Code Technology Committee
2006/2007 Cycle
Area of study - Balanced Fire Protection
Height and Area Related Public Comments

The following are Height and Area related code changes that received a public comment and will be considered at the 2007 Final Action Hearings.

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

Proposed Change as Submitted:

Proponents: 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 <u>building</u> area, provided such basement does not exceed the area permitted for a building with no more than one story above grade plane.

> **<u>Exception</u>**: <u>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.</u>

109.3.3 Lowest floor elevation. In flood hazard areas, upon placement of the lowest floor, including the basement<u>s</u>, 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 basement<u>s</u> and the hangar. Access to the basement<u>s</u> 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~~ basement<u>s</u>, 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.

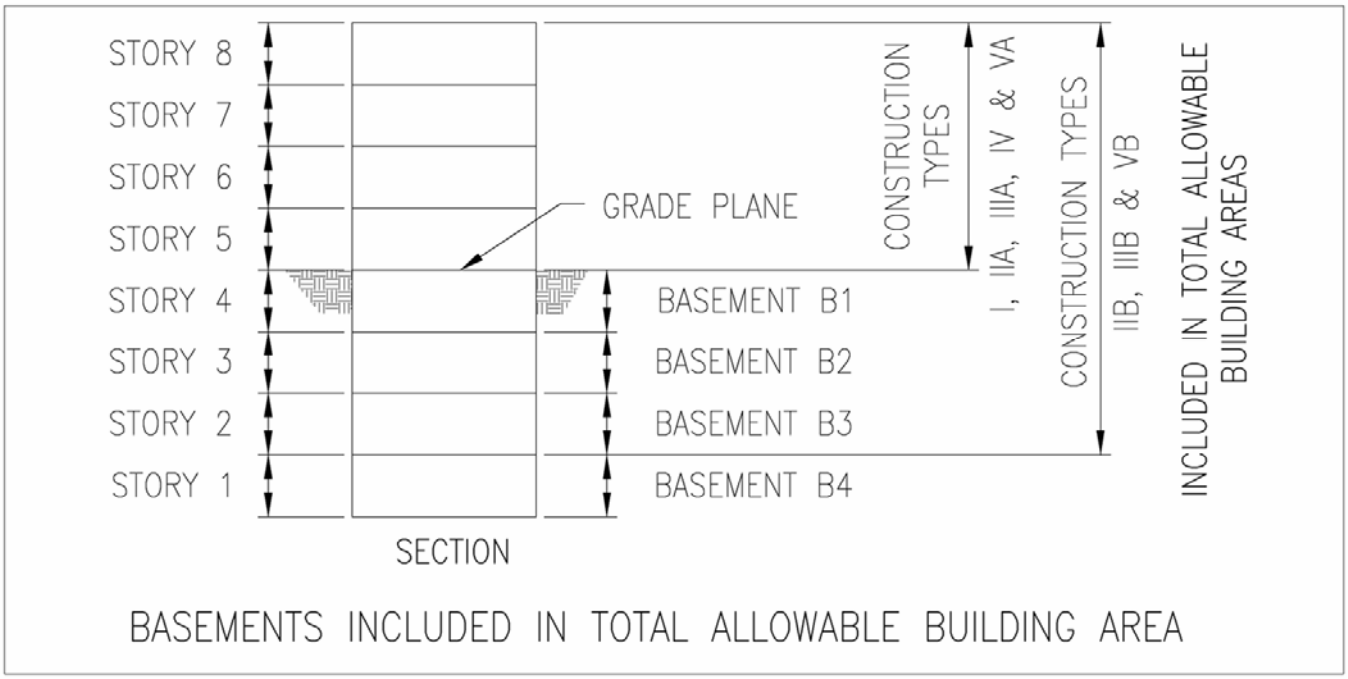
An exception to this, however, is the fuel load in a building, which increases with the number of stories above the foundation rather than

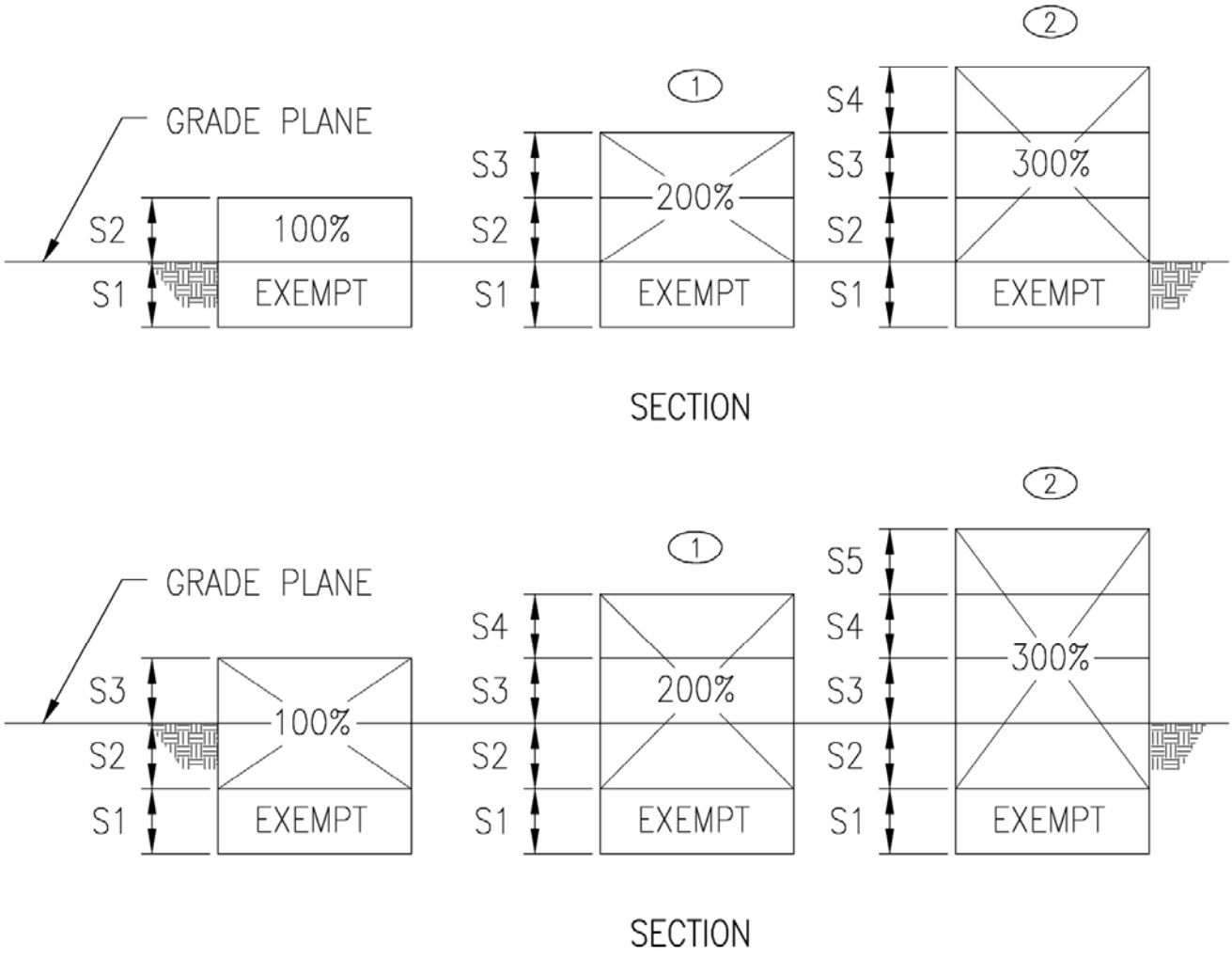
above grade. But multistory buildings are typically constructed with fire-resistance-rated horizontal assemblies supported by fire-resistance-rated structural frames (e.g., columns, beams, bearing walls, etc.), which typically form separate fire areas at each story. This occurs at buildings of Type I, 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.

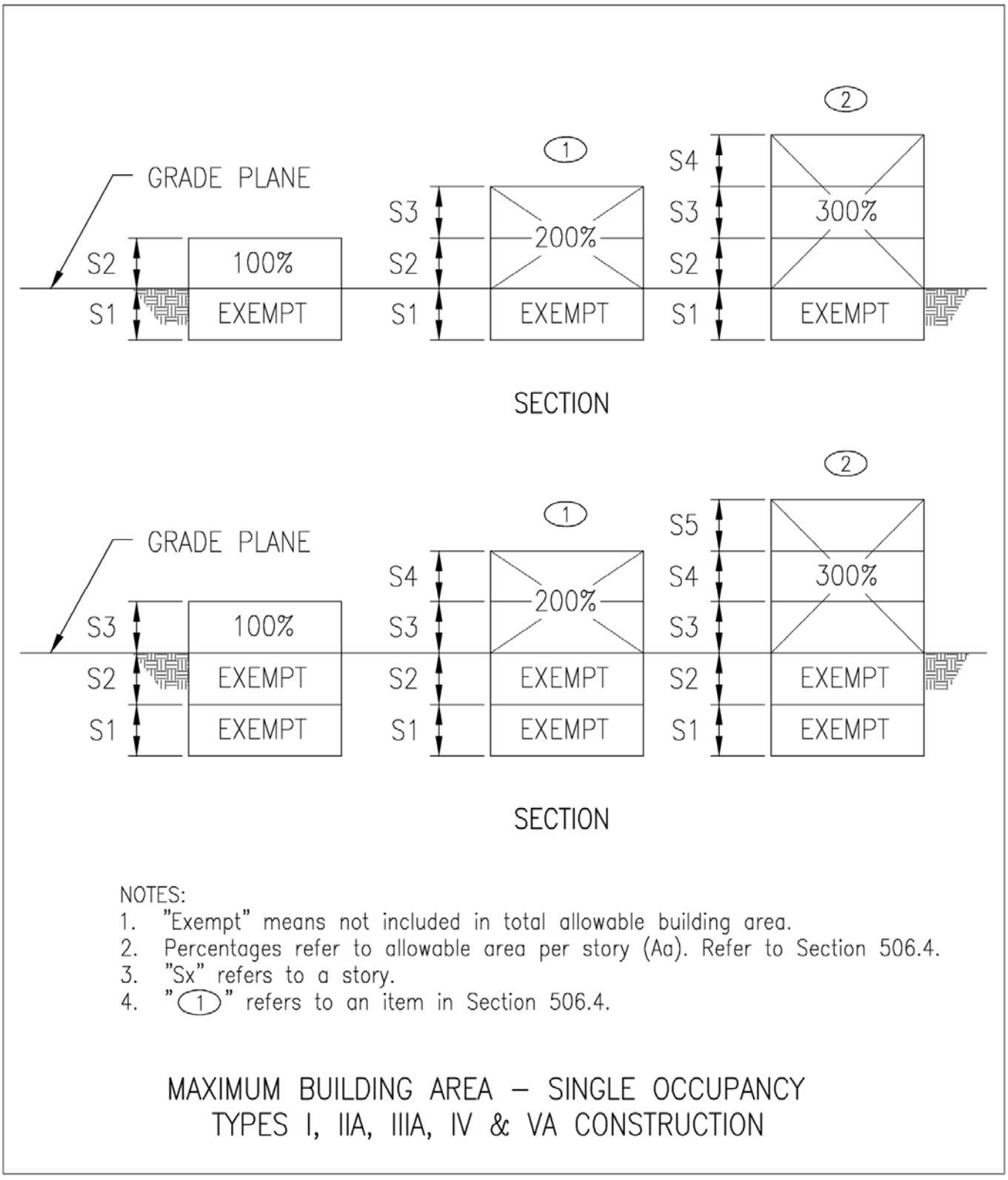




NOTES:

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.

Committee Action: **Disapproved**

Committee Reason: This proposal was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort to address concerns with the heights and areas within the code at the ICC Code Technology Committee. The intent is to form a working group to prepare a single public comment for the Rochester 07 meeting. The proponents include representatives from Alliance for fire and Smoke Containment and Control, American Forest and Paper Association, American Institute of Architects. American Iron and Steel Institute, Building Officials of Florida, Building Owners and Managers Association, California Building Officials, California Fire Chiefs Association, California State Fire Marshal's Office, ICC Tri-Chapter of Building Officials, National Association of State Fire Marshals, National Multi-housing Council and the US General Services Administration. The proposals included are as follows:

G10-06/07
G95-06/07
G99-06/07
G100-06/07
G101-06/07
G102-06/07
G103-06/07
G104-06/07
G105-06/07
G106-06/07
G107-06/07
G108-06/07
G109-06/07
G110-06/07
G111-06/07
G112-06/07
G113-06/07
G114-06/07
G115-06/07
G116-06/07
G117-06/07
G118-06/07
G120-06/07
G121-06/07
G122-06/07
G123-06/07
G223-06/07

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Philip Brazil, Reid Middleton, Inc., representing himself, requests Approval as Submitted

Commenter's Reason: At the 2006/2007 ICC code development hearings in Orlando, I agreed to ask for disapproval in conjunction with the initiative by several organizations to pursue resolution to the ongoing differences over the IBC provisions for allowable building heights and building areas, specifically through the efforts of the ICC Code Technology Committee. At the time of the deadline to submit public comments for consideration at the final action hearings in Rochester, that effort was ongoing. Consequently, I am asking for approval as submitted based on the original reason statement.

Final Action: AS AM AMPC _____ D

G99-06/07
Table 503

Proposed Change as Submitted:

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-1	S	UL	~~5~~ 4	~~3~~ 2	~~2~~ NP	~~3~~ 2	~~2~~ NP	~~3~~ 2	2	~~1~~ NP
	A	UL	~~UL~~ 29,900	~~15,500~~ 13,500	~~8,500~~ NP	~~14,000~~ 13,500	~~8,500~~ NP	~~15,000~~ 13,500	~~11,500~~ 10,500	~~5,500~~ NP

(Portions of table not shown remain unchanged)

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

[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] *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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07**.**

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G99-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G99-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and

Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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-1	S A	UL UL	5 ~~UL~~ 19,950	3 ~~15,500~~ 13,125	2 ~~8,500~~ 8,400	3 ~~14,000~~ 11,550	2 ~~8,500~~ 8,400	3 ~~15,000~~ 12,600	~~2~~ 1 ~~11,500~~ 8,925	1 ~~5,500~~ 4,200

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G100-06/07
Table 503

Proposed Change as Submitted:

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 A	UL UL	~~11~~ 12 ~~UL~~ 29,900	~~3~~ 2 ~~15,500~~ 13,500	~~2~~ 1 ~~9,500~~ 9,100	~~3~~ 2 ~~14,000~~ 13,500	~~2~~ 1 ~~9,500~~ 9,100	~~3~~ 2 ~~15,000~~ 13,500	2 ~~11,500~~ 10,500	1 6,000

(Portions of table not shown remain unchanged)

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 A	3 14,000	2 9,500
BOCA 1999	S A	2 3,300	1 2,400
SBC 1997	S A	2 12,000	2 8,000
UBC 1997	S A	2 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.
[10] *Nightclub Fires in 2000* (2004, June). U.S. Fire Administration and National Fire Data Center. Topical Research Series. Volume 3, Issue 7. Retrieved from: http://www.usfa.fema.gov/downloads/pdf/tfrs/v3i7.pdf
[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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G100-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G100-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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-2	S A	UL ~~UL~~ 7,200	~~11~~ 3 ~~UL~~ 5,700	~~3~~ 2 ~~15,500~~ 3,750	~~2~~ 1 ~~9,500~~ 2,400	~~3~~ 2 ~~14,000~~ 3,300	~~2~~ 1 ~~9,500~~ 2,400	~~3~~ 2 ~~15,000~~ 3,600	~~2~~ 1 ~~11,500~~ 2,550	1 ~~6,000~~ 1,200

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G101-06/07
Table 503

Proposed Change as Submitted:

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 remain unchanged)

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

[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/
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[11] Baptist Press Staff. (2005). Churches Shelter Hurricane Refugees, Relief Units Prepare to Deploy. *Lifeway.* Retrieved from: http://www.lifeway.com/lwc/article_main_page/0,1703,A%253D160765%2526M%253D50011,00.html
[12] *An Early View from Natchez, MS*. (2005, September 11). National Writing Project. Retrieved from: http://blogs.writingproject.org/blogwrite310/2005/09/11
[13] *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
[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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G101-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G101-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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 A	UL UL	~~11~~ 5 ~~UL~~ 19,950	3 ~~15,500~~ 13,125	2 ~~9,500~~ 8,400	3 ~~14,000~~ 11,550	2 ~~9,500~~ 8,400	3 ~~15,000~~ 12,600	~~2~~ 1 ~~11,500~~ 8,925	1 ~~6,000~~ 4,200

(Portions of table not shown do not change)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G102-06/07
Table 503

Proposed Change as Submitted:

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 remain unchanged)

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.

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/

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[9] *Emergency Medical Technicians and Paramedics*. (2004). Bureau of Labor Statistics. Retrieved from: http://www.bls.gov/oco/ocos101.htm.
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[11] *Disability Data from the American Community Survey: A Brief Examination of the Effects a Question Redesign in 2003*. (2005, January, 8). US Census. Retrieved from: http://www.census.gov/hhes/www//disability/ACS_disability.pdf
[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] 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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07**.**

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G102-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G102-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

Dave Collins, FAIA and Kate Dargan, Co-chairs Code Technology Committee Height and Area Study Group request Approval as Modified by this public comment.

Replace proposal with the following:

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		TYPE OF CONSTRUCTION								
	Hgt(feet)	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 UL	5 37,500	4 3 23,000	5 28,500	4 3 19,000	5 36,000	3 18,000	2 9,000

(Portions of table not shown do not change)

Commenter's Reason: This public comment reinstates the current values in Table 503 for Group B except for the proposed change to the height requirements for Types IIB and IIIB.

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

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

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

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

The study group noted that for Use Group B, M, S-1, and R buildings of Type IIB or Type IIIB construction, the allowance for 4 or 5 stories in the IBC was premised on the story heights allowed in the SBC. In all these instances, the SBC sprinklered height allowance for these Use Groups relied on a multiple story sprinkler increase. For example, for Use Group B, the SBC allowed 2 stories for unsprinklered construction and 5 stories for sprinklered construction. This exceeds the one story sprinkler height increase incorporated in the IBC height and area provisions.

Based on this review, the study group identified two anomalies from what was permitted by the legacy codes. First, the story height allowance for S-2 use groups is not based on any of the legacy code allowances. Second, for Use Group B, M, S-1, and R (Type IIB and IIIB construction), the IBC story height allowance for unsprinklered construction exceeds what was allowed by any of the legacy codes. For example, the maximum height for an unsprinklered Type IIB office building in any of the legacy codes was the NBC allowance for 3 stories. Currently, the IBC allows 4 stories for this condition. Rather than modify the sprinkler increase in the IBC, the study group suggested the following recommended story height changes:

IBC Table 503 Values

Use Group	IIB		IIIB	
	Unsp.	Spr.	Unsp.	Spr.
B	3	4	3	4
M	2	3	2	3
S-1	2	3	2	3
S-2	3	4	3	4
R* (13)	3	4	3	4

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

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

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

Subsequent discussion by the study group noted that a more comprehensive solution was needed to address R-1, R-2, and R-3 use groups. As a result, R occupancies were dropped from this recommendation with the understanding that work would continue. Unfortunately, the ICC Public Comment process did not present an acceptable option for addressing the study group's recommendations for Use Group M, S-1, and S-2. As a result, these modifications will have to be considered in future code change cycles. The only study group recommendation that could be incorporated in the 2006/2007 Public Comment period was the proposed reduction in story height for Use Group B, which is being presented as the public comment for G102. It is noted that the B use group represents one of the safer occupancies based on fire records.

In Orlando, Florida during the ICC Code Development Hearings, the creation of the CTC Height and Area Study Group was initiated in order to work toward an acceptable compromise among the proponents of the 20-plus code change proposals submitted on the height and areas provisions.

Toward that end, we have worked tirelessly to find common ground, address the concerns of building safety, and property protection, and to develop specific public comments to code proposals. That work is not yet complete, however a great deal of clarity and understanding of the subjects surrounding the changes has been gained. As a result, the Study Group has requested and been tasked to continue to work in the short-term and more fully explore the subject.

Our work is defined as short-term code proposals for the 2007/2008 cycle and the long-term proposals that may be prepared following publication of the 2009 IBC. The Study Group is proposing this public comment to G102-06/07 for this cycle. The Study Group has reviewed the development of Table 503 in the IBC and has come to agreement that some changes to height & area provisions are recommended but they are not the core issue for improving building safety when considering adequate fire protection features, maintenance and inspection of such features, and emergency response. The table is in need of changes in order for the values to be consistent with the development philosophy. However, these changes were beyond the scope of the various code changes that had been proposed in the current cycle and will require future code changes to accommodate them.

Height and area is often viewed as the "starting point" relative to building safety. While this is indeed true, it is not the only factor to be considered when evaluating building safety. We have concluded that much of the discussion relative to building safety falls into the CTC area of study for "Balanced Fire Protection". The Study Group will continue to work on these concerns and has been charged to

address them through continued improvement involving changes to not only the heights and area limits themselves but also related and integral building systems such as:

1. Exiting
2. Compartmentalization
3. Smoke Management
4. Automatic Sprinklers
5. Fire-Resistive Construction
6. Structural Integrity During Fires
7. Better Inspection and Maintenance Compliance,
8. Use of Fire Data, its Acquisition and Analysis

The formation of the Study Group has led to a solid base for longer-term discussions and more proposals to be developed in the future. There is an interest and an agreement among the participants to continue the effort to address these many unresolved and unanswered issues.

We look forward to working with the ICC membership in the development and consideration of future changes to the code that can truly improve the code to meet identified goals and objectives. Thank you for your patience as we move forward to achieve this worthwhile endeavor.

For those interested in the activities of this study group, you are encouraged to visit the CTC website at: http://www.iccsafe.org/cs/cc/ctc/Balanced.html

Height and Area Study Group Memberships - Laura Blaul, Cal Chiefs, CA; Carl Baldassarra, Schirmer Engineering; David Collins, AIA (co-chair); Kate Dargan, CA OSFM (co-chair); Sean DeCrane, IAFF (non-voting); Dave Frable, GSA; Sam Francis, AF&PA; Kevin Kelly, NFSA; Jim Messersmith, PCA; Jim Narva, NASFM; Ron Nickson, NMHC; Larry Perry, BOMA; Dennis Richardson, Peninsula, East Bay, and Monterey Bay Chapters of ICC ; Emory Rogers, VBCOA; Jerry Sanzone, BOAF; Jonathan Siu, City of Seattle, OR; Rick Thornberry, AFSCC; Robert Wills, AISI.

Public Comment 3:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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	UL	~~11~~ 7	5	~~4~~ 3	~~5~~ 4	~~4~~ 3	5	3	2
	A	UL	~~UL~~ 34,200	~~37,500~~ 22,500	~~23,000~~ 14,400	~~28,500~~ 19,800	~~19,000~~ 14,400	~~36,000~~ 21,800	~~18,000~~ 15,300	~~9,000~~ 7,200

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G103-06/07
Table 503

Proposed Change as Submitted:

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 A	UL UL	~~5~~ 4 ~~UL~~ 45,200	~~3~~ 2 ~~26,500~~ 20,200	~~2~~ 1 ~~14,500~~ 13,500	~~3~~ 2 ~~23,500~~ 20,200	~~2~~ 1 ~~14,500~~ 13,500	~~3~~ 2 ~~25,500~~ 20,200	~~1~~ 2 ~~18,500~~ 15,700	1 ~~9,500~~ 9,100

(Portions of table not shown remain unchanged)

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 A	3 23,500	2 14,500
BOCA 1999	S A	3 19,800	2 14,400
SBC 1997	S A	2 18,000	1 12,000
UBC 1997	S A	2 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 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:

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 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

[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] 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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07**.**

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G103-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G103-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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		TYPE OF CONSTRUCTION								
	Hgt(feet)	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 A	UL UL	5 ~~UL~~ 34,200	3 ~~26,500~~ 22,500	2 ~~14,500~~ 14,400	3 ~~23,500~~ 19,800	2 ~~14,500~~ 14,400	3 ~~25,500~~ 21,600	1 ~~18,500~~ 15,300	1 ~~9,500~~ 7,200

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G104-06/07
Table 503

Proposed Change as Submitted:

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-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 remain unchanged)

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 A	4 16,500	3 10,000
BOCA 1999	S A	4 11,550	3 8,400
SBC 1997	S A	N/A	N/A
UBC 1997	S A	2 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:

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. *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.

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] *Nursing Home Statistics*. (2000). American Nursing Association. Retrieved from: http://www.efmoody.com/longterm/nursingstatistics.html.

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

[12] *Long Term Care, Fact Sheet (FS27R).* American Association of Retired Persons. Retrieved from: www.aarp.org.

[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.

[14] Ahrens, M. (2003, June). *Facilities that Care for the Aged Including Nursing Homes and Residential Board and Care.* National Fire Protection Association. Retrieved from: www.nfpa.org.

[15] *Day Care/Adult Care/Assisted Living.* (2005, September 21). International Code Council: Code Technology Committee. Retrieved from: http://www.iccsafe.org/cs/cc/ctc/DayCare_PrelimAnalysis.pdf

[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

[17] *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

[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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07**.**

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G104-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G104-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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	UL	9	4	3	4	3	4	3	2
	A	UL	~~55,000~~ 19,950	~~19,000~~ 13,125	~~10,000~~ 8,400	~~16,500~~ 11,550	~~10,000~~ 8,400	~~18,000~~ 12,600	~~10,500~~ 8,925	~~4,500~~ 4,200

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G105-06/07
Table 503

Proposed Change as Submitted:

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		TYPE OF CONSTRUCTION								
	Hgt(feet)	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 remain unchanged)

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	NP
	A 12,000	NP
BOCA 1999	S 1	NP
	A 9,900	NP
SBC 1997	S 1	NP
	A 31,500**	NP
UBC 1997	S 1	NP
	A 6,800	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:

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 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.

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/

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[10] *Nursing Home Statistics*, (2000) American Health Care Association. Retrieved from: http://www.efmoody.com/longterm/nursingstatistics.html

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

[12] *Long Term Care - Fact Sheet (FS27R).* American Association of Retired Persons. Retrieved from: www.aarp.org

[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.

[14] Ahrens, M. (2003, June). *Facilities that Care for the Aged Including Nursing Homes and Residential Board and Care.* National Fire Protection Association. Retrieved from: www.nfpa.org.

[15] *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

[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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07**.**

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G105-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G105-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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 A	UL UL	4 ~~UL~~ 17,100	2 ~~15,000~~ 11,250	1 ~~11,000~~ 7,200	1 ~~12,000~~ 9,900	NP NP	1 ~~12,000~~ 10,800	1 ~~9,500~~ 7,650	NP NP

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G106-06/07
Table 503

Proposed Change as Submitted:

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~~ 45,200	~~3~~ 2 ~~26,500~~ 20,200	~~2~~ 1 ~~13,000~~ 13,500	~~3~~ 2 ~~23,500~~ 20,200	~~2~~ 1 ~~13,000~~ 13,500	~~3~~ 2 ~~25,500~~ 20,200	~~1~~ 2 ~~18,500~~ 15,700	1 ~~9,000~~ 9,100

(Portions of table not shown remain unchanged)

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:

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 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.

[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] *Trends in Adult Day Centers*. National Adult Day Services Association. Retrieved from: http://www.nadsa.org/press_room/facts_stats.htm.
[11] *Critical Facts About Young Children and Early Childhood Programs in the United States*. (2002). National Association for the Education of Young Children. Retrieved from: http://www.naeyc.org/ece/critical/facts2.asp
[12] ibid.
[13] Rohr, K. (November 2004). *Structure Fires in Educational Properties*. National Fire Protection Association. Retrieved from: www.nfpa.org
[14] *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
[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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G106-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G106-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Final Action: AS AM AMPC _____ D

G107-06/07
Table 503

Proposed Change as Submitted:

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-1	S	UL	~~11~~ 12	4	~~4~~ 2	4	~~4~~ 2	4	3	2
	A	UL	~~UL~~ 29,900	~~24,000~~ 13,500	~~16,000~~ 9,100	~~24,000~~ 13,500	~~16,000~~ 9,100	~~20,500~~ 13,500	~~12,000~~ 10,500	~~7,000~~ 6,000

(Portions of table not shown remain unchanged)

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	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-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°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 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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07**.**

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

John C. Dean, the National Association of State Fire Marshals requests Approval as Submitted.

Commenter's Reason: Proposal G107-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G107-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Public Comment 2:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment.

Replace proposal with the following:

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-1	S A	UL UL	~~11~~ 9 UL 22,800	4 ~~24,000~~ 15,000	~~4~~ 3 ~~16,000~~ 9,600	4 ~~24,000~~ 13,200	~~4~~ 3 ~~16,000~~ 9,600	4 ~~20,500~~ 14,400	3 ~~12,000~~ 10,200	2 ~~7,000~~ 4,800

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G108-06/07
Table 503

Proposed Change as Submitted:

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	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 remain unchanged)

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 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-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.
- *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-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.

Committee Action: **Disapproved**
Committee Reason: Based upon proponents request. See committee reason for G10-06/07**.**

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

William M. Connolly, State of New Jersey, Department of Community Affairs, Division of Codes and Standards requests Approval as Modified by this public comment

Replace proposal with the following:

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	S A	UL UL	~~11~~ 9 ~~UL~~ 22,800	4 ~~24,000~~ 15,000	~~4~~ 3 ~~16,000~~ 9,600	4 ~~24,000~~ 13,200	~~4~~ 3 ~~16,000~~ 8,800	4 ~~20,500~~ 14,400	3 ~~12,000~~ 10,200	2 ~~7,000~~ 4,800

(Portions of table not shown remain unchanged)

Commenter's Reason: The original proposal inserted values from the 1997 UBC into IBC Table 503. While we agree that some changes to the table are warranted it is felt that the UBC values are too restrictive and may not accurately represent a large portion of the built inventory. For this reason this modification inserts values from the 1999 BOCA code. In some cases the BOCA codes are greater than the original proposal and in some cases they are smaller. It is felt that the BOCA values are a reasonable compromise and have served well in previous years.

Final Action: AS AM AMPC _____ D

G110-06/07

503.1

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Philip Brazil, PE, Reid Middleton, representing himself, requests Approval as Submitted.

Commenter's Reason: At the 2006/2007 ICC code development hearings in Orlando, I agreed to ask for disapproval in conjunction with the initiative by several organizations to pursue resolution to the ongoing differences over the IBC provisions for allowable building heights and building areas, specifically through the efforts of the ICC Code Technology Committee. At the time of the deadline to submit public comments for consideration at the final action hearings in Rochester, that effort was ongoing. Consequently, I am asking for approval as submitted based on the original reason statement.

Final Action: AS AM AMPC _____ D

G113-06/07

504.2

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Rick Thornberry, P.E., The Code Consortium, representing the Alliance for Fire and Smoke Containment and Control (AFSC) requests Approval as Modified by this public comment.

Replace proposal with the following:

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~~ shall be increased by ~~20~~ 5 feet (~~6096~~ 1524 mm), except that for Group B and H-4 occupancies in buildings of Type IIA or IV construction, the increase shall be 20 feet, and the maximum number of stories ~~is~~ shall be increased by one. These increases ~~are~~ shall be permitted in addition to the area increases 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~~ shall be increased by ~~20~~ 5 feet (~~6096~~ 1524 mm) and the maximum number of stories ~~is~~ shall be increased by one, but shall not exceed four stories ~~or 60 feet (19 288 mm), 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.

Commenter's Reason: By doing this modification, which is basically a substitute proposal to the original code change, the vast majority of cases (as illustrated in the table contained in the Reason statement) where the BOCA NBC would still allow heights in feet greater than those allowed by the IBC without the 20 foot sprinkler increase would be eliminated. However, with the revised 5 foot sprinkler increase, the following types of construction/occupancy combinations under the BOCA NBC would still exceed the allowable height in feet for the IBC:

Construction Type		**Height Limit (ft)**		**Maximum**			
IBC	NBC	IBC*		NBC**		IBC**	**Stories*** **
IIA	2B		65'		B	85'	70'
		6					
					F-2	85'	
		6					
					H-4	85'	
		6					
					S-2	85'	
		6					
IV	4		65'		B	85'	70'
		6					
					F-2	85'	
		6					
					H-4	85'	
		6					
					S-2	85'	
		6					
VA	5A		50'		B	60'	55'
		4					
					F-2	60'	
		4					
					H-4	60'	
		4					
					I-1	60'	
		4					
					R-1	60'	
		4					
					R-2	60'	
		4					
					R-3	60'	
		4					

						S-2	60’	
			5					
VB	5B			40’		B	50’	45’
			3					
						F-2	50’	
			3					
						H-4	50’	
			3					
						I-1	55’	
			3					
						R-1	55’	
			3					
						R-2	55’	
			3					
		R-3	55’		4			
		S-1	50’					3
						S-2	50’	
			3					

*without 5 foot sprinkler increase
**with 5 foot sprinkler increase

***with 1 story sprinkler increase

A further look at the remaining table entries above can even eliminate some of them as not being practical for the application of the limitations. For example, the F-2’s and S-2’s can basically be discounted since they are very rare to begin with and certainly are not generally built to three stories or higher in height. The remaining S-1 entry can also be discounted since it is extremely rare that they would be built to two stories in height using Type VB construction. The R-3 entries can also be discounted since they were only allowed to be three stories in height under the BOCA NBC.

Basically, for Types IIA and IV construction this leaves Group B and H-4 occupancies which are 15 feet less in height than would have been allowed by the BOCA NBC. At the proposed 70 foot height limit, the average floor-to-floor height would be 11 feet 8 inches. Allowing for 3 feet of floor or roof structure including the floor or roof and the supporting beams and girders, this would accommodate a finished ceiling height of at least 8 feet 6 inches per story which is not unreasonable. However, to accommodate these occupancies, we have further modified the text to allow the full 20 foot height increase to be consistent with the BOCA NBC.

For Type VA construction which basically allows a maximum height of 4 stories, at the 55 foot height limit proposed, the floor-to-floor height would be 13 feet 9 inches which is more than adequate to accommodate the Group B, H-4, I-1, R-1, and R-2 occupancies that would still need to be considered because their height limit would be 5 feet less than that allowed by the BOCA NBC under this proposed modification.

For Type VB construction which basically allows a maximum three stories in height, at the proposed 45 foot height limit the floor-to-floor height would be 15 feet. Again, this would be much more than adequate for the Group B and H-4 occupancies which would be 5 feet less in height than that allowed by the BOCA NBC and for the Group I-1, R-1, and R-2 occupancies which would be 10 feet less in height than allowed by the BOCA NBC.

It should also be noted that for Type VA construction buildings not provided with an automatic sprinkler system to qualify for the height increase in feet, the BOCA NBC would limit them to 40 feet versus 50 feet in the IBC. Similarly, for Type VB construction for Groups B and H-4, the BOCA NBC would limit them to a height of 30 feet in a nonsprinklered building versus 40 feet in the IBC. And, finally, for Type VB construction for Groups I-1, R-1, and R-2 the BOCA NBC would limit these nonsprinklered buildings to 35 feet in height versus 45 feet in height in the IBC. Thus, the increased allowable heights for nonsprinklered buildings in the IBC will somewhat offset the lesser heights allowed for the very minimal cases documented above based on the proposed modification to reduce the 20 foot height sprinkler increase to 5 feet.

In summary, with this proposed modification there should be no significant impact on the existing building stock in those jurisdictions that have previously adopted the BOCA National Building Code. Yet when the buildings are sprinklered, this amendment would still allow for greater building heights than those currently allowed by both the SBCCI Standard Building Code and the ICBO Uniform Building Code where previously adopted. Basically, this proposed modification will bring the International Building Code back in line with what was previously allowed for building heights in feet by all three of the legacy model codes from which the IBC evolved. Certainly, there was no technical justification provided during the code development process for the IBC that substantiated increasing the heights across the board for all occupancies in virtually all construction types (other than Type I) with the installation of an automatic sprinkler system designed in accordance with NFPA 13. This code change proposal with this substitute modification will remedy this problem. Therefore, we urge the ICC voting membership to approve this code change proposal as modified by this Public Comment.

Final Action: AS AM AMPC _____ D

G115-06/07

504.2, 506.3

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Pete Wilt, City of Clovis, New Mexico, representing Southern New Mexico Building Officials Association requests Approval as Submitted.

Commenter's Reason: We share many of the same concerns that the ICC Tri-Chapters Code Committee and the California Fire Chiefs Association have expressed in the reason supporting their code change to eliminate what we call "double dipping," that is, allowing both a building area increase and a building height increase for the installation of an automatic sprinkler system. Therefore, we believe this code change should be approved by the ICC voting membership so that a sprinkler system can only be used to either increase the allowable area or increase the allowable height of the building, but not both for the same building.

Final Action: AS AM AMPC _____ D

G122-06/07

506.4

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

John C. Dean, the National Association of State Fire Marshals, requests Approval as Submitted.

Commenter's Reason: Proposal G122-06/07 was disapproved by the IBC-General Committee because it was one of a number of proposals that the proponents encouraged to be disapproved based upon an overall effort by an ICC Code Technology Committee study group to address concerns with height and area within all areas of the IBC. Due to the lack of any specific action from the study group on this proposal, we request that proposal G122-06/07 be approved as submitted based on the reasons originally stated in the proposal's justification.

Final Action: AS AM AMPC _____ D

G223-06/07

506.2.1, 506.3, 507.3, 1013.1, 3104.3

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: Based upon proponents request. See committee reason for G10-06/07

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Philip Brazil, PE, Reid Middleton, Inc., representing himself requests Approval as Modified by this public comment.

Replace proposal with the following:

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 (*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~~ 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.

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.

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.

Commenter's Reason: At the 2006/2007 ICC code development hearings in Orlando, I agreed to ask for disapproval in conjunction with the initiative by several organizations to pursue resolution to the ongoing differences over the IBC provisions for allowable building heights and building areas, specifically through the efforts of the ICC Code Technology Committee. At the time of the deadline to submit public comments for consideration at the final action hearings in Rochester, that effort was ongoing. Consequently, I am asking for approval as submitted, except for Item #5, based on the original reason statement.
I am requesting the membership disregard Item #5 because my understanding at the time of the deadline for submittal of public comments was that Section 3104.3, Exception 2, will be corrected by ICC errata.

Staff note: Please note that the errata to Section 3104.3 which will be corrected in the 3rd printing of the 2006 IBC is 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~~ Section 603.1, Item 1.3, shall be permitted for the roof construction of the pedestrian walkway where connected buildings are a minimum of Type I or II construction.

Final Action: AS AM AMPC _____ D