life and property in fires involving Group R-2 occupancies. But much is yet to be done. With hundreds of fire fatalities in Group R-2 occupancies each year, we should restore the Group R-2 tabular values in Table 503 as part of a broad strategy to further reduce the loss of life and property in Group R-2 occupancies. In 1992, firefighters responded to 472,000 residential fires. By 2001, the number had been reduced to 396,500 with just about one-quarter in multi-family dwellings. But 18.3 percent of the 1,049 residential fire deaths we saw in 2001 occurred in Group R-2 occupancies.[2] That remains an unacceptably high number of fatalities. We do not expect to save lives through building codes alone. We are now on the verge of effective, new fire safety requirements for the most flammable contents of Group R-2 occupancies, e.g., mattresses, upholstered furniture, consumer electronics, etc., and are making progress with automatic fire sprinklers. We believe that at a time when we are increasing fire safety across the board, it makes little sense to experiment with untested, lesser fire safety requirements contained in the IBC.

Justification 2: The IBC currently allows construction of taller, larger Group R-2 occupancies with greatly reduced levels of passive fire protection, and even larger buildings based on just active protection. The calculation begins with Table 503, which sets the base "maximum allowable area" by type of occupancy. Fire protection is defined subsequently. An architect may simply use the values in Table 503 to determine the size of a building. In Group R-2 occupancies, many of the "maximum allowable area" values in Table 503 are greater than what was allowed in any of the Legacy Codes. These values can be further increased by the use of height and area modifications.

At the Final Action Hearings in Detroit in October 2005, persons speaking against proposals similar to this one flatly stated that the tabular values in Table 503 are consistent with, and certainly no less restrictive than, comparable values in the Legacy Codes. To disprove that claim, we respectfully share this comparison.

R-2 Base Tabular Values Table 503			
		Type III	
		A	**B**
IBC 2003	S	4	4
	A	24,000	16,000
BOCA 1999	S	4	3
	A	**13,200**	9,600
SBC 1997	S	5	5
	A	36,000	24,000
UBC 1997	S	4	2
	A	13,500	9,100

We selected an example using Type III construction because it provides a fair and clear comparison of values. Because of differences among the Legacy Codes, other construction types are more difficult to compare with the IBC's Table 503.

NASFM membership includes both fire and building code enforcement officials who are well familiar with the ways these tables are used by those who are committed to public safety and those who are not. The Group R-2 tabular values in Table 503 are the starting point for a design process that moves through many other steps some of which are the subject of other code proposals. But, the Group R-2 tabular values in Table 503 start that process by allowing for the construction of larger buildings with considerably less fire protection than was required by similar requirements by the Legacy Codes. No building ever gets smaller than what is allowed by Table 503.

Justification 3: In Group R-2 occupancies constructed to the IBC's fire protection requirements, fire incident commanders are being asked to make an impossible choice: refuse to rescue persons unable to escape fires or ignore federal warnings of structural collapse and risk firefighters' lives. It comes down to four facts:

5. *"Rapid deflection occurred and imminent collapse became apparent between 1,000 °F and 1,200°F."*[3] Although published 35 years ago, J.A. Bono's research continues to be a valid description of how carbon steel structures perform in the high temperatures generated by fires.

6. *Fires generate very high temperatures in a matter of minutes.* The ASTM E119 fire curve is a well-accepted fire protection tool that requires tested materials to withstand 1,050°F at six minutes and 1,220°F at nine minutes. There are numerous full-scale test results that show how quickly the temperature rises following ignition. Most recently, the tests run by the National Institute of Standards and Technology (NIST) on The Station nightclub recreation showed peak temperatures between 1,100°F and 1,380°F in less than 1 1/2 minutes,[4] although these high temperatures were not sustained. In the experiments to simulate the World Trade Center fire spread over workstations, similar peak temperatures were sustained for over 30 minutes, but were not reached until 10 to 15 minutes into the test.[5]

7. *In ideal circumstances, the best trained and equipped fire departments arrive at fires approximately seven minutes after ignition of the fire. Most departments do not operate under ideal conditions.* In December 2002, the Federal Emergency Management Agency (FEMA), in cooperation with the National Fire Protection Association (NFPA), released a comprehensive study entitled *A Needs Assessment of the U.S. Fire Service*. Based on responses from more than 8,400 fire departments, the study found that an estimated 73,000 firefighters serve in communities that protect

50,000 people or more, yet have fewer than four career firefighters assigned to first-due engine companies. With that staffing level, the first arriving company cannot safely start an interior attack on a structure fire and must wait for additional responders.

In addition, about 45 percent of emergency responders on duty in a single shift lack portable radios and 36 percent lack self-contained breathing apparatus. About 57,000 firefighters do not have their own personal protective clothing.

More than a quarter million firefighters, mostly volunteers in rural communities, are involved in fighting structure fires but lack formal training to do so safely. Nearly three out of four communities have too few fire stations to meet the accepted ISO response-distance guidelines.

According to ISO, large numbers of fire departments provide only marginal or inadequate protection against structure fires. "Of almost 46,000 fire districts evaluated under the Public Protection Classification (PPC) program, some 14,000 (about 30 percent) have achieved only a Class 9 rating – the lowest recognized protection. More than 1,300 (or 3 percent) have the Class 10 rating – no recognized protection."[6]

8. In Group R-2 occupancies, those responders who arrive first must concentrate on rescue at the expense of suppression. As demonstrated in the discussion of steel's performance previously in this justification, every minute the fire is allowed to burn unchecked, the risk of structural collapse to firefighters and the residents they hope to rescue increases exponentially.

In a May 2005 alert from the National Institute for Occupational Safety and Health (NIOSH), firefighters are told not to risk their lives by entering a building if structural collapse is possible.[7] NIOSH states, "Firefighters should be discouraged from risking their lives solely for property protection activities." According to NIOSH, "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."

However, if there is any possibility that a burning building is occupied, emergency responders will go in to search for those occupants. At any time, more than one million firefighters,[8] 700,000 law enforcement officials[9] and almost 180,000 emergency medical technicians[10] must be prepared to initiate rescue operations in the event of a fire at apartment buildings, fraternity/sorority houses or other R-2 occupancies nationwide.

Additionally many firefighters may have no option but to enter these buildings from the ground level and make their way up through the interior of the building in their search for survivors, thus opening themselves up to the risk of structural collapse. In December 2002, the aforementioned FEMA needs assessment revealed that almost 900 communities, mostly with populations under 100,000, have buildings of four stories or more. In many of those communities, the tall buildings are often multifamily dwellings. Yet their fire departments often lack the ladder/aerial apparatus needed to approach the upper floors of a building from the outside.

Justification 4: Automatic fire sprinklers absolutely save lives and protect property, but they are far from perfect. *Automatic sprinkler systems are certainly the first line of defense.* Sprinkler systems have proven their value countless times. However, failure to properly maintain systems creates problems, as with any fire protection equipment or system. Loss of municipal water pressure, unapproved remodeling, unapproved change of hazard or occupancy, and other unapproved changes that often go undetected for months or even years could result in reduced effectiveness or even an ineffective sprinkler system. What makes sprinklers so valuable is that they often perform exceptionally well even when not properly maintained. In larger buildings, because of height and/or area, the risk is too great to eliminate or reduce other systems and still be able to adequately conduct rescue and suppression operations. However, increasingly over the years other built-in fire protection is being reduced or eliminated in sprinklered buildings. While some of the reductions or eliminations are justified, many were made without much thought, such as we have seen with the merging of the three legacy codes. Eliminating or reducing backup or redundant fire protection in many larger buildings can create unsafe conditions for both occupants and first responders.

- *Power outages and interrupted water service interfere with active protection.* In the case of multi-story buildings or where water pressure is inadequate, fire sprinklers commonly rely on pumps to ensure adequate water, and pumps require electricity either as their primary source of energy or to operate the electronic control modules that regulate most fuel-powered units. Without electricity, sprinklers above the first few levels of a building may not function. Emergency back-up electricity where required for Group R-2 occupancies but may not be sufficient for extended outages. Emergency energy is not required for all Group R-2 facilities. According to the Edison Electric Institute, 67 percent of all power outages are weather-related. Most power outages last a few hours. But when hurricanes hit the Southeast, ice storms cripple New England and the Midwest, and tornados and earthquakes devastate the West, power outages may extend to days and even weeks. For example, Hurricane Katrina disrupted electric service for more than 300,000 customers, including Group R-2 occupancies, for up to eight days in Birmingham and Tuscaloosa, Alabama – cities more than 150 miles inland.
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- *The challenge of replacing recalled sprinkler heads.* More than four years after the government announced the recall of 35 million defective fire sprinkler heads, nearly two-thirds remain in use, millions more have been recalled and a leading sprinkler head manufacturer reports that some claims of property loss have been made related to fires in buildings found to contain the recalled heads.[12] Recalled heads have been found in Group R-2 occupancies. In spite of a significant effort to replace defective heads in all occupancies, no one knows how many more recalled heads remain to be discovered in those Group R-2 occupancies that are sprinklered. In many jurisdictions, fire code officials lack the authority to require the replacement of recalled sprinkler heads which remain formally listed and therefore technically in compliance with the Model Codes.[13] Sprinkler manufacturers say they lack information on where the heads were installed, and installers expect reimbursement for labor to replace defective units.

Justification 5: Every new apartment building, fraternity and sorority house and other Group R-2 occupancy constructed in compliance with the Group R-2 tabular values in Table 503 is an experiment in safety. Hundreds of thousands of Group R-2 occupancies are being constructed to the IBC. According to federal sources, in January 2006 alone:

- 428,000 permits were granted for residential units in buildings with five or more units.
- Construction began on 427,000 units.
- 327,000 residential units in buildings with five or more units were completed.[14]

Adoption in this cycle is critical.

[1] LeBlanc, P. and Fahy, R. (2005, June). *Firefighter Fatalities in the United States – 2004.* National Fire Protection Association. Retrieved from: http://www.nfpa.org/assets/files/PDF/osfff.pdf
[2] *Fires in the United States: 1992-2001.* United States Fire Administration. Retrieved from: http://www.usfa.fema.gov/downloads/pdf/publications/fius13/ch3.pdf
[3] Bono, J.A. (1970). "New Criteria for Fire Endurance Tests." *Fire Test Performance, ASTM STP 464.* American Society for Testing and Materials. pp 106-126.
[4] *Report of the Technical Investigation of The Station Nightclub Fire*, June 2005. NIST NCSTAR 2, pp 4-36. Retrieved from: http://fire.nist.gov/bfrlpubs/fire05/PDF/f05032.pdf
[5] *Reconstruction of the Fires in the World Trade Center Towers.* NIST NCSTAR 1-5, p 78. Retrieved from: http://wtc.nist.gov/oct05NCSTAR1-5index.htm
[6] *Effective Fire Protection: A National Concern*. (2004). ISO. Retrieved from: http://www.iso.com/studies_analyses/fireProtection/docs/FireProtectionBrochure.pdf
[7] "Preventing Injuries and Deaths of Fire Fighters Due to Truss System Failures" NIOSH Publication No. 2005-132, May 2005. Retrieved from: http://www.cdc.gov/niosh/docs/2005-132/#sum
[8] *Firefighters*. (2005, February 1). United States Fire Administration. Retrieved from: http://www.usfa.fema.gov/statistics/firefighters/
[9] *Law Enforcement Statistics*. (2005, October 17). Bureau of Justice Statistics. Retrieved from: http://www.ojp.usdoj.gov/bjs/lawenf.htm.

[10] *Emergency Medical Technicians and Paramedics*. (2004). Bureau of Labor Statistics. Retrieved from: http://www.bls.gov/oco/ocos101.htm.
[11] *NFPA 25: Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.* (2002). National Fire Protection Association. Retrieved from: http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=25&cookie%5Ftest=1
[12] Eisler, P. (2006, February 13). "Defective Sprinklers Still in Use." *USA Today*, p. 1. Retrieved from: http://www.usatoday.com/news/nation/2006-02-12-defective-sprinklers_x.htm
[13] The 2006 International Fire Code was amended to provide Authorities Having Jurisdiction (AHJs) with the authority to compel replacement of fire protection technologies subject to voluntary or mandatory recalls. Underwriters Laboratories declined to remove the listing for the federally recalled sprinkler heads, but has modified its performance standards leading to listing.
[14] *New Residential Construction in January 2006.* (2006, February 16). US Census Bureau Joint Press Release with US Department of Housing and Urban Development. Retrieved from: http://www.census.gov/indicator/www/newresconst.pdf

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G109–06/07
503.1

Proponent: Sarah A. Rice, Schirmer Engineering Corporation

Revise as follows:

503.1 General. The height and area for buildings of different construction types shall be governed by the intended use of the building and shall not exceed the limits in Table 503 except as modified in Sections 503.1.1 through 503.1.3, Sections 504 through 509 and Chapter 4 ~~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.

Reason: Currently the only hint that the code user has in Chapter 5 that the height and area limitations in Sections 508 and 509, and Chapter 4 are allowed is found in the 1st sentence in Section 503.1, which states "The height and area for buildings of different construction types shall be governed by the intended use of the building and shall not exceed the limits in Table 503 except as modified hereafter."

Nowhere in Chapter 5 specifically is there a connector to Chapter 4 which contains many modifications to the heights and areas allowed by Table 503, e.g., covered mall buildings, high-rise, etc.

The proposed language is intended to make it clear the term "hereafter" not only refers to those items in Sections 503.1.1 through 503.1.3 and Sections 504 through 509, but also refers to those provisions found in Chapters 4 and 5 which are modify the heights and areas allowed by Table 503.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G110–06/07
503.1

Proponent: Philip Brazil, PE, Reid Middleton, Inc., representing himself

Revise as follows:

503.1 General. The height and area ~~for~~ of a building~~s of different construction types shall be governed by the intended use of the building and~~ shall not exceed the limits specified in Table 503 based on the type of construction as determined by Section 602 and the occupancies as determined by Section 302 except as modified hereafter. Each ~~part~~ portion of a building ~~included within the exterior walls or the exterior walls and fire walls where provided~~ separated by one or more fire walls complying with Section 705 shall be ~~permitted~~ considered to be a separate building.

Reason: The purpose of the proposal is to establish technically sound charging language for the provisions of Section 503. The current language references buildings of different construction types but not buildings of a single construction type. Section 602.1 requires buildings to be classified into a single construction type. Section 503, however, is silent on buildings complying with Section 602.1. Section 705.1 permits portions of a building separated by fire walls to be considered as separate buildings. This, in turn, provides the option of classifying portions of buildings separated by fire walls into different types of construction. Section 503, however, is also silent on buildings complying with Section 705.1. Section 503 limits the height and area of a building with different types of construction by reference to Table 503. Table 503, however, is silent on its application to buildings with different types of construction.

Section 503.1 permits a portion of a building included within the exterior walls or the exterior walls and fire walls to be a separate building. A portion of a building included within the exterior walls is not a portion of a building but is the entire building. Permitting a portion of a building separated by one or more fire walls to be a separate building challenges the laws of physics. A portion of a building separated from the remainder of the building by a fire wall is still a portion of a building but it can be considered as a separate building for the purposes of compliance with the IBC when the fire wall complies with Section 705.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G111–06/07
503.1, 503.1.4 (New)

Proponent: Sarah A. Rice, Schirmer Engineering Corporation

Revise as follows:

503.1 General. The height and area for buildings of different construction types shall be governed by the intended use of the building and shall not exceed the limits in Table 503 except as modified by Sections 503.1.1 through 503.1.4 and Sections 504 through 509 ~~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.

503.1.1 Special industrial occupancies. Buildings and structures designed to house special industrial processes that require large areas and unusual heights to accommodate craneways or special machinery and equipment, including, among others, rolling mills; structural metal fabrication shops and foundries; or the production and distribution of electric, gas or steam power, shall be exempt from the height and area limitations of Table 503.

503.1.2 Buildings on same lot. Two or more buildings on the same lot shall be regulated as separate buildings or shall be considered as portions of one building if the height of each building and the aggregate area of buildings are within the limitations of Table 503 as modified by Sections 504 and 506. The provisions of this code applicable to the aggregate building shall be applicable to each building.

503.1.3 Type I construction. Buildings of Type I construction permitted to be of unlimited tabular heights and areas are not subject to the special requirements that allow unlimited area buildings in Section 507 or unlimited height in Sections 503.1.1 and 504.3 or increased height and areas for other types of construction.

503.1.4 Special uses and occupancies. Buildings and structures of those special uses and occupancies found in Chapter 4 that require unusual heights and areas, shall be exempt from the height and area limitations of Table 503 to the extent prescribed in Chapter 4.

Reason: Currently the only hint that the code user has in Chapter 5 that the height and area limitations in Sections 508 and 509, and Chapter 4 are allowed is found in the 1st sentence in Section 503.1, which states "The height and area for buildings of different construction types shall be governed by the intended use of the building and shall not exceed the limits in Table 503 except as modified hereafter."

Nowhere in Chapter 5 specifically is there a connector to Chapter 4 which contains many modifications to the heights and areas allowed by Table 503, e.g., covered mall buildings, high-rise, etc.

The proposed language is intended to make it clear the term "hereafter" refers to those provisions found elsewhere in Chapters 5 and that the modifications in Chapter 4 to the heights and areas allowed by Table 503 is recognized.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G112–06/07
503.1.2

Proponent: Sheldon Rucinski, Schirmer Engineering Corporation

Revise as follows:

503.1.2 Buildings on same lot. Two or more buildings on the same lot shall be regulated as separate buildings or shall be considered as portions of one building if the height of each building and the aggregate area of buildings are within the limitations of Section 402 or Table 503 as modified by Sections 504 and 506. The provisions of this code applicable to the aggregate building shall be applicable to each building.

Reason: A new trend is emerging in the area of covered malls, commonly referred to as “towne centers” or “life style centers.” For all intense purposes these are look and smell just like any covered mall building out there with the exception that the common pedestrian area is “uncovered” to allow the occupants to experience the outside.

The recognition of covered mall buildings to the concept of buildings on the same lot, will allow for these designs. All other provisions in Section 402 will still apply, e.g., type of construction, open yard, fire alarm, sprinkler, etc.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

G113–06/07
504.2

Proponent: Rick Thornberry, P.E., The Code Consortium, representing the Alliance for Fire and Smoke Containment and Control (AFSC)

Revise as follows:

504.2 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the value specified in Table 503 for ~~maximum height is increased by 20 feet (6096 mm) and~~ the maximum number of stories is increased by one. ~~These~~ This increase~~s are~~ shall be permitted in addition to the area increase in accordance with Sections 506.2 and 506.3. For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2, the value specified in Table 503 for ~~maximum height is increased by 20 feet (6096 mm) and~~ the maximum number of stories is increased by one, but shall not exceed ~~60 feet (18 288 mm) or~~ four stories~~, respectively~~.

Exceptions:

1. Fire areas with an occupancy in Group I-2 of Type IIB, III, IV or V construction.
2. Fire areas with an occupancy in Group H-1, H-2, H-3 or H-5.
3. Fire-resistance rating substitution in accordance with Table 601, Note e.

Reason: The purpose of this proposed code change is to delete the 20 foot height increase allowed when an automatic sprinkler system is installed throughout the building. This would apply not only to NFPA 13 sprinkler systems, but also to NFPA 13R sprinkler systems for Group R occupancies. This issue has come to our attention after our participation in the California State Fire Marshal's code review and evaluation process set up for the adoption of the 2006 International Building Code (IBC). During a very thorough review conducted by the Height and Area Study Group, it was discovered that the 20 foot height increase for automatic sprinkler systems allows for taller buildings than any of the three legacy model building codes allowed with a few minor exceptions. Both the 1997 ICBO Uniform Building Code (UBC) and the 1999 SBCCI Standard Building Code (SBC) allowed the identical building heights for their comparable types of construction with the exception of IBC Type IB construction (UBC Type II – F.R. and SBC Type II) for which the UBC allowed the same height as the IBC of 160 feet as compared to 80 feet in the SBC. A maximum height of 120 feet was allowed in the 1999 BOCA National Building Code (NBC) for their comparable construction Type 2A.

However, for the lesser types of construction the BOCA NBC generally did not allow higher building heights even with the 20 foot height increase for automatic sprinklers (the BOCA NBC was the only legacy model building code that allowed for the 20 foot height increase for automatic sprinklers) than the maximum building heights allowed by the IBC without the 20 foot height increase for automatic sprinklers.

For the Committee's information, we have provided a table which compares the IBC construction types with the BOCA NBC construction types and shows the height limit allowed by the IBC without an automatic sprinkler increase of 20 feet and the BOCA NBC maximum height allowed with an automatic sprinkler increase of 20 feet. The final column to the right shows the maximum height allowed by the IBC with an automatic sprinkler system increase of 20 feet for an additional comparison.

A review of the table clearly shows that only in a very few limited cases would the BOCA NBC with the 20 foot height increase for an automatic sprinkler system allow building heights for specific types of construction and occupancy combinations to be as high as the IBC allowable height with the 20 foot sprinkler increase. For the vast majority of cases, however, for other than Type V construction, the BOCA NBC with the 20 foot sprinkler height increase allowed at most only a 5 foot increase, in effect, above that allowed by the IBC without the 20 foot height increase for automatic sprinklers. Where an occupancy group is not shown in the table, that means the maximum allowable height by the BOCA NBC with the 20 foot sprinkler height increase included did not even exceed the maximum allowable height permitted in Table 503 of the IBC without the 20 foot height increase for automatic sprinklers. Thus, the IBC is allowing buildings to be built taller than they were ever allowed to be built by any of the three legacy model building codes prior to the IBC. We are not aware of any technical justification provided during the ICC drafting process to justify this extra height increase. So it is very likely that there has been very little fire experience throughout the country to provide data that may indicate if the extra 20 foot height increase is acceptable and does not cause an adverse impact on fire and life safety.

Increasing the allowable building height will pose more of a challenge to the responding fire department to gain access to the roof or the upper floors of such buildings. This may mandate that they utilize more sophisticated ladders and aerial equipment which complicates their fire fighting and rescue efforts. Increased height means more time will be required to gain access to the roof or the upper stories of the building which delays rescue, as well as fire fighting operations, should the fire be on the upper floors or the roof. This will potentially reduce the overall level of fire and life safety provided in these buildings even though an automatic sprinkler system is installed. Since automatic sprinkler systems are not foolproof or fail safe, they may not be available at a critical time when a fire gets out of control and the fire department must respond to deal with a fire on the upper story of the building or the roof. This is even more critical in seismically active areas such as in California where an earthquake can knock out the water supply to the sprinkler system. Earthquakes will also put a greater demand on fire departments since they will be responding to multiple incidents and they will face more challenges if the buildings are allowed to be 20 feet higher than currently allowed by the UBC. This will certainly result in more property damage and more risk for the building occupants, as well as the fire fighters who have to respond to an uncontrolled fire in such buildings.

In conclusion, we believe it is inappropriate to retain the 20 foot height increase currently allowed for the installation of an automatic sprinkler system by Section 504.2 since there is no apparent technical justification to allow the increase above the maximum height levels allowed by virtually any of the previous legacy model codes. Without such technical justification why should the IBC be part of a grand experiment to determine what impact such a height increase will have on the building's overall fire and life safety in communities that adopt the IBC where they have never allowed such heights before?

Construction Type				Height Limit (FT)			
IBC	NBC		IBC*	NBC**			IBC**
IIA	2B	65’	B	85’			85’
					F-1	70’	
					F-2	85’	
					H-3	70’	
					H-4	85’	
					I-1		70’
					M		70’
					R-1	70’	
					R-2	70’	
					R-3	70’	
					S-1	70’	
					S-2	85’	
IIB	2C	55’	B	60’			75’
					F-2	60’	
					H-4	60’	
					I-1		60’
					R-1	60’	
					R-2	60’	
					R-3	60’	
					S-2	60’	
IIIA	3A	65’	B	70’		85’	
					F-2	70’	
					H-4	70’	
					I-1		70’
					R-1	70’	
					R-2	70’	
					R-3	70’	
					S-2	70’	
IIIB	3B	55’	B	60’			75’
					F-2	60’	
					H-4	60’	
					I-1		60’
					R-1	60’	
					R-2	60’	
					R-3	60’	
					S-2	60’	
IV	4		65’	B	85’		85’
					F-1	70’	
					F-2	85’	
					H-3	70’	
					H-4	85’	
					I-1		70’
					M		70’
					R-1	70’	
					R-2	70’	
					R-3	70’	
					S-1	70’	
					S-2	85’	
VA	5A	50’	B	60’			70’
					F-2	60’	
					H-4	60’	
					I-1		60’
					R-1	60’	
					R-2	60’	
					R-3	60’	
					S-2	60’	
VB	5B	40’	B	50’		60’	
					F-2	50’	
					H-4	50’	
					I-1		55’
					R-1	55’	
					R-2	55’	
					R-3	55’	
					S-1	50’	
					S-2	50’	

*without 20 foot sprinkler increase
**with 20 foot sprinkler increase

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G114–06/07

504.2, 506.3

Proponent: Rick Thornberry, P.E., The Code Consortium, representing the Alliance for Fire and Smoke Containment and Control (AFSC)

Revise as follows:

504.2 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one. These increases ~~are~~ shall be permitted in addition to the area increase in accordance with Sections 506.2 and 506.3. For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one, but shall not exceed 60 feet (18 288 mm) or four stories, respectively.

> **Exceptions:** The maximum height and maximum number of stories increases shall not be permitted for the following conditions:
>
> 1. Fire areas with an occupancy in Group I-2 of Type IIB, III, IV or V construction.
> 2. Fire areas with an occupancy in Group H-1, H-2, H-3 or H-5.
> 3. Fire-resistance rating substitution in accordance with Table 601, Note e.
> 4. Buildings of Type IIB, IIIB, or VB construction where the area increase permitted by Section 506.3 is used.

506.3 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the area limitation in Table 503 is permitted to be increased by an additional 200 percent (I_s = 2) for buildings with more than one story above grade plane and an additional 300 percent (I_s = 3) for buildings with no more than one story above grade plane. These increases ~~are~~ shall be permitted in addition to the height and story increases in accordance with Section 504.2.

> **Exception:** The area limitation increases shall not be permitted for the following conditions:
>
> 1. The automatic sprinkler system increase shall not apply to buildings with an occupancy in Use Group H-1.
> 2. The automatic sprinkler system increase shall not apply to the floor area of an occupancy in Use Group H-2 or H-3. For mixed-use buildings containing such occupancies, the allowable area shall be calculated in accordance with Section 508.3.3.2, with the sprinkler increase applicable only to the portions of the building not classified as Use Group H-2 or H-3.
> 3. Fire-resistance rating substitution in accordance with Table 601, Note e.
> 4. Buildings of Type IIB, IIIB, or VB construction where the height and story increases permitted by Section 504.2 are used.

Reason: The purpose of this code change proposal is to eliminate the current allowance in the code that permits both a height increase in stories and feet, as well as an area increase where an automatic sprinkler system is installed in buildings constructed of the non-rated types of construction, i.e. Types IIB, IIIB, and VB. We have focused in on the non-rated types of construction since we believe they pose the greatest challenge to fire and life safety should they experience a fire. If such buildings are allowed to take advantage of both the height and area increase for the installation of an automatic sprinkler system, they will be subject to greater fire losses should the sprinkler system not operate as designed. Since an automatic sprinkler system is not 100 percent foolproof, we believe this is an over reliance on the use of that sprinkler system to allow for these significant increases in the building heights and areas. These buildings have basically no built-in passive fire-resistive protection so that a fire that gets out of control could readily spread to multiple stories and cause early collapse of the building construction. It has been well documented that automatic sprinkler systems have a failure performance rate of somewhere in the neighborhood of 10 to 15 percent of all building fires involving sprinklers where the fire was judged to be large enough that it should have activated the sprinkler system.

What is even more disconcerting is that a comparison of the three legacy model codes will show that the utilization of both the height increase and the area increase almost always results in a larger building in both terms of height and area than was previously allowed by those legacy model codes.

Please refer to the example comparing the maximum allowable heights and areas for a Group B office building of Type IIB construction based on the current provisions in the IBC versus the three legacy model building codes. The example also shows what the maximum allowable areas and building heights would be if this code change proposal were approved. One can see that the allowable areas and heights under the current IBC are significantly greater for virtually every case. However, the implementation of the proposed code change indicates that the maximum allowable building areas and heights are generally still greater but not nearly as much.

We have also compiled tables comparing the maximum allowable heights and areas for other occupancies for these non-rated types of construction. Again, they clearly show the significantly larger building areas and heights permitted by the current IBC as compared to the previous legacy model codes for the vast majority of cases. However, this code change proposal will reduce those very large heights and areas so that they wont be nearly as excessive as they currently are. This will result in allowable building heights and areas that are more comparable to those that have been traditionally allowed by the previous legacy model building codes.

Why is this important? Because we don't have any substantiated fire record for these greatly larger buildings that have not been previously allowed by the legacy model building codes. We can only assume that allowing larger buildings than previously allowed based on the same type of construction for a given occupancy can only result in an increase in fire loss statistics over time as these larger buildings are constructed and occupied and suffer fires over their lifetime. For these reasons, we recommend that this code change proposal be approved as submitted.

Example: Group B Office Building

Type IIB Construction

Area Per Story

	ICC IBC		BOCA NBC		ICBO UBC		SBCCI SBC	
	Area	Height	Area	Height	Area	Height	Area	Height
Base	23,000 s.f.	4 st. 55'	14,400 s.f.	3 st. 40'	12,000 s.f.	2 st. 55'	17,000 s.f.	2 st. 55'
Max.	86,250 s.f.*	5 st. 75'	47,520 s.f.	4 st. 60'	48,000 s.f.	2 st. 55'	51,000 s.f.	5 st. 55'
	51,750 s.f.**				or			
					24,000 s.f.	3 st. 55'		

As Revised by this Proposal

	ICC IBC Area	Height
Max.	86,250 s.f.*	4 st. 55'
	64,688 s.f.**	
	or	
Max.	40,250 s.f.*	5 st. 75'
	30,188 s.f.**	

Total Building Area

	ICC IBC Area	Height	BOCA NBC Area	Height	ICBO UBC Area	Height	SBCCI SBC Area	Height
Base	69,000 s.f.	4 st. 55'	43,200 s.f.	3 st. 40'	24,000 s.f.	2 st. 55'	34,000 s.f.	2 st. 55'
Max.	258,750 s.f.	5 st. 75'	190,080 s.f.	4 st. 60'	96,000 s.f.	2 st. 55'	204,000 s.f.	4 st. 55'
					or		or	
					48,000 s.f.	3 st. 55'	255,000 s.f.	5 st. 55'

As Revised by this Proposal

	ICC IBC Area	Height
Max.	258,750 s.f.	4 st. 55'
	or	
Max.	120,750 s.f	5 st. 75'

*Maximum area allowed for any story provided the total building area does not exceed that allowed as indicated below.
**Maximum area allowed per story if evenly divided between all the stories allowed.

Type IIB Construction

Maximum Allowable Total Building Area

(sf)

Occ.	Proposed IBC (2x)	BOCA NBC	ICBO UBC	SBCCI SBC	Existing IBC (3x)
A-2	71,250	16,800 [1]	NP [10]	32,000 [7]	106,875
A-3	71,250	57,960 [2]	54,600 [3]	48,000 [8]	106,875
B	172,500	132,480	96,000	255,000	258,750
E	108,750	99,360	81,000	48,000	163,125
F-1	116,250	66,240	96,000	252,000	174,375
I-1	75,000	77,280	NP [4]	180,000 [9]	112,500
I-2	41,250	25,200	27,000 [5]	40,000	41,250
M	93,750	66,240	96,000	135,000	140,625
R-1/R-2	120,000	88,320	72,800 [6]	180,000	180,000
S-1	131,250	57,960	96,000	192,000	196,875

NP - not permitted

Footnotes:

[1] - BOCA NBC A-2 night club/dance hall

[2] - BOCA NBC A-3 restaurant/library/exhibition hall

[3] - ICBO UBC A-3 having assembly room with occupant load < 300 (no stage)

[4] - ICBO UBC I-2

[5] - ICBO UBC I-1.1

[6] - ICBO UBC requires 1 hour fire resistive construction throughout

[7] - SBCCI SBC Group A large assembly (no stage)

[8] - SBCCI SBC Group A small assembly (no stage)

[9] - SBCCI SBC Group R-4

[10] - ICBO UBC A-2.1 having assembly room with occupant load $\geq$ 300 (no stage)

Type IIB Construction

Maximum Allowable Total Building Height

(stories/feet)

	Not Sprinklered				**Sprinklered**			
Occ.	IBC	BOCA	ICBO [11]	SBCCI [12]	IBC	BOCA	ICBO [11]	SBCCI [12]
A-2	2/55	1/20 [1]	NP [10]	1/55 [7]	3/75	2/40 [1]	NP [10]	1/55 [7]
A-3	2/55	2/30 [2]	1/55 [3]	2/55 [8]	3/75	3/50 [2]	2/55 [3]	2/55 [8]
B	4/55	3/40	2/55	2/55	5/75	4/60	3/55	5/55
E	2/55	2/30	1/55	1/55	3/75	3/50	2/55	1/55
F-1	2/55	2/30	2/55	2/55	3/75	3/50	3/55	4/55
I-1	3/55	3/40	NP [4]	2/55 [9]	4/75	4/60	NP [4]	5/55 [9]
I-2	1/55	1/20	NP [5]	NP	1/55	1/20	1/55 [5]	1/55
M	4/55	2/30	2/55	2/55	5/75	3/50	3/55	5/55
R-1/R-2	4/55	3/40	2/55 [6]	2/55	5/75	4/60	3/55 [6]	5/55
S-1	3/55	2/30	2/55	2/55	4/75	3/50	3/55	4/55

NP - not permitted

Footnotes:

[1] - BOCA NBC A-2 night club/dance hall

[2] - BOCA NBC A-3 restaurant/library/exhibition hall

[3] - ICBO UBC A-3 having assembly room with occupant load < 300 (no stage)

[4] - ICBO UBC I-2

[5] - ICBO UBC I-1.1

[6] - ICBO UBC requires 1 hour fire resistive construction throughout

[7] - SBCCI SBC Group A large assembly (no stage)

[8] - SBCCI SBC Group A small assembly (no stage)

[9] - SBCCI SBC Group R-4

[10] - ICBO UBC A-2.1 having assembly room with occupant load $\geq$ 300 (no stage)

[11] - ICBO UBC will allow a 1 story height increase or an area increase for an automatic sprinkler system, but not both for the same building

[12] – SBCCI SBC will allow a 1 story height increase in the unsprinklered column in Table

500, but not an area increase, for an automatic sprinkler system. The sprinklered column in Table 500 generally allows at least a 1 story height increase plus an area increase for an automatic sprinkler system but does not allow the height increase for:

A-1 Large Assembly

A-2 Small Assembly

E - Education

Type VI - Unprotected construction

Type VB Construction

Maximum Allowable Total Building Height

(stories/feet)

	Not Sprinklered				Sprinklered			
Occ.	IBC	BOCA	ICBO [10]	SBCCI [11]	IBC	BOCA	ICBO [10]	SBCCI [11]
A-2	1/40	1/20 [1]	NP	NP [7]	2/60	2/40 [1]	NP	NP [7]
A-3	1/40	1/20 [2]	1/40 [3]	1/40 [8]	2/60	2/40 [2]	2/40 [3]	2/40 [8]
B	2/40	2/30	2/40	2/40	3/60	3/50	3/40	3/40
E	1/40	1/20	1/40	1/40	2/60	2/40	2/40	2/40
F-1	1/40	1/20	2/40	1/40	2/60	2/40	3/40	2/40
I-1	2/40	2/35	NP [4]	2/40 [9]	2/60	3/55	NP [4]	3/40 [9]
I-2	NP	NP	NP [5]	NP	NP	NP	NP [5]	NP
M	1/40	1/20	2/40	2/40	2/60	2/40	3/40	3/40
R-1/R-2	2/40	2/35	2/40 [6]	2/40	3/60	3/55	3/40 [6]	3/40
S-1	1/40	1/30	2/40	1/40	2/60	2/50	3/40	2/40

NP - not permitted

Footnotes:

500, but not an area increase, for an automatic sprinkler system. The sprinklered column in Table 500 generally allows at least a 1 story height increase plus an area increase for an automatic sprinkler system but does not allow the height increase for:

Type VB Construction

Maximum Allowable Total Building Area

(sf)

Occ.	Proposed IBC (2x)	BOCA NBC	ICBO UBC	SBCCI SBC	Existing IBC (3x)
A-2	45,000	8,400 [1]	NP [10]	NP [7]	45,000
A-3	45,000	29,400 [2]	36,000 [3]	20,000 [8]	45,000
B	67,500	49,680	64,000	54,000	101,250
E	71,250	50,400	72,800	32,000	71,250

F-1	63,750	33,600	64,000	40,000	63,750
I-1	33,750	28,980	NP [4]	42,000 [9]	50,625
I-2	NP	NP	NP [5]	NP	NP
M	67,500	33,600	64,000	36,000	67,500
R-1/R-2	52,500	33,120	48,000 [6]	42,000	78,750
S-1	67,500	29,400	64,000	24,000	67,500

NP - not permitted

Footnotes:

[1] - BOCA NBC A-2 night club/dance hall

[2] - BOCA NBC A-3 restaurant/library/exhibition hall

[3] - ICBO UBC A-3 having assembly room with occupant load < 300 (no stage)

[4] - ICBO UBC I-2

[5] - ICBO UBC I-1.1

[6] - ICBO UBC requires 1 hour fire resistive construction throughout

[7] - SBCCI SBC Group A large assembly (no stage)

[8] - SBCCI SBC Group A small assembly (no stage)

[9] - SBCCI SBC Group R-4

[10] - ICBO UBC A-2.1 having assembly room with occupant load $\geq$ 300 (no stage)

Type IIIB Construction

Maximum Allowable Total Building Height

(stories/feet)

	Not Sprinklered				**Sprinklered**			
Occ.	IBC	BOCA	ICBO [10]	SBCCI [11]	IBC	BOCA	ICBO [10]	SBCCI [11]
A-2	2/55	1/20 [1]	NP	1/55 [7]	3/75	2/40 [1]	NP	2/55 [7]
A-3	2/55	2/30 [2]	1/55 [3]	2/55 [8]	3/75	3/50 [2]	2/55 [3]	3/55 [8]
B	4/55	3/40	2/55	2/55	5/75	4/60	3/55	5/55
E	2/55	2/30	1/55	1/55	3/75	3/50	2/55	2/55
F-1	2/55	2/30	2/55	2/55	3/75	3/50	3/55	4/55
I-1	3/55	3/40	NP [4]	2/55 [9]	4/75	4/60	NP [4]	5/55 [9]
I-2	NP	NP	NP [5]	NP	NP	NP	NP [5]	NP
M	4/55	2/30	2/55	2/55	5/75	3/50	3/55	5/55
R-1/R-2	4/55	3/40	2/55 [6]	2/55	5/75	4/60	3/55 [6]	5/55
S-1	3/55	2/30	2/55	2/55	4/75	3/50	3/55	4/55

NP - not permitted

500, but not an area increase, for an automatic sprinkler system. The sprinklered column in Table 500 generally allows at least a 1 story height increase plus an area increase for an automatic sprinkler system but does not allow the height increase for:

Type IIIB Construction

Maximum Allowable Total Building Area

(sf)

Occ.	Proposed IBC (2x)	BOCA NBC	ICBO UBC	SBCCI SBC	Existing IBC (3x)
A-2	71,250	16,800 [1]	NP [10]	32,000 [7]	106,875
A-3	71,250	57,960 [2]	54,600 [3]	48,000 [8]	106,875
B	142,500	132,480	96,000	210,000	213,750
E	108,750	99,360	81,000	48,000	163,125
F-1	90,000	66,240	96,000	180,000	135,000
I-1	75,000	77,280	NP [4]	180,000 [9]	112,500
I-2	NP	NP	NP [5]	NP	NP
M	93,750	66,240	96,000	135,000	140,625
R-1/R-2	120,000	88,320	72,800 [6]	180,000	180,000
S-1	131,250	57,960	96,000	192,000	196,875

NP - not permitted

Footnotes:

[1] - BOCA NBC A-2 night club/dance hall

[2] - BOCA NBC A-3 restaurant/library/exhibition hall

[3] - ICBO UBC A-3 having assembly room with occupant load < 300 (no stage)

[4] - ICBO UBC I-2

[5] - ICBO UBC I-1.1

[6] - ICBO UBC requires 1 hour fire resistive construction throughout

[7] - SBCCI SBC Group A large assembly (no stage)

[8] - SBCCI SBC Group A small assembly (no stage)

[9] - SBCCI SBC Group R-4

[10] - ICBO UBC A-2.1 having assembly room with occupant load ≥ 300 (no stage)

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G115–06/07
504.2, 506.3

Proponent: George Thomas, P.E., CBO, City of Pleasanton, representing the Tri-Chapters Code Committee and Laura Blaul, Orange County Fire, representing the California Fire Chiefs Association

Revise as follows:

504.2 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one. These increases are permitted in addition to the area increase in accordance with Sections 506.2~~ and 506.3~~. For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one, but shall not exceed 60 feet (18 288 mm) or four stories, respectively.

Exceptions:

1. Fire areas with an occupancy in Group I-2 of Type IIB, III, IV or V construction.
2. Fire areas with an occupancy in Group H-1, H-2, H-3 or H-5.
3. Fire-resistance rating substitution in accordance with Table 601, Note e
4. This increase is not permitted in addition to the area increase in accordance with Section 506.3.

506.3 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the area limitation in Table 503 is permitted to be increased by an additional 200 percent (Is = 2) for buildings with more than one story above grade plane and an additional 300 percent (Is = 3) for buildings with no more than one story above grade plane. ~~These increases are permitted in addition to the height and story increases in accordance with Section 504.2.~~

Exception: The area limitation increases shall not be permitted for the following conditions:

1. The automatic sprinkler system increase shall not apply to buildings with an occupancy in Use Group H-1.
2. The automatic sprinkler system increase shall not apply to the floor area of an occupancy in Use Group H-2 or H-3. For mixed-use buildings containing such occupancies, the allowable area shall be calculated in accordance with Section 508.3.3.2, with the sprinkler increase applicable only to the portions of the building not classified as Use Group H-2 or H-3.
3. Fire-resistance rating substitution in accordance with Table 601, Note e.
4. These increases are not permitted in addition to the story increases in accordance with Section 504.2.

Reason: California code officials recognize and support the benefits of automatic fire sprinkler protection in buildings. The need for a balanced approach to fire protection is also recognized and is the basis for this proposal which permits the use of a sprinkler system for an increase in height or area but not both. During the California statewide code adoption process, building and fire officials reviewed data from various sources in an attempt to justify the increased building size over the allowable areas/heights in all three legacy codes. There appears to be little science behind the table values and formulas and California code officials are not comfortable with the elimination of redundancy from the code and an over-reliance on fire sprinkler systems. Several factors support the need to restore balance to this code:

- There is a public expectation of the level of safety inherent in the current codes which become policy upon local adoption. The west coast has a lower fire loss record than the rest of the county, which may be, at least partially attributed to construction requirements. There is an increase in risk that accompanies larger building sizes which cannot be justified in light of national fire statistics that are among the worst of any other industrialized nation.
- There are no redundant mitigating protective features to address the potential for sprinkler failure due to a disruption in water supply, mechanical failure, lack of proper maintenance, human error, or temporary disruptions to sprinkler systems that occur during typical remodeling and tenant improvement projects. Furthermore, reductions in water supply have resulted after every major seismic event in California, which would render an automatic sprinkler system ineffective if a fire were to occur. What is the true reliability of a sprinkler system? A recent article cites 89% as the figure when both the performance and operational reliability are factored in. They are out of service for maintenance, construction (tenant improvements), unintentional human error. There is also a vulnerability factor – besides seismic, we have experience where systems were taken out by vehicle crash or explosion. In instances of improper design/use or arson,

they system can be overcome. Sprinkler systems often don't extinguish the fire and there can be tremendous smoke generation and spread (particularly smoldering or shielded fires, etc). In fact, sprinklers drive the smoke lower and impede visibility. Building size becomes more of an issue to both rescue (panic) and firefighting.

- The quantity and capability of emergency response resources is based on the infrastructure and building design that has existed in California, and other states, for decades. Therefore, the level of fire and life safety would be decreased below what we have today in terms of building size. Public safety departments are staffed for current building sizes and larger buildings may lead to larger fires and need for staffing/tactical/infrastructure changes which may not be financially or politically feasible.
- This results in a decreased level of public safety because fire rescue and fire suppression responders would be required to accomplish their emergency response tasks in larger multi-story buildings without the benefit of increased fire protection based on a combination of sprinklers, fire-resistive construction, and fire walls.

By limiting the use of a fire sprinkler system to an increase in height or area, but not both, serves to restore balance to the code by reducing over reliance on those systems.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G116–06/07

504.2, 506.3, 506.4

Proponent: Kate Dargan, Assistant California State Fire Marshal, representing the California Department of Forestry and Fire Protection and the Office of the State Fire Marshal

Revise as follows:

504.2 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one. These increases are permitted in addition to the area increase in accordance with Sections 506.2 and 506.3. ~~For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one, but shall not exceed 60 feet (18 288 mm) or four stories, respectively~~.

Exceptions:

1. Fire areas with an occupancy in Group I-2 of Type IIB, III, IV or V construction.
2. Fire areas with an occupancy in Group H-1, H-2, H-3 or H-5.
3. Fire-resistance rating substitution in accordance with Table 601, Note e.

These increases shall not be permitted in addition to the area increase in accordance with Section 506.3.

506.3 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the area limitation in Table 503 is permitted to be increased by an additional 200 percent ($I_s = 2$) for buildings with more than one story above grade plane and an additional 300 percent ($I_s = 3$) for buildings with no more than one story above grade plane. ~~These increases are permitted in addition to the height and story increases in accordance with Section 504.2.~~

Exception: The area limitation increases shall not be permitted for the following conditions:

1. The automatic sprinkler system increase shall not apply to buildings with an occupancy in Use Group H-1.
2. The automatic sprinkler system increase shall not apply to the floor area of an occupancy in Use Group H-2 or H-3. For mixed-use buildings containing such occupancies, the allowable area shall be calculated in accordance with Section 508.3.3.2, with the sprinkler increase applicable only to the portions of the building not classified as Use Group H-2 or H-3.
3. Fire-resistance rating substitution in accordance with Table 601, Note e.

These increases shall not be permitted in addition to the story increases in accordance with Section 504.2.

506.4 Area determination. The maximum area of a building with more than one story above grade plane shall be determined by ~~multiplying~~ modifying the allowable area of the first story (A_a), as determined in Section 506.1, ~~by the number of stories above grade plane~~ as listed below:

1. For buildings with two or more stories above grade plane, multiply by 2;
2. ~~For buildings with three or more stories above grade plane, multiply by 3; and~~

~~3.~~2. No story shall exceed the allowable area per story (A_a), as determined in Section 506.1, for the occupancies on that story

Exceptions:

~~1.~~ Unlimited area buildings in accordance with Section 507.

~~2. The maximum area of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2 shall be determined by multiplying the allowable area per story (Aa), as determined in Section 506.1, by the number of stories above grade plane.~~

Reason: Revisions to Sections 504.2 and 506.3 are proposed to remove the allowance of the combined height and area increase with automatic sprinklers. Revisions to Section 506.4 are proposed to remove the tripling of the maximum allowable floor areas for building three-stories or taller and substituting the doubling of one story areas for multistory buildings. Furthermore revisions to 504.2 and 506.4 eliminate the allowances for Group R occupancy buildings protected with an NFPA 13R automatic sprinkler system.

To identify a balanced approach to fire protection based on the historical use of height and area provisions and data demonstrate California's minimum requirements for the built environment have safeguarded the public health, safety and general welfare of the occupants and to the property as a whole since the 1920s.

The additional safety provided by an automatic sprinkler system has been acknowledged as justification for either increasing the allowable height of a building by one (1) story or increasing the allowable area beyond the limits established in Table 5-A, but not both. The current code allows both without providing any mitigating protective requirements to balance the increased exposure risk to occupants and safety/rescue responders, as well as property protection.

The reduced sprinkler coverage allowed by NFPA 13R (NFPA 13R exempts concealed spaces such as attics) reduces the effectiveness of fire sprinklers within the most vulnerable occupancy types (Group R) for fire hazard. Furthermore, the IBC does not require any additional protective features to mitigate the increase in potential risk associated with a building that is both taller and larger in area, thereby resulting in a potential decrease in public safety. This section is further amended by removing language which permits additional height and story in Group R buildings equipped with an NFPA 13R (instead of an NFPA 13) fire protection system. While the code requires a full NFPA 13 system for other occupancy groups utilizing section 504.2 for height and story increase, it does not currently require mitigating protective features within R occupancies when utilizing the reduced NFPA 13R system for the same purpose. This amendment will address the unmitigated decrease in fire safety currently allowed by section 504.2.

The current code language allows for a tripling of the allowable floor area, as determined in Section 506.1, for buildings three-stories or taller, even if no sprinklers or other additional fire protection features are integrated into the building design. This results in a decreased level of public safety, because fire rescue and fire suppression responders would be required to accomplish their emergency response tasks in larger multi-story buildings, without the benefit of increased fire protection based on either sprinklers, type of construction, fire walls, or some combination thereof. Furthermore, the current code language allows for buildings equipped with a NFPA 13 sprinkler system throughout, to observe a maximum allowable floor area equivalent to the area determined in Section 506.1 multiplied by the number of stories. This increase relies solely on an automatic fire extinguishing system, and has no redundant mitigating protective features to address the potential for sprinkler failure due to a disruption in water supply, mechanical failure, lack of proper maintenance, or temporary disruptions to sprinkler systems that occur during typical remodeling and tenant improvement projects. A significant proportion of the multi-story buildings constantly undergo tenant improvements, and other activities, that result in modifications to, or disruptions of, automatic sprinkler systems. The disproportional reliance on active fire suppression (fire sprinklers) without added passive resistance significantly reduces life safety.

The California Department of Forestry and Fire Prevention, Office of the State Fire Marshal (OSFM) recognizes and supports the benefits of automatic fire sprinkler protection in buildings. The need for a balanced approach to fire protection is also recognized and is the basis for this proposal which permits the use of automatic sprinkler systems for an increase in height or area but not both. During the current California code adoption process, building and fire officials reviewed data from various sources in an attempt to justify the increased building size of the 2006 IBC over the allowable areas/heights in all three legacy codes. There appears to be little science behind the table values and formulas, OSFM and California code officials involved in this process are not comfortable and can not justify the elimination of redundancy from the code and an over-reliance on fire sprinkler systems. Several factors support the need to restore balance to this code:

a. There is a public expectation of the level of safety inherent in the current codes which become policy upon local adoption. The west coast has a lower fire loss record than the rest of the county, which may be, at least partially attributed to construction requirements. There is an increase in risk that accompanies larger building sizes which cannot be justified in light of national fire statistics that are among the worst of any other industrialized nation.

b. There are no redundant mitigating protective features to address the potential for sprinkler failure due to a disruption in water supply, mechanical failure, lack of proper maintenance, human error, or temporary disruptions to sprinkler systems that occur during typical remodeling and tenant improvement projects. Furthermore, reductions in water supply have resulted after every major seismic event in California, which would render an automatic sprinkler system ineffective if a fire were to occur. What is the true reliability of a sprinkler system? A recent article cites 89% as the figure when both the performance and operational reliability are factored in. They are out of service for maintenance, construction (TI), unintentional human error. There is also a vulnerability factor – besides seismic, we have experience where systems were taken out by vehicle crash or explosion. In instances of improper design/use or arson, the system can be overcome. Sprinkler system often do not extinguish the fire and there can be tremendous smoke generation and spread (particularly smoldering or shielded fires, etc). In fact, sprinklers drive the smoke lower and impede visibility. Building size becomes more of an issue to both rescue (panic) and firefighting.

c. The quantity and capability of emergency response resources is based on the infrastructure and building design that has existed in California, and other states, for decades. Therefore, the level of fire and life safety would be decreased below what we have today in terms of building size. Public safety departments are staffed for current building sizes and larger buildings may lead to larger fires and need for staffing/tactical/infrastructure changes.

d. This results in a decreased level of public safety, because fire rescue and fire suppression responders would be required to accomplish their emergency response tasks in larger multi-story buildings, without the benefit of increased fire protection based on either sprinklers, type of construction, area separation walls, or some combination thereof.

By limiting the use of a fire sprinkler system to an increase in height or area, but not both serves to restore balance to the code.

This code change also proposes to eliminate the special allowances given for Group R occupancy buildings that are protected with an NFPA 13R automatic sprinkler system as specified in Section 903.3.1.2. Currently, Section 504.2 will allow an increase in the building height of one story and 20 feet where an NFPA 13R sprinkler system is provided as long as the building does not exceed a total height of four stories or 60 feet which is within the scope limitations of the NFPA 13R standard. Furthermore, Section 506.4 allows an area increase for the installation of an NFPA 13R sprinkler system for Group R buildings that are greater than three stories in height. We do not believe it is appropriate to provide for such allowances for the types of construction which in essence lessens the built-in fire-resistive passive protection where an NFPA 13R sprinkler system is installed. NFPA 13R sprinkler systems are primarily provided for life safety. They were developed for that purpose as clearly stated in Section 1.2 of the 2002 edition. It is interesting to quote the Annex A discussion of the purpose of NFPA 13R which states: "Various levels of sprinkler protection are available to provide life safety and property protection. This standard is designed to provide a high, but not absolute, level of life safety and a lesser level of property protection. Greater protection to both life and property could be achieved by automatic sprinklers in all areas in accordance with NFPA 13… it should be recognized that the omission of sprinklers from certain areas could result in the development of untenable conditions in adjacent spaces. Where evacuation times could be delayed, additional sprinkler protection and other fire protection features, such as detection and compartmentalization, could be necessary." We believe that says it all about an NFPA 13R sprinkler system.

However, the intent of the IBC as expressed in Section 101.3 Intent is as follows: "The purpose of this code is to establish the minimum requirements to safeguard the public health, safety, and general welfare… and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations." We believe that allowing the use of an NFPA 13R sprinkler system to increase the size of a building would be counter to the intent and purpose of the IBC. Types of construction are designed to limit the height and area of buildings based on the occupancy and the degree of built-in fire-resistive protection and use of combustible or noncombustible construction materials. Buildings are allowed to get larger in area and taller in height with more fire-resistance built in and the lesser use of combustible construction for the building's structural elements. Therefore, property protection is a critical outcome of the use of types of construction. Of course, type of construction also plays a role in life safety, especially in multi-story buildings, and has an impact on fire fighter safety as well. But an NFPA 13R sprinkler system is basically a partial sprinkler system because the standard does not require sprinklers in many concealed areas including attics. So why should a building protected with an NFPA 13R sprinkler system basically enjoy the same increases as a building more completely protected with an NFPA 13 sprinkler system?

Within the last few years there have been many fires involving buildings protected with NFPA 13R sprinkler systems which have burned to the ground. In most of those cases, the fire was able to get into the unprotected attic space and spread throughout the building and then burn downward, overpowering the sprinkler system. Certainly, allowable increases in height and area are not appropriate for sprinkler systems that can allow a building to be burned to the ground.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G117–06/07
504.2, 506.4

Proponent: Bob Boyer, Building Officials Association of Florida (BOAF) Code Development Committee, Longwood, FL

1. Revise as follows:

504.2 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one. These increases are permitted in addition to the area increase in accordance with Sections 506.2 and 506.3. ~~For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one, but shall not exceed 60 feet (18 288 mm) or four stories, respectively.~~

Exceptions:

1. Fire areas with an occupancy in Group I-2 of Type IIB, III, IV or V construction.
2. Fire areas with an occupancy in Group H-1, H-2, H-3 or H-5.
3. Fire-resistance rating substitution in accordance with Table 601, Note e.

506.4 Area determination. The maximum area of a building with more than one story above grade plane shall be determined by multiplying the allowable area of the first story (A_a), as determined in Section 506.1, by the number of stories above grade plane as listed below:

1. For buildings with two stories above grade plane, multiply by 2;
2. For buildings with three or more stories above grade plane, multiply by 3; and
3. No story shall exceed the allowable area per story (A_a), as determined in Section 506.1, for the occupancies on that story.

Exceptions:

~~1.~~ Unlimited area buildings in accordance with Section 507.

~~2. The maximum area of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2 shall be determined by multiplying the allowable area per story (A_a), as determined in Section 506.1, by the number of stories above grade plane.~~

Reason: We do not believe it is adequate fire protection to allow the same construction credits for an NFPA 13R system that the code allows for an NFPA 13 system, plus an increase in story height, plus an additional 20 additional feet in height, plus an area increase for such buildings, plus all the other sprinkler trade-offs for built in fire and smoke protection permitted when a sprinkler system are installed. Although sprinklers are an effective tool, an NFPA 13R sprinkler system is only partial sprinkler system and many areas of the building, including concealed spaces, that will not be protected as they would be with an NFPA 13 system.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G118–06/07
504.2, 506.4

Proponent: George Thomas, P.E., CBO, City of Pleasanton, representing the Tri-Chapters Code Committee and Laura Blaul, Orange County Fire, representing the California Fire Chiefs Association

Revise as follows:

504.2 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one. These increases are permitted in addition to the area increase in accordance with Sections 506.2 and 506.3. ~~For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2, the value specified in Table 503 for maximum height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one, but shall not exceed 60 feet (18 288 mm) or four stories, respectively.~~

Exceptions:

1. Fire areas with an occupancy in Group I-2 of Type IIB, III, IV or V construction.
2. Fire areas with an occupancy in Group H-1, H-2, H-3 or H-5.
3. Fire-resistance rating substitution in accordance with Table 601, Note e.

506.4 Area determination. The maximum area of a building with more than one story above grade plane shall be determined by multiplying the allowable area of the first story (A_a), as determined in Section 506.1, by the number of stories above grade plane as listed below:

1. For buildings with two stories above grade plane, multiply by 2;
2. For buildings with three or more stories above grade plane, multiply by 3; and

~~3.~~ No story shall exceed the allowable area per story (A_a), as determined in Section 506.1, for the occupancies on that story.

Exceptions:

~~1.~~ Unlimited area buildings in accordance with Section 507.

~~2. The maximum area of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2 shall be determined by multiplying the allowable area per story (A_a), as determined in Section 506.1, by the number of stories above grade plane.~~

Reason: This code change proposes to eliminate the special allowances given for Group R occupancy buildings that are protected with an NFPA 13R automatic sprinkler system as specified in Section 903.3.1.2. Currently, Section 504.2 will allow an increase in the building height of one story and 20 feet where an NFPA 13R sprinkler system is provided as long as the building does not exceed a total height of four stories or 60 feet which is within the scope limitations of the NFPA 13R standard. Furthermore, Section 506.4 allows an area increase for the installation of an NFPA 13R sprinkler system for Group R buildings that are greater than three stories in height. We do not believe it is appropriate to provide for such allowances for the types of construction which, in essence, lessen the built-in fire-resistive passive protection where an NFPA 13R sprinkler system is installed.

NFPA 13R sprinkler systems are primarily provided for life safety. They were developed for that purpose as clearly stated in Section 1.2 of the 2002 edition. It is interesting to quote the Annex A discussion of the purpose of NFPA 13R which states: "Various levels of sprinkler protection are available to provide life safety and property protection. This standard is designed to provide a high, but not absolute, level of life safety and a lesser level of property protection. Greater protection to both life and property could be achieved by sprinklering all areas in accordance with NFPA 13… it should be recognized that the omission of sprinklers from certain areas could result in the development of untenable conditions in adjacent spaces. Where evacuation times could be delayed, additional sprinkler protection and other fire protection features, such as detection and compartmentation, could be necessary." We believe that says it all about an NFPA 13R sprinkler system.

However, the intent of the IBC as expressed in Section 101.3 Intent is as follows: "The purpose of this code is to establish the minimum requirements to safeguard the public health, safety, and general welfare… and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations." We believe that allowing the use of an NFPA 13R sprinkler system to increase the size of a building would be counter to the intent and purpose of the IBC. Types of construction are designed to limit the height and area of buildings based on the occupancy and the degree of built-in fire-resistive protection and use of combustible or noncombustible construction materials. Buildings are allowed to get larger in area and taller in height with more fire-resistance built in and the lesser use of combustible construction for the building's structural elements. Therefore, property protection is a critical outcome of the use of types of construction. Of course, type of construction also plays a role in life safety, especially in multi-story buildings, and has an impact on fire fighter safety as well. But an NFPA 13R sprinkler system is basically a partial sprinkler system because the standard does not require sprinklers in many concealed areas including attics. So why should a building protected with an NFPA 13R sprinkler system basically enjoy the same increases as a building more completely protected with an NFPA 13 sprinkler system?

Within the last few years there have been many fires involving buildings protected with NFPA 13R sprinkler systems which have burned to the ground. In most of those cases, the fire was able to get into the unprotected attic space and spread throughout the building and then burn downward, overpowering the sprinkler system. Certainly, allowable increases in height and area are not appropriate for sprinkler systems that can allow a building to be burned to the ground.

Cost Impact: The code change proposal may result in minor cost increases during construction. However, these revisions may ultimately result in overall cost savings throughout the life of the building due to reduced fire losses.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G119–06/07
505.2

Proponent: Ron Nickson, National Multi Housing Council/National Apartment Association

Revise as follows:

505.2 Area limitation. The aggregate area of a mezzanine or mezzanines within a room shall not exceed one-third of the floor area of that room or space in which they are located. The enclosed portion of a room shall not be included in a determination of the floor area of the room in which the mezzanine is located. In determining the allowable mezzanine area, the area of the mezzanine shall not be included in the floor area of the room.

Exceptions:

1. The aggregate area of mezzanines in buildings and structures of Type I or II construction for special industrial occupancies in accordance with Section 503.1.1 shall not exceed two-thirds of the floor area of the room.
2. The aggregate area of mezzanines in buildings and structures of Type I or II construction shall not exceed one-half of the floor area of the room in buildings and structures equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and an approved emergency voice/alarm communication system in accordance with Section 907.2.12.2.

Reason: To allow the option for increased area of a mezzanine permitted with a NFPA 13 sprinkler system to also be allowed with a NFPA 13R sprinkler system. Although it would not be typical for a four-story apartment building to be constructed as Type I or II construction there are times that it may be appropriate and desired. In such cases the allowance for increased area should also be permitted for the NFPA 13R sprinkler system because they provide the same level of safety as the NFPA 13 system does for the mezzanine area being protected.

Cost Impact: The code change proposal will decrease the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G120–06/07
506.3

Proponent: Bob Boyer, Building Officials Association of Florida (BOAF) Code Development Committee, Longwood, FL

Revise as follows:

506.3 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the area limitation in Table 503 is permitted to be increased by an additional ~~200~~ 100 percent (I_s = ~~2~~ 1) for buildings with more than one story above grade plane and an additional ~~300~~ 200 percent (I_s = ~~3~~ 2) for buildings with no more than one story above grade plane. These increases are permitted in addition to the height and story increases in accordance with Section 504.2.

Exception: The area limitation increases shall not be permitted for the following conditions:

1. The automatic sprinkler system increase shall not apply to buildings with an occupancy in Use Group H-1.
2. The automatic sprinkler system increase shall not apply to the floor area of an occupancy in Use Group H-2 or H-3. For mixed-use buildings containing such occupancies, the allowable area shall be calculated in accordance with Section 508.3.3.2, with the sprinkler increase applicable only to the portions of the building not classified as Use Group H-2 or H-3.
3. Fire-resistance rating substitution in accordance with Table 601, Note e.

Reason: By comparing the maximum allowable heights and areas for a Group B office building of Type IIB construction, for example, for the current provisions in the IBC versus the three legacy model building codes, it is apparent that the allowable areas and heights under the current IBC are significantly greater in nearly every case - without technical support as to why such expansion is justified. The implementation of the proposed code change permits the maximum allowable building areas and heights to be generally increased, but not nearly as much, and the values are more compatible with the previous legacy codes.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G121–06/07

506.4, 506.4.1

Proponent: George Thomas, P.E., CBO, City of Pleasanton, representing the Tri-Chapters Code Committee and Laura Blaul, Orange County Fire, representing the California Fire Chiefs Association

Revise as follows:

506.4 Area determination. The maximum area of a building with more than one story above grade plane shall be determined by multiplying the allowable area of the first story (A_a), as determined in Section 506.1, by 2. ~~the number of stories above grade plane as listed below:~~

~~1.~~ ~~For buildings with two stories above grade plane, multiply by 2;~~
~~2.~~ ~~For buildings with three or more stories above grade plane, multiply by 3; and~~
~~3.~~ No story shall exceed the allowable area per story (A_a), as determined in Section 506.1, for the occupancies on that story.

Exceptions:

~~1.~~ Unlimited area buildings in accordance with Section 507.
~~2.~~ ~~The maximum area of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2 shall be determined by multiplying the allowable area per story (A_a), as determined in Section 506.1, by the number of stories above grade plane.~~

506.4.1 Mixed occupancies. In buildings with mixed occupancies, the allowable area per story (*Aa*) shall be based on the most restrictive provisions for each occupancy when the mixed occupancies are treated according to Section 508.3.2. When the occupancies are treated according to Section 508.3.3 as separated occupancies, the maximum total building area shall be such that the sum of the ratios for each such area on all ~~floors~~ stories as calculated according to Section 508.3.3.2 shall not exceed 2 for ~~two-story buildings and 3 for~~ buildings ~~three~~ with two or more stories ~~or higher~~ above grade plane.

Reason: This code change proposal is actually a companion code change to another code change proposal we have jointly submitted to revise Sections 504.2 and 506.3 regarding allowable height and area increases for the installation of an automatic sprinkler system. Most of our concerns that have been expressed in our supporting statement for that code change proposal also hold true for this code change proposal.

The overall concern we have is that the combination of allowable height and area increases along with the 3x multi-story multiplier of the allowable area for a single floor for buildings greater than 2 stories in height creates extremely large buildings with lesser degrees of fire-resistive protection and more use of combustible construction materials than we have previously been exposed to. This will potentially place a significant challenge on our fire service who must respond to fires in these buildings at some time in their lives. We cannot totally rely upon the automatic sprinkler system to perform as intended since we know through experience that they are not foolproof. In fact, we are familiar with studies that indicate sprinklers have a failure rate in the range of 10 to 15 percent which we feel is unacceptable for such potentially large buildings. We are also concerned here in California because of the possibility of having severe earthquakes which will disrupt the water supplies to the sprinkler systems, as well as potentially damage the sprinkler systems themselves, so they cannot function as designed.

As another facet of our approach to bringing the allowable heights and areas for buildings under the International Building Code (IBC) into more realistic values that we believe we can safely live with, we have also proposed this code change to reduce the 3x multiplier for multi-story building areas to 2x that allowed for a single floor area. This results in an overall reduction of 33 percent of the total building area that is presently allowed by the IBC. This is also what we're used to in California where the code we are currently under, the 1997 ICBO Uniform Building Code (UBC), also utilizes the 2x multiplier for multi-story buildings. Our fire service infrastructure is geared to deal with buildings that are much smaller in size than those that can be constructed in accordance with the current requirements of the IBC. Therefore, it is essential that these large buildings be reduced in size.

Another of our main concerns regarding the generous allowance for increases in allowable areas of multi-story buildings is that it will often result in a building being constructed without any built-in passive fire-resistive protection and with a greater use of combustible materials than would have been the case if the area limits had been lower. Thus, we will end up with more buildings that can potentially be life threatening, not only to the building occupants, but also to the safety of the fire fighters who must enter the buildings to fight the fires that may be out of control by the time they arrive on the scene. And, of course, this will also contribute to more property loss in the long term.

In researching this issue as we worked our way through the California State Fire Marshal's code amendment/adoption process which is currently underway, we discovered that the IBC will allow even larger buildings than any of the previous legacy model codes allowed. We have reviewed a study conducted by the Portland Cement Association which evaluated this very issue of the 3x multi-story multiplier. In the summary of that study the following conclusions were noted regarding a comparison of the three legacy model codes to the IBC. It was concluded that the average of the aggregate allowable floors areas permitted by the IBC exceeded those of the legacy codes by the following percentages:

BOCA NBC	30%
ICBO UBC	152%
SBCCI SBC	102%

Obviously, if the 3x multiplier is reduced to a 2x multiplier, it will impact the three story building as well as those buildings greater than three stories which are currently impacted by the 3x multiplier. The average value differences will drop significantly and fall within a reasonable range for the three legacy model codes. Yet, for the most part, they will still allow greater areas than would have been allowed prior to the IBC.

In conclusion, we feel very uncomfortable with the current area allowances that the IBC permits which allow for buildings to be built larger for the same type of construction and occupancy classification than they would have been allowed to have been built under the previous legacy model building codes. We will be allowing those buildings to be constructed without any knowledge of how they would have performed in the past since they were actually never constructed under any of the previous model codes. Thus, there is no track record to indicate if they have performed to an acceptable level of fire and life safety. Without adequate technical justification to support such large building areas, we believe it is prudent to begin to adjust these allowable areas downward by reducing the multi-story multiplier from 3x to 2x that allowed for a single story building.

Cost Impact: The code change proposal may result in minor cost increases during construction. However, these revisions may ultimately result in overall cost savings throughout the life of the building due to reduced fire losses.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G122–06/07

506.4

Proponent: John C. Dean, the National Association of State Fire Marshals

Revise as follows:

506.4 Area determination. The maximum area of a building with more than one story above grade plane shall be determined by multiplying the allowable area of the first story (A_a), as determined in Section 506.1, by 2. ~~the number of stories above grade plane as listed below:~~

~~1. For buildings with two stories above grade plane, multiply by 2;~~
~~2. For buildings with three or more stories above grade plane, multiply by 3; and~~
~~3.~~ No story shall exceed the allowable area per story (A_a), as determined in Section 506.1, for the occupancies on that story.

Exceptions:

~~1.~~ Unlimited area buildings in accordance with Section 507.
~~2. The maximum area of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2 shall be determined by multiplying the allowable area per story (A_a), as determined in Section 506.1, by the number of stories above grade plane.~~

Reason: NASFM proposes a reduction of the total allowable building area from three to two times that allowed for a single floor area based on the calculations of A_a (allowable area) per floor as determined in Section 506.1.

Two of the three Legacy Codes did not permit an architect to multiply the allowable floor space by a factor of three and the third only addressed this multiplier in limited situations. The National Association of State Fire Marshals (NASFM) understands the economic benefits to developers of being able to construct much larger buildings with less built-in fire-resistance on a defined parcel of land. But the economic benefits to developers do not justify the increased risk to occupants and emergency responders. Nor do they justify the on-going costs to owners and tenants.

Taken together with other provisions of the International Building Code (IBC), the current allowance means that occupancies – including health care facilities, schools, residences and office buildings – may be built taller and larger, with less built-in fire protection. If firefighters must enter a burning building to rescue patients, students, physically challenged or otherwise immobile persons, they now face the prospect of climbing higher and traveling further into hostile conditions. The longer they remain in a burning building, the greater the risk of structural collapse. In addition, our most vulnerable structures – tall buildings – will present challenges that many American fire departments are not equipped to handle. As these buildings are allowed to expand in area and in height, without a corresponding increase in built-in fire resistance, the risks to occupants and emergency first responders grow exponentially. Larger, taller buildings with less built-in passive protection also invite increases in fire load comprising materials that generate higher temperatures much more quickly. Due to the increase in size, coupled with limited fire service resources, tall buildings will be required to sustain themselves for longer periods of time.

Firefighters take responsibility for their own safety. The National Institute of Occupational Safety and Health (NIOSH) has advised fire departments to refrain from sending firefighters into buildings if there are concerns about structural collapse. NASFM concurs with this advice from NIOSH, and encourages fire departments to understand the implications of the fire protection requirements in the IBC.[1] Fire chiefs often bear responsibility for plan review, inspections and fire fighter safety. As a result of the NIOSH advisory, they have little choice but to use what they know about a building to prepare for suppression activities.

It makes little sense to await the loss of life and property before we consider returning to proven safety practices. In fact, "waiting and seeing" begs the question, "How many lives must be lost to justify a return to what we know to be safe?" Our intuitive presumption would be that making buildings larger, both in height and area, with less built-in passive fire resistive protection and the use greater use of combustible materials can only result in greater property loss and the potential for greater loss of life. We all agree that one life lost is one too many. So let us prevent the loss of that one life.

The more responsible policy is to return to the well-tested requirements of the Legacy Codes, so that emergency responders and the persons they are sworn to protect may be confident in the safety of buildings.

[1] NIOSH Alert: Preventing Injuries and Deaths of Fire Fighters due to Structural Collapse. (1999, August). Center for Disease Control & National Institute for Occupational Safety and Health. *NIOSH Alert*, *99: 146*. Retrieved from: http://www.cdc.gov/niosh/99-146.html

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G123–06/07
506.4

Proponent: Bob Boyer, Building Officials Association of Florida (BOAF) Code Development Committee

Revise as follows:

506.4 Area determination. The maximum area of a building with more than one story above grade plane shall be determined by multiplying the allowable area of the first story (A_a), as determined in Section 506.1, by 2 ~~the number of stories above grade plane as listed below:~~

~~1.~~ ~~For buildings with two stories above grade plane, multiply by 2;~~
~~2.~~ ~~For buildings with three or more stories above grade plane, multiply by 3; and~~
~~3.~~ No story shall exceed the allowable area per story (A_a), as determined in Section 506.1, for the occupancies on that story.

Exception~~s~~:

~~1.~~ Unlimited area buildings in accordance with Section 507.
~~2.~~ ~~The maximum area of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2 shall be determined by multiplying the allowable area per story (A_a), as determined in Section 506.1, by the number of stories above grade plane.~~

Reason: This purpose of this code change is to reduce of the total allowable building area from three times to two times for a single floor area based on the calculations of A_a (allowable area) per floor. The overall volume of the building determined by the allowable area per floor and the allowable number of stories and height of the building is significantly greater in the majority of cases than was allowed by any of the previous model codes. By limiting the total building area to twice that allowed for a single floor, the volume of the building will be significantly reduced, but will be more in line with the legacy codes in most cases.

The proposed approach of limiting the total allowable building area to twice that allowed for a single floor area is the same as that used in the UBC, and is similar to the approach that was used in the NBC.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

G223–06/07
506.2.1, 506.3, 507.3, 1013.1, 3104.3

Proponent: Philip Brazil, PE, Reid Middleton, Inc., representing himself

Revise as follows:

506.2.1 Width limits. The value of *"W"* ~~must~~ shall be at least 20 feet (6096 mm). Where the value of *W* varies along the perimeter of the building, the calculation performed in accordance with Equation 5-2 shall be based on the weighted average of each portion of exterior wall and open space where the value of *W* is greater than or equal to 20 feet (6096 mm). Where the value of *W* exceeds 30 feet (9144 mm), a value of 30 feet (9144 mm) shall be used in calculating the weighted average, regardless of the actual width of the open space.

Exception: The ~~quantity~~ value of *W* divided by 30 shall be permitted to be a maximum of 2 when the building meets all requirements of Section 507 except for compliance with the 60-foot (18 288 mm) public way or yard requirement, as applicable.

506.3 Automatic sprinkler system increase. Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the area limitation in Table 503 is permitted to be increased by an additional 200 percent ($I_s = 2$) for buildings with more than one story above grade plane and an additional 300 percent ($I_s = 3$) for buildings with no more than one story above grade plane. These increases are permitted in addition to the height and story increases in accordance with Section 504.2.

Exception: The area limitation increases shall not be permitted for the following conditions:

1. The automatic sprinkler system increase shall not apply to buildings with an occupancy in ~~Use~~ Group H-1.

2. The automatic sprinkler system increase shall not apply to the ~~floor~~ building area of an occupancy in ~~Use~~ Group H-2 or H-3. For ~~mixed-use~~ buildings containing such occupancies, the allowable area shall be ~~calculated~~ determined in accordance with Section 508.3.3.2, with the sprinkler system increase applicable only to the portions of the building not classified as ~~Use~~ Group H-2 or H-3.

3. Fire-resistance rating substitution in accordance with Table 601, Note e.

3. Revise as follows:

507.3 Sprinklered, one story. The area of a one-story, Group B, F, M or S building, or a one-story Group A-4 building, of other than Type V construction, shall not be limited when the building is provided with an automatic sprinkler system throughout in accordance with Section 903.3.1.1 and is surrounded and adjoined by public ways or yards not less than 60 feet (18 288 mm) in width.

Exceptions:

1. Buildings and structures of Type I and II construction for rack storage facilities that do not have access by the public shall not be limited in height, provided that such buildings conform to the requirements of Sections 507.2 and 903.3.1.1 and NFPA 230.
2. The automatic sprinkler system shall not be required in areas occupied for indoor participant sports, such as tennis, skating, swimming and equestrian activities in occupancies in Group A-4, provided that:
   2.1. Exit doors directly to the outside are provided for occupants of the participant sports areas; and
   2.2. The building is equipped with a fire alarm system with manual fire alarm boxes installed in accordance with Section 907.
3. Group A-1 and A-2 occupancies of other than Type V construction shall be permitted, provided:
   3.1. All assembly occupancies are separated from other spaces as required for separated ~~uses~~ occupancies in Section 508.3.3.4 with no reduction allowed in the fire-resistance rating of the separation based upon the installation of an automatic sprinkler system;
   3.2. Each Group A occupancy shall not exceed the maximum allowable area permitted in Section 503.1; and
   3.3. All required exits shall discharge directly to the exterior.

4. Revise as follows:

1013.1 Where required. Guards shall be located along open-sided walking surfaces, mezzanines, ~~industrial~~ equipment platforms, stairways, ramps and landings that are located more than 30 inches (762 mm) above the floor or grade below. Guards shall be adequate in strength and attachment in accordance with Section 1607.7. Where glass is used to provide a guard or as a portion of the guard system, the guard shall also comply with Section 2407. Guards shall also be located along glazed sides of stairways, ramps and landings that are located more than 30 inches (762 mm) above the floor or grade below where the glazing provided does not meet the strength and attachment requirements in Section 1607.7.

Exception: Guards are not required for the following locations:

1. On the loading side of loading docks or piers.
2. On the audience side of stages and raised platforms, including steps leading up to the stage and raised platforms.
3. On raised stage and platform floor areas, such as runways, ramps and side stages used for entertainment or presentations.
4. At vertical openings in the performance area of stages and platforms.
5. At elevated walking surfaces appurtenant to stages and platforms for access to and utilization of special lighting or equipment.
6. Along vehicle service pits not accessible to the public.
7. In assembly seating where guards in accordance with Section 1025.14 are permitted and provided.

5. Revise as follows:

3104.3 Construction. The pedestrian walkway shall be of noncombustible construction.

Exceptions:

1. Combustible construction shall be permitted where connected buildings are of combustible construction.
2. Fire-retardant-treated wood, in accordance with Table 601, Note ~~c~~ d, shall be permitted for the roof construction of the pedestrian walkway where connected buildings are ~~a minimum of~~ Type I or II construction.

Reason: 1. Internal consistency with revisions approved by code change proposal G113-04/05(AM).
2. Consistency with revisions approved by code change proposal G14-04/05(AMPC1) plus editorial suggestions.
3. Consistency with revisions approved by code change proposal G14-04/05(AMPC1).
4. Consistency with the other deletions approved by code change proposal G88-04/05(AS).
5. First change is for consistency with revisions approved by code change proposal G158-04/05(AMPC1). Second change is because the phrase is superfluous.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

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