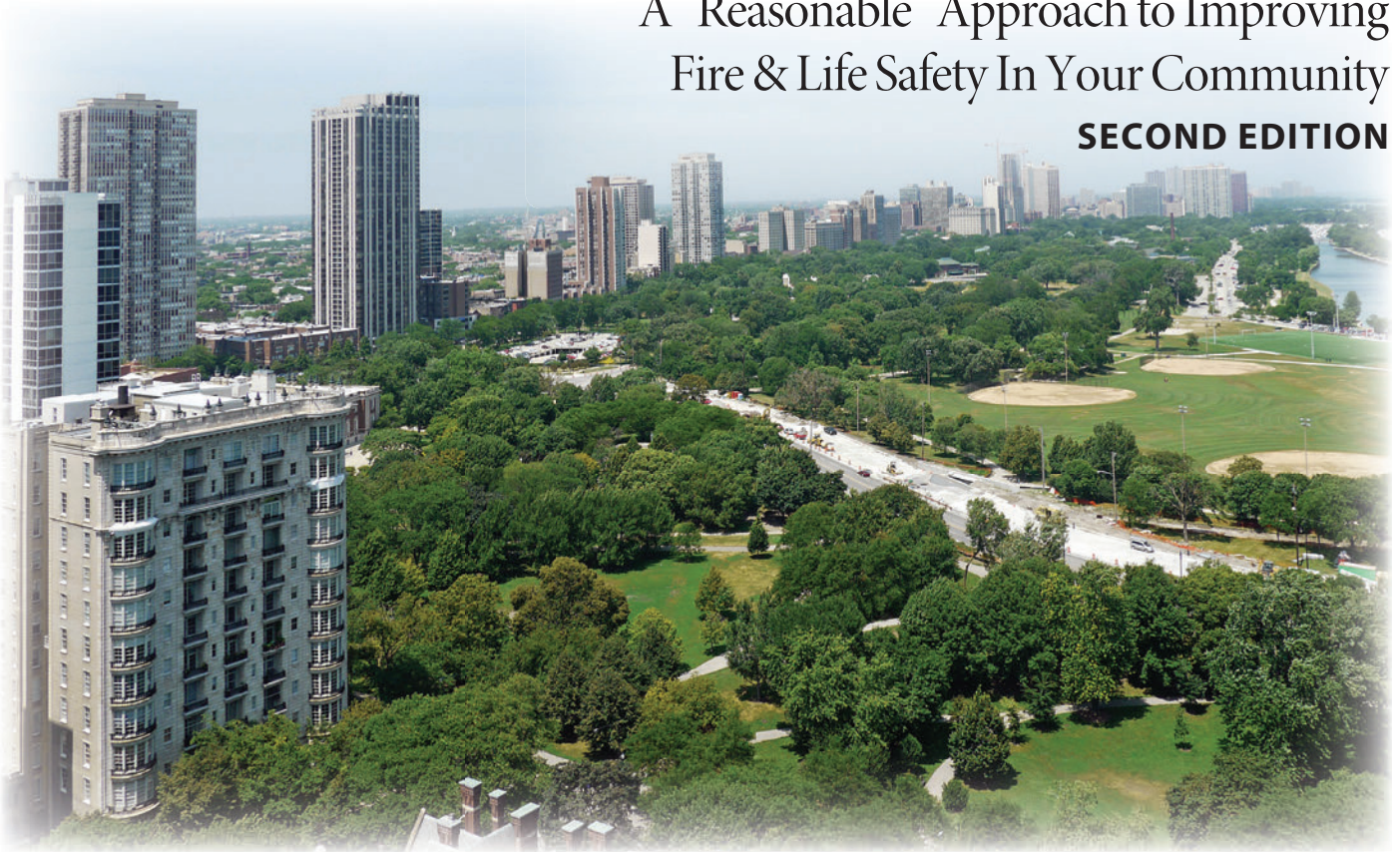


FIRE SPRINKLER RETROFIT GUIDE

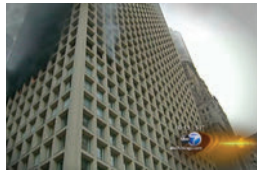
MAKING YOUR COMMUNITY FIRE SAFE

A “Reasonable” Approach to Improving
Fire & Life Safety In Your Community

SECOND EDITION



We don't need to see scenes like these again...



514 Progress Drive, Suite A
Linthicum Heights, MD 21090 • nfsa.org

This document was originally published as *Fire Sprinkler Retrofit – A Step-By-Step Approach for Communities*. Jim Dalton, the Director of Public Fire Protection for the National Fire Sprinkler Association (NFSA), developed it in 2006. In his acknowledgement section, he noted the assistance he received from other NFSA staff, specifically the Director of Regional Operations, Buddy Dewar, and the National Training Manager, John Corso. These gentlemen participated on the development team and provided valuable input along the way. However, Jim gave the lion's share of the credit for the original draft of the manuscript to Mr. Steve Hart, who at that time worked for the National Automatic Sprinkler Industry Fund. In Jim's words, "As a past local Fire Marshal and Deputy State Fire Marshal in California, Steve's knowledge and experience in local and state fire protection issues and initiatives made him the perfect choice to produce an initial draft for the team to work from and eventually produce this user friendly guide."

As a result of the "Great Recession" that took place in the United States in the decade between the original publication of this document and the current revision, there have been fewer fire sprinkler retrofit programs especially at the municipal and state level. Nevertheless, fire sprinkler retrofit has continued with federal rulemaking that requires the complete retrofit of the nation's nursing homes. There is also continued voluntary efforts to retrofit student housing on college and university campuses. There are a number of individual municipal efforts to ensure that these initiatives happen. Optimistically, this update of the Retrofit Guide will encourage others to be a voice and move forward with the vision held by Jim Dalton a decade ago; moving toward a safer future through the retroactive installation of fire sprinkler systems.

The new title *Fire Sprinkler Retrofit... Making Your Community Fire Safe* reflects a change in approach for the publication itself. Instead of simply recommending consideration of individual campaigns for fire sprinkler retrofit of the most dangerous occupancies such as high-rise buildings or nightclubs, this document contains a recommended option to address community fire safety as a whole, by urging the adoption of minimum fire sprinkler requirements for the variety of existing occupancies for which there is already widespread agreement that retrofit is needed. Regardless of what building and fire codes have been adopted and enforced within a community this document recommends the adoption of the fire sprinkler requirements for existing occupancies that have been recommended through a consensus process and recognized by the American National Standards Institute. As such, these thresholds for fire sprinkler retrofit represent minimum requirements for a reasonable level of protection. Citizens of every community deserve this level of protection; all that is needed are community leaders that can accomplish this a reality, and make their communities fire safe.

*National Fire Sprinkler Association
May 2017*

TABLE OF CONTENTS

Introduction.....	2
The Last 50 Years – A Growing Appreciation for Fire Sprinklers.....	3
Statistics and Facts on Fires and Fire Sprinkler Performance in the United States.....	4
The Special Role of Fire Sprinklers.....	4
Part 1 – A Consensus Plan for SprinklerRetrofit.....	7
Part 2 – Targeted Plans for Sprinkler Retrofit.....	11
Part 3 – Identifying Barriers to Retrofit.....	21
Part 4 – Preparing the Necessary Documents.....	31
Part 5 – The Adoption Process.....	35
Part 6 – Implementation and Customer Service.....	41



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August 2017

Dear Community Fire & Life Safety Leader/Advocate,

The National Fire Sprinkler Association (NFSA) is honored to not only provide this retrofit guide as a resource, but to also be available to you in your quest for improved fire and life safety in your community.

We have watched recent fires that will be recorded for their historical significance unfold to remind us that fire is faster than ever, and modern furnishings and contents are a gamechanger for fire protection professionals. This guide is intended to give you a start to the important task ahead in retrofitting high-risk occupancies and/or historical properties with fire sprinklers.

Team NFSA respects the role our local, state, and national fire service leaders play and want you to know we have legal, technical, and policy expertise in fire protection to assist. Please let us be a resource if you have questions in regard to process, cost, contractors, manufacturers, and systems available to provide the greatest protection to citizens, firefighters, building owners, and the overall community.

We believe that by working together, we can create a safer world by minimizing the impact of fire. We are pleased to have our partners the National Fallen Firefighters Foundation (NFFF) and the International Association of Fire Chiefs (IAFC) involved with us as we work to bring you the resources.

The future is ours to define, we look forward to working with you to protect everything from homes to high-rises....and buildings in between.

A grateful,

Shane Ray, President

Appendices

A – An Express Model Ordinance for Consensus Sprinkler Retrofit.....	52
B – Sample Sprinkler Retrofit Ordinances.....	54
C – A Fire Sprinkler Contractors Perspective....	57
D – Websites for Additional Resources.....	59

**Partners in Progress:
National Fire Sprinkler
Association (NFSA), the
International Association
of Fire Chiefs (IAFC)
and the National Fallen
Firefighters Foundation
(NFFF)**



August 2017

Dear Life Safety Advocate and Fire Service Community Leader:

For over a decade, the National Fallen Firefighters Foundation has been working with an array of groups and individuals in support of the installation of residential fire sprinklers and other Community Risk Reduction Initiatives to make our neighborhoods safe from the ravages of fire. It is our firm belief that we can make a difference in reducing civilian and firefighter deaths and injuries because of these lifesaving initiatives.

Specifically, we encourage every community to put forth the efforts necessary to enact fire sprinkler legislation and retrofit actions by taking a stand for the safety and survivability of our neighbors and ourselves. We continue to see the ever-changing dynamics of fire occurrence in today's modern living conditions and understand the need for the fast application of water to hold the spread of fire in check until our personnel arrive on the scene, with everyone safely outside the structure awaiting our arrival.

Through our combined efforts, we can make a difference. This was represented back in 2004 and 2014 in Tampa Florida when our profession created and then reaffirmed the 16 Firefighter Life Safety Initiatives and specifically Initiative #15: *Advocacy must be strengthened for the enforcement of codes and the installation of home fire sprinklers*. At both those gatherings our industry confirmed the importance of residential fire sprinklers and the need to take appropriate steps to insure their installation nationwide, new and retrofit.

The National Fallen Firefighters Foundation stands in support of these efforts and encourages the use of this retrofit guide as tool to assist you in making your communities a safer place to live, work and play. We applaud the National Fire Sprinkler Association and the International Association of Fire Chiefs for their involvement as we partner in support of the delivery of this vital resource document. Together we can make a difference.

Sincerely,

A handwritten signature in black ink, reading "Ronald J. Siarnicki".

Chief Ronald Jon Siarnicki
Executive Director

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International Association of Fire Chiefs (IAFC) and
the National Fallen Firefighters Foundation (NFFF)**



INTERNATIONAL ASSOCIATION OF FIRE CHIEFS

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4025 FAIR RIDGE DRIVE • FAIRFAX, VA 22033-2868 • TEL: 703/273-0911 • FAX: 703/273-9363 • www.iafc.org

August 2017

Dear Life Safety Advocate and IAFC Member:

The role that fire sprinklers play in preventing fire deaths and conflagrations in our communities is significant. While fire service leaders often focus on the justification and acquisition of physical resources in their cities, the need to retrofit existing buildings with automatic fire sprinklers must also be at the top of our list of priorities. Fire sprinklers have an unprecedented history of being reliable and reducing the chance of catastrophe.

The International Association of Fire Chiefs (IAFC) fully supports fire sprinkler retrofit initiatives. These initiatives not only translate into civilian lives saved, but also have a positive impact on the lives of firefighters. We, as fire service leaders, must examine local codes and ordinances and work to find opportunities to help retrofit existing buildings to reduce the risk to our communities. On the behalf of the 12,000 members of the IAFC, we challenge you to help with this critical safety effort by listening, learning, and taking action within your own jurisdiction.

Making change in public safety can be difficult. However, it is through learning, collaboration, and brave action that we can hope to actually make a difference. The IAFC is proud to work with the National Fire Sprinkler Association on this crucial topic.

In Service,

Mark W. Light, CAE
Chief Executive Officer and Executive Director

Fire Chief Thomas C. Jenkins V
President and Chairman of the Board

Partners in Progress:

**National Fire Sprinkler Association (NFSA), the
International Association of Fire Chiefs (IAFC) and
the National Fallen Firefighters Foundation (NFFF)**

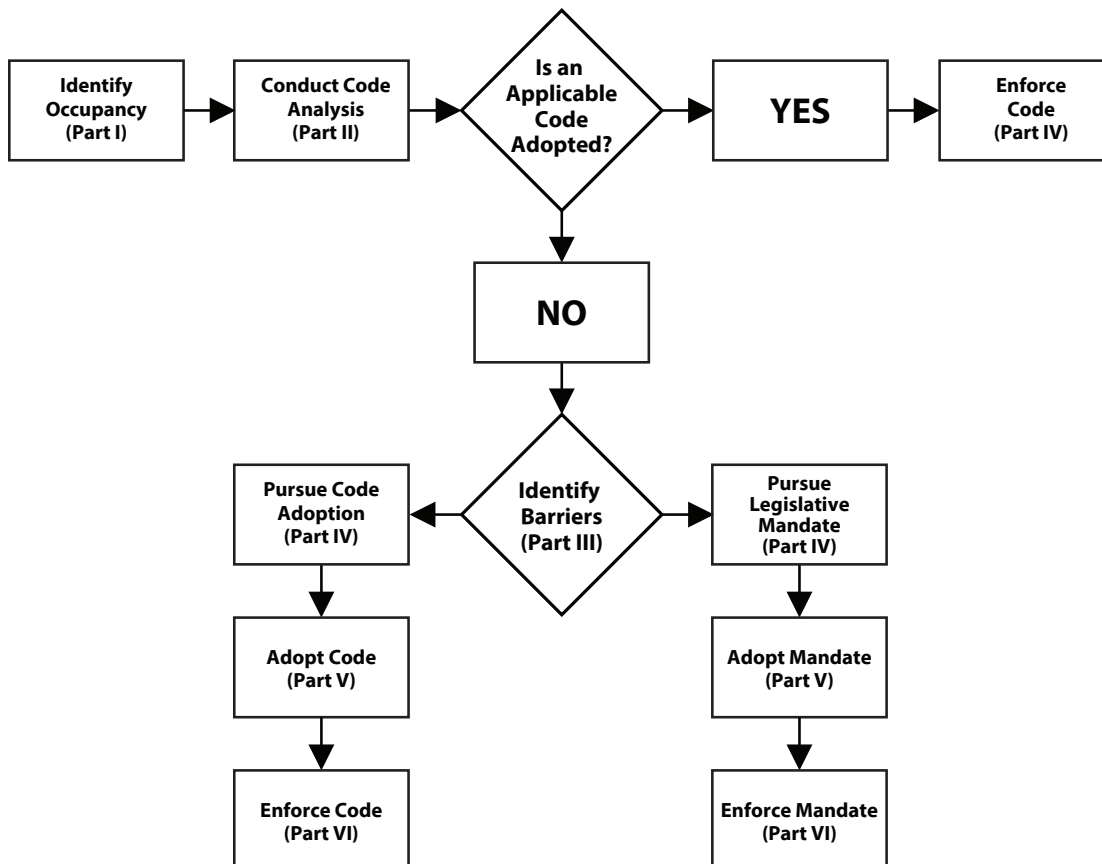
This document, hereafter referred to as the *Retrofit Guide*, is intended to assist fire chiefs and other community leaders with implementing a fire sprinkler retrofit program within their communities. The original National Fire Sprinkler Association (NFSA) Retrofit Guide began by directing the reader through a Fire Sprinkler Retrofit Decision Flowchart, to help establish whether current State, Local laws, and/or Ordinances had been adopted that included fire sprinkler retrofit provisions. The Decision Flow Chart was supported by a Code Matrix developed to identify the various codes building and/or fire, new and existing National Fire Protection Association (NFPA) or International Code Council (ICC) and the respective code sections that already addressed retrofit provisions of the various occupancy classifications. This flowchart is still useful today as a tool to help develop programs advocating retrofitting.

The premise behind this approach was that many communities already have sprinkler retrofit requirements enacted through code adoption, primarily the existing building provisions of the *NFPA 101 Life Safety Code*®. The *Life Safety Code* is developed by the Committee on Safety to Life, formed

in the aftermath of the 1911 Triangle Shirtwaist fire that killed 146 workers in a New York City garment factory. Published for many years as the *Building Exits Code*, the *Life Safety Code* is often adopted in addition to building and fire codes. The National Fire Protection Association, which promulgates the code, reports that it is currently used in every state, and adopted statewide in 43 states. Yet the provisions for existing buildings are often not enforced, among which are fire sprinkler retrofit provisions.

This *Retrofit Guide* still follows that process in Part 2, however Part 1 encourages a faster more comprehensive effort to recognize and publicize the need for fire sprinklers in buildings where they are absolutely needed and encouraging community leaders to enact specific rules to bring about an orderly program of compliance. This document assumes that even if the *NFPA 101 Life Safety Code*® has been legally adopted at some point in the past, it has not to date been rigorously enforced. Therefore, it encourages the adoption of the sprinkler retrofit provisions of that document as a new ordinance, with full public review, adoption, and enforcement within a reasonable time frame for compliance.

FIRE SPRINKLER RETROFIT DECISION FLOW CHART



THE LAST 50 YEARS – A GROWING APPRECIATION FOR FIRE SPRINKLERS

In March of 1968, the United States Congress passed Public Law 90-259 – The Fire Research and Safety Act of 1968 which, among other elements, authorized directly or through contracts and grants, *“research into the causes and nature of fires, and the development of improved methods and techniques for fire prevention, fire control, and reduction of death, personal injury, and property damage.”*¹

The law also created the National Commission on Fire Prevention and Control, which was directed *“to undertake a comprehensive study and investigation to determine practicable and effective measures for reducing the destructive effects of fire throughout the country.”*²

On May 4, 1973 the National Commission on Fire Prevention and Control issued its comprehensive report “AMERICA BURNING,” which outlined the nation’s fire problem, addressing fire and the building environment, the fire service and fire prevention efforts, and programs for the future. Among the Commission’s recommendations was that *“the proposed U.S. Fire Administration support the development of the necessary technology for improved automatic extinguishing systems that would find ready acceptance by Americans in all kinds of dwelling units.”*³

The recommendations led to federal funding of research and by the 1980s culminated in the development of residential and quick response sprinklers, which have now effectively replaced older technology fire sprinklers intended only for property protection. The improved technology has led to improved performance. As a result, fire sprinkler systems are now required throughout the country in almost all-new construction. A growing number of communities and at least two states, California and Maryland, additionally require sprinkler protection of all new single-family homes.

In the summer of 1999, the Director of the Federal Emergency Management Agency (FEMA) formally re-commissioned a Blue Ribbon Panel of experts to assess the progress related to the concerns raised in the “America Burning” report created more than twenty-six years earlier. This new panel of experts developed an updated report “AMERICA BURNING RECOMMISSIONED – AMERICA AT RISK” which formulated its conclusions as “Findings and Recommendations.” On May 3, 2000, the report was issued, with a subsequent publication date of October 2000.

While Finding No. 1 addressed implementation of loss prevention strategies, the second finding directly addressed the need for fire sprinkler systems.⁴

Finding No. 2 – The Application and Use of Sprinkler Technology

The most effective fire loss prevention and reduction measure with respect to both life and property is the installation and maintenance of fire sprinklers. If the focus is limited to prevention and reduction of the loss of life, smoke alarms are also extremely effective. However, the use of sprinklers and smoke alarms has not been sufficiently comprehensive.

RECOMMENDATIONS:

FEMA/USFA should develop a long-term implementation strategy for fire sprinklers and smoke alarms. The plan should include the following implementation aspects:

- The approach should be community based;
- No tactic or strategy should detract from the requirement for sprinklers. Smoke alarms (or other measures) should always be the locality’s second option as a loss reduction measure;
- Exploration of the technical, economical and practical aspects of utilizing smoke alarms and sprinkler systems that provide automatic notification to a firehouse. These systems should be professionally maintained and monitored;
- Confirmation of the accuracy of the belief that the appropriateness of the emplacement of sprinklers and smoke alarms may be based on rural and urban distinctions, and whether other distinctions such as residential construction, commercial construction and critical facilities may also be appropriate;
- The plan should distinguish between requirements for new construction and existing construction.

¹ Title-I of Public Law 90-259

² Title-II of Public Law 90-259

³ Op. Cit. p. 120

⁴ America Burning Recommissioned – America at Risk, Federal Emergency Management Agency, May 2000.

STATISTICS AND FACTS ON FIRES AND FIRE SPRINKLER PERFORMANCE IN THE UNITED STATES

Based on national fire incident reporting, the National Fire Protection Association (NFPA) has estimated that there were 1,345,500 fires in the United States during 2015, an increase of 3.7% from 2014.⁵ This meant that a fire department was responding to a fire somewhere in the United States on an average of every 23 seconds. These fires were reported to have resulted in total of 3,280 civilian fire deaths, 15,700 civilian injuries, and \$14.3 billion in property damage. Of these fires, more than half a million were structure fires.

It is widely acknowledged that fire sprinkler systems have helped reduce these losses over the past few decades, and could reduce them even further.

In addition to statistics regarding fires, the NFPA has compiled statistics on the performance of automatic fire sprinkler systems,⁶ and has concluded that they are “highly reliable and effective elements of total system designs for fire protection in buildings” that “save lives and property, producing large reductions in the number of deaths per thousand fires, in average direct property damage per fire, and especially in the likelihood of a fire with large loss of life or large property loss.”

While modern building codes require the installation of automatic sprinklers in almost all new construction of size, there have been many buildings constructed over the years without sprinkler protection. The NFPA sprinkler performance report stated that, based on fire department data for the years 2007 to 2011, sprinkler systems were present in only 10 percent of reported structure fires.

Because of their potential to reduce fire loss, many communities have enacted fire sprinkler retrofit requirements, especially for the occupancies that, based on past experience, present the greatest risks to civilians. In many cases, the communities have addressed multiple occupancies at the same time by adopting a code that contains occupancy-based requirements for sprinkler retrofit. As stated previously, this Retrofit Guide envisions a dual approach that essentially overlays the code-based consensus provisions for sprinkler retrofit through the adoption of a special ordinance. In this manner there can be a clear understanding of the need and plan for implementation that simultaneously applies to all dangerous existing occupancies in need of fire sprinkler retrofit.

THE SPECIAL ROLE OF FIRE SPRINKLERS

While fire protection provisions in building and fire codes deal with a great many items in addition to fire sprinkler systems, it should be recognized that these systems are unique. These systems have the ability to make up for a wide range of other fire protection deficiencies by addressing the fire while it is still contained, and controlling or extinguishing the fire before it can grow into a major threat to life and property.

Nowhere can this be better seen than in the *Fire Safety Concepts Tree*, originally developed as a logic tree in 1973 and today contained within *NFPA 550 – Guide to the Fire Safety Concepts Tree*. In combination, Figures 4.3 and 4.5.1 of the 2017 edition of this document shows how a fire sprinkler system that both detects fire and applies sufficient suppressant satisfies the “and” gate to suppress the fire. From that point upward there are only “or” gates to reach the Fire Safety Objective. In other words, a properly designed, installed and maintained fire sprinkler system provides fire safety, and can overcome a failure to prevent fires or other fire protection deficiencies.

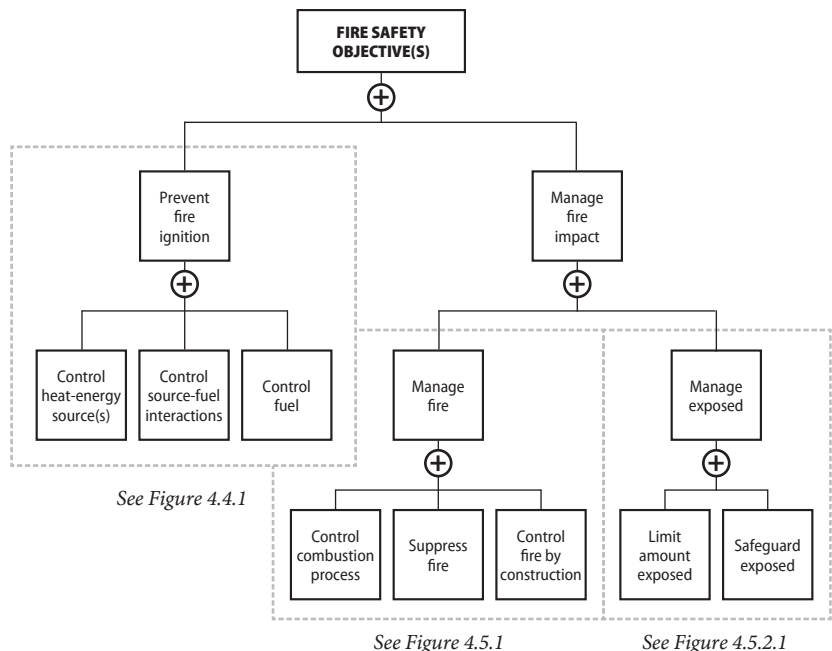


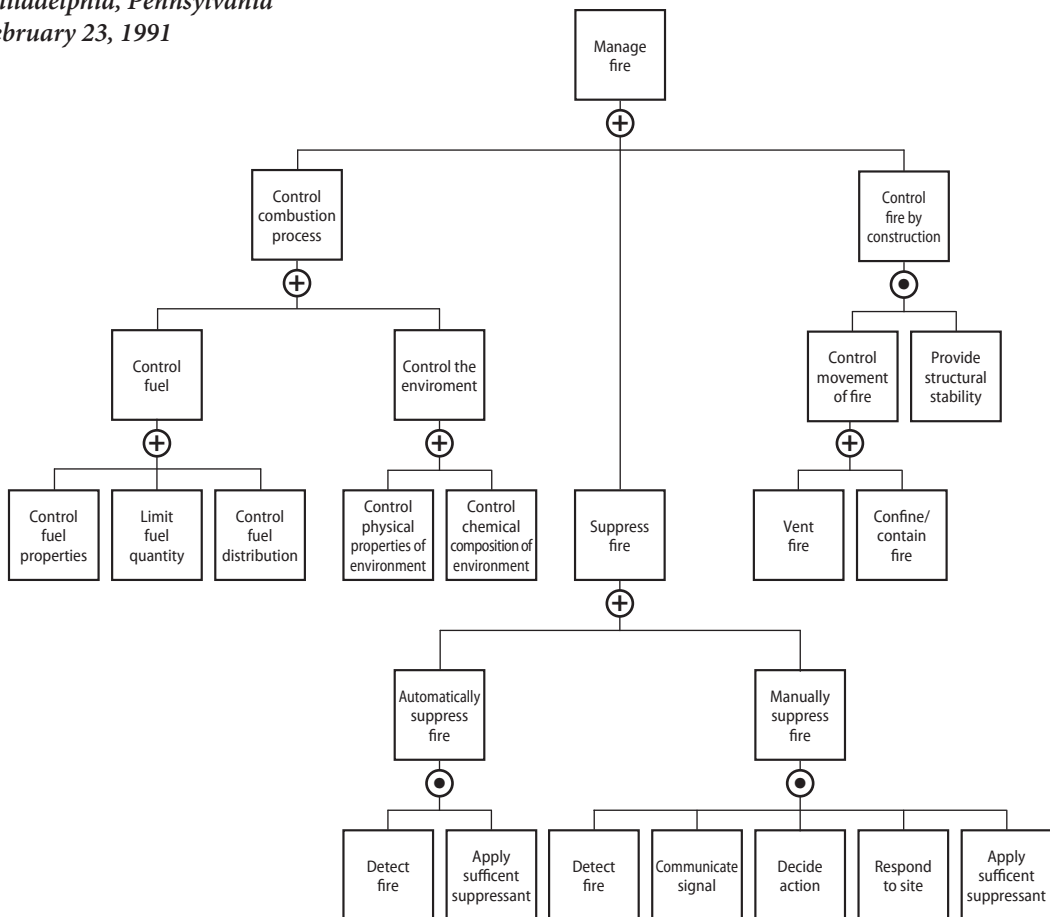
Figure 4.3 Top Gates of the Fire Safety Concepts Tree with Selected Lower-Tiered Gates (Figures © 2016 NFPA. Used with permission.)

⁵ Haynes, Hylton J.G., “Fire Loss in the United States During 2015,” National Fire Protection Association, September 2016.

⁶ Hall, John R. Jr., “U.S. Experience with Sprinklers,” National Fire Protection Association, June 2013.



*One Meridian Plaza
Philadelphia, Pennsylvania
February 23, 1991*



*Figure 4.5.1 “Manage Fire” Branch of Fire Safety Concepts Tree.
(Figures © 2016 NFPA. Used with permission.)*



*Grenfell Tower
London, England
June 14, 2017*



PART 1 – A CONSENSUS PLAN FOR SPRINKLER RETROFIT

The fire sprinkler requirements for existing buildings, like other requirements within the NFPA 101 Life Safety Code®, were developed under a consensus process recognized by the American National Standards Institute (ANSI). The basic provisions have been in place for decades, although they are continually examined and modified in the light of new fire data and experience. For example, the requirements for fire sprinklers in existing nightclub occupancies were strengthened in the aftermath of the 2003 Station Nightclub fire in West Warwick, Rhode Island, that killed 100 individuals and left many others with severe injuries. But because sprinkler retrofit provisions can be considered the “national standard,” their adoption can be considered an “express plan” for fire sprinkler retrofit. In other words, there is widespread agreement that certain occupancies identified by size and configuration are inherently unsafe without the benefit of automatic fire sprinkler systems. Virtually all of the multiple casualties due to fires that have taken place over the past century have been in buildings contained in the previously mentioned categories.

The *Life Safety Code* is certainly not the only code that requires sprinkler protection of existing occupancies. For example, the *International Fire Code*, promulgated by the International Code Council, now also contains fire sprinkler requirements for existing nightclubs. However, the *Life Safety Code* fire sprinkler requirements address a wide range of occupancies, and have been developed by multiple technical committees, each of which includes experts in the particular occupancy area. These experts, including user groups, fire officials, engineers, insurance authorities, and others, have carefully studied their occupancy characteristics over a long period of time, and have come to recognize when the benefits of fire sprinkler systems are absolutely needed.

Once these technical committees agree on minimum requirements for a reasonable level of protection for their occupancy groups, a process that includes multiple opportunities for public input and focus groups, as well as provisions that are codified into the language of the new edition of the *Life Safety Code*. The fact that the code is recognized as a national standard by the ANSI means that the process under which it was developed is considered to be a legitimate consensus process. ANSI will only recognize one document within a given subject area as the national standard meanwhile giving NFPA 101 a special status with regard to its provisions. For this reason, the *Life Safety Code* is recognized and utilized by numerous federal government agencies, including the Department of Veterans Affairs and the Centers for Medicare and Medicaid Services.

As stated in the Introduction, the *Life Safety Code* addresses a wide range of building exit and other fire protection issues, but the intent of this Retrofit Guide is to encourage only the adoption of fire sprinkler retrofit provisions as a special overlay, recognizing that fire sprinklers can make up for numerous other fire protection deficiencies and ensure mitigation of loss due to fire. To date, **there is no known incidence of a multiple loss of life of building occupants due to a fire originating in a building protected with a properly designed, installed and maintained automatic fire sprinkler system.** It is no surprise that existing occupancies that are in most need of fire sprinkler protection are those in which multiple life loss fires continue to take place in the absence of fire sprinklers.

The following are the summarized requirements for fire sprinklers in existing occupancies as contained in the 2015 edition of the *NFPA 101 Life Safety Code*,^{*} approved as the American National Standard on September 3, 2014.

RETROFIT IN THE IFC, IBC AND THE IEBC

The International Building Code (IBC), International Fire Code (IFC) and the International Existing Building Code (IEBC) can apply to existing buildings depending on triggers. These triggers are generally tripped when work is being done on the building. The 2015 IFC does, in Chapter 11, have several areas where active fire protection is required to be retrofitted in existing buildings:

Fire Sprinklers

- I-2 occupancies, such as hospitals and nursing homes, shall be retrofitted with sprinklers in all existing I-2 fire areas, throughout the floors containing the I-2 fire area and on all intervening floors to the level of exit discharge.
- I-2 Condition 2 occupancies (facilities that provide nursing, medical care and provide surgery, emergency care, obstetrics or in-patient stabilization) shall be retrofitted throughout the building with sprinklers by a separate ordinance.
- Cellulose nitrate film and pyroxylin plastics manufacturing, storage or handling requires sprinklers throughout.
- The 2018 IFC will require A-2 occupancies with fire areas having more than 300 occupants consuming alcohol to retrofit with sprinklers. 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.

Standpipes

- Buildings with occupied floors more than 50 feet above (or below) the nearest level of fire department access are required to retrofit with standpipes.
- Buildings with existing helistops or heliports that are over 30 feet above the lowest level of fire department access shall be retrofitted with standpipes.

The IBC is primarily for new construction and requires fire sprinklers in several occupancies and generally where the highest floor of the building exceeds 55 feet from the lowest level of fire department access. The IEBC code is to provide alternative approaches to remodeling, repair, additions, alterations, renovations, or change of occupancy of existing buildings. This code allows for maintaining basic levels for fire prevention, structural and life safety features while controlling design decisions and costs.

The IEBC provides three main options for the user in dealing with rehabilitation of existing buildings. The options are better described as paths of compliance for the architect. Once a path is chosen, the IEBC narrows down the rules for compliance. Regardless of the path chosen, fire protection upgrades or retrofit is generally limited to the area or floor where the work is being performed.

ASSEMBLY OCCUPANCIES

- Where the occupant load exceeds 100 in the following assembly occupancies: dance halls, discotheques, nightclubs, and assembly occupancies with festival seating.
- Coming up in the 2018 IFC: The 2018 IFC will require A-2 occupancies with fire areas having more than 300 occupants consuming alcohol to retrofit with sprinklers. 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.
- Where the exhibition or display area exceeds 15,000 sq. ft. in any assembly occupancy used or capable of being used for exhibition or display purposes, except that sprinklers are not required over seating or floor areas within stadia or arenas.
- Stages, including storerooms, workshops, permanent dressing rooms and all accessory spaces contiguous to the stages, except for stages 1,000 sq. ft. in area or less where curtains scenery and other combustible hangings are not retractable vertically, and where combustible hangings are limited to borders, legs, a single main curtain, and a single backdrop, and except for under-stage areas less than 4 ft. in height used exclusively for chair or table storage and lined on the inside with gypsum wallboard or the approved equivalent.

EDUCATIONAL OCCUPANCIES

- In buildings with unprotected openings between floors.
- In every portion of a floor in which student occupancy exists below the level of exit discharge, except where windows for rescue and ventilation are provided and approved by the authority having jurisdiction.
- In every portion of a floor below the level of exit discharge in which student occupancy does not exist, except where such floors are separated from the rest of the building by a minimum of one-hour fire resistant construction.

HEALTH CARE OCCUPANCIES

- All nursing homes, except where alternative protection measures have been approved.
- All high-rise buildings containing health care occupancies. With the exception of patient rooms and clothes closets where the area does not exceed 6 sq. ft. and provided that the coverage areas of room sprinklers extend to the back walls of the closets.

DETENTION AND CORRECTIONAL OCCUPANCIES

- All detention and correctional facilities, except where alternative protection measures have been approved.

HOTELS AND DORMITORIES

- All high-rise buildings, except where each guest room or suite has exterior exit access, with the exception of guest rooms or suites, where provisions for closely spaced sprinklers and draft stops around floor openings are not required, nor are sprinklers required in closets not exceeding 24 sq. ft. or bathrooms not exceeding 55 sq. ft.

APARTMENT BUILDINGS

- All apartment buildings, except where every dwelling unit has exterior exit access. The exception to this is where an engineered life safety system developed by a registered professional engineer experienced in fire and life safety system design has been approved to provide an equivalent level of safety.

RESIDENTIAL BOARD AND CARE FACILITIES

- All facilities having impractical evacuation capability
- All high-rise buildings

MERCANTILE OCCUPANCIES

- All occupancies with a story over 15,000 sq. ft. in area, except street-floor single-story buildings
- All occupancies exceeding 30,000 sq. ft. in gross area
- All stories below the level of exit discharge where such stories have an area exceeding 2,500 sq. ft. used for sale, storage or handling of combustible merchandise
- Throughout mixed occupancies where any of the above conditions apply to the mercantile portion

DAY CARE OCCUPANCIES

- In buildings with unprotected openings between floors.

HIGH-RISE BUILDINGS, INCLUDING OFFICES, ESPECIALLY RESIDENTIAL

- All except as detailed above for selected occupancies.

NOTE: The City of Chicago has a special exception that allows the construction of a building up to 80' without fixed fire protection.

A simple model ordinance has been included as Appendix A of this *Retrofit Guide* to help implement this broad overlay program for sprinkler retrofit. Like other aspects of the model ordinance, implementation measures are subject to modification, but the measures proposed are based on what has been effectively enforced in various communities around the country. Using a staggered approach would lessen the load on the enforcing authority.

Rarely would a simple ordinance be suitable for adoption by a jurisdiction and Appendix B shows some sample ordinances that have been adopted throughout the United States.

While Part 2 of this *Retrofit Guide* handles the development of a more customized plan for fire sprinkler retrofit, parts can be adapted to amend the model ordinance.

Regardless of which form of the final proposed ordinance or legislation, Part 3 of this *Retrofit Guide* addresses concerns regarding implementation and enforcement.



*Triangle Shirtwaist Factory
New York, New York
March 25, 1911*

PART 2 – TARGETED PLANS FOR SPRINKLER RETROFIT

In addition to occupancies for which the national consensus is clear on the need for fire sprinkler retrofit, there are additional occupancies for which sprinkler retrofit can and perhaps should be considered. In some cases, these are subsets of the major occupancy groups addressed in Part 1 which have unique characteristics that cause them to be an occupancy type of concern within a community. Typical examples include:

- Student Housing
- Housing for the Elderly
- Historically Significant Buildings
- Downtown (core) Business Districts

In such cases, a process can be followed to identify and focus on the specific occupancies that should be included in a fire sprinkler retrofit program.

WHY A TARGETED APPROACH?

There are many reasons a jurisdiction may choose a targeted approach. The most common is in the aftermath of a tragic fire, when there is public consensus that a tragedy “like this one” can never be allowed to happen again. In such cases, it is easier to visualize the need for fire sprinkler retrofit in the single occupancy type that is still on the front pages of the newspapers than in the broad range of dangerous occupancies discussed earlier. However, there are other reasons as well, which become clearer as the process proceeds.

Don’t wait for “the fire” to take action. Even with a targeted approach, it still takes a major commitment to make progress to prevent the tragedy. As true leaders we shouldn’t let tragedy drive our fire and life safety agenda. Historical fires, from the Triangle Shirt, One Interstate Bank, One Meridian Plaza, 750 Adams, to the Greenfell Tower fire in London, from the Rythem Night Club, Coconut Grove, Beverly Hills Supper Club, to the Station Night Club.

Be prepared and make sure public officials and owners are aware of the need.

ESTABLISHING THE SCOPE OF A PROPOSAL

Establishing the scope of the proposed retrofit fire sprinkler requirements is one of the first decisions to be made. If the proposal is to be considered statewide, then state legislation must be used; however, if the retrofit fire sprinkler requirements are to be adopted and enforced at the local level (county, city, or any portion thereof), then the ordinance/requirement and impact will be limited to the local jurisdiction.

CONSIDERING SPRINKLER RETROFIT AS THE CORNERSTONE OF A MASTER PLAN

In recent years there has been a growing movement towards the concept of public/private partnerships in providing a higher level of services to a community. The use of automatic fire sprinklers has been recognized for years as a way to enhance the ability of fire service agencies in the reduction of fire loss, fire related injuries and property losses. Many communities and fire service agencies work under a General Plan, or Master Plan that outlines the needed aspects of fire protection. For example, communities in California deal with significant climatic, geographic, and topographic considerations. With this, built-in fire protection has been identified as an effective way to address resulting concerns. Consider these additional elements as you proceed with the development and presentation of a retrofit fire sprinkler ordinance package:

1. The automatic fire sprinkler ordinance may allow the Fire Department to perform its other functions better (Medical Aid, Transport, Training, Rescue, Hazardous Materials, Fire Prevention Inspections, Equipment Maintenance, etc.)
 - Response time enhancement
 - Better and safer utilization of staffing and equipment
 - Reduction of out-of-service time while on scene at a fire call
 - Reduction of workmen's compensation expenses
 - Potential station relocation based on medical emergency needs
2. Automatic fire sprinkler ordinances are long range planning elements and will be beneficial for years and decades to come.
 - If the fire problem for the community/jurisdiction has been researched and found to be in specific occupancies, then you will utilize resources today to solve future fire problems.
3. Automatic fire sprinkler ordinances can be used to enhance water conservation programs and policies.
 - Built-in protection allows use of smaller water mains, based on historic fire-flow demand tables.
 - Water storage capacities can often be reduced, based on critical demand calculations
 - A reduction in expected water usage is based on fire-flow comparisons

As the retrofit concept begins to evolve, it is important to begin to define exactly what the focus will be, or identify targeted types of buildings for the ordinance or requirement. The decision must be made as to whether the scope will include a specific downtown area (such as a historical business district) or be inclusive of the entire city. Furthermore, such decisions should include the desire to include all existing high-rise buildings, which are already sprinklered, or limiting the application to specific occupancies.

Therefore, one must begin the process of defining certain elements. Elements can be known and/or unknown, but nonetheless necessary in the initial stages of the evolution of developing a retrofit ordinance/requirement. The following questions should be addressed as candidly as possible:

Who desires the Ordinance?

- ☐ Fire Marshal
- ☐ Community Leaders
- ☐ Fire Chief
- ☐ Developers
- ☐ City or County Manager
- ☐ General Public

Why is the Ordinance being considered at this time?

- ☐ Cost Savings
- ☐ Staffing Limitations
- ☐ Public Safety Issue
- ☐ Curb an Identified Fire Problem
- ☐ Normal Adoption
- ☐ Intense Growth Pattern
- ☐ Follow-up to a Recent Significant Fire/Event
- ☐ To Keep Up With Social/Technological Changes
- ☐ To Resolve Future Problems today

When would the Ordinance take effect?

- ☐ Immediately
- ☐ Phased in Over Period of Time
- ☐ Implemented following a Physical Change (area, height, growth, annexation)

What Occupancies would be impacted by the Ordinance?

- ☐ All existing occupancies
- ☐ Apartment Buildings
- ☐ Assembly occupancies
- ☐ Lodging and Rooming Houses
- ☐ Educational occupancies
- ☐ Mercantile
- ☐ Day Care
- ☐ Business
- ☐ Health Care
- ☐ Industrial
- ☐ Residential Board and Care
- ☐ Storage
- ☐ Ambulatory Health Care Centers
- ☐ Special Structures
- ☐ Detention and Correction
- ☐ High-rise Buildings
- ☐ Hotels and Dormitories
- ☐ Underground/Windowless
- ☐ Historical Buildings
- ☐ An Area/District (specific)

Will the retrofit fire sprinkler ordinance also impact existing housing stock?

- ☐ Multi-Family Residential (Motels/Hotels, Apartments, Condominiums, Townhouses, etc.)
- ☐ Residential High-Rise Buildings
- ☐ Mixed Occupancy (Commercial & Residential) Buildings
- ☐ Residential Dwellings
- ☐ Single-Family buildings?
- ☐ Attached two-family dwellings?
- ☐ Manufactured housing?

Would retrofit/retroactive provisions be identified that trigger the requirements of this Ordinance?

- ☐ Based on area of existing buildings
- ☐ Based on area added to existing buildings
- ☐ Based on height of buildings
- ☐ Based on height added to existing buildings
- ☐ Based on occupancy change or use change
- ☐ Based on fire-flow demands
- ☐ Based on a geographic location of the building with respect to community
- ☐ Based on type of construction (example: Type V-non-rated)
- ☐ Other criteria (specify)

Will any other elements (resolutions, guidelines, fee schedules, etc.) need to be adopted as a part of this Ordinance?

- ☐ YES
- ☐ NO

FIRE SPRINKLER RETROFIT DECISION FLOW CHART

The Fire Sprinkler Retrofit Decision Flow Chart referenced in the introduction reminds us that sometimes codes are already adopted but simply not enforced. Therefore, any attempt to target an occupancy for sprinkler retrofit should begin with a review of existing regulations affecting that occupancy.

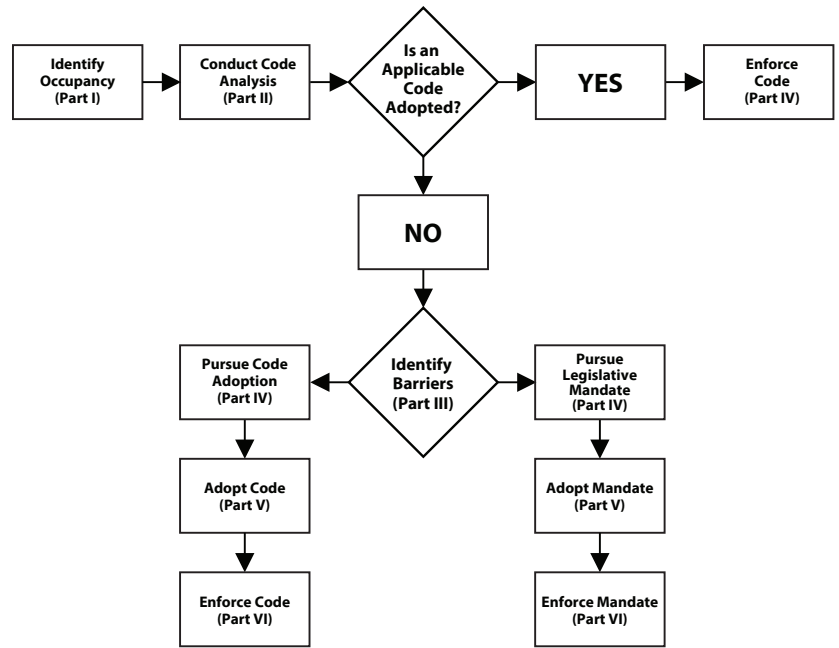
IDENTIFY OCCUPANCIES

It is essential that the target area(s), occupancy classification(s), and other criteria for the buildings that are required to be retrofitted with automatic fire sprinkler systems are clearly identified. This will establish the impact on the fire department or other lead agency with regard to workload. It will also reflect the magnitude of the financial impact to building owners, tenants, and the community.

CONDUCT CODE ANALYSIS

The code analysis is a critical step to ensure that the lead agency has performed a review of the currently adopted codes (building and fire codes) and has a clear understanding of what is currently required and permitted to be enforced by the agency, based on what the state/local has adopted, as well as preemptions and restrictions.

The lead agency must have a clear understanding of the state/local building and fire code regulations in regard to the issue of minimum and maximum restrictions. This refers to the issue of a state adopting a building or fire code with the premise that either one or both codes have been adopted as a “minimum code,” which is to say that the state has established a minimum code threshold. Likewise, a state may have statutory authority to adopt the building or fire code for that state as the “maximum code,” which is to say that the state has established a maximum code threshold. Additionally, some states do in fact establish both minimum and maximum thresholds, which would bind the local authorities having jurisdiction to simply enforce the state-adopted building and fire codes, allowing no amendments.



IDENTIFY BARRIERS

During this Decision Tree review process we will be identifying barriers that must be overcome if the retrofit ordinance proposal is to move forward. Unquestionably, the ability to adopt or amend a more restrictive fire sprinkler ordinance within your community is the single most important barrier to resolve. Jurisdictions in those states with “mini/max” state building and fire codes will need to confer with their legal counsel and state officials to determine if there is an opportunity statewide to modify the codes.

Other barriers, such as staffing levels needed to implement and enforce new retrofit regulations, must be accounted for and justification must be clearly noted in the presentation documents. One question, which must be addressed, is what happens to additional staff members once the retrofit program is completed? Will the need exist to maintain additional staff members? Will they require reassignment? Will they be used to fill in for those staff members who retire or move on in their careers? Finally, will permit and inspection fees charged as a result of a new ordinance offset additional salaries and benefits?

The primary question from the building owners’ vantage point will be: “What impact will the implementation of an ordinance have on my business?” Economic impacts must be addressed, which include but are not limited to permits, design, installation, repairs and remodeling associated with

retrofitting of the buildings. Business interruption, productivity, and visual aesthetic issues will all become potential barriers to recognize and attempt to resolve. Issues may not surface until there are public hearings, but preparation must be made in advance to address them.

Next come financial barriers that, in addition to system installation cost, include considerations such as insurance and asbestos abatement costs. It is difficult if not impossible to get concrete numbers on insurance savings for an existing building that is retrofitted with an automatic fire sprinkler system. It is important to get the appropriate stakeholders in contact with the actual insurance providers to determine the cost versus benefits..

The asbestos abatement effect should be addressed in two parts. The first factor involves recognizing that if asbestos is present in a building and a fire should occur, hazardous materials cleanup costs could be greater than the actual fire damage. One example of this was the Dupont Plaza hotel fire, in San Juan, Puerto Rico on December 31, 1986, where 96 fire deaths occurred in a 20-story building. Due to the presence of asbestos in the structure, fire investigators and construction workers were prohibited from entering the burned-out building for approximately 6 months after the fire. Similar stories have been documented elsewhere.

When the asbestos issue first surfaced in the early 1970's, the approach was to remove any and all asbestos found existing within a building. By the 1980's, however, it was noted that "spot abatement" was adequate in those circumstances where the existing conditions did not pose a health hazard. Today, fire sprinkler systems can be installed utilizing spot abatement at the specific locations where a pipe hanger or brace is to be installed, resulting in a considerable reduction in overall installation costs.

PURSUE CODE ADOPTION

A review of currently adopted building and fire codes can often verify if specifications are already present in the current state or locally adopted code that allow for the retrofit provisions you are anticipating to amend. For this reason, it is essential that a thorough review be undertaken to ensure that a code provision does not already exist.

If during the code analysis process, it is noted that the jurisdiction has not adopted the current building or fire code that would provide the greatest benefit, a few ideas should be determined. Is this information necessary in moving forward with the adoption of retrofit fire sprinkler provisions for the targeted buildings? Since the answer is most likely yes it may be necessary to step back, review and develop a document, which would justify the adoption of the latest and most effective code. In many areas of the country, building and fire codes are adopted on a three-year rotation, as this is typically the "code cycle" for new modified language within the model codes.

The method of adopting and modifying building and fire codes varies greatly from one state to another and from one jurisdiction to another. There are also legal and philosophical differences in what a jurisdiction can or cannot adopt or amend.

An example of this was a prototypical case in California years ago in which a fire protection district amended the building code to require fire sprinklers in a certain occupancy of a certain size or height. The building contractor challenged the district before, during and after his building was being constructed and, upon completion, filed a lawsuit challenging the validity of the fire sprinkler requirements.

The finding of the court was that the fire protection district did not have the legal authority to amend the building code. The rationale was that this was an area of responsibility reserved for the county building department, and that while the fire protection district could adopt or amend the fire code, it had no jurisdiction in the adoption or amendment of the building code. [Danville Fire Protection District v. Duffel Financial & Construction Company (1976) 58 Cal.App.3d 241]

Ultimately, when undertaking a code adoption that includes optional appendices, or an ordinance, it is important that one looks at the process as a team effort of the building department, fire department, city or county attorney, water department, and others, working together within their areas of responsibility. Cooperation is needed to guarantee that in the quest to create a safer environment where people live, work, and play, that the process is consistent with all the rules and regulations governing code adoptions and amendments.

PURSUE LEGISLATIVE MANDATE

If your jurisdiction has adopted building and fire codes that do not address retrofit of fire sprinklers for targeted buildings, then a document, typically an ordinance, must be developed that will address the scope and nature of the provisions being required for those existing buildings. Some codes, such as the IFC, have adoptable appendices. An appendix is code text that generally works well with the remaining text, but needs to be specifically included when adopting the IFC. Again, the specific format, language and related issues vary greatly from one state to another and from one jurisdiction to another. There are also legal and philosophical differences in terms of what a jurisdiction can or cannot adopt or amend, such as some states are considered “mini-max” and local ordinances that are more restrictive may not be allowed. Knowing the parameters of adopting local ordinances is key to this part. Where mini-max state codes exist, while it may be an option to legislatively pursue a change, know it will be costly.

It is important to know and understand the ordinance philosophy of your jurisdiction, and to be as specific as possible in describing the nature of retrofit fire sprinkler requirements. This ranges from the geographical area (*Downtown Historical Business District – Boundaries from First Street north, Fourth Street south, Main Street east to Center Street west*) that it will impact, to targeted buildings or occupancies and the standard to be utilized for sprinkler system design and installation criteria (*such as NFPA 13, Standard for the Installation of Sprinkler Systems, 2016 edition*).

Creating the “code language” is important to ensure that new retrofit requirements do not conflict with other code sections, and to provide for a clear understanding of just what is to be expected. One of the first decisions is to decide into which code the retrofit provisions will be placed. As discussed earlier, if the jurisdiction is the fire department, the code amendments will typically be included as part of the fire code. If the fire department is a part of a city or town government, they may also be adopted into the building code through the building department of that particular city.

It is important to keep in mind, as one writes the “code language,” what you are attempting to convey is the issue of “retrofitting” buildings that are currently constructed and in use. It is important to have a clear understanding of what the word “retrofit” denotes:

According to Merriam-Webster’s online Dictionary:

Word: **Retrofit**

(Function: transitive verb)

- 1) “To furnish with new or modified parts or equipment not available or considered necessary at the time of manufacture” (construction).
- 2) “To install (new or modified parts or equipment) in something previously manufactured or constructed.”

Therefore, as one searches for code sections to be modified, it is important to have in mind that there is an existing building or structure, which at the time of construction, was not required to have automatic fire sprinklers installed even though the technology of fire sprinklers has been available for buildings constructed within the past 130 years. One may ask the question, “why now?” The answer is a combination of steadily improved technology and lessons learned over time.

ADOPT CODE/MANDATE

The typical adoption process takes a considerable amount of time. There are a variety of steps that need to occur, such as completing the research, identifying those buildings which will be impacted by the retrofit requirements, completing the presentation package, preparing the ordinance and supportive documentation, establishing staffing levels and paperwork process, and holding public hearings before the Board of Supervisors, City Council, District Board and other necessary agencies. A fire sprinkler ordinance will typically not be considered an “emergency ordinance” and thus there will usually be more than one public hearing. There is a systematic process, which typically begins with the public notice phase followed by the first reading, the second reading, and the 30- to 60-day appeals period before it would take effect.

As you will see through this guide, there are many tasks that must be undertaken to ensure the success of the adoption of a retrofit fire sprinkler ordinance. It cannot be stressed enough that by taking shortcuts the likelihood of failure is great.

ENFORCE CODE/MANDATE

If a provision has been found within the adopted building or fire code that addresses the retrofitting of the targeted buildings, and the jurisdiction has not enforce those provisions to date, it is imperative that some type of public notice be developed. This public notice should be with concurrence of the jurisdiction's legal department and political entity (City Council, Board of Supervisors, Board, etc.) to ensure those departments are aware of the provisions and there is a new intent to enforce those provisions.

The implementation phase may seem like the task at hand has been completed, but keep in mind the work has just begun. Issues will surface on a daily basis, and the care taken in the system you create will be reflected in the number of issues that surface as the real ramifications of the retrofit ordinance become apparent.

Be prepared to address initial issues that surface in the first few weeks or months of the program in a very formal manner and address them with a framework initiative as though every future applicant may have the same problem. Your staff must be prepared for applicants that appear frustrated from the beginning of the process, and have a working atmosphere that is conducive to resolving situations and conflicts that arise.

The bottom line to the retrofit fire sprinkler process is that you are creating a proactive fire protection defense system within each targeted building, as opposed to having an existing building that is protected by a reactive fire protection system. The installation of a fire sprinkler system will be disruptive to the building owner and his/her tenants for a few weeks to a few months, but the result will be a safer environment for the occupants as well as to the firefighters who may be called to the scene of a fire in those buildings.

Lastly, as the retrofit fire sprinkler ordinance proceeds through the implementation sequence of events, it is extremely important to provide status reports to the Board of Supervisors, City Council, and/or Board Members giving them the statistical recap on the progress and problems of their adoption of the retrofit ordinance package. They need to hear from you as well as their fire protection expert, on the progress of the plan to mitigate the identified fire hazards.

DEFINING THE IMPACT – THE INVENTORY

One of the main keys to success in the process of adopting a retrofit fire sprinkler requirement is to have solid data early in the process, and to ensure that you have more data than your opposition may possess. To accomplish that, you will need to do extensive research, and do it extensively.

If you are proposing a specific area of the city to be impacted by retrofit requirements, you need to know just how many buildings are going to be affected, how many businesses will be affected, and how many business/building owners will be required to spend money to meet the new retrofit requirements.

Data needs to be collected on each and every building in the defined area of the retrofit proposal, reflecting:

- Each building by street address
- Height of each building (basement, 1st floor, 2nd floor, 3rd floor, 4th floor, mezzanines)
- Square footage of each building (broken down by floor)
- Use and occupancy classification (single or mixed uses by percentage of floor area)
- Fire-flow demand for each building

You may even want to have several different listings reflecting the demographic makeup of the area to be impacted. You may want to show current fire flow demands, based on the Insurance Services Office (ISO) Fire Flow Formula, which considers type of construction and size. This type of information will be helpful when you are trying to show the credits given to buildings that are protected by automatic fire sprinklers, and the fact that the insurance industry as well as building and fire codes recognize the advantages of fire sprinklers and do give credits (in fire flow demands) for their installation.

In developing a retrofit fire sprinkler mandate, as a general rule, the buildings' height (both in feet and stories), aggregate floor area, number of occupants, type of construction, and occupancy classification are commonly identified in a listing of affected buildings. An example of criteria to be considered for researching and listing by occupancy classification may include:

All Existing Occupancies

- Listing of buildings
- By street address
- By height of buildings
- Listing by type of construction
- By year built (or age)

Assembly Occupancies

- Listing of public assembly buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Listing by sub-category (nightclubs, etc.)
- Listing of maximum occupant loads
(What is the legally posted occupant load?)



Educational Occupancies

- Listing of campuses and buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Listing of numbers of students
- Listing of maximum occupant loads
- Listing by age group of the students

Day Care

- Listing of buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Listing of numbers of children (and adults)
- Listing of maximum occupant loads
- Listing by age group of children
- Other special information
(such as hours of operation)



Health Care

- Listing of facilities
 - By street address
 - By height of buildings
- Listing by year built (or age)
- Listing by type of construction
- Listing by number of patients
- Listing by age group and abilities of patients
 - Number of ambulatory/non-ambulatory/bedridden Patients
 - Number of staff personnel
 - Special information
(such as 24-hour operation)

Residential Board and Care

- Listing of facilities
 - By street address
 - By height of buildings
- Listing by year built (age)
- Listing by type of construction
- Listing of age group and abilities of patients
 - Number of patients
 - Typical ages of patients
 - Number of ambulatory/non-ambulatory/bedridden patients
 - Number of staff personnel
 - Special information
(such as 24-hour operation)

Ambulatory Health Care Centers

- Listing of facilities
 - By street address
 - By height of buildings
- Listing by year built (or age)
- Listing by type of construction
- Listing of age group and abilities of patients
 - Number of patients
 - Typical ages of patients
 - Number of staff personnel
 - Special information
(such as 24-hour operation)

(Note: It is essential that the jurisdiction proposing the retrofit fire sprinkler mandate/ordinance have in mind the state's definitions of what is Ambulatory, Non-Ambulatory, and/or Bedridden. These criteria change from state to state.)



Detention and Correctional

- Listing of facilities
- Listing by year built (or age)
- Listing by type of construction
- Level of confinement
 - Number of inmates
 - Typical ages of Inmates
 - Number of staff personnel



Hotels and Dormitories (including Fraternity and Sorority Houses)

- Listing of buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Listing of numbers of hotel/dorm rooms
- Listing of maximum occupant loads (by building)

Apartment Buildings

- Listing of buildings
 - By street address
 - By height of buildings (number of stories)
- Listing by type of construction
 - By Year built (or age)
- Listing of Numbers of Apartments
- Listing of "Maximum" Occupant Loads
(by building; 200 rooms x 2-persons = 400 guests)

Lodging and Rooming Houses

- Listing of Buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Listing of numbers of rooms
- Listing of maximum occupant loads
(by building)



Mercantile

- Listing of buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)



Business

- Listing of buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)

Industrial

- Listing of buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Listing by special hazards and/or processes

Storage

- Listing of buildings
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Listing by special hazards of storage

Special Structures

- Listing of special structures
 - By street address
 - By height of buildings
- Listing by type of construction
 - By year built (or age)
- Identify the special hazards related to these structures



High-Rise Buildings

- Listing of **ALL** high-rise buildings
- Listing of those currently fully sprinklered
- Listing of those currently partially sprinklered
- Listing of those **not** sprinklered
- Listing of non-sprinklered high-rise
- Listing by street address (and name of building)
- Listing by height (stories and feet)
- Listing by year built (or age)
- Listing by type of construction
- Listing of occupant loads
- Listing by occupancy classification and use (Public assembly percentage, apartments, hotel, office, etc.)

Underground and Windowless

- Listing of buildings
 - By street address
 - By height of buildings
 - By year built (or age)

Historical Buildings

- Listing of historical properties
- Identify historical significance
 - National Historical Registry
 - State Historical Registry
 - County/City Historical Registry
 - Community Heritage
- Define the number of individual buildings
 - Identify names of buildings
 - Listing by street address
 - Listing by year built

An Area or District (specific)

- Define the boundaries of the area or district
- Define the number of buildings affected
 - Listing by street address
 - Listing by property owners
- Determine (estimate) size of area or district

PART 3 – IDENTIFYING BARRIERS TO RETROFIT

APPLICABLE CODE IS ADOPTED

A review of currently adopted building and/or fire codes can often verify if there are provisions already set forth in the current state or locally adopted code that allow for the retrofit provisions you are anticipating to amend. For this reason, it is essential that a thorough review be undertaken to make certain that a code provision does not already exist. Crucial to this review are the specific requirements and allowances for the targeted buildings that are under consideration for retrofitting.

APPLICABLE CODE IS NOT ADOPTED (PURSUE ADOPTION)

ADOPT CODE

If during the code review process it is found that the jurisdiction has not adopted the current building and/or fire code that would provide the greatest benefit in moving forward with the adoption of a retrofit fire sprinkler ordinance for the targeted buildings, then it may be necessary to step back, review and develop a document that would justify the adoption of the latest and most effective building or fire code. In many if not most areas of the country, building and fire codes are adopted on a triennial basis (every 3-years), as this is typically the “code cycle” for new modified language and/or sections within the model codes on which most legally adopted codes are based.

As discussed earlier, the method of adopting and modifying these building and fire codes varies greatly from one state to another and from one jurisdiction to another, and there can be legal and philosophical differences in what a jurisdiction can or cannot adopt and/or amend.

LEGISLATIVE MANDATE (PURSUE ADOPTION OF PRESCRIPTIVE LEGISLATION)

If your jurisdiction has adopted a building and fire code that does not address the retrofit of fire sprinklers within the given area and/or targeted building(s), then a document, typically an Ordinance must be developed which will address the scope and nature of the provisions being required of these existing buildings. Again, the specific format, language and related issues vary greatly from one state to another and from one jurisdiction to another.

It is important to know and understand the ordinance philosophy of your jurisdiction, and to be as specific as practical in describing the nature of the retrofit fire sprinkler requirements; from the geographical area (*Downtown Historical Business District – Boundaries from First Street – North, Fourth Street South, Main Street – East to Center Street – West*) that it will impact, to the targeted buildings and/or occupancy(s) and the standard(s) to be utilized for design and installation criteria (most likely *NFPA 13 - Standard for the Installation of Sprinkler Systems*, 2016 edition).

As with any legal document, it is essential that a retrofit ordinance be clear as to time limits for certain elements to be completed, such as written notification of the building owners by the jurisdiction, timeframe for plans and specifications to be filed, time limits for compliance, etc. and the prioritizing of buildings when appropriate.

Note: In certain cases, such as a high-rise retrofit fire sprinkler ordinance, it may be necessary to stagger the compliance dates based on height of buildings (up to and including 9 stories: 4 years; up to and including 14 stories: 6 years; over 14 stories: 8 years). This reflects consideration for not only the size and number of the high-rise buildings, but also gives consideration to the jurisdiction's ability to keep up with the anticipated increase workloads generated by the adoption of the retrofit ordinance. This type of staggered approach proved to be effective in the City of Louisville, Kentucky when they proposed their High-Rise Building Sprinkler Retrofit Ordinance in September of 1992.

Special Note: The key word here is:
“REASONABLE”

(Note: Webster's Dictionary defines reasonable as “not excessive,” “just,” “fair,” and “wise.” These terms should be clearly recognized and taken into consideration.)

POLITICAL AGENDAS VERSUS PUBLIC SAFETY

During the adoption process you will most likely be confronted with direct and/or indirect opposition raised in regards to the proposal, intended to address a “public safety” problem. The Fire Chief and his/her staff are generally considered the leading fire professionals with expertise on how to best manage fire emergencies that may be present in the community they serve. It is essential that you address problems raised as a professional and keep clear of political games that may surface during various forums. Stay focused on the goal to adopt a retrofit fire sprinkler ordinance, and use facts, not fiction, to respond to the issues being raised.

Installing an automatic fire sprinkler system in the various existing buildings targeted by the ordinance package throughout your jurisdiction/community will allow occupants more time to escape and fire fighters to rescue those who can't rescue themselves.

- Accountability (Personnel, Fire Department, Government, and Community)
- Transfer of Responsibility from the Public Sector (Fire Department) to the Private Sector (Building Owner)

SPRINKLER ALTERNATIVES (EQUIVALENT LEVEL OF SAFETY)

In some cases an alternative to a sprinkler system may be suggested. Such an alternative should only be acceptable if it can provide a level of safety equivalent to an automatic fire sprinkler system. When the National Institute for Standards and Technology (NIST) was asked to establish the capabilities of a fire sprinkler system that an equivalent system would need to deliver, NIST provided the following three benchmarks:

1. Prevent flashover in the room of fire origin
2. Limit fire size to no more than 1 megawatt (950 Btu/sec)
3. Prevent flames from leaving the room of origin

“The term ‘equivalent level of safety’ means an alternative design or system (which may include automatic sprinkler systems), based upon fire protection engineering analysis, which achieves a level of safety equal to or greater than that provided by automatic sprinkler systems.”

– Source: *Public Law 102-522-OCT. 26, 1992*

“A second alternative is applicable for typical office and residential scenarios. In these situations, complete sprinkler protection can be expected to prevent flashover in the room of fire origin, limit fire size to no more than 1 megawatt (950 Btu/sec), and prevent flames from leaving the room of origin.”

– Source: *General Services Administration, 41 CFR Part 101-6 [FPMR Amendment A]*

The economics of the alternatives to a sprinkler system are often more expensive than the sprinkler system itself. In the past, efforts by fire protection engineers to design building protection with a true equivalency to automatic fire sprinkler systems have not been successful. However, some jurisdictions are willing to accept less than a true equivalency, allowing alternatives that are considered to provide an adequate level of life safety in lieu of fire sprinkler protection. These are considered **engineered alternatives, not equivalencies**. They are often developed through what are termed *Life Safety Evaluation Systems*.

The following is a partial list of codes containing Life Safety Evaluation Systems that can be used in evaluating alternative fire protection features in existing buildings. These evaluations will identify the existing buildings in your jurisdiction that are most unsafe. Use of these analysis methods will not result in retrofitting of sprinkler systems in all dangerous existing buildings, but should call for sprinkler mandates for the identified buildings.

- NFPA 101A
- IEBC Chapter 14
- NFPA 5000

ECONOMICS

Whenever a governmental agency deliberates to adopt a requirement that will cost the general public and/or a specific group of business or building owners money, it is more likely than not that there will be opposition expressed by various groups of the general public, business and/or building owners. In addressing the economics of adopting a retrofit fire sprinkler ordinance, it may be necessary to define the costs associated with retrofitting fire sprinklers, as well as demonstrating the benefits of performing such installations by conducting a cost/benefit analysis. Considering that, Fire Chiefs and/or Fire Marshals are not economists, it is important that in conducting a cost/benefit analysis, the accounting methodology should be thorough and accurate.

A number of studies have been carried out over the years in which the costs and benefits of installing automatic fire sprinklers has been defined and expressed. Considerations include, but are not limited to, insurance rates [as recommended by the Insurance Services Office (ISO)], income tax Incentives (depreciation allowances for the cost of the system), interest on loans used to finance the retrofit installations, qualified rehabilitation tax credits that may be available, and the possibility of federal or state tax credits. Federal legislation also played a role, such as with the Hotel and Motel Fire Safety Act of 1990, the Americans with Disabilities Act (ADA), and federal legislation as in the nursing home industry. While liability avoidance and business interruption, costs should play a large role in the decision to retrofit, experience demonstrates that these areas are often overlooked. In one form or another, all of the above items have been successfully invoked at times to educate building owners and promote the retrofit installation of fire sprinklers in thousands of buildings over the years.

In recent years, some fire agencies have used figures of \$1.50 to \$3.00 per square foot as a rough estimate of the cost of installing fire sprinklers in new commercial construction, with a factor of 25% to 50% added when the sprinklers are being retrofitted into an existing building. In recent years there has been a greater appreciation for the variability of local factors ranging from strength of available water supplies to the prevailing labor and wage conditions.

An enormous factor in the cost of retrofitting is the availability of an adequate water supply and in the case of a high-rise building whether or not the building is already protected with a fire department standpipe system. Commonly, when retrofitting a

sprinkler system to connect to the existing standpipe system, it is unnecessary to install new vertical piping within the building. Since the demands of standpipe water is higher than sprinkler systems water demands, existing water supplies, including any pumps, are most likely adequate to supply the fire sprinkler system as well.

The cost associated with a historical downtown district or perhaps nightclub, entertainment, and assembly occupancies, the cost varies greatly because of the cities infrastructure and associated fees.

Another important factor is the ease of fitting sprinkler piping into ceilings. Suspended ceilings with removable tiles clearly make retrofitting much easier and less expensive, although there are now “Soffit Systems” on the marketplace that allow the use of attractive shielding to cover the installation of piping and sidewall sprinklers in the upper corners of rooms without disturbing existing wall and ceiling surfaces. This type of new technology, along with extended coverage sprinklers, nonmetallic piping, and flexible drops, has helped make sprinkler retrofitting more efficient and economical.

Taking all of these factors into consideration, the answer as to the cost of fire sprinkler retrofit remains complicated.

Example: A Fire Marshal once made the following comments in Memorandum to Architects, Engineers, Developers, and Owners:

“It is often noted that the codes do not require installation of sprinklers in all buildings. It should be remembered that the codes are minimum requirements. We in the United States have the worst fire safety record of any industrialized country in the world. Each large loss of life or property fire results in legislation mandating sprinkler installations. This has happened in Las Vegas, Boston, Baltimore, San Juan, Puerto Rico, and most recently in Los Angeles.

With the advent of the current sprinkler technology, the _____ Fire Department recommends that automatic sprinklers be installed in all new and existing buildings of all use groups.

In weighing the costs and benefits one cannot overlook the potential liability for the owner, developer and design professional when:

- *A building is designed, built and occupied and the decision is made not to incorporate state of the art fire protection because the code in effect at the time does not require it.*
- *The fire protection authority recommends that state of the art fire protection be installed at an*

incremental cost of between 3% and 6% of total building cost.

- *A fire occurs and an occupant is injured or killed.*

After a fire, the legal community is sure to ask questions. Was this event foreseeable? Preventable? At a reasonable cost?”

It should be noted that the economic effect will most likely be one of the most important areas to consider. Be prepared to address economics in the written report to your political entity (City Council, Board of Supervisors, Board Members, etc.). Do your research and be prepared.

IDENTIFYING ACTUAL COSTS

This is where the NFSA can provide the most assistance and please don’t hesitate to reach out. We have an entire team who can assist at no cost to you. We do not make a commission or get a portion of the work. We don’t sell anything or install anything. We are strictly the non-profit association that represents our members and that’s you.

The NFSA is here as a resource to get you the contractors, suppliers, manufacturers, designers, engineers, fire officials, owners, etc. who can assist with the process, cost estimates, hurdles, etc. that will be involved.

Naturally, the cost of retrofitting a building with fire sprinklers will vary greatly based on many factors. Some of these factors include type of building, size, location, available water supply, permit fees, etc. which are covered later in this guide.

The cost of retrofitting will also vary based on the region of the country the building exists. The cost of labor, materials, fees and taxes vary across the country and so do fire sprinklers.

In order to identify the actual costs associated with the retrofitting on an existing building, you will need to be innovative in your approach. You must be able to cost analyze from the perspective of the build owner.

The hardship of business interruption must also be figured in the cost analysis of retrofitting an occupied building. When looking at the figures, the hardship in retrofitting residential occupancies is affected by the vacancy rate during the installation period. For this reason, college dormitories are most times retrofitted during summer months, with applicable contractual penalties if the work is not be completed by the start of the fall semester. Hotels and motels are often able to select times of the year when vacancy rates are highest.

Note: The Marriott Corporation reported that it retrofitted hotels across the United States with the cost for retrofitting averaging \$1,000 per room. Due to the use of new piping materials and methods, it was often possible to retrofit a room with sprinklers and reserve the room for guests the same evening. This situation created no loss in revenue.

A good source for obtaining information for your local area is from the local fire sprinkler contractors, who may be able to provide data from actual retrofit appointments that have been completed. Having these “local” figures will help you to present your cost analysis. Obtaining these numbers in writing can be a challenge in some cases, but this is the only kind of documentation that can be considered valid.

Note: The NFSA has personnel that can facilitate the contacts who can assist in obtaining information.

PUTTING RETROFIT COSTS INTO PERSPECTIVE

Before presenting a retrofit ordinance to your governing body, it is essential that you research and understand the actual costs of these requirements to the building owner, condominium association, or other corporate entities. It is essential that when putting cost figures together that you have current and accurate numbers that relate to your area of the country and reflect the real world. The worst thing that one can do is to give an unrealistically low estimate as to the amount the project will cost. The numbers you predict will either support or torment your efforts.

Considering the cost of retrofitting a high-rise building should be defined in terms of installation criteria, starting with the location, existing water supply, design of the underground and overhead piping, pumps, valves, asbestos abatement (spot or total), alarm system add-ons, and fees relating to permitting and inspections.

To assist you in collecting these figures, the following outline of costs has been developed so that you can collect estimates from local fire sprinkler contractors who typically work in your jurisdiction and have a solid understanding of the actual cost associated with retrofit projects.

Permits:

- Plan Review Costs
 - Initial plan review
 - Back-checks
 - Change order reviews
 - Plan retention fee

- Construction Permits
 - Underground service (Water purveyor)
 - Service Tap/Connection (Water purveyor)
 - Street Opening (Public Works)
 - Overhead Piping (Building/Fire Department)
 - Electrical (Building Department)

Fees/Charges:

- Plan Review Fees (Building/Fire Department)
- Permit Fees (Building/Fire Department)
- Inspection Fees (Building/Fire Department)
- Service Connection Fee (Water Purveyor)
- Backflow/Cross Connection Fee (County/City Health Department)
- Service Tap Charge (Water Purveyor)
- Street Opening Permit (Public Works)
- Monthly Standby Charge (Water Purveyor)
- Monitoring Fee (Central Station monitoring)
- Telephone Line (Local Telephone Company)

Inspections:

- Street Opening (Public Works)
- Service Tap (Water Purveyor)
- Overhead Piping (Building/Fire Department)

Underground Piping:

- Saw Cuts
- Trenching (backhoe)
- Piping, Fittings, Values
- Cross Connection/Backflow Device
- Backfill (materials)
- Pavement/Street and Concrete/Sidewalk

Overhead Piping:

- Coring (Walls, Floors, Stairwells, etc.)
- Risers (Piping, Valves, Hangers/Bracing, Fittings, Gages, etc.)
- Mains, Cross-mains, Branch-lines, Fittings, Sprinklers, Hangers, Bracing)
- Caulking Material
- Flow/Tamper Alarm Components

Fire Pumps:

- Fire Pump(s) (Diesel/Electric)
- Fuel Storage Tank (Diesel)
- Control Panel(s)
- Fire Pump Room
- Monitoring (Run, Trouble, Out-of-Service Alarm)

Secondary Water Storage:

- Onsite Water Storage
- Level Monitoring

Fire Alarm System:

- Fire Alarm (Flow/Tamper) Wiring
- Fire Alarm (Flow/Tamper) Panels
- Fire Alarm Monitoring/Supervision
 - Onsite
 - Offsite
- Fire Pump/Onsite Water Storage Monitoring

Monitoring Costs:

- Monthly Monitoring Charges
- Quarterly Testing/Annual Servicing Charges

Maintenance, Service & Testing Costs

- Quarterly Service
- Annual Service & Maintenance
- 5-Year Service, Maintenance & Testing



A MATTER OF COMPARISON

Whenever you are dealing with costs, code requirements, and a retrofit fire sprinkler ordinance, it is important that you are dealing with similar buildings, situations, costs, etc. in addressing issues. Using installation figures for high-rise office buildings currently under construction in your area would not be appropriate for an existing high-rise building requiring retrofit.

Likewise, using the retrofit costs for a high-rise hotel would not be comparable to the retrofit costs for a high-rise office building. The hotel may have the option of having a complete floor vacated during the retrofit process; whereas, the office building may not have that option, therefore cost would be more variable.

The other factor, which enters into comparison, is conceivably one building owner may have multiple buildings, which are impacted by the retrofit mandate, whereas another owner may have a single building requiring retrofitting. This could potentially present a significant negotiation advantage in terms of pricing for the owner with multiple buildings.

STAKEHOLDERS (ADVOCATES AND ADVERSARIES)

During the preparation and presentation phases of the retrofit fire sprinkler ordinance development process, you will quickly find many individuals and organizations who are in favor, and conversely, many individuals and organizations who will be in opposition to the adoption of a retrofit requirement.

Example: Your jurisdiction is looking to develop and adopt a “Residential Board & Care” retrofit ordinance, which would require all existing residential board and care homes to be retrofitted with automatic fire sprinklers within 5 years from the date of passage.

Question: In considering your community, who would be in support (advocate) and who would be in opposition (adversary) to such a requirement?

	Advocate Groups	Adversary Groups
Councilman/Supervisor	<input type="checkbox"/>	<input type="checkbox"/>
City Manager/Administrator	<input type="checkbox"/>	<input type="checkbox"/>
Fire Chief	<input type="checkbox"/>	<input type="checkbox"/>
Firefighters	<input type="checkbox"/>	<input type="checkbox"/>
Firefighters Association/ Organization	<input type="checkbox"/>	<input type="checkbox"/>
Fire Prevention Bureau	<input type="checkbox"/>	<input type="checkbox"/>
Other Local Fire Departments	<input type="checkbox"/>	<input type="checkbox"/>
General Public	<input type="checkbox"/>	<input type="checkbox"/>
Building Industry Assn.	<input type="checkbox"/>	<input type="checkbox"/>
General Bldg. Contractors	<input type="checkbox"/>	<input type="checkbox"/>
Fire Sprinkler Contractors	<input type="checkbox"/>	<input type="checkbox"/>
Architects	<input type="checkbox"/>	<input type="checkbox"/>
Developers	<input type="checkbox"/>	<input type="checkbox"/>
Water Purveyors	<input type="checkbox"/>	<input type="checkbox"/>
Insurance Companies	<input type="checkbox"/>	<input type="checkbox"/>
Insurance Brokers	<input type="checkbox"/>	<input type="checkbox"/>
Finance/Revenue Div./Dept.	<input type="checkbox"/>	<input type="checkbox"/>
Planning Department	<input type="checkbox"/>	<input type="checkbox"/>
Control/Slow Growth Groups	<input type="checkbox"/>	<input type="checkbox"/>
Fire Protection Engineers	<input type="checkbox"/>	<input type="checkbox"/>
Professional Engineers	<input type="checkbox"/>	<input type="checkbox"/>
Consulting Engineers	<input type="checkbox"/>	<input type="checkbox"/>
Interior Designers	<input type="checkbox"/>	<input type="checkbox"/>

The support and opposition factions will also be evident within the Fire Department itself. Questions that will arise may focus on current staffing levels. Through the adoption of the retrofit mandate, will staffing levels decrease or increase in order to address the perceived decrease or increase in workloads? The proposed workload would include but is not limited to: processing, plan review, field inspection and fire fighting, responses.

It is important to recognize that the increased workload of the Fire Prevention Bureau (FPB) for processing, plan reviews and field inspections just to name a few, will be limited to the timeframes established for the implementation and completion of the retrofit program. Once those steps have been accomplished, it may be necessary to reassign or reduce staffing levels with the Bureau.

ESTABLISHING A REALISTIC TIMEFRAME FOR COMPLIANCE

It is essential that you consider and recognize the issues surrounding a “realistic” timeframe for compliance by a building owner as far as mandates of a retrofit fire sprinkler ordinance. It is important to recognize not only the practical abilities of a building owner to have a fire sprinkler system installed, while the building is occupied, but also the financial implications as well.

Retrofit provisions must be realistic as to compliance regardless of the time frame. Often there are established benchmarks by which certain elements must be completed to show progress; letters of notification/agreements, plan submittals, basic piping system (risers), common areas, and in the case of residential occupancies, the living area.

NFPA 1 gives a realistic time frame for high-rise buildings of 12 years. Occupancies such as nightclubs or entertainment venues may be more reasonable at 18-36 months. Historical buildings and districts may be given a time frame or when business license change.

It is important to point out that unlike a commercial building which typically would have occupants in it during regular business hours, a residential building is assumed to be occupied 24-hours a day, 7-days a week, 365-days a year. Retrofitting a residential high-rise building takes careful planning and working in very defined and regimented restrictions as to not have a negative impact on the occupants. Activities such as drilling holes, cutting and hanging pipe during the evening hours may be appropriate for a commercial building (which is unoccupied); however, in a residential building this would not be acceptable, nor tolerated.

Often, listening to the tenants and managers of these buildings can be very informative. It might be that the time frame for a retrofit would entail wording such as:

- “within a time frame of 5-years,” or
- “when units become available due to vacancy and/or sale,” or
- “upon change in ownership,” or
- “within the time frame of 10 years or when a tenant remodels, or
- “floors above the 15th floor within 2-years, above the 10th floor within 3-years, above the 5th floor within 5-years, and above the 1st floor within 7-years”.

It is important to work with the building owners and tenant associations to create a spirit of support and cooperation, rather than a feeling of resentment and obstructionism. Be open to opportunities to support each other’s position.

LACK OF KNOWLEDGE AND UNDERSTANDING (ADDRESSING THE MYTHS ABOUT AUTOMATIC FIRE SPRINKLERS)

It is interesting that misconceptions related to fire sprinklers continues to spread mistrust and perceptions about fire sprinkler protection. These fictitious stories reflect a lack of understanding and knowledge regarding the operation of fire sprinklers in general and has probably caused many lives to be lost due to political decisions which were made based on falsehoods. While we have heard various myths before, it is essential that any proposal must address fictitious statements and to educate the general public, stakeholders, and elected officials before embarking on the effort to consider the adoption of a retrofit fire sprinkler ordinance.

“Fire Sprinklers May Go Off Accidentally.”

FALSE. Loss records from Factory Mutual Research showed that the probability of a fire sprinkler accidentally discharging due to a manufacturing defect is only 1 in 16 million sprinklers per year in service.

“If One Fire Sprinkler Goes Off, They All Go Off.”

FALSE. Fire Sprinklers are manufactured to react to temperatures in each room individually. Normally, only the fire sprinkler nearest the fire will

activate. Data shows that particularly in residential fire scenarios, typically a single fire sprinkler will control a developing fire.

“Fire Sprinklers Cause Excessive Water Damage.”

FALSE. Take into consideration that a single fire-fighter using a normal 1½-inch fire hose can be applying between 175 to 400 gallons of water per minute when attempting to extinguish a fire. Contrarily, a single fire sprinkler will produce between 18-40 gallons of water per minute. Using the above values, the calculation for a five-minute fire scenario would be as noted:

- **Firefighter with 1½-inch fire hose**
 175 x 5 minutes = 875 gallons of water
 400 x 5 minutes = 2,000 gallons of water
- **Fire sprinkler system**
 18 x 5 minutes = 90 gallons of water
 40 x 5 minutes = 200 gallons of water

Note: As a general rule, fire department hose streams apply ten times the amount of water to suppress a fire compared to an automatic fire sprinkler system. (www.homefiresprinkler.org – Fire Sprinkler Facts) The advancement in the restoration industry allows more to be salvaged than ever before. Water only damages, fire destroys.

“Fire Sprinklers Are Just Too Expensive to Install.”

FALSE. Studies have proven that the cost of installing fire sprinklers has actually decreased over the past decades. The cost of installing fire sprinklers depends, to a large part, on five factors:

- 1) The size of the building
- 2) The construction limitations and restraints
- 3) The available water supply, specifically when the existence of a fire standpipe system is already within the building
- 4) The piping materials being used
- 5) The design and layout of the fire sprinkler system

There have been many fires in the U.S. and around the world where cosmetic upgrades were made costing millions of dollars while fire protection upgrades were not made. To make matters worse, not only were fire protection upgrades not made and built in fire protection retrofitted, the contents and cosmetic improvements were more flammable and less safe.

The most recent example was the Grenfell Tower fire in London on June 14, 2017 which claimed many lives and destroyed the entire building. The Wedgewood Senior Apts fire in Castle Hills, Texas (San Antonio metro area) on December 28, 2014 is another example of a tragedy that costs lives, stretched the fire department beyond its capabilities, and resulted in public outcries.

The cost of fire sprinklers are affordable and it should not take a tragedy to improve community fire protection.



*Winecoff Hotel
 Atlanta, Georgia
 December 7, 1946*



*Wedgwood Senior Apartments
San Antonio, Texas
December 28, 2014*



PART 4 – PREPARING THE NECESSARY DOCUMENTS

STATISTICAL DATA COLLECTION AND UTILIZATION

For fire protection decisions to be supported, they must be based on sound engineering practices and information, which is true with current statistical data. To that end, it is essential that during the preliminary stage of research that a systematic approach be undertaken to collect data, which is pertinent to the issues that will be raised and discussed. The old axiom “garbage in – garbage out” is especially true when it comes to what data can and will be utilized for your justification and future presentation.

As the model codes move towards the performance-based models for the design of buildings and their component systems, this premise will become even more essential. Evidence based statistics and studies must be current (5-years or less preferred).

What Fire Data Reporting System does your agency utilize, and does it have the statistics you will be able to utilize?

- National Data
 - National Fire Incident Reporting System (NFIRS)
 - Fire Data Management System (FDMS)
- State/Regional Data
 - *Example:* California Fire Incident Reporting System (CFIRS)
- Local/Area Data
 - Individual Agency Data Collection Systems

Local fire agencies often collect comprehensive and very thorough statistics, which are utilized in Department Annual Reports. These statistics are easily obtained and can reflect trends in the sheer number of responses over the past several years. Consider the number of responses (calls) your department/agency made just ten (10) years ago, in comparison to today. This can be used very effectively to show your elected officials past and current workloads.

TEN-YEAR HISTORY OF RESPONSES (EXAMPLE):

Month	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Jan.	178	186	197	207	159	102	76	78	64	38	80
Feb.	144	147	167	164	143	112	66	65	60	46	53
Mar.	192	168	172	169	127	96	92	76	65	65	77
Apr.	172	165	178	187	159	109	84	63	63	72	70
May	163	184	199	169	162	93	89	83	62	73	58
June	203	192	180	187	167	106	119	83	66	91	69
July	221	221	178	169	180	117	105	76	89	86	76
Aug.		177	190	187	170	114	110	84	68	73	68
Sept.		154	189	165	182	103	72	75	58	74	92
Oct.		205	198	196	204	122	88	89	83	69	71
Nov.		206	214	179	161	155	79	76	80	73	63
Dec.		200	189	187	165	156	82	92	71	86	57
TOTALS		2,205	2,251	2,166	1,979	1,385	1,062	940	829	846	834

When using this type of data set of responses which is reflective of a ten (10) year span, it must be clearly defined in your presentation document if additional Fire Stations have been added, additional staffing has been added, and above all, if additional land have been added to the Department/Agency during that same time frame. Likewise, if additional Services, such as Emergency Medical Services (EMS) Hazardous Materials Services (HazMat), or Medical Transport has been initiated, these too must be clearly defined in a professional presentation.

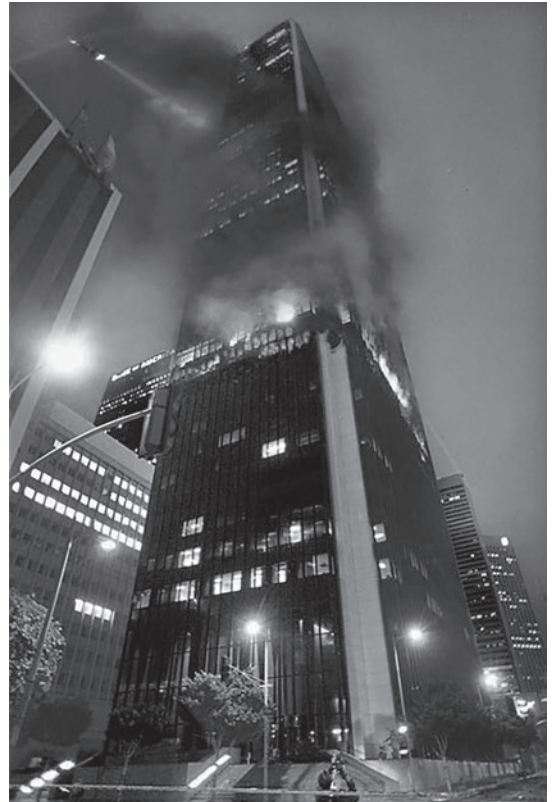
In addition to this recap of the Department/Agency Response Chart, it is important to define the actual fires which have occurred within the past year to eighteen 18 months. This can also be very effective in reinforcing facts, which may have been forgotten and/or initiated the fire sprinkler concept. Consider the following format:

XYZ Fire Department/Agency
(Structure Fire Listing: January to Date)

Date	Report No.	Address	Type of Building	Nature of Fire Origin	Damage	Lives Impacted	Injuries	Deaths
00/00/00	04-000025	123 Fire Ln.	SFD	Electrical				

Depending on the valuations of these above listed fires, you may wish to include a column that indicated the dollar value lost. However, this could be a separate chart, showing valuations over the past several years.

The City of Scottsdale, Arizona presents a unique opportunity to study a rapidly growing community, and utilizing the fire sprinkler technology for both commercial and residential construction. In July of 1985, the City of Scottsdale passed Ordinance #1709, which, when the city finally reaches its full growth potential, it is estimated that it will be a community with over 300,000 residents and more than 65% of the residential homes and 85% of the commercial property will be protected by automatic fire sprinkler systems.



*First Interstate Tower
Los Angeles, California
May 4, 1988*



PART 5 – THE ADOPTION PROCESS

STRATEGIES TO WINNING ADOPTION/APPROVAL:

Preparation is the key to success, and when proceeding with the development and adoption of a retrofit fire sprinkler ordinance, it is essential to have your proposal both, user friendly, for the presenter and clearly defined for the political decision makers. With planning, research and analysis accomplished (Parts I, II, III, and IV) focus is turned to the presentation. The following considerations must be clearly known and defined regarding the presentation:

Who will be making the presentation before the Council, Fire Board, or Board of Supervisors/Commission?

- ☐ City Manager/County Administrator
- ☐ Fire Chief
- ☐ Fire Marshal
- ☐ Building Official
- ☐ Community Development Director

What will be the format for the presentation?

- ☐ Memorandum
- ☐ Report
- ☐ Oral Presentation
- ☐ Overhead Charts & Graphs
- ☐ Slide Program
- ☐ PowerPoint Presentation
- ☐ Video Tape
- ☐ Combination of _____, _____, _____, _____

Note: Video tapes such as “Count down to Disaster,” “Fire Power,” etc. could prove effective in educating all parties in understanding the concept and functional operation of automatic fire sprinklers; however, they are somewhat lengthy and might best accomplish this educational process if given to the Councilmen, Board Members to review at their leisure.

What type of forum will the presentation be made to?

- ☐ Media – Editorial (Print/Broadcast)
- ☐ Regular Scheduled Meeting (Agenda Item)
- ☐ Special Session
- ☐ Study Session
- ☐ Joint Meeting of the Council and Planning Commission
- ☐ In conjunction with the adoption of other Codes/Regulations

How much time will be allocated to the presentation?

- ☐ Will the time be limited?
 - Do not go over the allocated time limit
 - The limit is _____-minutes
- ☐ Will the audience be allowed a question and answer period?

What is the Political Process (timeframes) of “Public Hearings”?

- ☐ Draft Ordinance/Legislation
- ☐ Identify Sponsor to Introduce Ordinance/Legislation
- ☐ Place on Agenda
- ☐ First Reading of the Ordinance at Public Hearing
- ☐ Waiting Period between First and Second Reading (2-weeks/30-days?)
- ☐ Second Reading of the Ordinance at Public Hearing
- ☐ Waiting Period before Ordinance goes into effect
 - ☐ Emergency Ordinance (immediate)
- ☐ Appeals Process
 - ☐ If someone appeals between First and Second Reading, or after Second Reading, what is the process to be undertaken?

How many copies of materials will be required?

- ☐ Number of copies _____-copies
- ☐ Who will be responsible for the printing/distribution?
- ☐ When should the masters be submitted to be in the packets?

Note: Consider the lead-time necessary to insure your materials are on time and have the highest quality.

PRESENTATION MUST BE OF THE HIGHEST QUALITY

The document, which includes a report, memorandum, presentation and package, must be of the highest quality and fit the format typically used by the agency. It may be necessary to review documents from other departments to insure that the presentation is consistent with the organizational culture. Another element of the document preparation is to recognize that people in a technical field, such as fire protection, need to express their ideas clearly yet limit the use of highly technical engineering or scientific terms.

The following is a typical format for a staff report, which is often used to present a proposed change to an organization:

Heading Section

To: (Mayor and Members of the City Council)
 Via: (City Manager)
 From: (Department Head)
 Date: (Date of Council Meeting)
 Subject: (Topic to be Presented)

Body Section

RECOMMENDATION (This section would simply state the staff recommendations)

EXECUTIVE SUMMARY (This section would be a short, 1-4 sentence summary or purpose of the staff report)

BACKGROUND (This section would provide historical information up to the point where the analysis of the situation or issue would begin. Examples would include:

- Past staff reports
- Surveys and studies
- Prior decisions or policies

ANALYSIS (This section would analyze the situation or issue from the current perspective and may include some or all of the following items:

- Environmental Impacts
- Financial Impacts
- Scheduling/Timing
- Pros and Cons/Controversies
- Evaluation of data/proposal/statistics
- Legal considerations

ALTERNATIVES (This section would define any viable alternatives to the proposal or issue which could receive consideration.

ATTACHMENTS (List of supportive documents, by title.)

An alternative format, sometimes used would reflect the following elements:

Heading Section

To: (Mayor and Members of the City Council)
 From: (Department Head)
 Date: (Date of Council Meeting)
 Subject: (Topic to be Presented)

Body Section

EXECUTIVE SUMMARY
 RECOMMENDATIONS

- *Requested Action/Listing of Action Items*

BACKGROUND
 HISTORICAL OVERVIEW
 DISCUSSION
 REFERENCES
 APPENDICES

It can not be stressed enough that it is not the amount of material and paper that is presented, but rather the quality of the information needed that will best state the necessity for the sprinkler ordinance. The staff report should be limited and where possible, charts and critical data should be easily understood at a glance. Considering the multitude of reports being reviewed by elected officials, getting to the point quickly and efficiently is often more effective.

DEVELOPING MATERIALS WHICH CAN BE EFFECTIVELY USED DURING THE PRESENTATION

During the Planning, Research, and Analysis Phase of a retrofit fire sprinkler proposal, a list or materials is suggested. Now is the time to organize that material as you prepare for your presentation. Consider these elements:

- ☐ Readitly Accessible and Accurate
 - ☐ Information at your fingertips
 - ☐ Easy retrieval of Supportive Data and Information
- ☐ The “Ordinance” (Resolutions and Guidelines)
 - ☐ Written in accordance with state/local law

Note: Be prepared to know if your state statutes are minimum, maximum, and/or “mini/max” laws, which allow or prohibit a local agency from being more restrictive than state law.

- ☐ The “Ordinance” (Resolutions and Guidelines)
- ☐ Written in accordance with organizational policy

Note: Make certain that the fire sprinkler regulations being proposed do not create conflict with building and/or fire codes.

DISCUSSION OF THE PROACTIVE VERSUS REACTIVE ELEMENTS OF FIRE PROTECTION

As organized as a fire department may be in responding to a fire emergency, or any emergency for that matter, it must be said that they can only respond to the alarm once it has been called in and subsequently dispatched. Until arrival at the scene of an emergency, there is little that can be accomplished to control and extinguish a fire. Both the firefighter and the automatic fire sprinkler work a schedule that is 24-hours, 7-days a week, 365-days a year. The difference is that a fire sprinkler is located directly over the area of fire origin and can operate as soon as the temperature in that area reaches the activation temperature, which in the case of a residential fire sprinkler is 135-170-degrees F.

Similarly, an automatic fire alarm system works the same schedule but can only detect and alert the fire department or occupants in the event of a fire. While the need for detection and notification is essential, through the use and installation of smoke alarms, for a balanced fire protection design, it must also be recognized that fire detection does not proactively control the growth of a fire, while the automatic fire sprinkler system designed and installed in accordance with NFPA 13 “Standard for the Installation of Sprinkler Systems” is to provide a reasonable degree of protection for life and property as a result of fire.

Special Note: It is worthy of noting that a fire sprinkler, designed and installed in accordance with the NFPA residential sprinkler standards, NFPA 13R or NFPA 13D, is expected to “**prevent flashover, or total involvement, in the room of fire origin, where sprinklered, and to improve the chance for occupants to escape or be evacuated.**” (Section 1-2.2 of NFPA 13R and Section 1-2.2 of NFPA 13D, 2016 editions)

Where enhanced property protection is also desired, NFPA 13 can be specified to provide such protection:

“**Greater protection to both life and property could be achieved by sprinklering all areas in accordance with NFPA 13, which permits the use of residential sprinklers in residential areas.**” (Section A.1.2 of NFPA 13R, 2016 edition)

The above Sections are referenced only to clarify any drawbacks that may result from the misunderstanding of those who would require a sprinkler system installed in accordance with NFPA 13R or 13D based on that system being used for not only life safety, but also for property protection. While many fires have been controlled and extinguished as a result of the activation of fire sprinklers in residential occupancies protected by NFPA 13R and 13D systems, they have not been designed for that purpose.

A residential fire sprinkler system is designed as a fast-response sprinkler making the time of temperature activation much less than that of a conventional sprinkler. Additionally, the discharge characteristics are required to administer water within 28 inches of the ceiling at the perimeter of their coverage areas, addressing the likely placement of furnishings along walls. This combination of high wall wetting pattern and fast thermal response helps the residential sprinkler system control or suppress typical residential fires with water flows much lower than standard sprinklers.

In comparing a residential fire sprinkler system designed in accordance with NFPA 13R or NFPA 13D to a conventional NFPA 13 fire sprinkler system found in a commercial building, the following differences should be mentioned:

NFPA 13 – Standard for the Installation of Sprinkler Systems, 2016 edition

- 282-pages of design and installation requirements
- Design area for residential areas of four operating sprinklers
- Water Supply – must be capable of providing the required flow and pressure for a minimum of 30 minutes in residential occupancies, and up to two hours for some types of occupancies

NFPA 13R –Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies, 2016 edition

- 29 pages of design and installation requirements (hydraulics per NFPA 13)
- Design area maximum of four (4) operating sprinklers
- Water Supply – preferably domestic supply for minimum 30 minutes

NFPA 13D – Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, 2016 edition

- 33 pages of design and installation requirements
- Design area maximum of two operating sprinklers
- Water Supply – preferably domestic supply for minimum 10 minutes

Performance of current technology (quick response):

- Automatic Fire Sprinkler Technology as an element of a “Systems Approach to Fire and Life Safety”
- Fire Research as it relates to “Built-In” Protection (See Appendix Item “B”)

PROPERTY PROTECTION VERSUS LIFE SAFETY PROTECTION

Typically, when discussing fire sprinkler protection the issue is raised as to whether a residential fire sprinkler system is a life safety system or also designed for property protection. When addressing this issue it must be pointed out that the design criteria is established “to prevent flashover (total involvement) in the room of fire origin, where sprinklered, and to improve the chance for occupants to escape or be evacuated” (NFPA 13R and NFPA 13D) and therefore must be considered a life safety system; A benefit of the system is that its’ design “to prevent flashover (total involvement) in the room of fire origin” the system will reduce the property damage resulting from a fire.

While you may develop additional benefits, here is a start to what a residential fire sprinkler system can accomplish:

- Fire Sprinklers protect building occupants
- Fire Sprinklers protect buildings and property
- Fire Sprinklers protect Fire Fighters who are asked to perform entry for search and rescue and then to extinguish fires in buildings.



PART 6 – IMPLEMENTATION AND CUSTOMER SERVICE

CONSIDERATIONS RELATED TO ALL STAKEHOLDERS

There are many stakeholders involved in the retrofit process and as the leader of the requirement the more involvement up-front the better the outcome. While a lot of investment will be made into the community, the return on this investment will be greatly beneficial to all for many years to come. At this point in the process, the convincing part should be over and the delivery part begins.

Individual meetings should be held with the impacted building owners as they begin the process and receive official notification of the requirements. Ensuring they have access to reputable architect/engineering firms, fire sprinkler contractors, etc. who are familiar and capable of conducting such projects will be very helpful in the overall success of the program.

It is also important to keep in mind that you will have external and internal customers. External customers are essential to the success of the project. Internal customers play a key role in the success of the project in that they interact with the external customers throughout the project.

As a Fire Chief, there may be a natural tendency to focus on the relationship with external customers, as they are the ones who will be managing the inspections and processes. You can take steps to improve internal relations by training employees on the process and express expectations. The key to success is educating on why this is important and ensuring enforcement isn't heavy handed.

Building strong rapport with your stakeholders is imperative to the success of one's retrofit effort. A solid relationship with your customers or stakeholders will increase the chances of success and limits the chances of retrofit projects being delayed.

When considering the adoption of a retrofit fire sprinkler ordinance (whether it is exclusively residential or in general in scope), it is critical that you identify the target customers who will be impacted by the requirements. The list of customers could include, but not limited to:

1. Building Owner
 - Onsite and/or Absentee
2. Building Tenants
 - Demographic Information
3. Tenant Groups/Association(s)
 - Real Estate Sales Groups
 - Condominium Associations
 - City/County Housing Authorities
4. Business Association(s)
 - Control Growth Groups
 - Slow Growth Groups
 - Chamber of Commerce
 - Insurance Companies
 - Insurance Brokers
5. Fire Protection Contractor
 - Sprinkler Fitters Unions/Associations
6. General Building Contractor
 - Home Builders (NHBA, CBIA, BIA Chapters)
7. Fire Protection Engineer
 - Local chapters of Society of Fire Protection Engineers
8. Architect
 - Interior Designers
9. Developers
 - Local, State and National
10. Water Purveyor(s)
 - Public (typically regulated by a Public Utilities Commission)
 - Private (typically regulated by a State or County Health Agency)
11. Consultant(s)
12. Councilmen/Supervisors/Board Members
13. City Manager/Administrator
14. General Public
15. Fire Department
 - Firefighters
 - Firefighter Associations
 - Fire Prevention Bureau Staff
 - Other Fire Departments/Agencies
16. Planning Department
 - General Plan Provisions
17. News Media
 - Printed (newspapers, periodicals, etc.)
 - Broadcast (radio, television, etc.)

As you can tell from looking at the list of potential customers, each will have a different level of knowledge and understanding of construction law, building regulations, permit processing, plans and specifications. Each will also have a different vested interest in the retrofit ordinance and its implications. To address each group of individuals could prove to be complex and a single document could be lengthy; however, addressing concerns and processes in a systematic manner could help to reduce the number of questions each may have, while creating a system which promotes uniformity and helps to speed up the application and inspection process.

DEVELOPING A STRATEGY TO SUPPORT THE CUSTOMERS

Establishing the philosophy of *customer service*

- Define the concept of customer service as it relates to your particular agency.
- Define the general concerns that will need to be addressed.

Identifying the necessary information that must be conveyed from your agency to the customer.

Create a listing of the criteria for use by the customer which discusses the retrofit requirements and outlines the various Codes/Standards being utilized for the various occupancy classifications.

Example 1:

Apartment Buildings: (4-stories or less in height)

Installation Standard to be used: NFPA 13R

Example 2:

Apartment Buildings: (5-stories or more in height)

Installation Standard to be used: NFPA 13

Note: Be specific as to the provisions of the design area, and the criteria outside the dwelling unit. Clarify the provisions for dwelling units as they relate to the coverage in bathrooms, clothes closets, linen closets and pantries.

Defining criteria needed to accomplish the tasks:

- Number of plans/ calculations to be submitted
- Detail listing of what needs to be shown on the plans

Defining the process and procedures:

- Turnaround times
Example: 5-working days, 2-weeks, etc.
 - Pre-submittal reviews (optional)
 - Initial plan review
 - Back-check
 - Change order plan reviews
 - As-built drawings

Collection of Fees and Charges:

- Plan-check Fees
- Permit Fees
- Inspection Fees
- Penalty Inspection Charges/Fees (not ready, 2nd or 3rd re-inspection)
- Additional Charges/Fees (Back-Check, Change or As-Built Reviews)
- Plan Achieve Fees (per set or per page)

Anticipating the common questions raised by the customer(s):

- Preconceive basic/complex questions that may be asked

Recognize the Customers Needs:

- Don't overwhelm the customer with bureaucratic procedures or language.
- Try to avoid technical words which are often used by the Fire Service or Fire Protection Industry. The meanings of the terms may be obscure to the general public.

Informing the Architects/Engineers/Contractors:

- If a question was raised even once by one applicant, the answer could/should be published for current and future applicants.
- No Surprises, No Problems:
- Have the criteria outlined in a handout before the adoption process. This will insure the governing Board/Council that the adoption was thought out and well planned.

Special Note: Do not change the process and procedures once it has been adopted. Changing the procedures and process once it has been adopted will create ambiguity.

CREATING AND UTILIZING CHARTS AND MATRIX TO SHOW THE PROCESS/ PROCEDURES:

One of the best ways to inform your customer on how to prepare, submit, and have a clearer understanding of your agencies processing/procedures for obtaining a permit or inspection is to document the system under which you are working. Consider utilizing a flow chart or matrix format for describing your organizational requirements. Additionally, you will need to clearly understand not only your organization, but also the other departments and divisions you coordinate your efforts with for planning, community development, building inspection services, public works and water purveyor. In many communities, there is a combination of the above services in one or more departments or divisions.

ORGANIZATIONAL CHART/MATRIX

It is important for your organization and for the potential customer to have a clear understanding of where and how the Fire Prevention Bureau relates to the other departments/divisions within and outside of your governmental entity. When developing the Organizational Chart/Matrix, make certain that the position is clearly defined with respect to depth within the organization (Agency, Council, Manager, Department, Division). This will help should a customer choose to appeal a decision to the higher level.

This Organizational Chart/Matrix quickly becomes the "Chart of Appeals" by which a customer knows who has authority above the Fire Prevention Bureau (Fire Marshal)

- Recognize that everyone has a supervisor and the right to appeal a decision is a normal given the "true" facts of the challenge.
- The key departments and divisions that need to be clearly defined include the Fire Department/ Fire Prevention Bureau, Community Development/Building Inspection Division, and Public Works/Water Division.

PLAN REVIEW PROCESS CHART/MATRIX

The Community Development Department Plan Review Process is extremely helpful to educate the architect, developer engineer and, to a lesser degree, the contractor in understanding the layered approach to reviewing large and complex projects. Preliminary reviews help to outline the agencies general requirements and to steer the proposed project in a positive direction. While specific code requirements and formal plan reviews are not accomplished at this level, preliminary reviews and study sessions help to define what will be expected when the plans are finally submitted for review to the Building Department/Division and Fire Department/Prevention Bureau.

Utilize the Planning Review Process to inform the applicants of Fire Department conditions and requirements:

- Accessibility Issues
- Water Supply Issues
- Fire Sprinkler Requirements
- Plan Review Requirements
- Permit Issues

Formalize Fire Department requirements within the City/County General Plan and ensure that it is current and being administered by both the City/County as well as the Fire Agency is an ongoing issue.

- Review the current General Plan with emphasis on the Fire Department criteria.
- Revise as deemed necessary any outdated and/or necessary additional requirements.

Special Note: The General Plan of a community is the cornerstone of the planning and development future and is reviewed and revised periodically by the Planning Department. This is often an overlooked document to the Fire Service, but can hold the key to many progressive and innovative construction features that can enhance the fire protection of the community.

BUILDING PERMIT PROCESS/MATRIX

Most applicants who are required, or voluntarily desire, to install a fire sprinkler system simply want to know what the process is for submitting an application, plans and supportive data. They also want a clear understanding of what the turnaround time will be. The “Building Permit” Process Chart/Matrix, whether administered by the Building Inspection Department/Division and/or the Fire Department is an effective tool to outline the process under which they will be required to follow.

When developing the Chart/Matrix diagram a step by step process

- Be as specific as possible.
- Check with other departments/divisions to ensure that you have the correct terms and location on the diagram where they are involved.

Remember that with any business, the fees and charges paid become a significant element, which must be identified and designated.

INSPECTION SEQUENCE CHART/MATRIX

An Inspection Sequence Chart/Matrix is critical internally as well as externally to insure that the agency’s staff, as well as the customer, knows when certain inspections will be performed. All too often it is assumed, by the local authority having jurisdiction (AHJ), that everyone knows when to call for, and when to perform certain inspections.

Note: Working closely with your building official a chart or matrix can be developed in a relatively short period of time, but can have lasting impact of workload and efficiency.

Beginning with the building code, a sequence of inspections can be developed.

- It is essential that the Building Inspection and Fire Department Inspections be relatively consistent so that the construction industry is not confused.
- Defining as many detailed inspections as possible will help to support the effort, thus creating consistency between multiple inspectors from the same agency.

FIRE PREVENTION BUREAU PLAN REVIEW PROCESS (CODES/ELEMENTS)

A Plan Review Process Chart/Matrix helps to clarify as many of the codes and standards that will be utilized during the plan review process, and will highlight many of the elements that will be evaluated during the plan review process. These elements become red flags for architects, contractors and owners to recognize as they prepare their plans.

- When listing codes and standards, attempt to prioritize based on the highest level of authority; State Law, followed by Locally Adopted, and followed by nationally recognized standards and so forth.
- The listing does not need to involve the detail of the various NFPA standards at this point.
- When listing the elements keep in mind that as you list each, you should have a guideline (handout) which would be written detailing each of these issues (fire apparatus access, water supply, etc.).
- These guidelines (handouts) become an effective tools to distribute to the customers who are required to address these elements during the development of their project.

STRATEGIES TO BE USED TO ENSURE TRUE CUSTOMER SERVICE

- Consider the customer whenever you are developing a procedure, guideline, adoption of a requirement, or changing an existing requirement.
 - Put yourself in the applicant's position.
 - Discuss conceptual ideas with various customers (Owner-Builders, Architects, Developers, Contractors, Water Purveyors,).
- Take an objective look at the Plan Review Process and determine if adequate information has been provided to clarify what you are requiring.
 - Is your staff technically ready to implement a new program?
 - Will the level of training and education of staff members be required prior to implementation?
 - Does the reference library your staff utilizes have adequate and current publications necessary for them to perform their function?

EFFECTIVE CUSTOMER SERVICE

Developing Guidelines (handouts) before you adopt a fire sprinkler ordinance can save you time and effort over the long haul. Distribution of these guidelines to local active architects, developers, engineers, fire protection contractors and home building contractors can prove to be successful. Being prepared, and service oriented can be effective and a prudent expenditure of time and effort.

Know that your customers are essential.

- Develop a mailing list of actively working architects, developers, engineers, fire protection contractors, building contractors, and business owner association(s).
- Use this mailing list to distribute useful information that can make their businesses and your agency work together as a team.

DEVELOPING A DEPARTMENT GUIDELINE (HANDOUT) FOR YOUR FIRE SPRINKLER CUSTOMER

The purpose of this handout is to create a document which can be given to an architect, fire sprinkler contractor, developer, owner-builder, or tenant/renter that will assist the individual or firm in preparing, submitting, installing and obtaining the necessary inspections. The document will be a vehicle by which the applicant will know what is required and how to obtain the necessary approvals.

Special Note: While the handout being described covers both commercial (NFPA 13) and residential fire sprinkler systems (NFPA 13, NFPA 13R, and NFPA 13D) you should consider developing two separate handouts that target the two different, yet similar audiences. This will reduce confusion and will assist the construction professionals (architect, contractor, developer) and/or business owner or tenant.

CRITERIA TO BE INCLUDED IN GUIDELINES

Section I - Codes and Standards

- Building Code (Edition) currently adopted.
 - Ordinance No. _____
- Fire Code (Edition) currently adopted.
 - Ordinance No. _____
- Standards (be specific as to which ones) currently adopted.
 - Ordinance No. _____
 - By Reference?

Section II – Plan Review Procedure

- Drawings and supportive calculations shall be submitted to:
 - Name of Agency
 - Address
 - City, State, Zip
 - Phone Number
 - Fax Number
 - E-Mail Address
 - Office Hours (MTWTF)
 - 8:00 a.m. to 12:00 (noon)
 - 1:00 p.m. to 5:00 p.m.
- Minimum number of drawings and supportive calculations
- Details on Drawings shall include:
 - NFPA 13, 20____ edition
 - Review and outline the dozens of items listed in the standard to ensure that your agency accepts at least these criteria.
 - Add to the listing any changes and/or additional requirements.
 - Be specific and make certain that they stand out from the items required by NFPA 13.
 - NFPA 13R, 20____ edition
 - Review and outline the items listed to ensure that your agency accepts at least these criteria.
 - Add to the listing any changes and/or additional requirements.
 - Be specific and make certain that it stands out from the items required by NFPA 13R.
 - NFPA 13D, 20____ edition (Plans not required by document.)

Special Note: Most authorities having jurisdiction (AHJ) will require plans and calculations to be submitted; however, NFPA 13D does not outline what those plans should contain. Plans are prepared basically for two purposes: (1) Installation instructions, and (2) submittals for approval

The following is a listing of what might be considered by the AHJ as a minimum set of criteria for these systems:

- A site plan showing the footprint of the structure, any access roads, nearest fire hydrants and size and location of the water supply.
- A reflected ceiling plan showing sprinkler head location in relation to walls, beams, and other obstructions that may affect the fire sprinkler water distribution.
- A piping plan, which includes pipe size, type and center-to-center dimensions if not “cut length” dimensions. (The piping plan may be shown as part of the reflected ceiling plan, provided it does not make the drawing too cumbersome.)
- Type and location of hangers or a general notation regarding hangers. (Copy of cut-sheet/specification sheet of hangers to be used highly recommended.)
- Location of hydraulic reference points.
- Model identification (SIN numbers) of all fire sprinklers that are to be used. (Copy of cut-sheet/specification sheet of each model of fire sprinkler to be used highly recommended.)
- Alarm equipment type and location.
- Riser detail including all valves, fittings, and other equipment. (Copy of cut-sheet/specification sheet of all valves (control, check, etc.) flow-switches and other equipment to be used highly recommended.)
- Any building that has other than flat smooth ceilings throughout should include sectional drawings that show the sprinkler locations in relationship to obstruction features.
- Simplified hydraulic calculations as per NFPA 13D that can easily be related to the piping plan. The isometric drawing (common to plumbing plans) is one of the best styles of which can be used to relate calculations to piping.
- All technical data sheets of the products that are to be used in the system.
- All plans must be complete to the water supply.
- All plans must include in the title-block the name of the property, the point of compass, and the scale of the drawing.
- All plans must include the title block, the name, address, and phone number of the designer and/or the installer.

Section III – Applicants Should Recognize the Timeframes

The time frame for providing certain services varies widely from agency to agency. There are restraints given staffing levels, seasonal demands, and a number of factors, which changes from time to time. However, the fundamental criteria established by the agency should be somewhat consistent. The customer, whether that is an architect or a homeowner, a fire sprinkler contractor or an owner-builder, deserves to know the approximate scheduling of submitting, and receiving a permit to proceed. A guideline is a great place to inform the customer what to expect.

The plan check fee is to be paid at the time plans are submitted for review or approval.

- If the fee is to be paid in another office (such as the Revenue/Finance/Building Inspection Division, etc.) you should note this in the guideline.

The customer deserves to know how long the plan review process will take).

- Be clear so that you minimize frustration of multiple telephone inquiries by the customer checking on the status of his/her plans.

Note: If the agency sends the plans out to a private consultant or plan check service to perform the plan review service, indicate that information keeping the agency's information confidential.

Any and all items identified in the initial or subsequent plan reviews must be completely and clearly addressed and corrected on the drawings prior to re-submittal for the additional funding.

- “Redline” drawings (corrections made in red and/or pen/pencil) on the original drawings should be discouraged as the field inspector in the field may not be able to determine/establish which changes were made during the formal plan review and which were done after the fact.

Upon re-submittal, the items noted in the original plan review will be checked and if found to be corrected, the drawings and calculations (every sheet) will be stamped with the official agency approval stamp.

- This will greatly aid the field inspector who will be checking the actual installation against the approved drawings.

Should a fee (penalty charge) be levied against a re-submitted set of drawings/calculations which have ignored being corrected, the agency should define the policy and authority under which this action is taken.

- A warning, in writing is invaluable when you are being challenged.

A policy by which inspections must be made utilizing the approved (stamped) drawings is essential to complete the circle of the systematic approach to design, review, installation, and inspection of a system.

- Without matching the installation to the approved drawings, the field inspector is simply presuming.

A copy of the approved/stamped set of the drawings and calculations (including any and all cut sheets) shall be maintained in the Fire Prevention Bureau for the life of the structure. These construction documents are valuable references to the fire safety system installed.

Section IV – Water Supply Information (Fire Flow Data)

Water supply data used to design a hydraulically designed fire sprinkler system is the single most important factor to consider when reviewing and approving a fire sprinkler system. The idiom “garbage in – garbage out” was never more applicable than when it comes to hydraulically calculated fire sprinkler systems. If the flow data is incorrect on the front end of the system design, then the error is multiplied at the other end where the water will be needed. Too many agencies rely on outdated or otherwise unreliable water supply data.

Considering the customer, where should he/she be directed in order to obtain current and accurate water supply information?

- Give the same criteria you would need if you were trying to obtain this data:
 - Water agency name
 - Water agency address
 - Water agency telephone number
 - Water agency fax number
 - Water agency e-mail Address
 - Water agency contact person
 - Water agency office hours:

- Does your agency (or should your agency) require the water data to be confirmed by either a form, letter or telephone verification?
 - Consider being a little more formal than simply a verbal confirmation.
 - **DO NOT** accept simply a notation on the drawings indicating static, residual, and pitot readings with observed flows of _____ GPM.
- How current is the data that your agency will accept?
 - 6-months
 - 1-year
 - 18-months
 - Unlimited time frame?

Note: It is highly desirable to have a conversation with your water purveyor(s) and to define some working criteria whereby your agency gets what it needs (accurate and current water supply data) and to formalize the working relationship between your agency and the water purveyor(s).

Section V – Modifications to Existing Fire Sprinkler Systems

Permit required for fire sprinkler modifications

- Refer contractor to Plan Review Procedure.

Placing fire sprinkler system “out-of-service”:

- Notification required:
 - Telephone number
 - Questions to be addressed:
 - Address of system/Name of business?
 - Name of contractor?
 - Telephone number of contractor?
 - Nature of work and if permit issued?
 - Inspection required?
 - Monitoring company notified?

Unless otherwise authorized (in writing) by permit, the fire sprinkler system is expected to be placed back into service as soon as possible, and/or by 5:00 p.m. of the same day.

- Will fire watch be required, based on occupancy classification?
 - Identify the policy for testing the modified piping and/or the entire system.
 - Is there a 10, 15, or 20-sprinkler rule for hydrostatic test?
 - In accordance with NFPA 13, 20____ edition

Section VI – Fire Sprinkler Inspection Criteria

It is essential that the inspection policy for fire sprinkler systems being installed is clear and consistent with the nationally recognized standards (NFPA 13, 13R, 13D, and/or 24). It is also necessary to ensure the customer is aware of how requests for inspections are made. While most agencies require a telephone request at least 24 hours prior to the time and date of the inspection being requested, some agencies allow for a faxed or e-mail request to initiate the inspection.

It is important to indicate that the customer must confirm with the agency or inspector that the requested time and date is acceptable and that unless otherwise cancelled, the inspection will be performed and the system will be ready for the inspection requested.

Specific inspections should be outlined:

Underground piping flush

- In accordance with NFPA 13, 20____ edition
- In accordance with NFPA 13R, 20____ edition

Underground piping hydrostatic test

- In accordance with NFPA 13, 20____ edition
- Backfilled between joints to prevent movement during test.
- In accordance with NFPA 13R, 20__ edition

Overhead piping walk-thru inspection prior to “ANY” portion being covered over by insulation and/or sheetrock.

- In accordance with NFPA 13, 20__ edition
- In accordance with NFPA 13R, 20__ edition

Overhead piping hydrostatic test

- In accordance with NFPA 13, 20__ edition
- In accordance with NFPA 13R, 20__ edition
- In accordance with NFPA 13D, 2016 edition

Final Inspection walk-thru prior to occupancy of the building or space

- In accordance with NFPA 13, 2016 edition
- In accordance with NFPA 13R, 2016 edition

Fire sprinkler system alarm test

- In accordance with NFPA 13, 2016 edition
- In accordance with NFPA 13R, 2016 edition
 - Flow alarm test
 - Tamper switch test
 - Central station monitoring alarm test



*Midtown Towers
Pittsburgh, Pennsylvania
May 15, 2017*



*Marco Polo Condominium
Honolulu, Hawaii
July 14, 2017*

APPENDICES

A – An Express Model Ordinance for Consensus Sprinkler Retrofit	52
B – Sample Sprinkler Retrofit Ordinances	54
C – A Fire Sprinkler Contactors Perspective	57
D – Websites for Additional Resources	59

APPENDIX A

SAMPLE EXPRESS CONSENSUS FIRE SPRINKLER RETROFIT ORDINANCE

Local Law No. _____ - 201____

A local law providing for amendment of specific sections of Chapter _____ of the _____ (jurisdiction code) and Chapter _____ of the _____ (jurisdiction's fire code) of the _____ (jurisdiction), to upgrade fire sprinkler requirements in various occupancies in accordance with minimum requirements for existing buildings as specified as the standards of consensus codes recognized by the American National Standards Institute.

Be it enacted, by the _____ (authorizing body) of the _____ (jurisdiction) as follows:

Section 1. Existing buildings required to have automatic fire sprinkler systems.

All buildings and occupancies as defined below which do not contain automatic fire sprinkler systems as defined herein, shall be required to comply with this section within 48 (forty-eight) months from the effective date of this ordinance, except that buildings more than 4 (four) stories in height shall be required to comply within 60 (sixty months) from the effective date of this ordinance. For purposes of compliance, owners of buildings in these categories shall be required to enter into a valid contract for such installation within 24 (twenty-four) months of the effective date of this ordinance, except that owners of buildings more than 4 (four) stories in height shall be required to enter into a valid contract within 36 (thirty-six) months of the effective date of this ordinance. In all cases, the installation of the fire sprinkler system shall be required to be completed within 24 (twenty-four) months of the date on which a valid installation contract is signed.

1. Assembly Occupancies

- a. Throughout all dance halls, discotheques, night-clubs, and assembly occupancies with festival seating in which the occupant load exceeds 100.
- b. Throughout all assembly occupancies in which there are area exceeding 15,000 sq ft used or capable of being used for exhibition or display purposes, except that sprinklers are not required over seating or floor areas within stadia or arenas.
- c. In all stage areas of assembly occupancies, including storerooms, workshops, permanent dressing rooms and all accessory spaces contiguous to the stages, except for stages 1,000 sq ft in area or less where curtains scenery and other combustible hangings are not retractable vertically, and where combustible hangings are limited to borders, legs, a single main curtain, and a single backdrop, and except for under-stage areas less than 4 ft in height used exclusively for chair or table storage and lined on the inside with gypsum wallboard or the approved equivalent.

2. Educational Occupancies

- a. Throughout educational occupancies with unprotected openings between floors.
- b. In every portion of a floor of an educational occupancy in which student occupancy exists below the level of exit discharge, except where windows for rescue and ventilation are provided and approved.
- c. In every portion of a floor of an educational occupancy below the level of exit discharge in which student occupancy does not exist, except where such floors are separated from the rest of the building by a minimum of one-hour fire resistant construction.

3. Health Care Occupancies

- a. Throughout all nursing homes, except where alternative protection measures have been approved.
- b. Throughout all high-rise buildings containing health care occupancies, except that sprinklers are not required in patient room clothes closets where the area does not exceed 6 sq ft and provided that the coverage areas of room sprinklers extend to the back walls of the closets.

4. Detention and Correctional Occupancies

- a. Throughout all detention and correctional facilities, except where alternative protection measures have been approved.

5. Hotels and Dormitories

a. Throughout all high-rise buildings, except where each guest room or suite has exterior exit access, except that, within guest rooms or suites, provisions for closely spaced sprinklers and draft stops around floor openings are not required, nor are sprinklers required in closets not exceeding 24 sq. ft. or bathrooms not exceeding 55 sq. ft.

6. Apartment Buildings

a. Throughout all high-rise buildings, except where every dwelling unit has exterior exit access, or except where an engineered life safety system developed by a registered professional engineer experienced in fire and life safety system design has been approved to provide an equivalent level of safety.

7. Residential Board and Care Facilities

a. Throughout all residential board and care facilities that are not able to establish practical evacuation capability.
b. Throughout all high-rise buildings containing residential board and care facilities

8. Mercantile Occupancies

a. Throughout all mercantile occupancies with a story over 15,000 sq. ft. in area, except street-floor single-story buildings.
b. Throughout all mercantile occupancies exceeding 30,000 sq. ft. in gross area
c. Throughout all stories below the level of exit discharge in mercantile occupancies where such stories have an area exceeding 2,500 sq. ft. used for sale, storage or handling of combustible merchandise.
d. Throughout all mixed occupancies where any of the above conditions apply to the mercantile portion of such occupancies.

9. Day Care Occupancies

a. Throughout buildings containing day care occupancies in which such buildings contain unprotected openings between floors.

10. Other High-Rise Buildings, including Office Occupancies

a. Throughout all high-rise buildings except as detailed above for selected occupancies.

Section 2 – Definitions

For purposes of this ordinance, the following definitions of terms apply.

Approved – Approved by the _____ (position of authority) of _____ (jurisdiction).

Automatic fire sprinkler system – A system designed and installed in accordance with the requirements of the _____ edition of NFPA 13 – Standard for the Installation of Sprinkler Systems or NFPA 13R – Standard for the Installation of Sprinkler in Low-Rise Residential Occupancies, as applicable.

Throughout – Provision of a fire sprinkler system with coverage areas protected in accordance with the applicable NFPA fire sprinkler installation standard.

Section 3 – This local law shall take effect immediately.

APPENDIX B

SAMPLE RETROFIT ORDINANCES

City of Chicago Retrofit of High-Rise Buildings

13-196-205 Automatic sprinkler system installation in existing high-rise buildings

Subject to the exceptions listed below, every existing building exceeding 80 feet in height above grade shall be protected throughout by an approved automatic sprinkler system meeting the requirements of Chapter 15-16 of this Code unless otherwise provided by Section 13-196-207. The owner of each such building shall, no later than September 1, 2005, submit for approval to the bureau of fire prevention a plan for compliance with the requirements of this section. The requirements of this section shall be enforceable against the building owner and against any subsequent owner.

Every building subject to the provisions of this section shall comply with the following schedule for installation of an approved automatic sprinkler system: one-third of the gross square footage of the building shall be equipped with automatic sprinklers by January 1, 2009; two-thirds of the gross square footage of the building shall be equipped with automatic sprinklers by January 1, 2013; and the entire gross square footage of the building shall be equipped with automatic sprinklers by January 1, 2017. Buildings subject to any of the following exceptions 3 through 7, inclusive, shall comply with the requirements of Section 13-196-206.

Exception Number 1: An open-air parking facility meeting the requirements of Section 13-96-920 of this Code.

Exception Number 2: The open-air portions of a stadium.

Exception Number 3: A building that is classified as a Class A-2, Multiple Dwelling, and that is a non-transient residential use. This exception includes (a) all approved auxiliary use areas of the building other than parking garages; and (b) any parking garage in the building that is used exclusively by the building's non-transient residential occupants and their guests or by persons who, pursuant to a written lease agreement, rent space in the building's parking garage for use by a designated motor vehicle in time increments of at least one month in duration.

Exception Number 4: The following portions of a building classified as a mixed occupancy building:

- (A) any portion of a mixed occupancy building that is classified as a Class A-2, non-transient residential use;
- (B) any approved auxiliary use area wholly contained within a Class A-2, non-transient residential use portion of a mixed occupancy building;
- (C) any parking garage in a mixed occupancy building that is used exclusively by the building's non-transient residential occupants and their guests or by persons who, pursuant to a written lease agreement, rent space in the building's parking garage for use by a designated motor vehicle in time increments of at least one month in duration;
- (D) any portion of a mixed occupancy building, other than those portions of the building classified as a Class A-2, non-transient residential use, if all of the following criteria are met:
 - (1) the cumulative total of the building's floor areas not classified as a Class A-2, non-transient residential use does not exceed ten percent of the total floor area of the building. The floor areas of parking garages used exclusively by the building's non-transient residential occupants and their guests shall be excluded from the calculation of the building's total floor areas not classified as a Class A-2, non-transient residential use and from the calculation of the total floor area of the building; and
 - (2) occupancy separations are provided in accordance with Table 13-56-280 as set out in Section 13-56-280 of this Code; and
 - (3) the mixed occupancy building must be either of Type I, fire-resistive construction or of Type II, non-combustible construction; and
 - (4) all of the exempted areas within the mixed occupancy building, other than those portions of the building classified as a Class A-2, non-transient residential use, are located in the building at a floor level elevation that does not exceed 80 feet in height above average grade.

Exception Number 5: A building designated as a Chicago Landmark pursuant to Article XVII of Chapter 2-120 of this Code unless the landmarked building is required to be equipped with an automatic sprinkler system by other provisions of this Code.

Exception Number 6: A building within a landmark district designated pursuant to Article XVII of Chapter 2-120 of this Code and determined to be a contributing building unless the contributing building is required to be equipped with an automatic sprinkler system by other provisions of this Code.

Exception Number 7: A building color-coded red or orange in the Chicago Historic Resources Survey, published in 1996, unless the building is required to be equipped with an automatic sprinkler system by other provisions of this Code.

For purposes of this section, “non-transient residential” means a residential use other than a hotel, motel, bed-and-breakfast establishment, dormitory, transitional shelter, emergency shelter or other temporary residential use.

(Added Coun. J. 12-15-04, p. 39962, § 3)

Chapel Hill, NC – Sprinkler Retrofit for Establishments Serving Alcohol

AN ORDINANCE TO AMEND THE CODE OF ORDINANCES OF THE TOWN OF CHAPEL HILL TO REQUIRE THE INSTALLATION OF SPRINKLERS IN NEW AND EXISTING ESTABLISHMENTS SERVING ALCOHOLIC BEVERAGES IN ACCORDANCE WITH CERTAIN SIZE, STRUCTURE AND TIME LIMIT STANDARDS (2003-09-22/O-5)

BE IT ORDAINED by the Council of the Town of Chapel Hill as follows:

Section 1. Chapter 7, Article II of the Chapel Hill Code of Ordinances is hereby amended by adding a new Division 7 to read as follows:

“DIVISION 7. SPRINKLER REQUIREMENTS-PLACES SERVING ALCOHOLIC BEVERAGES

Sec. 7-60. Sprinkler Requirements for new establishments with an occupancy load exceeding 200 persons serving alcoholic beverages.

Any new occupancy to be established with a rated occupancy load exceeding 200 persons and serving alcohol under a North Carolina ABC classification of private club or retail on-site consumption of mixed drink or malt beverage must have an approved NFPA 13 fire sprinkler system installed prior to issuance of a Certificate of Occupancy.

Sec. 7-61. Sprinkler Requirements for existing establishments with an occupancy load exceeding 200 persons serving alcoholic beverages.

Any existing occupancy with a rated occupancy load exceeding 200 persons and serving alcohol under a North Carolina ABC classification of private club or retail on-site consumption of mixed drink or malt beverage must be retrofitted with an approved NFPA 13 fire sprinkler system within 5 years of the enactment of this Division. At the end of the 5-year period any occupancy as described in this section without an approved sprinkler system the occupancy shall have its Certificate of Occupancy revoked by the Town.

APPENDIX B *(continued)*

SAMPLE RETROFIT ORDINANCES

Sec. 7-62. Sprinkler Requirements for new establishments with an occupancy load exceeding 100 persons serving alcoholic beverages.

Any new occupancy to be established with a rated occupancy load exceeding 100 persons and serving alcohol under a North Carolina ABC classification of private club or retail on-site consumption of mixed drink or malt beverage and that has any of its required egress points one story or more above or below grade must have an approved NFPA 13 fire sprinkler system installed prior to issuance of a Certificate of Occupancy.

Sec. 7-63. Sprinkler Requirements for existing establishments with an occupancy load exceeding 150 persons serving alcoholic beverages.

Any existing occupancy with a rated occupancy load exceeding 150 persons and serving alcohol under a North Carolina ABC classification of private club or retail on-site consumption of mixed drink or malt beverage and that has any of its required egress points one story or more above or below grade must be retrofitted with an approved NFPA 13 fire sprinkler system within 5 years of the enactment of this Division. At the end of the 5-year period any occupancy as described in this section without an approved sprinkler system shall have its Certificate of Occupancy revoked by the Town.

Sec. 7-64. Restaurants exempted.

None of the provisions of this Division shall apply to restaurants as defined in North Carolina General Statute Sec. 18B-1000 (6).

Sec. 7-65. Automatic sprinkler system not to be disabled.

Upon the occupancy of any new structure subject to this Division or upon the completion of the installation of an automatic fire sprinkler system in an existing structure subject to this Division, no person shall shut off or disable such automatic fire sprinkler system and no owner or resident of such structure shall fail to prevent the shutting off or disabling of such a system. Provided, however, that a sprinkler system may be shut off in order to perform maintenance work on the system during the time that qualified maintenance personnel are on the premises performing necessary maintenance work. Such maintenance work shall only be conducted after notice to and approval by the Town Fire Department.

(Ord. No. 96-11-11/O-5a, § 1, 11-11-96)

Sec. 7-66. Penalties.

(a) Criminal penalties. Violation of any provision of this division shall be a misdemeanor and shall be subject to a fine of \$500.00 or imprisonment for not more than 30 days.

(b) Civil enforcement. This division may be enforced by civil penalty or appropriate equitable remedy as may be authorized by applicable N.C. General Statutes, including but not limited to G.S. Sec. 160A-175, G.S. Sec. 160A-432 and G.S. Sec. 143-139.”

(Ord. No. 96-11-11/O-5a, § 1, 11-11-96)

Section 2. This Ordinance shall be effective upon enactment and shall apply to all buildings for which building permits are issued by the Town after the date of enactment.

APPENDIX C: A FIRE SPRINKLER CONTACTORS PERSPECTIVE

This perspective is provided by Jay Livingston of Livingston Fire Protection in Hyattsville, Maryland. Mr. Livingston has been a long-time member of NFSA and a strong supporter and advocate at the local, state and federal level. Jay traveled across his state and around the country assisting in local and state government with fire sprinkler requirements and doing so without getting any of the work. His commitment to improving fire and life safety was recognized by the NFSA when he received the Technical Service Award, which was presented by then-Governor of Maryland, Martin O'Malley.

RETROFIT OF FIRE SPRINKLERS IN EXISTING BUILDINGS

The most difficult installation of a fire sprinkler system is the retrofit of an existing property.

Estimating the cost and sale price for the retrofit of an existing, occupied residential single family dwelling is vastly different from retrofitting a high rise residential property and an occupied commercial property.

Vast differences in material and labor must be considered. Projects require differences in layout, surveying and water supply requirements which must be considered. Differences in exposed piping and the concealment of piping are major cost factors. The providing of fire standpipe risers, floor control assemblies, drains and core drilling costs for high rise properties add substantially to the cost per sprinkler installed and tested.

Cost and material preparation will be higher when considering a metallic piping system as compared to a non-metallic system.

In other than a single family residential property, if for some reason metallic piping is used, additional labor may be required in an occupied residential property to drain down existing systems at the beginning of each work day and if required by the AHJ, filling of the system at the conclusion of a work day in order to keep existing sprinklers in service when the system is not being worked on, adds to labor costs for non-productive time and fewer materials being installed each shift day. The requirement for maintaining protection on an existing system may not be possible due to the fact that nonmetallic piping must endure cure time before placing into service or testing.

Protection of valuables, inventory and furnishings differ in occupied versus a vacant property which could add additional labor time to the installation.

Cutting and patching of walls and ceilings, removal and replacement of ceiling tile, providing or upgrading of water supply requirements, will also impact the cost of retrofitting an existing property and must be considered in the computation of labor hours.

While considering performing a retrofit fire sprinkler system in an existing property, there are numerous additional factors that must be evaluated. Retrofitting of existing properties is a dangerous undertaking for a company unless they are fully versed on the possibilities of success and failure. Local requirements vary greatly in permit costs, material acceptance and testing requirements. Job-site requirements involving treatment of existing surface finishes, pipe and sprinkler locations, water supply regulations, hanger and insulation requirements and protection of certain occupancy spaces and their use must be known before compiling an estimate to proceed.

In order to help prepare for estimating a retrofit fire sprinkler system, the below listed considerations are necessary to evaluate. Due to the fact that costs for materials, fees and labor vary from region to region, ranges and hours are used without specific local costs:

Estimated cost ranges for the retrofit of an existing property with fire sprinklers:

Field check – This function must be performed by an experienced estimator/layout technician – 2 to 4 hours per floor. This estimate is for a single family, townhouse and high rise residential property with duplicate units. If the system is to be concealed throughout, 8 to 16 hours per floor may be required.

Permit fees – These fees vary greatly from jurisdiction to jurisdiction. Some jurisdictions charge a single fee for single family and another fee for high rise residential properties. Others that we have encountered charge a range from \$3.50 per sprinkler to up to \$17.00 per sprinkler. One should be sure that the permit charges are known before being shocked well into the project performance.

Layout costs – If relatively accurate plans are available for the property, the layout cost by a certified layout technician should be $\frac{3}{4}$ of an hour per

APPENDIX C *(continued)***A FIRE SPRINKLER CONTACTORS PERSPECTIVE**

sprinkler for single family and 1 hour per sprinkler for high rise residential. If relative accurate plans for the property are not available, and field measurement is necessary 1 hr. to 1 ½ hr. per estimated sprinkler may be necessary.

Material cost – a conservative material cost should be \$18.50 per sprinkler. Additionally, in the case of a high rise retrofit that consisted of a fire sprinkler control assembly on each floor, the additional floor control and alarm/ test/drain assembly costs should be in the vicinity of \$900.00 per floor level and 4 hours of additional labor cost per floor. Additional costs will involve core drilling of holes for drain piping and alarm wiring. Core drilling costs range from \$50.00 to \$60.00 per hole depending on the number and size of the holes required. One should secure the price of core drilling from the provider or have a good idea of the cost if performed in house. Hanger and device costs can be determined by the pipe sizes and material preparation processes. Most of the time, these costs will be close to \$4 to \$6 per sprinkler through 2” pipe and \$11 to \$13 per sprinkler up to 6” pipe.

Metallic fabrication costs – Fabrication costs to prepare and prefabricate materials for shipping and installation are based on pipe sizes and fabrication machinery. The estimator should determine this cost in concert with the fabrication department manager or outside fabrication provider. Differences in the costs of screwed and welded piping differ from company to company. There are not usually fabrication costs related to nonmetallic piping other than sorting materials and delivery costs to the jobsite. Some companies arrange for nonmetallic materials to be delivered directly to the jobsite from their material supplier.

For water supply costs to supply a fire sprinkler system for a multistory residential or commercial fire sprinkler retrofit, the costs will vary depending on the hazard classification and layout demands.

The high rise residential property would likely have an existing wet fire standpipe system. To supply a residential retrofit for such a building, it is normal to cut into the existing fire standpipe system piping on each floor and install a check valve, control valve, water flow alarm switch and a test and drain assembly. As mentioned above, it may be necessary to core drill a series of holes for the drain piping and alarm wiring to be extended to lower levels of the building. It is important to include or exclude the cost of alarm wiring and systems to the retrofit selling price. One should be sure that

the existing water supply and volume will serve the most remote fire sprinklers without the need of a fire booster pump, which if overlooked, could be a devastating additional expense.

Labor cost – The most variance in the cost of retrofitting any type of fire sprinkler system, throughout our country, is that of labor; therefore we will deal with man-hours rather than the cost of labor per man-hour.

If the property is occupied, the installation labor cost can escalate to 5 to 7 sprinklers per day for steel piping if the system is to be drained down and filled at the beginning and end of each daily shift. It is not possible to drain down and fill a system each day if nonmetallic piping is used due to cure time of the materials installed during the same day.

Testing and final Inspection – Depending on the jurisdiction charges, it is usual for the permit fee to include a pressure and close-in inspection, testing and final inspection. The contractor should determine if additional charges by the local jurisdiction will require additional charges for these two job site visits and additional charges for repeat inspections should one inspection fail. The close-in inspection involves a required hydrostatic pressure test and a visual inspection of all piping before any covering, such as drywall, ceiling tile installation or manufactured concealment is put into place. In areas that have freezing temperatures and the areas being tested are below freezing at the time of the test. Additional care must also be taken to be sure all water is drained from the system after the test is completed until proper insulation and heating of the property is in service to stay. Care must be taken to protect the piping from freeze damage both during and after the test. Some jurisdictions require that the sprinkler openings be plugged and the sprinklers not be installed until after the hydrostatic test is approved. Test pressures for the test vary according to the jurisdiction.

Having performed and passed the visual and pressure test, the fire sprinkler contractor must wait until all concealment, insulation, painting, alarm and water supplies are in place before installing the sprinklers and/or escutcheon plates.

The final inspection usually takes place when the property is ready for occupancy; all interior finishes are completed and all trade inspections have been passed.

In the case of high rise residential retrofit, the pressure tests and final inspections can be performed on each floor level as the floor level has

APPENDIX C *(continued)***A FIRE SPRINKLER CONTACTORS PERSPECTIVE**

been tested and approved. We typically prefer to begin a high rise retrofit on the highest floor levels to provide protection to the most vulnerable occupants to fire evacuation and work downward toward completion.

Commercial concealment – Some retrofit operations require mechanical concealment of piping. There are two approved systems presently widely used for this purpose:

SoffitSteel – This concealment product consists of a metal molded, three sided product that can be installed over piping, attached to a wall or overhead surface, to conceal the piping and hangers. The current price of this product is approximately \$17.00 per foot installed. **DeccoSheild** – This product is a non-metallic product that is molded to cover piping on both sidewall and ceiling surfaces as well. The current installed price for this product is approximately \$10.00 to \$15.00 per foot.

Both of the aforementioned products require special hanger devices that secure the piping as well as the covering material.

Exclusions from contract costs and responsibilities: Being a fire sprinkler contractor, we cannot be considered the “jack of all trades”. For that reason, we must be perfectly clear when providing a contract price to a potential customer about what we will do and what we will not do for the contract price provided.

The following is a partial list of exclusions that a fire sprinkler contractor may list from the contract responsibility. Some of these services could be in the scope of the fire sprinkler contractor’s capabilities, however all should be considered. Some services can be included in the fire sprinkler contractor’s scope and subcontracted to other skilled trades within the discipline needed:

- Cutting and patching of drywall, plaster and other surfaces penetrated by the fire sprinkler layout. Removal and replacement of ceiling tile and ceiling structures.
- Water supply flow tests of outside supply sources. Standpipe risers and supply piping.
- Covering of valuables, furnishings and carpeting. Core drilling for riser and/or drain piping.
- Painting and patching of any surfaces penetrated by the retrofit operations. Damage to valuables left within the occupancy and not put away as instructed.

In conclusion, retrofitting of existing properties is a very important service of our trade and should be performed with care and skill.

Local regulations have not widely required retrofitting of existing properties unless the properties are undergoing a major remodeling. We need for our municipal legislators to be convinced that fire sprinklers are the major product available today to save lives and property. One of the major responsibilities of our legislative bodies is to protect the welfare of the citizenry.

The writer wishes for this brief explanation of the performance of a retrofit property with lifesaving fire sprinkler protection will serve to further detail the relative cost of providing fire sprinklers compared to other inflated, uneducated prices that have been published by others to discourage retrofit regulations to be considered. Of course the retrofitting of an existing property is expensive. What is a life worth?

APPENDIX D: WEBSITES FOR ADDITIONAL RESOURCES

- 1) **National Fire Sprinkler Association**
<http://www.nfsa.org>
<http://www.highriselifesafety.com>
- 2) **Campus Fire Safety**
<http://www.campusfiresafety.org>
- 3) **National Fire Academy (NFA)**
<http://www.usfa.fema.gov/nfa>
- 4) **National Fire Data Center (NFDC)**
<http://www.usfa.fema.gov/nfdc>
- 5) **National Fire Protection Association (NFPA)**
<http://www.nfpa.org>
<http://www.firesprinklerinitiative.org>
- 6) **National Institute of Standards & Technology (NIST)**
<http://www.nist.gov/topics/fire>

National Fire Sprinkler Association

514 Progress Drive, Suite A
Linthicum Heights, MD 21090
845-878-4200
www.nfsa.org

About NFSA

Established in 1905, the National Fire Sprinkler Association (NFSA) is the voice of the fire sprinkler industry. NFSA leads the drive to get life-saving and property protecting fire sprinklers into all buildings; provides support and resources for its members – fire sprinkler contractors, manufacturers and suppliers; and educates authorities having jurisdiction on fire protection issues. Headquartered in Patterson, N.Y., NFSA has regional operations offices throughout the country.

NFSA Mission Statement

To protect lives and property from fire through the wide-spread acceptance of the fire sprinkler concept.



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