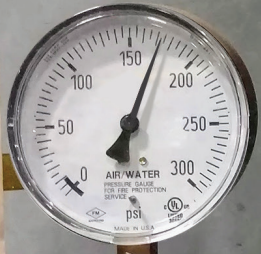
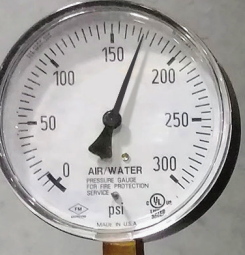


ADDRESS \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_  
SYSTEM NO. \_\_\_\_\_ SPRINKLERS TO DISCHARGE AT \_\_\_\_\_  
IS DESIGNED FOR \_\_\_\_\_ G.P.M. PER SQUARE FOOT OVER A MAXIMUM  
FLOOR AREA OF \_\_\_\_\_ SQUARE FEET WHEN SUPPLIED WITH  
WATER AT THE RATE OF \_\_\_\_\_ G.P.M. AT A PRESSURE OF \_\_\_\_\_  
P.S.I. AT \_\_\_\_\_ FEET TUBE  
"K" FACTOR \_\_\_\_\_ ORIFICE 1/2" NPT TEMPERATURE \_\_\_\_\_  
HOSE STREAM ALLOWANCE \_\_\_\_\_ 250 MAX. STORAGE HOT \_\_\_\_\_  
OCCUPANCY CLASS \_\_\_\_\_ EXTRA HAZARD  
COMMODITY CLASS \_\_\_\_\_ RECEIVING WING

7



MAIN DRAIN



# Guide to Fire Sprinkler Changes in the 2018 IFC, IBC, IRC and IEBC

by Jeffrey M. Hugo, CBO  
NFSA's Director of Codes and Fire Protection



# Guide to Fire Sprinkler Changes in the 2018 IFC, IBC, IRC and IEBC

## Introduction

This short guide is compiled of several articles written by National Fire Sprinkler Association’s Director of Codes and Public Fire Protection, Jeffrey M. Hugo, CBO, and reprinted from the National Fire Sprinkler Magazine to highlight the changes and new code requirements in the 2018 International Codes, such as the International Fire Codes(IFC), International Building Code (IBC) International Existing Building Code (IEBC) and the International Residential Code (IRC).

This guide is prepared to assist jurisdictions, code officials, architects, engineers and contractors with the latest adoption and enforcement of the most recent and updated codes.

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# Significant Changes to the 2018 IFC, IBC, IRC and IEBC

by Jeff Hugo, CBO, NFSA's Manager of Codes



This article summarizes the 21 most significant changes for the fire sprinkler industry in the new 2018 "I" Codes that are scheduled to be available mid-2017. Many of these changes deserve more discussion. Some will be explained in-depth in future issues. It is important to note that this article is put together from the proposals the ICC membership accepted during the cycle. The code sections listed may change slightly when the code books are

printed. However, the technical changes remain and the NFSA membership stands to gain, again, from fully participating in the code development process. Many changes in the 2018 editions increase fire sprinkler installations in new and existing construction and increase life safety and property protection.

## IFC

### Fire Pump and Fire Sprinkler Riser Rooms - IFC/IBC 901.4.6

The section in the 2018 IFC for rooms that house fire sprinkler risers and fire pumps is expanding. What's new is fire pumps, controllers and risers shall be readily accessible within the room and to those who access the room. If the room has a lock, then the key needs to be always available to those who need to access the room. Signage is required on the access doors to fire pump and riser rooms and shall consist of letters at least two inches in height. Fire pump and riser rooms shall be maintained to be no lower than 40 degrees Fahrenheit, with the heating device permanently installed. Permanent artificial lighting is now required to be installed by the 2018 IFC/IBC.

### Integrated Testing - IFC/IBC 901.6.2

NFPA 4 is a new standard for testing integrated fire protection and life safety systems. The 2018 IFC/IBC will reference the 2015 NFPA 4 for integrated testing on high-rise buildings and when a fire alarm system is integrated with a smoke control system. For all other buildings, when two or more fire protection or life safety systems are integrated, the IFC/IBC only requires verification that the integrated systems signal, when initiated. It is important to highlight that these systems (other than high-rise and those

connected to smoke control) are not required to comply or follow the procedures in NFPA 4.

### Ambulatory Care Facilities - IFC/IBC 903.2.2

Ambulatory care facilities first became an occupancy and required to be sprinklered in the 2009 IFC/IBC. A sprinkler system is required throughout the floor where the facility is located and extended down to the nearest level of exit discharge. The 2018 IFC/IBC is increasing the fire sprinkler system to include all floors below the level of exit discharge, unless the floors are an open parking garage. There are many scenarios and structures where the nearest level of exit discharge has several floors beneath it. This change will sprinkler the remaining floors below the ambulatory care facility regardless of the occupancy. According to 2017 Dodge Construction Outlook, "...the rise of offsite health clinics and the growing need to serve an aging population will also contribute to growth in 2017."

### Education Occupancies - IFC/IBC 903.2.3

The 2018 IFC/IBC provides an additional threshold for fire sprinklers in education occupancies. Currently the trigger for fire sprinklers is fire areas over 12,000 sq. ft. and floors under the lowest level of exit discharge. In 2018, any fire area that exceeds a 300-person occupant load and any floor other than the floor on the level of exit discharge requires fire sprinklers. The fire code committee and membership agreed it was time to increase the threshold for educational facilities because of security and egress needs, such as locking devices and lockdown practices that use a "protect-in-place" strategy. According to 2017 Dodge Construction Outlook, "...educational facilities is seeing an increasing amount of K-12 school construction, supported by the passage of recent school construction bond measures..." with a projected +9% in starts and 138 million square feet in 2017.

### Attic Protection for NFPA 13R Protected Structures - IFC/IBC 903.3.1.2.3

The 2018 IFC/IBC contains additional criteria for attics in residential occupancies protected by NFPA 13R systems. These

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requirements stem from the 2015 NFPA 13R Summit hosted by NFPA, written about by myself, Roland Asp and Russ Fleming in the Mar/Apr 2016 issue of SQ. The technical changes to the 2018 IFC/IFC were explained in great detail in the Jan/Feb 2017 issue of the National Fire Sprinkler Magazine. In summary, the changes require sprinklers in occupied attics and attics used for storage, and a single sprinkler when fuel-fired appliances are installed. The biggest change is for pedestal or podium type buildings where the attic is over 55 feet from the lowest level of required fire department vehicle access. When this height is exceeded, the attic is required to have fire sprinklers, or the attic can be constructed of fire-retardant-treated wood or of non-combustible materials, or filled entirely with non-combustible insulation.

### **Occupant Hose Lines – IFC/IBC 905.3.1**

Removal of occupant hose lines for Class III standpipes has been in the IFC for a few cycles. However, the IBC and IFC created a paradox, meaning, the IBC requires the Class III hose when built, then the IFC permits it to be removed if the occupants are not trained to use the hose. This change in 2018 IFC/IBC will permit the code official to waive the hose line requirement before construction. Furthermore, another change to this section permits B and E occupancies to have Class I standpipe systems.

### **Maintenance and Testing of Smoke and Heat Vents – IFC 910.5**

Smoke and heat vents, like other fire protection devices, need to be inspected, maintained and tested on a regular basis to ensure proper operation. The change better correlates the IFC and NFPA 204 to provide the code official with needed information for the inspection, testing and maintenance of these devices. However, rather than testing all smoke and heat vents annually as NFPA 204 requires, this change revises the IFC testing requirement of smoke and heat vents to once every 5 years.

### **Retrofitting A-2 Occupancies with Sprinklers – IFC 1103.5.1**

The 2018 IFC will require A-2 occupancies with fire areas having more than 300 occupants consuming alcohol to retrofit with sprinklers. This requirement, in part, comes from Recommendation #1 of the NIST Report of the Technical Investigation of The Station Nightclub Fire. This requirement is not a blanket A-2 retrofit, but only those A-2 fire areas where alcohol is consumed that exceed 300 occupants will require fire sprinklers. According to [www.SprinklerSaves.com](http://www.SprinklerSaves.com) in the past few years, over 1,400 occupants, in only five establishments, were saved by fire sprinklers when they activated during operating hours. One nightclub, with another 600 occupants, had two fires in the past two years! Sprinklers controlled both fires.

### **Amusement Buildings using Tents and Membrane Structures – IFC 3103.3.1**

Tents and other membrane structures have become a popular option for temporary special amusement buildings. One reason is that the IFC and IBC did not tie together the sprinkler requirements.

This change points the user of the IFC to the amusement building sprinkler requirement in IBC Section 411. This changes closes a loophole and will increase occupant safety without introducing the more burdensome requirements of Section 411. The IBC permits an approved temporary water supply, providing some flexibility to sprinkler installations.

### **High-Piled Storage – IFC Chapter 32**

NFSA staff and several members were involved in ICC's Fire Code Action Committee's (FCAC) task group to make over 14 different proposals to change and update the 2018 IFC Chapter 32. An article for the Nov/Dec, 2015 edition of SQ, titled, "Classifying Commodities in IFC Chapter 32 and NFPA 13" explained the largest change to the chapter on the correlation of classification of commodities. The reason for the several changes is primarily to update the chapter and correlate it with NFPA 13 and the new technologies that have occurred since the 2000 edition. Look for future articles explaining more specific details of the reworked chapter.

### **Laboratories – IFC Chapter 38 and IBC 427**

The 2018 IFC has a new chapter on higher education laboratories. This chapter covers labs and laboratory suites in Group B occupancies used for educational purposes above the 12th grade. Among other building and safety criteria it has requirements for fire sprinkler systems.

### **High-Rise Retrofit Schedule – IFC M103.1**

The IFC has a high-rise retrofit requirement in Appendix M. It becomes an IFC requirement only when specifically adopted, but is similar to NFPA 101's 12-year schedule for compliance. The change to the 2018 IFC Appendix M starts the 12-year compliance schedule only when the building owner receives a notice of violation from the code official. This new language will avoid a possible loophole in the current language that may be interpreted to restart the schedule every time a new code is adopted.

## **IBC**

### **Self/Mini-Storage – IBC 311.2**

The mini-storage or self-storage building is now specifically classified as a S-1 occupancy in Chapter 3. Based on an ICC interpretation this change gives code officials a definite classification for mini-storage buildings. This change correlates the fire sprinkler requirement for S-1 occupancies in Chapter 9, meaning, mini-storage fire areas that exceed 12,000 sq.ft., located more than three stories or where all fire areas exceed 24,000 sq.ft. require a NFPA 13 fire sprinkler system. According to the Self-Storage Association, there are 58,000 self-storage facilities with an average of 566 units per facility. The average size of each facility is 39,620 sq.ft. and if each were built new to the 2018 IBC, fire sprinklers would be required.

### **Occupied Roof – IBC 503.1.4**

New construction architectural practices in urban areas often try to

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use the roof top as an accessory space as attractive environments for people. The 2018 IBC, in Section 503.1.4 states that the occupied roof is not subject to the height, area, and number of story limitations of the main structure. What makes this change to the IBC to the fire sprinkler industry is the new “tradeoff” by this change. A NFPA 13 or NFPA 13R system permits the occupied roof to be of a different occupancy than the story below. This means, for example, a four story, fully sprinklered, office building could have an assembly use on the occupied roof, whereas the unsprinklered office building would be limited to a business use for the occupied roof (and be limited to three stories).

#### **A-4 Ancillary Spaces – IBC 507.4**

The IBC permits specific occupancies in unlimited area buildings when fully sprinklered. For A-4 occupancies (indoor sporting events with spectator seating), fire sprinklers are not required to be over the sporting areas, but the change in the 2018 IBC requires fire sprinklers in the ancillary spaces, such as storage rooms, press boxes, concession booths, and others. There are similar requirements for A-5 occupancy ancillary spaces in earlier editions of the IBC. Data from [www.SprinklerSaves.com](http://www.SprinklerSaves.com) shows there have been several recent fires in ancillary spaces of indoor and outdoor stadiums that sprinklers controlled the devastating effects of fire.

#### **Exterior Areas for Assisted Rescue – IBC 1009.7**

The IBC provides an exterior landing for occupants who need assistance when rescued when the building cannot or does not provide a route for the occupant. The exterior landing is required to be separated by an exterior one-hour wall, with a rated wing wall, and opening protection for doors and windows. The change in 2108 provides a tradeoff of the fire rated wall(s) and opening protection when the interior is protected by a NFPA 13 or NFPA 13R fire sprinkler system.

#### **Basement Egress Windows – IBC 1030.1 and IRC R310.1**

The 2018 IBC and IRC provides an exception for basement sleeping room (bedroom) emergency escape and rescue openings (egress windows or doors). The provision only applies to IRC, R-2 and R-3 occupancies that are fully sprinklered per NFPA 13, NFPA 13R, NFPA 13D and P2904. The sleeping room window can be eliminated when the basement either has: one means of egress and one egress window OR two means of egress. This change provides a cost savings by eliminating each basement escape window and the associated ladder and window well that goes with each window installation. Combine with the benefit of eliminating leakage and maintenance issues and tripping/fall hazards that may be associated with window wells. This change will offer for homebuyers, who will gain the option of finishing a rough-in basement without the constraint of laying out sleeping rooms based on existing window locations or having to add windows to an existing basement.

## **IEBC**

#### **Existing Windows and Doors Near Fire Escapes – IBC 405.5**

The International Existing Building Code (IEBC) has three dif-

ferent pathways or methods to use when renovating an existing building. Each method has its own advantages and disadvantages. When it comes to sprinkler tradeoffs, each method should be equal. Specifically, this change correlates when buildings are sprinklered, the windows and doors along the fire escape do not need the opening protection, such as fire shutters or rated doors. This provides a tradeoff or incentive to sprinkler existing buildings using the IEBC.

#### **Level 3 Alterations – IEBC 904.1.4**

The IEBC Work Area Method has three levels for alterations and the fire protection requirements increase as each level increases. For example, a Level 1 Alteration keeps status quo, meaning if fire protection was present before, then the same level remains. Level 2 Alterations would require fire sprinklers for the work area (with stipulations) if the building has a municipal water supply unless the new sprinkler system triggers a new fire pump, then the work area is exempt from sprinklers. Level 3 Alterations increase the threshold for sprinkler installation. The change for the 2018 IEBC is a new Section 904.1.4 that requires sprinklers in work areas when the building site has municipal water for Level 3 Alterations. This change removes the “new fire pump” trigger and loophole for several occupancies when major alterations are performed on existing buildings. This change should lead to more fire sprinkler installations when the IEBC and Level 3 Alterations are used.

## **IRC**

#### **IRC Backflow – IRC P2904.1 and P2902.5.4**

The residential plumbing portion of the 2018 IRC will not require backflow preventers when the sprinkler system is installed according to P2904 or NFPA 13D, the piping material complies with the IRC, no antifreeze and the system does not have a fire department connection. This change is not totally new, but is written and correlated to end any confusion within the IRC about backflow preventers for any (including standalone) fire sprinkler system.

#### **IBC Occupancies Built in the IRC – IRC R101.2**

The IBC permits some small occupancies to be constructed in the IRC, such as live/work units, owner-occupied lodging houses and care facilities. Many of these are limited to five or fewer persons or rooms. It is important to note that these are small commercial buildings that fall under the IBC, however, because many of these small occupancies are “home-based” they fit better in the community when constructed as a home. The IBC permits the IRC to be used for every aspect; construction, plumbing, mechanical, electrical, but only when they have fire sprinklers. The change to the 2018 IRC uses the sprinkler requirement in the charging language then lists all the small IBC occupancies permitted to use the IRC. The 2018 change does not require anything new, but does specifically require sprinklers in the code text when sprinkler requirement for one and two family dwellings is removed in R313. •

# NFPA 13R Attic Protection Addressed in 2018 IBC and NFPA 5000

by Jeff Hugo, CBO, NFSA's Manager of Codes



The purpose of the three-year code cycle for codes and standards is to address new technology and contemporary issues that arise between cycles. One of the current issues is the concern of the lack of fire protection in the attics of commercial residential occupancies. The fire sprinkler standard (NFPA 13R) that protects most of the up-to-four-story apartment and hotel buildings does not require fire sprinklers in the attic space. This article discusses

the text that addresses this current fire protection issue that appears\* in the upcoming 2018 edition of the International Building Code (IBC), International Fire Code (IFC) and NFPA 5000

In December 2015, NFPA hosted a summit to discuss the recent concerns of fires in unsprinklered residential attics (IBC R-1 and R-2 occupancies) in otherwise sprinklered buildings per NFPA 13R. The summit was prompted because of several recent fires that started in attic spaces that led to huge losses of property, but no loss of life. A complete summary of the NFPA 13R summit from NFSA staff can be found in the Mar/Apr 2016 (No. 195) issue of SQ. One of the major action items from this summit is to make changes to the building codes to provide attic protection. During the code development cycle in 2016, the text of the changes, shown in Figure 1, was submitted by the National Multifamily Housing Council and is also supported by the ICC's Fire Code Action Committee (FCAC). Code text, like Figure 1, was discussed in the NFPA 5000 BLD-RES committee for the 2018 NFPA 5000.

The text of the changes for attic protection, in Figure 1, apply only to NFPA 13R systems, hence the new Section 903.3.1.2.3 only applies to attics in buildings protected by NFPA 13R systems. What exactly is an attic? NFPA 13R does not define what an attic is, but the IBC does. The IBC defines an attic as: "The space between the ceiling beams of the top story and the roof rafters." While this definition could be argued to limit to specific construction techniques and terms, the intent is clear; an attic is the space above the topmost story and the roof framing structure. It applies only to the spaces above the topmost story, meaning, because of this definition, the fire protection requirements herein only apply to the attic and not other concealed spaces, such as floor/ceiling

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## NEW 2018 IBC/IFC Section 903.3.1.2.3 for Attics

Attic protection shall be provided as follows:

1. Attics that are used or intended for living purposes or storage shall be protected by sprinklers.
2. Where fuel-fired equipment is installed in an unsprinklered attic, at least one quick-response intermediate temperature sprinkler shall be installed above the equipment.
3. Where located in a building of Type III, Type IV or Type V construction designed in accordance with Section 510.2 or Section 510.4 of the International Building Code, attics not required by Item 1 to have sprinklers shall comply with one of the following if the roof assembly is located more than 55 feet (16 764 mm) above the lowest level of required fire department vehicle access:
  - a. Provide sprinkler protection.
  - b. Construct the attic using noncombustible materials.
  - c. Construct the attic using fire-retardant-treated wood complying with Section 2303.2 of the International Building Code.
  - d. Fill the attic with noncombustible insulation.
 

The height of the roof assembly shall be determined by measuring the distance from the lowest required fire vehicle access road surface adjacent to the building to the eave of the highest pitched roof, the intersection of the highest roof to the exterior wall, or the top of the highest parapet, whichever yields the greatest distance. For the purpose of this measurement, required fire vehicle access roads shall include only those roads that are necessary for compliance with Section 503.
4. Group R-4 Condition 2 occupancy attics not required by Item 1 to have sprinklers shall comply with one of the following:
  - a. Provide sprinkler protection.
  - b. Provide a heat detector system throughout the attic that is arranged to activate the building fire alarm system in accordance with Section 907.2.10.
  - c. Construct the attic using noncombustible materials.
  - d. Construct the attic using fire-retardant-treated wood complying with Section 2303.2 of the International Building Code.
  - e. Fill the attic with noncombustible insulation.

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assemblies or other concealed spaces.

The first and second requirement of attic protection in the new Section 903.3.1.2.3 (Figure 1) correlates to the 2016 NFPA 13R. These requirements will apply to all attics protected by NFPA 13R. Section 6.6.6 of the 2016 NFPA 13R does require attics that are used for living space, storage or that have fuel-fired equipment to have sprinklers. However, both the code (IFC/IBC in Figure 1) and standard (NFPA 13R) will not require complete attic sprinkler protection for fuel-fired equipment. Where an attic has fuel-fired equipment, only the equipment in the attic is sprinklered, with at least one quick-response of intermediate temperature (175-225 °F) sprinkler installed above.

The third requirement of attic protection in the new Section 903.3.1.2.3 (Figure 1) comes out of the discussions held at the NFPA 13R summit from December of 2015. The following requirements for attics only apply to the special provisions in the IBC for pedestal or podium style (Figure 2) construction found in IBC Section 510.2 and 510.4:

1. The special fire protection requirements for the attic in the building located on the pedestal top applies only to mixed combustible or combustible type of construction (Type III, IV, and V) protected by NFPA 13R systems. It is important to repeat: this portion of the new requirement will only apply to pedestal buildings, meaning, this section does not apply to standalone NFPA 13R residential buildings.
2. The special fire protection requirements are only required when the roof assembly is more than 55 feet above the required fire vehicle access road. The 55 feet to the roof assembly is measured to: the eave (Figure 3), the intersection of the roof to the exterior wall (Figure 4), the top of the highest parapet (Figure 5). The reason for the threshold of 55 feet is because manual suppression by the fire department becomes more difficult at this height. The 55 feet requirement is also used in the IBC/IFC as a threshold for sprinkler installation (Section 903.2.11.3) for any building that exceeds this height. The bottom of the measurement starts at the “required “fire apparatus access road, meaning, the measurement is specific to the required apparatus road, not to any or every paved surface adjacent to the building.

Where the roof assembly exceeds the 55 feet threshold the choice of fire protection in the attic is similar to some of the exempt sprinkler areas in NFPA 13. The choices for attic protection in tall

FIGURE 2

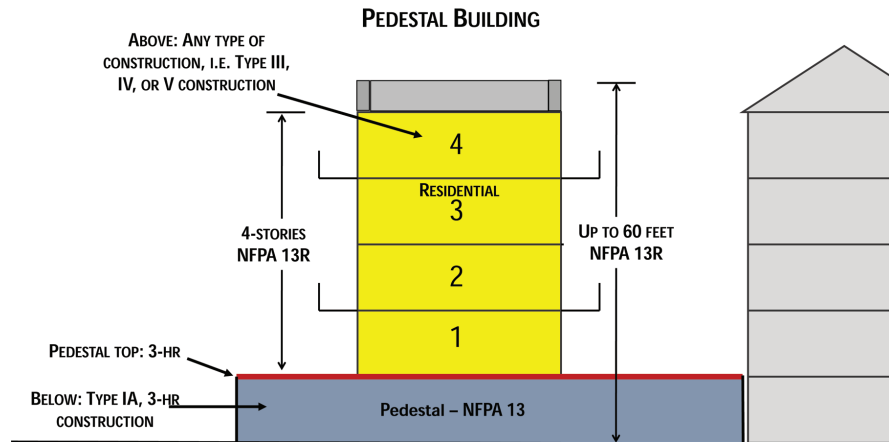
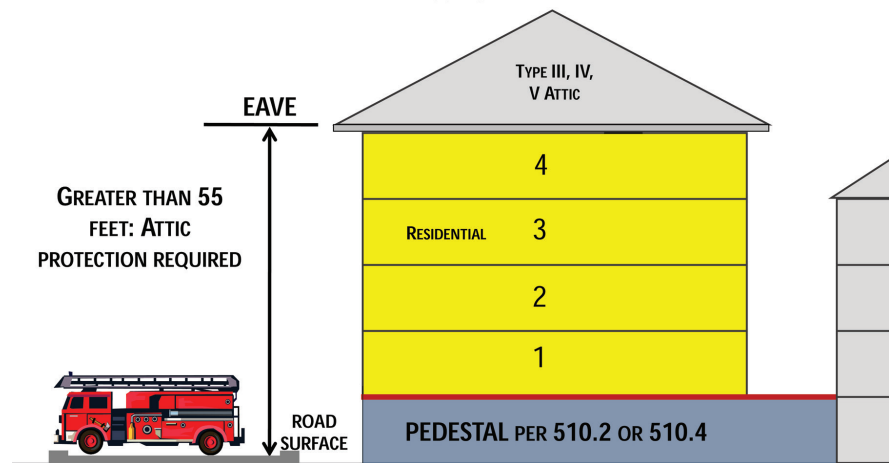


FIGURE 3



pedestal buildings protected by NFPA 13R are as follows:

- a. Provide fire sprinkler protection in the attic space. Follow NFPA 13R or NFPA 13 for fire sprinkler installation in the attic space.
  - b. Construct the attic using noncombustible materials. A Type III, IV or V building is permitted to have materials that are more restrictive, such as steel roof trusses and fire retardant treated roof sheathing.
  - c. Construct the attic using fire-retardant-treated wood.
  - d. Fill the attic with noncombustible insulation. As in NFPA 13, there is no limit to the volume or area of attic space filled with noncombustible insulation.
3. The fourth requirement of attic protection in the new Section 903.3.1.2.3 (Figure 1) is not new to the 2018 edition but is moved from the 2015 Section 903.2.8.3 for Group R-4 Condition 2 attic spaces. The attic fire protection options are nearly the same as explained above, but for R-4 Condition 2 attics, a heat detection system is permitted, whereas it is not an option for the tall pedestal attics above.

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FIGURE 4

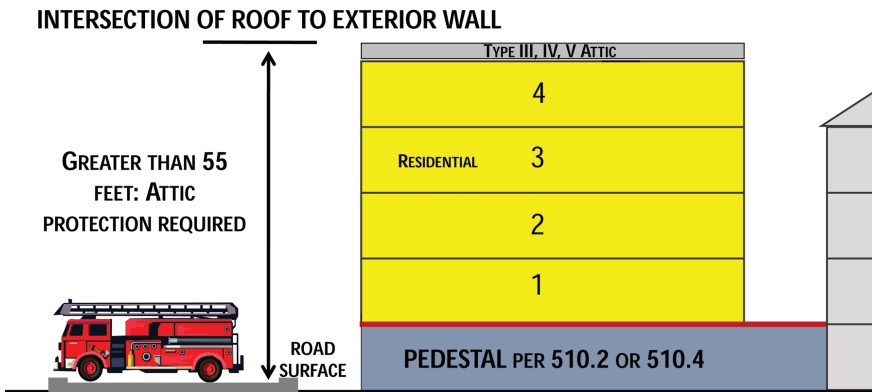
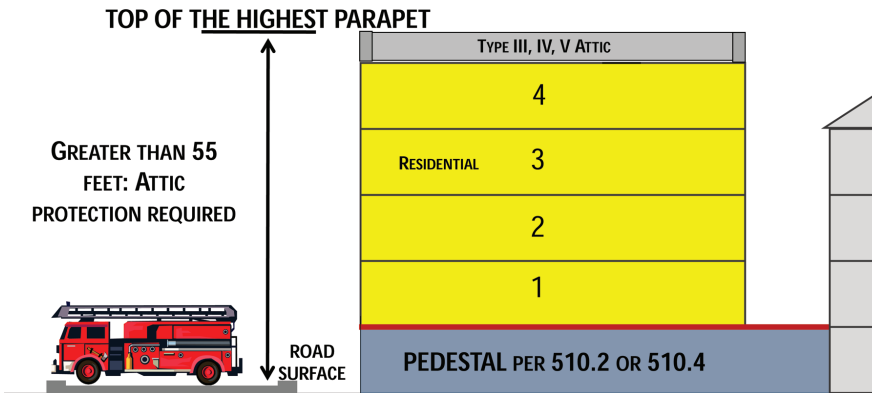


Figure 5



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The changes explained here for buildings protected by an NFPA 13R system are to provide additional protection against fires that originate in the attic. These increases also provide additional protection for tall pedestal buildings that may slow down or delay access to attic fires from the responding fire department. •

*\*It should be noted here, while at the time this article is published, both ICC and NFPA 2018 editions are not yet ratified by their membership, however, because of the wide support of these changes for attic protection, it is presumed to be code when published. Contact NFSA's Public Fire Protection Department and Manager of Codes, Jeffrey M. Hugo for more information.*



# Fire Sprinklers for Commercial Uses in Dwellings and Townhouses

by Jeffrey M. Hugo, CBO,  
NFSA's Manager of Codes



## History

Having a home-based business has deep roots in the U.S. Many people who own commercial businesses had a start in their home. An artist may have had a small studio within a home, as well as a cobbler with a few employees who worked within the cobbler's house and among his family. Care for an aged relative and a few friends, or renting rooms for transient travelers all have years of history within our society. When does a "few" become a commercial business? When does the home become a commercial use? More importantly for the readers of this publication, if a commercial use is fully sprinklered, do sprinkler systems from the commercial use follow back to a home-based business? Local zoning codes have their say where and when these uses apply locally, but for construction and fire sprinkler purposes, the International Building Code (IBC) and the International Residential Code (IRC) address commercial uses in dwellings and townhouses.

## Live/Work Units

Live/work units are first addressed in the 2009 editions of the IBC and IRC. This becomes a starting point for the first commercial use within the IRC townhouse that is permitted. Live/work units are R-2 occupancies with any other occupancy (excluding H and S). The IRC reference, Section 101.2, applies only to townhouses, and is referenced back to IBC, Section 419 for special use requirements and Section 419.5 for fire sprinklers. As with all the commercial uses in IRC, the permission to leave the IBC, to be built under the IRC, comes with it being fully sprinklered to at least NFPA 13D. Live/work units may be required to have a monitored fire alarm system as if it is a R-2 occupancy. There are limitations placed on live/work units in townhouses, such as: limited to 3,000 sq.ft., 50% of the unit is the maximum for the "work" side and is limited to the first or main floor, up to five commercial employees or nonresidential workers are permitted. The "live" side and the "work" side do not have the traditional occupancy separations, when the area and use limitations are followed in Section 419. As mentioned

above, any occupancy, except H and S is permitted, however, storage areas up to 10 % per floor as an accessory occupancy is permitted.

## Owner-Occupied Lodging

Owner-occupied lodging is first addressed in the 2012 edition of the IRC. This occupancy is a single-family dwelling and permits up to five guestrooms for rent, where the owner of the home resides. The 2012 IRC adds in the new language in Section 101.2, Exception 2, and definitions with the caveat being the owner-occupied lodging is fully sprinklered per IRC, Section P2904 (which also includes NFPA 13D). Regardless of whether a local jurisdiction removes the Section R313 sprinkler mandate for all dwellings, this is a specific sprinkler requirement in the IRC. While the 2012 IBC considers this a R-1 occupancy, the 2015 IBC changes the owner-occupied lodging with (maximum) five guestrooms as a R-3 occupancy and includes specific permission to use the IRC in IBC, Section 310.5.2.

## Care Facilities

Care facilities with up to five persons receiving custodial or medical care are permitted by the 2012 (and current) IRC in a dwelling unit and any care of up to five persons is permitted by the IRC in any single-family dwelling. Once again, all these IBC occupancies (I-1, I-2, I-4, and R-3), are allowed to occur in the IRC, through the IBC (Sections 308.3.4, 308.4.2, 308.6.4 and 310.5.1) where provided with an automatic sprinkler system per IRC, Section P2904 (includes NFPA 13D). This is perhaps the biggest change for residential neighborhoods, as it allows medical and custodial care, or institutional occupancies, such as: group homes, drug and alcohol centers, halfway houses, board and care, foster care, detox facilities and nursing homes placed among other single-family dwellings. It is also important to note that other care facilities, such as day care, up to five persons in a dwelling unit, also are R-3 occupancies that are permitted to be constructed by the IRC, with fire sprinklers.

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## Sprinkler Standards

These home-based commercial occupancy sprinkler systems in the IRC are referenced to IRC, Section P2904, which is considered equivalent to NFPA 13D. The IRC does not require any other add-ons to the P2904/NFPA 13D systems such as flow switches, listed pumps and tanks, garage coverage, increased density, more design sprinklers, etc. These homes with the increased number of occupants, employees, materials, storage, processes, are likely have similar fire loading as the residential loading of the IRC dwelling. Where a live/work unit is constructed in the IBC (stays in the IBC) as an R-2 townhouse, there is increased sprinkler protection (NFPA 13 or NFPA 13R) with fire department connections, flow switches, densities, listed equipment, etc. and a fire alarm system. However, when built

to the IRC, it follows the IRC P2904 or NFPA 13D standard.

## Summary

The IBC allows several occupancies with limited occupants to be built under the IRC if these occupancies are sprinklered per IRC P2904 or NFPA 13D. Where a jurisdiction removes the code-wide residential sprinkler mandate (R313) in the IRC model code, the sprinklered IBC occupancies are to remain as these requirements were specifically heard and requested by the ICC voting membership to retain the sprinklers in the IRC. It is important to point out the 2018 IRC, Section 101.2 has updated and provided updated text with clear intent, see Figure 1. Communities are changing or reverting to areas where a person can live, work and shop in the same community without a long commute and it is clear the codes are changing with the times. •

**R101.2 Scope.** The provisions of the *International Residential Code for One- and Two-family Dwellings* shall apply to the construction, *alteration*, movement, enlargement, replacement, repair, *equipment*, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and *townhouses* not more than three stories above *grade plane* in height with a separate means of egress and their *accessory structures* not more than three stories above *grade plane* in height.

Exceptions: The following shall be permitted to be constructed in accordance with this code where provided with a residential fire sprinkler system complying with Section P2904:

1. Live/work units located in *townhouses* and complying with the requirements of Section 419 of the *International Building Code*.
2. Owner-occupied lodging houses with five or fewer guestrooms.
3. A care facility with five or fewer persons receiving custodial care within a dwelling unit.
4. A care facility with five or fewer persons receiving medical care within a dwelling unit.
5. A care facility for five or fewer persons receiving care that are within a single- family dwelling.

# Guide to Benefits of Fire Sprinklers in the IRC – From 2000 to 2018

by Jeffrey M. Hugo, CBO,  
NFSA's Manager of Codes



The International Residential Code (IRC) is the predominant model residential code in the U.S. The IRC as a model code requires sprinklers throughout one- and two-family homes and townhouses. However, several jurisdictions remove the fire sprinkler mandate. This short guide considers the mandate, but accounts that jurisdictions do adopt the IRC without sprinklers in new construction. This guide is useful to sprinklered and unsprinklered IRC users, as it locates each fire sprinkler benefit in the IRC, summarizes the benefit, quotes the IRC section number (as it pertains to the 2018 edition) and identifies which edition of the IRC the benefit was first introduced into the code and remains in the IRC up to the 2018 edition.

## IBC Occupancies in the IRC

- The following International Building Code (IBC) occupancies are permitted, by the IBC to be built to the IRC, when sprinklers are installed per P2904/NFPA 13D throughout:
  - > Live/work units located in townhomes. R101.2
    - 2009 edition
  - > Owner-occupied lodging with five or fewer guest rooms (IBC 310.4.2). R101.2
    - 2012 edition
  - > A care facility with five or fewer persons receiving custodial care within a dwelling unit. (IBC 308.2.4 and 308.5.4)
    - 2012 edition
  - > A care facility with five or fewer persons receiving medical care within a dwelling unit. (IBC 308.3.2)
    - 2012 edition
  - > A care facility for five or fewer persons receiving care that are within a single-family dwelling. (IBC 310.4.1)
    - 2012 edition

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**TABLE R302.1(2)  
EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the <i>International Building Code</i> with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	3 feet <sup>a</sup>
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood <sup>b, c</sup>	2 feet <sup>a</sup>
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	NA	< 3 feet
	Unlimited	0 hours	3 feet <sup>a</sup>
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet <sup>a</sup>

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## Exterior Walls

- Exterior walls in homes with sprinklers can be built closer to lot line. Projections, openings in walls and penetrations into dwellings with sprinklers are permitted more than unsprinklered dwellings. Table R 302.1(2)
  - 2009 edition

(see Table 1 on previous page)

## Townhouses

- The common wall between townhomes can be reduced from 2-hr to 1-hr fire-resistance rated wall where dwellings on both sides of the common wall are sprinklered per P2904/NFPA 13D. R302.2.2
  - 2015 edition

## Two-Family Dwelling

- Dwelling unit separation wall can be reduced from 1-hr to 30 minutes where sprinklered per NFPA 13. This is the only occurrence in the IRC where a NFPA 13 system is indicated for the benefit. R302.3
  - 2000 edition

## Membrane Penetrations

- Fire sprinklers with metal escutcheons installed in fire-resistance rated walls or ceilings protect membrane penetrations. R302.4 (3)
  - 2000 edition

## Fire Protection of Floors

- Fire sprinklers eliminate ½ inch gypsum or 5/8-inch wood panel on underside of floors. R302.13
  - 2012 edition

## Residential Subdivisions

- Residential subdivisions where all homes are sprinklered can have nonrated exterior walls and unprotected openings/penetrations with a zero feet lot line. Adjoining lot line setback shall be six feet minimum. Table R302.1. (2) Footnote a
  - > If attached garages have exterior walls adjacent to the lot line, garages shall have sprinklers. R309.5
    - 2009 edition

## Emergency Escape Windows in Basements

- Fire sprinklers eliminate emergency escape and rescue openings in every basement sleeping rooms where one of the following are present: R310.1
  - > One means of egress according to R311 and one emergency escape and rescue opening, or
  - > Two means of egress according to R311.
    - 2018 edition

## Mezzanines

- Open and unenclosed mezzanine area can be increased to one-half (an increase from one-third) of the floor area of the room of sprinklered dwellings. Cannot be combined with enclosed mezzanine exceptions in R325.5. R325.3
  - 2018 edition
- Mezzanines in buildings up to two stories, having two or more means of egress are not required to be open to the same room as the mezzanine where sprinklers are installed according to NFPA 13R and NFPA 13D. R325.5
  - 2015 edition

## IRC sprinkler benefits in the IFC

- Fire flow (Appendix B of the IFC and needs to be specifically adopted by the jurisdiction)
  - > Single-, two-family, townhouses, Group R-3 and Group R-4. IFC Table B105.1(1) 2015 edition
- Sprinklered buildings of 0-3,600 sq. ft. have a min flow of 500 gpm for 30 minutes vs. unsprinklered of 1,000 gpm for 60 minutes
- Sprinklered buildings 3,601 sq. ft. and greater have one-half the gpm (fire flow) for 60 minutes maximum.
- Fire hydrant spacing (Appendix C of the IFC and needs to be specifically adopted by the jurisdiction)
  - > Fire hydrant spacing is increased for distance between hydrants and road frontage to hydrants by 25%. IFC Table C102.1 footnote g. 2015 edition
- Fire apparatus access roads (Appendix D of the IFC and needs to be specifically adopted by the jurisdiction)
  - > One- and two-family developments
- Two separate fire apparatus access roads are required where there are more than 30 dwelling units, however where sprinklered to NFPA 13D, access from two directions is not required. IFC D107.1 2015 edition

 #fastestwater 

# 2018 IFC Chapter 32 Changes

by Jeffrey M. Hugo, CBO,  
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In Chapter 32 of the 2018 International Fire Code (IFC) has significant changes to high-piled storage. This chapter, through the ICC Fire Code Action Committee (FCAC), was updated through a working group of several NFSA members, other industries, and code officials (See Nov/Dev 2015 issue of SQ). This article highlights the changes.

## Permits

Operational permits in Section 105.6.23 was changed to require permits when the high-piled storage exceeds 500 sq. ft., not when the building exceeds 500 sq. ft.

New in Section 105.7.11, are construction permits for high-piled storage where the installation or modifications exceed 500 sq. ft. This change that requires a construction permit in the IFC would now trigger the fire code officials to be involved in plan review and planning prior to the work being done.

## Construction Documents and Storage Layout

The changes to Section 3201.3 for construction documents do not change what is required for review, but what is required after construction. New to 2018 is Section 3201.3.1, that requires a floor plan of the storage layout on the wall, in an approved location. The floor plan, which is a reference for all future inspectors, owners and users of the space, is required to have the following on the plan:

1. Locations, dimensions and rack layout of high-piled storage areas.
2. Design storage height for each storage area.
3. Types of commodities.
4. Commodity clearance between top of storage and the sprinkler deflector for each storage arrangement.
5. Aisle dimensions between each storage array.
6. For palletized and solid-piled storage, the maximum pile volume for each storage array.
7. Location and classification of commodities in accordance with Section 3203.
8. Location of required fire department access doors.

9. Location of valves controlling the water supply of ceiling and in-rack sprinklers.

## Fire Safety and Evacuation Plan

The fire safety and evacuation plan for high-piled storage is not necessarily new to the IFC. The new text correlates all the special requirements the IFC previously had and located it in one place, Section 403.11.5. This plan, if required by the following, is part of the construction permitting and plan review process:

1. The high-piled storage area exceeds 500,000 square feet for Class I-IV commodities.
2. The high-piled storage area exceeds 300,000 square feet for high-hazard commodities.
3. The high-piled storage is in a Group H occupancy.
4. The high-piled storage is in a Group F occupancy with an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.
5. The high-piled storage is in a Group M occupancy with an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.
6. Where required by the fire code official for other high-piled storage areas.

## Commodities

The current list of commodities in the IFC has had minimal revision since the 2000 IFC, while NFPA 13 has included, expanded and revised its commodity classification list every edition since 1996. The biggest visual change of the 2018 IFC is adding in the tables and figures to improve consistency with the 2016 NFPA 13. The individual lists for Class I through IV, high-hazard and plastic commodities have been replaced with Table 3203.8 as is contained in the 2016 NFPA 13. While, NFPA 13 does not use the term “high-hazard” for a commodity, the items which have been determined to be high-hazard in the IFC are noted, as well as a new item, under the category of “biomass.”

The other change in this category addresses the figure for mixed commodities. Since the 2000 IFC, a mixed commodity with a Group A plastic was determined through Figure 3203.7.4. The

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2018 IFC moves this figure closer to correlation to NFPA 13 by breaking the figure into two figures. It is important to note there are differences between the IFC and NFPA 13 on this table and improvements are in store for the 2021 IFC to close some of the gaps between the two documents.

### General Fire Protection and Life Safety Requirements Table

Many requirements of Chapter 32 revolve around Table 3206.2 (General Fire Protection and Life Safety Requirements Table). The user first classifies the commodity and the size of the high-piled storage area then scrolls across the row for fire protection requirements. The changes in the 2018 table are numerous and outlined in the following:

- For Class I-IV, the rows from 12,001-500,000 sq.ft. are combined as they have the same requirements.
- Maximum pile dimensions are adjusted to 120 feet for Class I-IV and 60 feet for High-hazard with no changes to height or pile volume. This was done to accommodate tilt up construction structural spacing.
- Footnote e, eliminates the reference to Section 503 for apparatus access and the old Footnote f, becomes new Footnote e.
- High-hazard in the high-piled area column is changed to greater than 300,000 with new Footnote f (old Footnote g).
- Old Footnote h is eliminated. Having a 2-hour fire wall conflicts with unlimited area buildings in the IBC.

### Fire Department Access Doors

The Fire Department Access Doors Section is updated to work with varying building configurations. First, the door distribution has increased from 100 lineal feet between doors to 125 feet between

doors, and the distance between doors for existing buildings is increased to 200 feet. Second, exterior walls that do not face a fire apparatus access road are permitted to exempt doors, where the building is fully sprinklered, the opposite exterior wall has exterior doors and all portions of the interior are less than 150 feet from a fire department access door. Third, fire department access doors shall be accessed without the use of a ladder. Finally, signage for all fire department access doors is included in this section of changes.

### High-piled Storage Area

The changes to the high-piled storage areas clarify the size of the storage area by using the footprint of the racks, shelves, or piles, including all the interior aisles and a 15-foot perimeter around the racks, shelves, or piles. These areas are applied to their commodity classification in Table 3206.2. Further changes to this section divides the multiple high-piled and multiple class storage areas into separate sections for clarity.

### Flue Spaces

The application of flue space requirements and the format of Table 3208.3 have created confusion, and changes to the 2018 table is intended to clarify the requirements. The most visible change is a new table that correlates exactly to the NFPA 13 flue space requirements. The text to the section also clarifies flue spaces are only required above the first tier or level.

### Conclusion

The changes to the 2018 IFC Chapter 32 are a result of a multi-member industry and code official working group. This method of code work has proven to be the most effective and collaborative way to make changes to codes. It is important to note, as a reader, this article was written prior to publishing the 2018 IFC code. Text and section numbers may be different from the published version. •

# A-2 Retrofit in the 2018 IFC

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The 2018 International Fire Code (IFC) has a new retrofit requirement for fire sprinklers in A-2 (bars, nightclubs, restaurants, halls, etc.) that serve alcohol. This move stems from the 2003 Station Nightclub fire that claimed 100 lives and injured over 187, that prompted changes in building and fire codes to lower their fire sprinkler threshold trigger to 100 occupants for new A-2 occupancies starting in the 2006 International Building Code (IBC) and IFC. Existing A-2 occupancies can operate as status quo, unsprinklered, with no requirements in the IFC to trigger sprinklers until the 2018 edition.

The changes to 2018 IFC were long coming. They would have been in the 2015 IFC, but a late evening code hearing in Atlantic City in 2013 changed the balance of code officials in favor of retrofitting fire sprinklers to increase life-safety of assembly use patrons. Where NFPA took immediate action, through the TIA process in 2003, to upgrade the 2003 NFPA 1, 101 and 5000 to require sprinklers where the occupant load exceeded 100, the ICC membership struggled several cycles to find a balance of life-safety and political safety requiring fire sprinklers retroactively in their jurisdictions. Depending on the area of the country, where NFPA or ICC codes were adopted, sprinklers in A-2 occupancies were immediate or still wait until this day.

The 2018 IFC, puts the fire sprinkler retrofit in Chapter 11 where all retrofit and other minimum fire and life-safety increases are required for existing buildings. Specifically, Section 1103.5.1 states,

*“Where alcoholic beverages are consumed in a Group A-2 occupancy having an occupant load of 300 or more, the fire area containing the Group A-2 occupancy shall be equipped with an automatic sprinkler system in accordance with Section 903.3.1.1.”*

Note the IFC text is not a blanket retrofit requirement. There are several triggers that need to be satisfied to get a fire sprinkler system installed. The text mentions that a fire area, with 300 occupants or more where alcohol is consumed, requires sprinklers. What does this really mean?

- The occupant load of 300 or more occupants occurs where the alcohol is actually being consumed. This could eliminate several areas of the building, such as other non-assembly use floors, bathrooms, kitchens, vestibules, etc.
- A fire area is a fire-rated compartment that separates one area of the building from another. Where alcohol is not being consumed, such as the bathroom and kitchen area, they are separated from the alcohol consumption fire area with 2-hour fire barriers. The floor and ceiling of the area of alcohol consumption is fire-rated with 2-hour fire barrier horizontal assemblies.
- A fire area with assembly occupant loads can be as large as 4,500 sq. ft. (tables and chairs: 15 sq/ft net) or as low as 1,500 sq. ft. (standing room only: 5 sq/ft net).
- Where there are fire areas that separate the areas where alcohol is being consumed versus the non-consumption areas, the fire sprinkler system installed to the 2013 NFPA 13 is only installed in the fire area where alcohol is being consumed.

A question that comes up frequently is; Can sprinklers be eliminated with this 2018 IFC code text? The answer is “yes”. This applies only to fire areas where alcohol is consumed. If a neighborhood bar has a basement used only for storage or a second-floor existing apartment and the alcohol consumption area is less than 300 occupants per fire area, sprinklers would not be required. However, all fire areas (2-hr walls, floors and ceilings) could be eliminated with sprinklers throughout. The cost-benefit of each scenario would need to be weighed.

Most restaurants, bars, nightclubs and banquet halls are wide open spaces that allow for better ambiance, increased occupants and an aesthetic experience, it would be difficult to start maneuvering the occupant loads and floor spaces to accommodate small compartments to avoid sprinklers. Using fire areas may only be beneficial to small assembly buildings, such as a neighborhood bar. To leave as an open space and to eliminate adding new fire-rated

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walls and floor/ceiling assemblies, install the sprinkler system. There are numerous fire code benefits that allow for increased occupant loading, exiting, and elimination or reducing existing passive fire protection measures, such as door closers and rated doors. A full fire sprinkler system provides life-safety, lower insurance premiums and a shorter business interruption when a fire occurs. With the latest tax reform changes, small business owners can now fully expense the cost of retrofitting the fire sprinkler system up to \$1million per year.

Many areas of the country, along the east coast, Nashville, TN, Portland, OR, and many more have retrofitted fire sprinkler systems in their existing assembly buildings. Many lives have been saved since sprinklers were installed, as documented almost daily on [www.sprinklersaves.com](http://www.sprinklersaves.com). It is important to keep these requirements in the 2018 IFC adoptions that occur locally across the country. Please contact the NFSA if you know of any jurisdiction that opts out or is considering opting out of adopting the 2018 IFC. •