

Bridging the Gap: A Guide to Implementing a Residential Sprinkler Requirement



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By Jim Tidwell
with Michael Love

January, 2011

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Introduction

Residential sprinklers are widely recognized as the next revolution in reducing our nation's losses due to fire. While avoiding unfriendly fires is our goal, once a fire breaks out, the earliest intervention possible leads to the best outcome. Several studies verify the fact that the vast majority of fires are extinguished before they grow large enough to be of consequence¹; however, the small percentage of fires that grow beyond the control of building occupants cause the vast majority of deaths, injuries, and damage to property. Residential sprinkler systems present the most effective system response to these fires in homes. It is anticipated that the installation of residential sprinklers will result in reducing injuries, deaths, and property loss to a far more acceptable level than we are currently experiencing. The regulatory community has embraced this theory so that now every model code related to one- and two-family dwellings contains requirements for the installation of residential sprinkler systems.

Because residential sprinkler requirements are relatively new to most jurisdictions, there is an overall lack of guidance about their implementation. This guide is intended to provide a roadmap for jurisdictions that have adopted residential sprinkler system requirements to implement that regulation in a logical, business-like manner. The information herein is based upon successes (and failures) of other jurisdictions that have executed such a policy in the last few years. Realizing that every jurisdiction is different, we have taken into account resource allocation issues, technical barriers, and other concerns that will necessitate different approaches by different jurisdictions.

Included in this guide are sample policies, procedures, and checklists to assist jurisdictions in formulating their own best practices. These samples are a compilation of those from successful implementations across the country, and are considered "open source" so that anyone can copy, modify, and use them as they see fit. The guide is organized into sections that provide a series of decision points that should be considered as a jurisdiction moves forward with implementation.

¹National Fire Protection Association "U.S. Experience With Sprinklers": 65% of fires in buildings equipped with sprinklers were too small to activate the sprinkler system. Consumer Product Safety Commission "Residential Fire Survey, 2004-2005": Only 3.4 percent of all fires are reported to fire departments.

This guide is not all-inclusive of the best practices, but is a starting point for collecting and providing access to the successful work of jurisdictions throughout the United States that have residential sprinkler mandates. It is arranged using four major topics:

- Addressing Policy Issues
- Organizing a Stakeholder Group
- Considerations for Key Decision Points
- Background, Models, Best Practices and Examples

Within each major topic are sub-topic areas that provide guidance on related issues. The sub-topic areas contain best practices gathered from throughout the United States that can provide the implementing jurisdiction with a model for practices on managing the business of a residential fire sprinkler requirement. To enhance visual presentation, this guide provides flow charts, matrixes and other visual means to help the reader make decisions or see how a process works.

Addressing Policy Issues

In order to best manage the development and implementation of a residential sprinkler regulation, it's important to understand the legal basis for the authority to do so. A discussion of the U. S. legal process can be found in [Appendix D](#).

The most common types of residential sprinkler legislation are:

- Stand-alone ordinances (municipal, county, fire district/authority). This is probably the most predominant style of regulation at the time of publication. A stand-alone ordinance has the benefit of providing significant opportunity for input and influence by local stakeholders. Issues of interest to any stakeholder can be vetted through a comprehensive, collaborative process. Concerns of contractors, water purveyors, and citizens will be considered during the development of the legislation, assuring that all points of view are taken into account.
- Model Code Adoption (municipal, county, fire district/authority). Recently the International Residential Code followed NFPA 101 and NFPA 5000 in placing a requirement in the model code for one- and two-family residences to be equipped with residential sprinkler systems.
- State adoption of minimum code requirements (usually based upon model codes).¹
- State adoption of mini-maxi code requirements (usually based upon model codes).²

¹Statewide minimum codes allow local jurisdictions to adopt more restrictive requirements than the state code.

²Statewide Mini-Maxi codes seldom allow any local changes to the state code and only under rare and unusual circumstances.

Stand-alone ordinances were adopted in many jurisdictions prior to the inclusion of residential sprinkler requirements in the model codes. These ordinances were typically initiated by the fire service, with support from various community leaders, industries, and trades, depending upon the politics of the jurisdiction. The goal of these efforts was to achieve a higher level of fire safety in the community, and, in some cases, lower the overall cost of fire protection. A stand-alone ordinance has the advantage of being considered separate and apart from a larger code adoption so that stakeholders can focus on this single issue rather than getting caught up in all of the issues complicit in a major code update. Homebuilders, water purveyors, fire protection professionals and others have ample opportunity for input, discussion, and collaboration. While it's probably more difficult from a political perspective to adopt a stand-alone ordinance, it's possible that because of the added focus, it will be more readily accepted.

The advantage to adopting a model code rather than a stand-alone ordinance is that the model code provides a wide range of fire and life safety requirements in a single document, and those provisions are coordinated to avoid conflicting provisions. The code has been through a national consensus process, and may have greater legal standing than a regulation produced locally. In addition, once the code is adopted, the sprinkler requirement becomes one of many contained in the regulation, making it a less likely target than if it were a stand-alone document. Once adopted, the sprinkler requirement is easier to defend and justify as an overall part of the code.

Most jurisdictions that adopt model codes as the basis for their building and fire regulations go through an amendment process to address issues important to the individual community. These may be related to climate, topography, or other criteria identified by the community leaders. The requirement for residential sprinklers is likely to be hotly debated at the local level, with proposals to delete the requirement entirely or to provide additional incentives. (Note that those individuals or organizations that have weighed in on both sides of the issue are likely the very individuals or organizations that should be part of the stakeholder group when it is time to implement the requirement.)

A number of states adopt statewide minimum standards for construction. In some states that omit the residential sprinkler requirement from the model code, local jurisdictions are permitted to introduce such a requirement on a local level. This will be similar to passing a local ordinance, or simply amending the state regulation locally.

In “mini-maxi” states, construction regulations are promulgated at the state level, and local jurisdictions aren’t authorized to amend them. In some of these states, local jurisdictions are charged with the responsibility of enforcing the state standards, but have no authority to change them. Local jurisdictions in states that adopt regulations requiring sprinklers in one- and two-family dwellings may find themselves in a situation whereby they must develop a process for enforcing this new regulation over a short period of time with little room for negotiation with stakeholders.

Regardless of the type of legislation, it will be important to pursue a collaborative approach to implementation. Identifying stakeholders and an appropriate organizational approach will form the foundation of your implementation effort. This activity will be addressed in the next section of this guide.

In jurisdictions with a building code that doesn’t have a residential sprinkler requirement, it is still possible to pursue other avenues to achieve sprinkler protection in homes. By building alliances and promoting the inclusion of residential fire sprinklers in homes, you can encourage voluntary installations. Promoting residential fire sprinklers to developers and builders is often accomplished by offering incentives that reduce the cost of construction projects and enable streamlined business processes that can save time on the project. [Appendix A](#) of this guide provides considerations for voluntary inclusion of residential fire sprinklers.

Other Policy Areas to Consider:

If your jurisdiction has adopted a code or regulation requiring residential fire sprinklers, there may be other policy areas that need to be considered in the implementation of the requirement. While assuring code compliance may not require changes to your business process, there may be opportunities for policy changes that will streamline the enforcement and make the regulation more palatable to those in opposition. Some of these policy changes include:

- Financial impacts: Building permit fees are normally based upon the estimated cost of construction. This cost includes all components and systems, including sprinklers. If an additional fee is required to review and inspect residential sprinkler systems, the building community may object to what they perceive as paying twice for the same service.
- Incentives considered for installing sprinklers are contained in the model codes; however, if the jurisdiction determines that its citizens will enjoy additional financial benefits, it is appropriate to consider reductions in

some of the fees associated with permits, inspections, and approvals for these systems.

- New licensing and certification for trades associated with fire sprinklers may be considered where licensing is currently based upon the requirements for designing and installing commercial fire sprinkler systems. Residential systems are, by design, less complicated than their commercial cousins, and the same level of expertise may not be required for installers. Where designs are provided by factory or proprietary system engineers, local engineering criteria may not be necessary. Some states have implemented separate, less restrictive criteria for the licensing of persons who design and/or install residential sprinkler systems.

Another policy decision is whether the jurisdiction will accept the model code or standard intact, or will make local changes to accommodate some perceived weakness in the requirements. A note of caution here: Changes to the national standards to make them more restrictive that increase their cost will almost certainly have a negative impact on the overall program. Some of the more stringent requirements that have been adopted in jurisdictions include:

- Requiring sprinklers in garage areas
- Requiring sprinklers in attics
- Requiring sprinklers in small bathrooms and closets
- Requirements for material-specific piping (for example, copper piping)
- Prohibitions against some materials (for example, PEX piping)
- Increasing water supply requirements

Prior to the residential sprinkler standards' being developed (NFPA 13R and NFPA 13D), the only national sprinkler standard was intended for the protection of commercial property (NFPA 13). The NFPA standard requires virtually 100 percent coverage of all spaces, it includes water supply requirements based upon commercial fire loads, and, in general, is considered far more robust than necessary for residential occupancies. Based upon that assumption, new standards were developed for the specific purpose of providing a high level of life safety in residential applications, and to accept a certain level of risk to the property in return for a lower overall cost of the system. The national consensus processes used to develop these standards provide a significant amount of credibility when they're adopted. Local changes to these standards may not enjoy that same level of credibility; therefore, any changes to the national standards should be well thought out and made acceptable to all stakeholders if possible.

Organizing a Stakeholder Group

It's likely that a stakeholder group was assembled to pass the legislation leading to a residential sprinkler requirement. It's also likely that a stakeholder group was assembled to oppose the requirement. If so, the members of both groups should be invited to serve on the stakeholder committee to develop the implementation criteria. Having the right players – supporters and opponents – at the table when discussing all of the decision points will provide the greatest opportunity to resolve any controversial issues prior to implementation.

Implementing a residential fire sprinkler requirement impacts many people in the community. No matter how the regulation came about, involvement by people that will be most affected is a necessary part of the implementation process. People buy into change more readily when they are able to communicate their concerns and help to resolve problems and overcome barriers.

This section of the guide assists in identifying stakeholders and presents some best practices to approach involvement of stakeholders. While two of the best practices represent very formal techniques, they are not the only way to approach this helpful step in the implementation. Any methodology that provides for robust communication and is acceptable and viable for the community involved will serve to promote a smooth implementation. The objective is to emphasize the importance of collaboration with all interested parties to identify issues that may affect the success of the implementation.

Why Stakeholder Support Is Needed

Having stakeholder support is a significant benefit to implementing a residential sprinkler requirement without major setbacks or unnecessary delays. A move to residential fire sprinkler systems in residential structures is a complex process that impacts a wide range of stakeholders. These stakeholders probably already have a position on residential sprinklers and can be supportive, resistant, or ambivalent. Some may be completely unaware of the technology, or otherwise indifferent. But if all the groups participate sincerely, many positive benefits will accrue.

Involving stakeholders in a change process is a positive strategic approach. In the book *Managing at the Speed of Change*, author Daryl Conner describes the benefits of

active involvement of those who are subjected to change and asserts that this positive involvement can create synergy, defined as a result that is greater than the sum of its parts. The members still may not be positive supporters of residential sprinklers, but they may become a positive supporter of you as the implementer.

The main goal of this phase is to identify any problems or issues that will arise and start to gather information to develop solutions. Stakeholder involvement not only helps to build consensus but it increases the knowledge needed to accomplish the little-known areas of processes that are sometimes referred to as the “devil in the details.” By creating and managing the stakeholder group, you will create a mechanism and forum for obtaining needed technical input as well as to address any misinformation or misunderstandings that may exist.

What to Call the Stakeholder Group

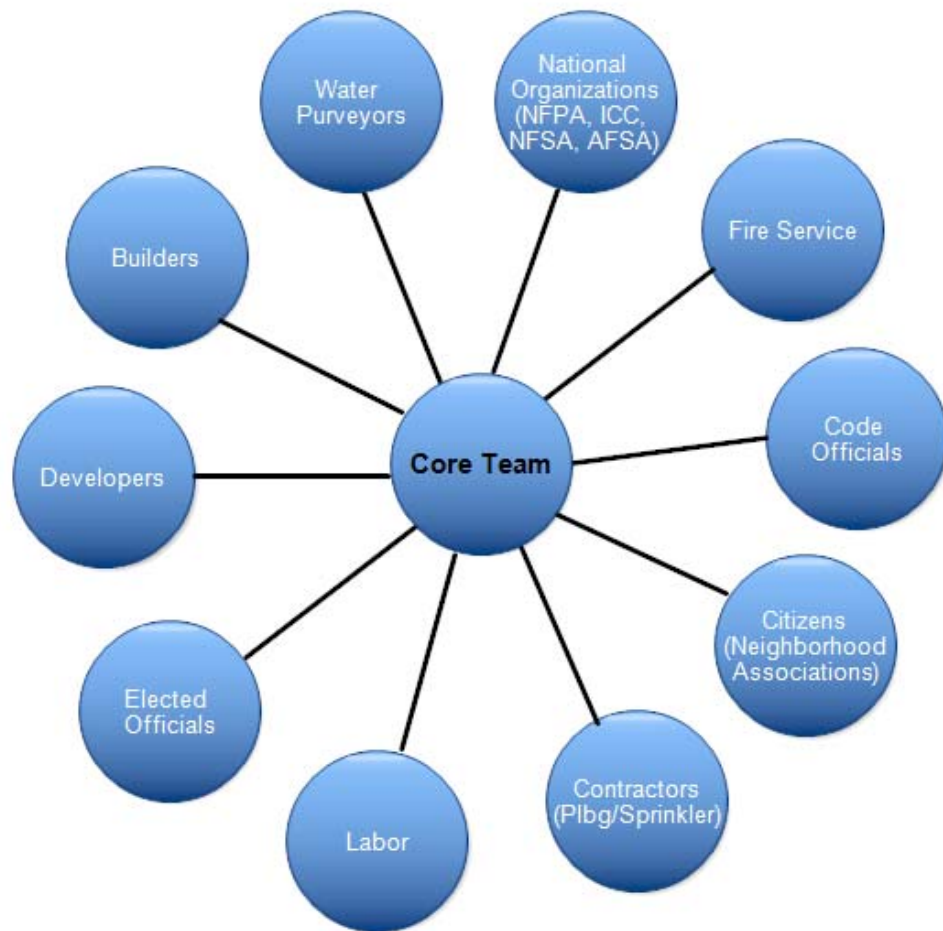
There are many ways to gather the input needed for the implementation. The name of the group assembled is less important than the makeup and the outcomes, but some of the more common names include task forces, committees, and work groups. For the purposes of this guide, we’ll use the term “task force” to identify the core stakeholder group. Task forces have become a popular way to organize around problem solving or information gathering and lend themselves to a diverse range of people and issues.

A task force is a group that is formed to work through a specific short term issue. Generally, task forces are defined by a purpose, in this case to identify all areas of concern and issues involving the implementation of a residential fire sprinkler requirement. A task force should have a specific starting point and ending point. This range from start to finish doesn’t necessarily need to be based upon a specific time frame, but could be goal based, or could meet until there is consensus of the issues identified. Using a task force process allows you to meet on a regular basis with stakeholders, identify key areas of concern, and produce a documented end product. Since it’s likely that a number of functions will be undertaken simultaneously to speed up the process, it will be helpful to have subgroups to accomplish work on some of the more specific issues.

Best practices for stakeholder involvement can be found in [Appendix B](#).

Do You Have the Right Members in Your Stakeholder Group?

STAKEHOLDER MEMBERSHIP



For purposes of this discussion, a stakeholder can be described as a person or organization that is concerned about or affected by a change; has a vested interest in the change; or is just involved in some way in a proposed change. A new residential sprinkler requirement is an important change that affects many people. To identify the potential stakeholders, a small planning group may be assembled to answer some key questions, such as:

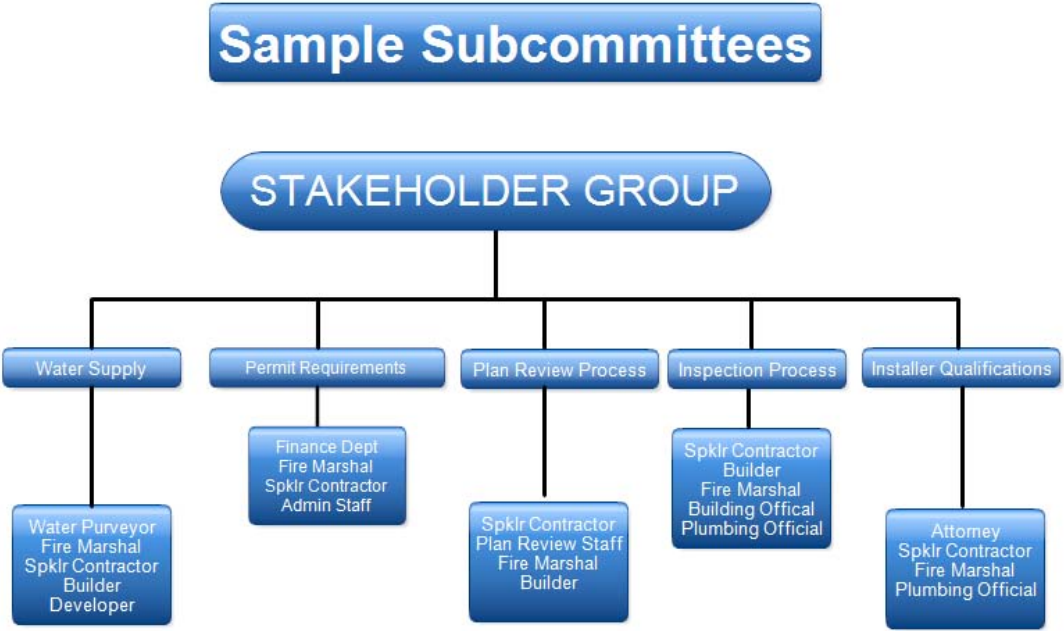
- Who has a stake in the requirement for residential fire sprinkler systems?
- Who is most affected by the problems or issues created by a requirement?
- Who has concerns?
- Who might have a different view?
- Who is best able to solve problems that may come up in discussions?
- Who might have a positive opinion or could be a champion for the effort?
- Who has expressed opposition?

The various stakeholders chosen to participate in a 2009 task force on residential fire sprinkler system requirements in California included representatives from the following:

- California Fire Service
- Building Industry
- Building Officials
- Public Health Officials
- State Agencies
- National Fire Protection Association
- National Fire Sprinkler Association
- League of California Cities
- Manufactured Housing Institute
- Design Professionals
- Water Purveyors
- American Water Works Association

In 1986 Prince George’s County, Maryland, identified similar groups but also included representatives from the Board of Trade, Insurance Industry, and Elected Officials.

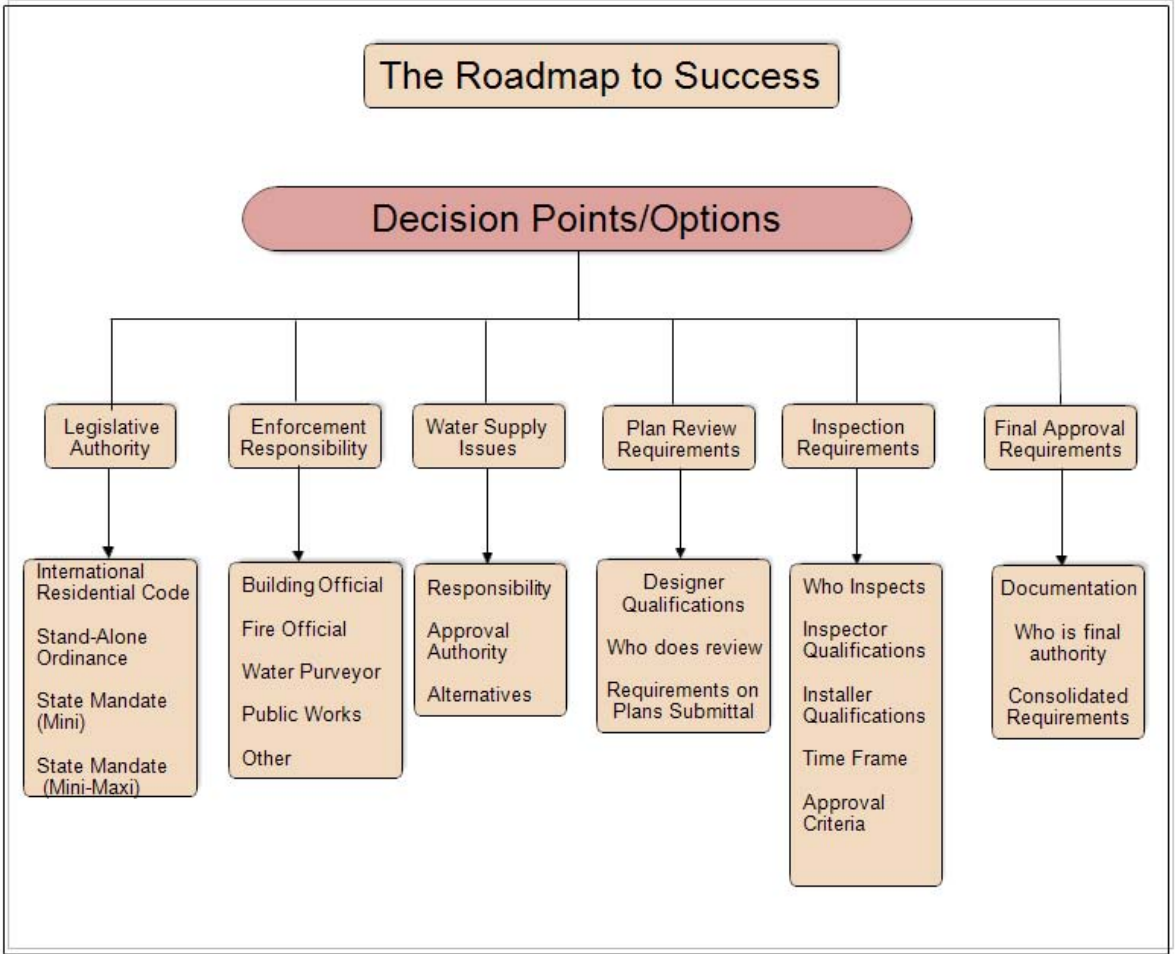
If you compile a list similar to the examples above and consider staff involvement, the number of people and interests becomes significant. There may be some people who will have limited specific roles and others whose involvement falls across the entire scope of the sprinkler implementation. This step (identifying stakeholders) will provide a good starting point for input and discussion. This group will provide important information, and will be a resource for implementing all the other aspects of the ordinance. Each person and organization should be acknowledged in any report or document that results from the effort. Including their contact information (with permission) is also a good idea, as others may have specific issues they wish to submit to one of the members.



Note: Number and size of subcommittees will be contingent upon the needs of the core group; this graphic is only one example

Considerations for Key Decision Points

Boiled down to its simplest form, stakeholders are needed to gain consensus and support for the decisions of the group. Identifying as many of these decision points in advance of meeting with the stakeholders will help illustrate the kinds of issues to be addressed. Some of those decisions may have already been made during the legislative process, and should be clearly identified as to what the decision was, why it was made, and how it affects the implementation. The graphic below shows many of the typical decisions involved in the implementation process.



Decision Point: What Is the Legislative Authority for the Residential Sprinkler Requirement?

The decision to require residential sprinklers is typically made as a part of the legislative process; however, it's important to identify the source of the regulation, and any impacts it may have on other issues. For instance, if the International Residential Code (IRC) was adopted, it contains optional design criteria (IRC P2904) to the other national standard, NFPA 13D. However, if a stand-alone ordinance was adopted, this option may not be legislated, but could be part of the discussion as an alternative means of compliance. The IRC provisions contained in P2904 have been deemed equivalent to NFPA 13D. The difference is that the IRC approach is more prescriptive in nature, and doesn't require the level of engineering that may be necessary under the NFPA standard. Homebuilders, plumbers, and others that aren't as familiar with the engineering aspect of sprinklers seem to prefer the prescriptive approach. (Many of the prescriptive criteria in the IRC have been incorporated into the latest version of NFPA 13D).

If a statewide mini-maxi code has been adopted, it's likely that any alternatives are off the table for the task force. In this case, an explanation of the legal requirements will be helpful to avoid spending time and resources debating issues that are beyond the control of the group. The attorney for the jurisdiction will probably be in the best position to provide this explanation. Whether the attorney is a member of the task force or not is a decision for the task force leadership; at a minimum, the jurisdiction's attorney should be available to the task force to answer any questions that might arise during discussions.

The following model codes include requirements for residential fire sprinkler systems:

Code	
International Residential Code	IRC: R313 Automatic Fire Sprinkler Systems
International Building Code	903.2.8: Sprinkler Systems in Residential Buildings
NFPA 5000 Building Construction and Safety Code	5000: 22.3.5.1 Extinguishment Requirements
NFPA 1 Fire Code	1: 13.3.2.18 One- and Two- Family Dwellings
NFPA 101 Life Safety Code	101: 24.3.5.1 Extinguishment Requirements

The following reference standards are frequently identified for specific information about installations and equipment involving fire sprinkler systems:

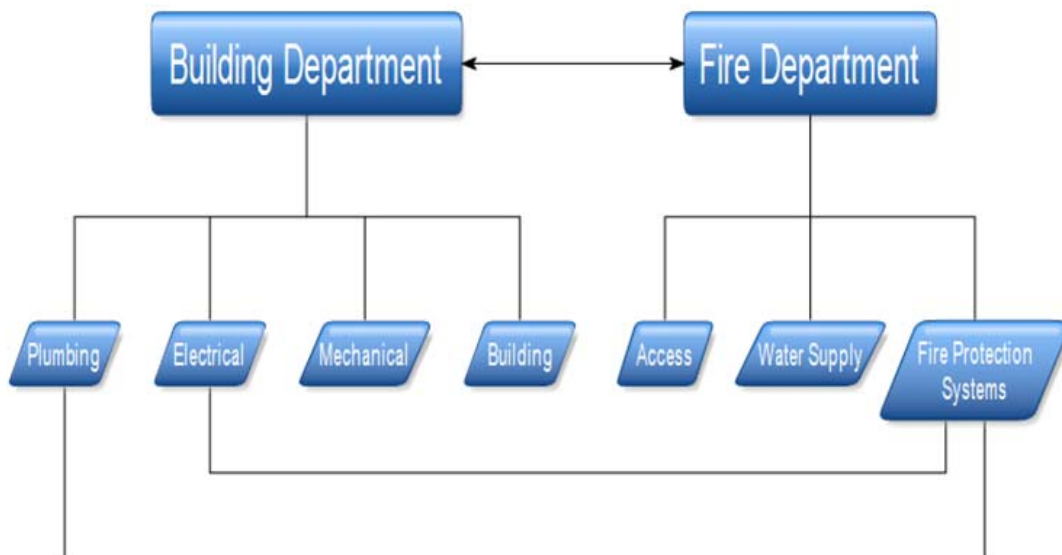
Reference	
NFPA 13 Standard for the Installation of Sprinkler Systems	This standard doesn't specifically address residential sprinkler systems, but provides substantial information that may be helpful
NFPA 13D Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes	
IRC 2904	This portion of the IRC has installation requirements for residential sprinkler systems.

More background on the legal authority for code compliance can be found at [Appendix D](#).

Decision Point: Who Has Enforcement Responsibility?

The authority for enforcement will normally fall upon an existing agency within the jurisdiction. Depending upon the characteristics of the jurisdiction, this responsibility might fall to the fire department’s fire prevention office, the building official, or the plumbing official. Other options would include the water purveyor or public works, if they have the technical expertise and other resources to manage the process.

If no existing agency has the resources to enforce the new provision, consideration may be given to dividing the work among agencies. For example, the fire department might conduct plan review, and the plumbing inspectors might inspect the sprinkler system while on site conducting the plumbing inspection.



If work is to be shared between departments, close coordination and communication is critical to a successful outcome. A jurisdiction’s building department is often the responsible agency for all one- and two-family dwellings, even if the fire department is involved in commercial construction. In these communities, a case can be made that the building department should have overall enforcement authority for all work involved, including sprinklers in one- and two-family dwellings. It would be wise for the building department to work closely with

the fire department, as the level of public acceptance will be higher with a coordinated approach than with a single department.

In jurisdictions with little or no existing resources to undertake enforcement activities, or when the existing resources are not sufficient to do so, consideration of using outside organizations to conduct the plan review and inspections may be necessary. This could be as simple as requiring a certification from a qualified third party that the system is designed and installed in accordance with the regulation, or it could involve considerable qualifications criteria, quality control checks and oversight by the jurisdiction.

There are two common methods for jurisdictions to utilize third-party plan review and inspection agencies. Probably the most predominant method is to identify the necessary qualifications for the third-party firms, and allow the third parties to contract directly with the developer/builder. This is the simplest and most straightforward way for a jurisdiction to avoid the cost of enforcement activities while maintaining some regulatory oversight. The other common method is for a jurisdiction to contract directly with one or more third-party agencies to conduct plan reviews and inspections in the jurisdiction. The jurisdiction collects fees for permits to cover the cost of the third-party work. This arrangement provides somewhat more oversight by the jurisdiction, and still provides significant flexibility in allocating resources. The costs of the third-party activities are directly tied to their production, so that when development slows down, with a correlating reduction in permit fees, the costs of the third party also go down. In this case, the private sector is responsible for down-staffing or otherwise cutting costs to meet demand.

Decision Point: Will Permits Be Required, and What Will the Permit Requirements Be?

There are several reasons to require permits as one component of the regulation. Permits allow a jurisdiction to open a dialogue with the installer, communicate expectations, scrutinize the installer's qualifications, and potentially recover part or all of the cost of implementing a requirement. Should a jurisdiction decide to forgo specific permitting of residential sprinkler system installation as a part of its implementation, consideration of other means to trigger plan reviews, inspections, and other enforcement actions must be made. Some jurisdictions include the residential sprinkler system in the overall building permit, and treat it like any other system in the building. This may be an effective and appropriate process if the components of a separate permitting system are added to the over-arching building

permit. Regardless, if no permit is required, oversight of the program will be severely constrained.

There are several pieces of the permit issue that the task force should consider:

- **Identification of Funding Sources.** Most jurisdictions today are underfunded, and will be reluctant to embark upon any new programs without identifying funding sources. Permit fees can underwrite whatever portion of the program's cost the task force deems appropriate.

When considering cost recovery, one formula is to identify the comparative benefit of the installation to the individual homeowner and the community at large. Because a residential sprinkler requirement will reduce the community's overall exposure to losses due to fire, everyone receives a benefit. However, the homeowner receives the most direct benefit, enjoys any incentives the jurisdiction offers, as well as reduced insurance costs, and a higher level of safety for his or her immediate family.

The task force should determine the percentage of benefit to the homeowner and the community. If the program costs \$100,000 to implement, and the task force determines that the homeowner gains 75 percent of the benefit, then permit fees should generate \$75,000, and the balance should come from the general tax base. The actual process to make this determination is significantly more complicated, but the outcome should be similar.

In order to calculate the actual cost of implementation, (permitting, plan review, and inspection services), the jurisdiction's finance group should be called upon for assistance. Identifying all of the activities and their costs will provide a clear indication to policy makers that the task force is competent and serious about their work. Salaries and benefits of employees, vehicle and other equipment costs, overhead including building rent, utilities, etc., and any maintenance costs should be included. It's likely that some personnel costs will be for persons who have responsibilities beyond the residential sprinkler project. Permit technicians, inspectors, and plan reviewers are likely to spend a portion of their time on residential sprinkler installations, so only a percentage of each will be used to calculate the actual cost of the program.

This exercise is also helpful in determining whether the regulatory activities will be conducted in-house by existing or new employees, or by qualified third-party contractors. The cost of each, along with an assessment of the benefits and barriers of each, should be considered to reach the best decision for the jurisdiction.

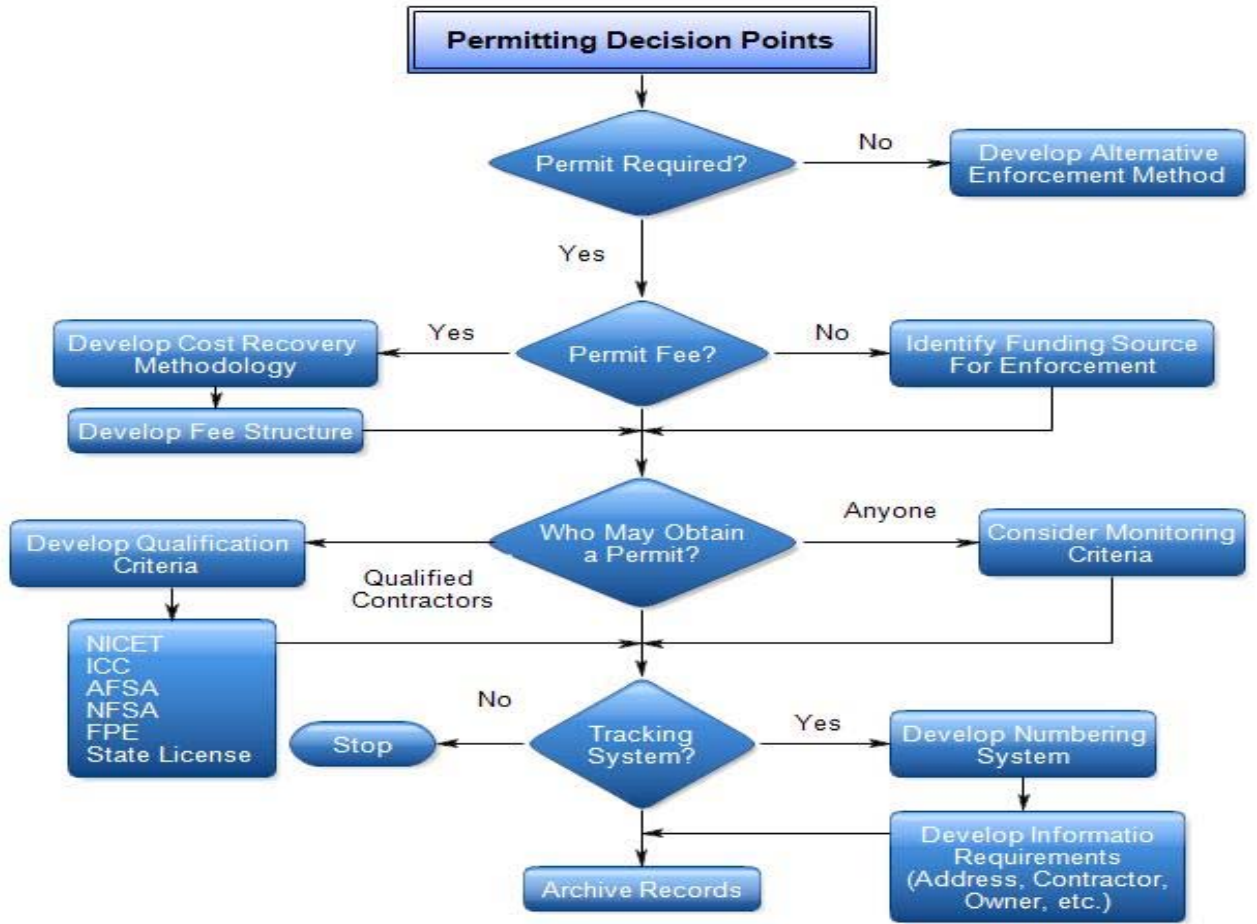
- **Qualifications of the Permit Applicant.** The permit applicant should be the person or company that will actually be submitting plans and installing the system. As such, it's appropriate to evaluate the qualifications of the applicant to assure he or she is competent to do the job. Allowing people who may not have the qualifications to obtain a permit may lead to misunderstandings and damage the credibility of the program. Some jurisdictions allow homeowners to obtain a permit for their own home. In these cases, there should be clear understandings about the requirements for plans submittals, installation criteria, etc., so that the homeowner fully appreciates the job he or she is undertaking. The jurisdiction should anticipate providing significantly more feedback to a homeowner than is normally required for contractors. Sample permit applications and checklists can be found in [Appendix C](#).

Another consideration here is state licensing requirements. Many states require the design and installation of sprinkler systems to be performed by a licensed contractor. These requirements normally specify the required training, certification, experience, and other requisites for license holders. In these cases, the person or company applying for the permit should adhere to the state requirements.

It's probably a good idea to be sure that all stakeholders are aware of the difference between a license and a certification. A license is issued by a governmental agency, and is normally required for conducting certain activities (driving, cutting hair, designing fire protection systems). Licensing requirements routinely include training, experience, and insurance as minimum qualifications, and a fee is paid to the agency to cover the costs of the licensing process. A licensee is typically accountable to an oversight body (state agency) that is authorized to enforce the licensing regulation and to ensure adherence to industry standards. Violators can be disciplined through a number of actions, up to and including revocation of their license.

A certification is normally considered evidence of knowledge or competence to conduct certain activities. Certifying agencies are normally private-sector organizations that have developed training, testing, or other methods to determine an applicant’s knowledge or ability to engage in the work described. Some manufacturers certify their technicians (GM certified mechanics), but there are also organizations that exist solely for the purpose of certifying individuals engaged in certain activities (accounting, building inspection). Some of these private sector organizations have more credibility than others; when determining qualifications for fire protection activities, investigation and analysis of the certifying organization is prudent.

Best Practices for permitting systems may be found in [Appendix B](#).



Decision Point: How Are Water Supply Issues To Be Handled?

This is a consistently controversial discussion that takes place wherever residential sprinkler systems are mandated. A dependable, adequate water supply is an essential ingredient of the residential fire sprinkler system and can often be the critical path issue in the implementation of a requirement. Water supply, fees and meter sizes have been some of the more difficult issues, and in some cases barriers, to a successful implementation. The water purveyor should be a key stakeholder and involved as early as possible.

In order to best engage the water suppliers, it's important to understand the philosophy that is used in their pricing of meters, water, waste water, and pumping capacity (impact fees). With water shortages occurring in many parts of the United States, and a continuing decline in fresh water supplies across the globe, these organizations are under pressure to control water consumption and recoup virtually all of their costs in the acquisition, treatment, and distribution of that commodity. Different utilities use different models to accomplish these goals; the most common method to correlate the supply requirements to the demand is the size of the water meter.

Meter size is used by many water suppliers to gauge the potential water use at a facility (residential or commercial). The theory is that larger meters will be used to consume larger amounts of water. Because the supplier must construct pumping stations, piping networks, etc., in advance of development, they charge the consumer for that infrastructure at the time of the building's construction based upon meter size.

Increasing the size of a meter for built-in fire suppression systems may result in significant increases in the cost – sometimes thousands of dollars. Many suppliers don't realize that the fire suppression system actually reduces their overall supply requirements; others recognize this fact, but are reluctant to take it into consideration because once the meter is in place, there is no way to control the potential increased water use by the building owner. Where entire subdivisions are being sprinklered, it's possible to show the water supplier that, because of the reduced fire flow requirement, they can actually reduce the water main sizes and pumping capacity for that subdivision. This is probably the strongest argument against increasing the cost of larger meters for fire protection use.

For example, in the city of Bremerton, Washington, the fire department worked closely with the water department to determine the impact that residential

sprinklers would have on their water system. The outcome was that the water department now offers a larger meter for dwellings installing residential sprinkler systems at no additional cost. This particular example illustrates the value of a close working relationship between the fire department and the water department.

Another option is to connect the fire sprinkler system ahead of the water meter. From a fire protection perspective, this is an acceptable arrangement, although it will require separate backflow prevention, and this arrangement will not allow the plumbing and fire protection systems to be combined.

An example of a jurisdiction that is working proactively to balance the public safety interests with the water supply interests is California. Phase I of the California residential fire sprinkler task force focused on building a relationship with the state's water purveyors and identifying any issues that are currently barriers to a residential fire sprinkler requirement.

The California task force identified a number of topic areas for discussion including:

- Fees
- Connection and Configuration
- Laws and Regulations
- Process Efficiencies and Cost Impacts

These sub-groups within the California task force are all areas that have received national attention as issues when implementing residential fire sprinkler programs. Working to solve these issues so they do not become barriers is a positive benefit of task force type work.

The California report [*Residential Fire Sprinkler/Water Purveyor Task force: Final Report/Recommendations \(click here\)*](#), describes how California worked through its water supply issues and contains many best-practice examples that can be useful to any jurisdiction.

Decision Point: How Will Plan Review Requirements Be Addressed?

Both the International Residential Code and NFPA 13D specify the information required on plans that are to be submitted for approval. These requirements should be part of the consideration of the task force, and may be modified to the jurisdiction's needs.

Additional questions to be discussed by the task force include:

- **Designer Qualifications.** Some states license sprinkler designers; in that case, a minimum requirement would be for the person to possess the appropriate state license. In the absence of a state license requirement, consideration should be given to professional qualifications such as the National Institute for Certification in Engineering Technologies ([NICET](#)), International Code Council ([ICC](#)) certification, or trade association credentials ([NFSA](#), [AFSA](#)). Each of these qualifying criteria should be compared with the community's expectations, and one or more could be deemed acceptable by the task force. At the time of publication, there were other efforts underway to create new certification and accreditation programs. Research and consideration of all available programs will best serve the community.

NICET is probably the most widely used and accepted qualifying organization for fire protection system designers. NICET utilizes a four-level program to certify individuals who plan, organize, and design fire sprinkler systems. The NICET certification requires work experience and successful completion of knowledge-based tests to determine the competency level of technicians.

The International Code Council has certifications for several disciplines, including residential sprinkler installers. The ICC certifications are granted upon completion of knowledge-based examinations and are considered to be valid in most states. The advantage of this certification is that it's based solely on the requirements necessary for residential sprinkler installation. Other certifications may be offered for inspectors, plan reviewers, and designers.

The National Fire Sprinkler Association (NFSA) and the American Fire Sprinkler Association (AFSA) have ongoing programs to train and certify individuals in the various disciplines associated with fire sprinkler installation, and may develop specific programs for residential sprinkler systems as well.

- **Compliance Issues.** Will plans be reviewed for compliance with statutes and regulations? If there is no current plan review capacity within the jurisdiction, the decision may be to forgo plan review entirely. In this

case, consideration for the designer qualifications becomes paramount. The jurisdiction should consider mandating the qualifications of the designers and require a signed, stamped (where appropriate) statement that the plans meet the regulatory requirements of the jurisdiction. Appropriate credentials for designers include NICET certified engineering technicians, Professional Engineers in the appropriate discipline (usually fire protection), and individuals licensed by a state agency for this purpose.

Most design professionals are competent and ethical; however, it's important to remain vigilant to assure the reviewing person is actually conducting a thorough review. This should be part of any program's quality control process.

- **Third-Party Plan Reviewers.** Third-party plan review is gaining in popularity across the United States. One reason is that the use of third-party contractors reduces a jurisdiction's personnel costs, and as the economy cycles, they aren't faced with decisions about reducing staff. In addition, managing contractors is considered far less complicated than managing full-time staff, where payroll, benefits, and other issues consume considerable time and other resources.

A jurisdiction may decide to contract with a third party directly or to accept third-party plan reviews from qualified individuals who are paid by the developer or builder. Either way, the qualifications of the person conducting plan reviews should be scrutinized to assure a level of competency acceptable to the jurisdiction.

The use of third-party contractors may not provide the most control over the quality of inspections and the level of customer service. For purposes of this discussion, the highest level of control would be to hire full-time staff for the jurisdiction to conduct plan reviews and inspections; the next highest level of control would be for the jurisdiction to contract directly with the third party; of the three options, the least amount of control would be to permit the installers or builders to contract directly with the third parties and provide reports to the jurisdiction. Stakeholders should determine the level of customer service, the credibility desired, and the overall level of safety that can be delivered under each type of system and make the best decision for the community.

- **Reviewing Agency.** If a jurisdiction decides to conduct plan reviews internally, the question becomes who/what agency conducts the reviews. This should be a question of who has the technical expertise and staffing to conduct competent plan reviews in a timely manner. If no such resource exists within the jurisdiction, identify the most effective manner to acquire such expertise (hire qualified individuals, train current employees), and compare the cost and effectiveness, both short term and long term, with the potential to contract with qualified individuals or firms. Some jurisdictions have cost-sharing arrangements whereby each jurisdiction assumes responsibilities for specific code enforcement activities across jurisdictional boundaries. Innovation is sometimes the key to success, especially in times of scarce resources.
- **Identifying Required Information.** Information necessary for the review of plans is outlined in the codes; however, if there is a need for additional information, the task force should identify the items needed, and justify the need as a part of their discussions. Samples of checklists for required information can be found in [Appendix C](#).
- **Turn-Around Time.** Finally, the time from plans submittal to completion of review, called turn-around time in most jurisdictions, should be quantified by the task force. This has become a very controversial issue in many jurisdictions, as contractors need approved plans to begin work, and extended turn-around times can have a severe negative impact on the entire construction project. The performance expectation for plan review of one- and two-family homes may be significantly shorter than it is for commercial projects. The current level of plan review service must be quantified and the proposed level of service under the residential sprinkler requirement should not cause a reduction in this level of service. The turn-around time will depend upon the level of resources available, the technical expertise of the reviewers, the quality/intensity of the review, and the volume of plans. If a jurisdiction is conducting plans review in-house, consideration should be given to a method of handling spikes in the workload. One way to do so is to have a standing contract with a third party, and when the turn-around time reaches the critical point, begin sending plans to the third party.
- **Replicable Components and Systems.** Any discussion about plan review for residential sprinkler systems wouldn't be complete without a mention of replicable building components and systems. Most large developments

are built by single entities, usually large developer/homebuilders. Typically, the number of floor plans is limited, although the elevations of the homes may be different. In some cases, a subdivision of 300 homes or more may have only five or six floor plans (sometimes fewer). In these cases, it's likely that one comprehensive plan review for each floor plan will suffice, assuming the same piping and head layout will be used throughout the subdivision. A quick study of the hydraulic characteristics may be necessary for each home, especially if the subdivision is in terrain that changes elevations a lot. When attempting to identify necessary resources for plan review, it's good to consider the fact that many tract home developments will not require full plan reviews of each home.

Decision Point: What Will the Inspection Requirements Be?

Residential sprinkler systems are life safety systems, and, as such, demand a high level of oversight. Some of the considerations for the task force when considering the inspection process and requirements include:

- **Qualifications.** What are the necessary qualifications for the inspector? The installer? If there are state licensing requirements, these may be the only necessary requirements; however, consideration for national certifications for installers and inspectors should be considered. These include ICC, NICET, and trade associations' certification programs. Evaluating the available certifications and accreditations in view of the jurisdiction's culture will provide the best fit.
- **Required Inspections.** What inspections are necessary? Residential sprinkler systems are installed in phases, like many other systems. Does the water supply connection need to be verified for compliance with plans? Should a rough-in inspection be conducted to assure piping is properly attached to the structure and complies with the plans? Is a final inspection necessary to verify the piping is insulated, and heads are properly located? Each of these questions must be answered with consideration for the necessary resources, cost, and benefit to the community.
- **Disapprovals and reinspections.** What will the jurisdiction's policy be regarding the disapproval of a system based upon an inspection? What will the policy be regarding re-inspections? Timing? Costs? The more

detail the task force can generate on these issues, the smoother the implementation will be.

- **Turn-Around Time.** What will the time frame be for inspections? Homebuilders have become accustomed to same-day or next-day service after a request. It would be detrimental to the implementation process to reduce the current level of service.
- **Inspectors.** Who will conduct the inspection? If current resources exist with the necessary expertise, this is an easy answer; however, if resources need to be added, where should they reside? If a plumbing inspector is already going to be on the site conducting a plumbing inspection, can he or she be trained to conduct the sprinkler inspection? Is there a need for another inspector on the site? If the jurisdiction doesn't have the necessary funding to obtain the necessary resources, one solution might be to require certification of the system installation by an approved contractor (third party). While this may not be a jurisdiction's first choice, it may provide a level of safety consistent with the community's expectations.

The International Residential Code Fire Sprinkler Coalition offers training (beginning in August, 2011) for individuals charged with inspection of residential fire sprinkler systems and provides train-the-trainer programs to assist individuals who are interested in training new inspectors. The programs are tailored for education of fire, building, mechanical, plumbing, or combination inspectors. For more information on this program, [click here](#)

A sample inspection checklist can be found in [Appendix C](#).
Inspection best practices can be found in [Appendix B](#).

Decision Point: What Are the Requirements for Final Approval?

The decisions made regarding permitting, plan review, and inspection will drive the final approval criteria. In order to gain final approval of the sprinkler system, a permit will be required, plans must be approved in accordance with the plan review process, and any inspections will need to be completed satisfactorily. These are basic issues; some of the decisions that need consideration at this point are:

- What is the process for final approval? Typically, if plans have been approved, then whoever completes the final inspection will grant final approval of the system. However, if the final inspection is by a third-party inspector, it's advisable to consider an additional step in the process to allow an employee of the jurisdiction to actually grant the approval. This could be the building official or the fire marshal, depending upon who is best situated to do so.
- How to assure all items are complete prior to occupancy? In most jurisdictions, the building official issues a Certificate of Occupancy (CO) when a building has been approved for occupancy. This CO is issued only after all of the plans for the building (structural, electrical, mechanical, etc.) have been approved and all final inspections completed. The sprinkler system should be included in this process; a CO should never be issued, thus the building should not be occupied, until the sprinkler system is approved.

Again, collaboration is the key to success. Communication between the building official, the fire department, the sprinkler contractors and any third parties doing plan review or inspection is critical to successful completion of a project. Failure to communicate will result in confusion and finger-pointing, which is in no one's best interest.

Decision Point: How Will You Define and Measure Effective Customer Service?

This entire guideline is intended to provide insight into how to manage the implementation of a residential fire sprinkler requirement with a customer service approach. The first priority, then, is to identify your customer. In the case of implementing a residential sprinkler requirement, it's important to recognize that your customers are varied, and may have competing interests. Consider the following (partial) list of customers:

- Firefighters: These individuals depend upon the residential sprinklers to provide an enhanced level of safety in their "workplace"
- Homeowners: Depend upon the residential sprinklers to protect their largest investment
- Homebuilders: Need timely response to inspection requests, etc.
- Sprinkler Installers: Need a balanced regulatory system to assure they and their competition are held to a consistent standard
- Members of the Community
- Developers

- Water Purveyors
- Building Design Community

By listening to and understanding the customers' concerns, issues and needs throughout implementation and beyond implementation, you will be setting up an intuitive and transparent process. Add to this the clear, well-described expectations, checklists for plan review and inspections, interpretations of how you will apply the code and your accessibility to your customers, and you are establishing an effective customer service approach.

Let us emphasize that customer service is not a one-time task, but rather an overall orientation. For it to be of value, it needs to be a way of doing business in every part of every service delivered. Work to embed it naturally into your business process, and it will help you eliminate conflict that takes time and energy away from your main job of ensuring that residential fire sprinklers are installed according to your code.

Decision Point: How Will You Collect Data on Sprinkler Systems Installed?

At some point in the future of your residential fire sprinkler requirement, you may need to be able to go back and use information about the community's sprinkler experience to solve a problem or reflect on a positive story. Residential fire sprinklers have been promoted by the fire and life safety community for over 30 years as critical technology to reduce residential fire risk. Implementing a requirement offers opportunities to create a data collection process that will provide future information on outcomes and the concrete benefits. Once you have begun finalizing inspections and people begin to move in to completed homes, you will move on to the next construction project. During implementation is the best time to create a data collection tool and process.

Your data collection process does not need to be complex as long as there is a way to link it to other data that will be collected and retained. Usually information about home construction is kept for many years, and today's demand for more electronic records makes it easier because you do not need to worry about physical space. Make sure that the electronic file for the sprinkler design and associated material information sheets are combined with the construction plans. Be aware that often the work plans for construction of the structure precede design plans for the fire sprinkler system, so you need to ensure the records are combined in the long-term file archive with the building official. This is also important since the fire authority

having jurisdiction may not be the same as the building official, so there needs to be coordination and collaboration on this detail. Future issues involving the sprinkler system may require local research that includes identifying the sprinkler installer, or information such as the lot number or individual serial numbers of the sprinklers.

The best opportunity to enter information that creates a record about the sprinkler system is when the permit is considered. Many communities have electronic systems that integrate functions electronically and include processing the permit; fees handling; billing; and accounts payable. It may be possible to include a data subset for information about the sprinkler system or the ability to export data from this system to a spreadsheet or separate data base. An integrated system can minimize efforts at documenting your data. If there is no such central ability to track data about the sprinkler system, then it will be necessary to create a system.

In creating a data system, a table format is all that is needed and can be created in a spreadsheet. The advantage of a spreadsheet is that there are functions that facilitate sorting, and completing mathematical formulas that would be helpful in telling a story about the data. It also assists you in finding specific information so you do not need to look through every item of data manually.

Data bases can provide a simple process with some up-front formatting. The power of data bases is that you can create entry forms that allow you to input one record at a time without looking at the rest of the data, such as in a spread sheet. Data bases also have the ability to accept ancillary files such as photos and scanned images, which could be helpful in saving space that is required when keeping hard-copy files.

When planning what data will be collected, consider brainstorming some of the areas for which you can envision using the data. Some examples may include: the need to track the inspection of back flow preventers, or the manufacturer of the sprinkler and serial numbers. This would be the place where you would want to annotate any activation of a sprinkler and the reason why it activated. While it may not be necessary to include all the details of the activation, a summary or comment area can allow an opportunity to include brief information and include any fire record identification number, or incident number. Some of the essential fields needed for your data collection tool may include:

- Fire Protection Permit Number
- Rework of Existing Fire Protection System Yes or No
- If Rework what is the original permit number

- Date of Final Permit Approval
- Building Permit Number
- Full Address where system was installed
- Installer (Company)
- Installer Contact Information
- Record of sprinkler activation
- System design criteria (IRC 2904, 13D etc)
- Type of system (combination, stand alone, grid, tree)
- Information regarding antifreeze in system
- Component description (type/make of heads, piping, backflow preventer, etc.)
- Comments

If the data base is driven by the permit number as the key field, then when there is work in the future it can be linked to any previous permits and provide an explanation why an address is repeated. These are just examples of what may be considered and it is up to an individual jurisdiction to determine what information they would like to consider for future use.

Case Study:

A Tale of Three Cities

To illustrate the philosophies contained in this guide, we will observe three different mythical cities. These could easily be fire districts, counties, fire authorities or any other unit of local government; however, we'll use cities for purposes of illustration.

Cashville, Arklahoma

The first city is Cashville, Arklahoma. Cashville is an affluent suburb of a large city. In Cashville, the citizens expect their government to provide a high level of service at a reasonable cost. They are progressive, and believe that public safety is one of the core services their local government should provide.

Recently, Arklahoma adopted the International Residential Code statewide, including a requirement for residential sprinkler systems in all homes to be constructed after January 1, 2012. The Mayor has tasked the Fire Department with developing the implementation plan for the residential sprinkler requirement. Chief Nar, the chief of the department, meets with his senior leadership team to craft a strategy to assure a successful implementation. During this meeting, he appoints his Fire Marshal, Chief Doit, as the lead Fire Department person for the project, and encourages his other senior leaders to support the Fire Marshal in any way they can.

Chief Doit begins by identifying every group that he believes will have an interest in the process relating to the implementation. After compiling his list, he contacts a person in each group, and asks for a volunteer to serve on a steering committee to develop the implementation plans for the residential sprinkler regulation. In addition to inviting someone from each group, he also shares his list and asks for input as to any additional groups or people that should be included in the effort. This process takes about three weeks, as some of the groups need to discuss the project and identify their best representative. The result of this effort is a large, diverse group of stakeholders, all with an interest in the residential sprinkler project, and a commitment to work together to achieve the best outcome for Cashville. The first steering committee meeting is one month after the initial meeting with Chief Nar.

Prior to the initial steering committee meeting, Chief Doit assembles an information package for each member. In the package are examples of other programs around

the state and the country. In addition, he identifies a series of discussions that need to take place, realizing that it will take time for the committee members to become familiar with each other, and for the committee as a whole to become fully functional.

Chief Doit makes a presentation to the committee at its first meeting to outline the process and some of the issues in need of resolution. The committee takes time to discuss each issue, and some of the members have other issues they want to consider. After a series of meetings, the steering committee decides that there is a need for permitting, plan review, and inspection. Also, because of recent water shortages, and the implementation of significant fees for water usage, the committee identifies water supply issues as critical to the success of the implementation. Subcommittees are appointed to work on each of these issues. In addition to the mechanical processes for implementation, the committee determines that there is a need for significantly enhanced communication to all affected parties, and methods to get the information to contractors, builders, citizens, and other stakeholders should be considered. Additional subcommittees are appointed to develop communication projects for the implementation plan. The steering committee recognizes that, as additional issues arise in the subcommittee meetings, more decisions will need to be made.

Permitting/Plan Review Subcommittee:

The permitting subcommittee is made up of a homebuilder, the building official, the fire marshal, a person from the city's finance department, a sprinkler contractor, and a representative from Cashville's League of Neighborhoods. The industry representatives would like to keep the cost of permits as low as possible, maintaining that the residential sprinkler systems benefit all of the citizens, so the cost of implementing the system should be borne by all taxpayers, and not be a burden to the construction industry. The League of Neighborhoods representative argues that the sprinklers do little, if anything, to lessen the burden on existing homeowners, who already pay taxes for fire response, and won't enjoy the benefits of added protection to their homes. Therefore, the League believes that the entire burden of implementation should be borne by the construction industry and passed on to the purchasers of the homes. After much debate, the subcommittee agrees that a reasonable cost sharing is 75/25, with the permits covering 75 percent of the cost of implementation, and the general fund of the city funding the balance.

At this point, the committee tasks the finance department with determining the actual cost of implementation. They stress that both hard costs and soft costs be included, i.e., not only the actual cost of new employees, overtime, and new

equipment, but also overhead such as office space, a portion of management, human resources department, etc. Also, the building official and the homebuilders association are tasked with projecting the number of homes that will be constructed during the first year of the program so that the workload can be identified and resources acquired to meet the demand. During this discussion, other decision points are identified:

Will the sprinkler permit be a stand-alone permit, or will it be combined with the construction permit?

What department will be responsible for plan review, what is the cost of the personnel?

What department will be responsible for inspection, what are the personnel costs?

Because the steering committee has decided that the program should recover 75 percent of the cost through permit fees, the subcommittee determines that it would be problematic to try to adjust building permit fees to accomplish this. Far easier would be a stand-alone permit, with associated fees clearly identified for cost recovery.

The Building Department doesn't have anyone on staff with the expertise to review fire protection drawings; they regularly review plumbing systems, but these reviews don't normally consider the details of the hydraulic characteristics of the system. The Fire Department has been conducting reviews of commercial sprinkler systems, so the committee decides that they should also conduct the review of residential sprinkler systems. The salary range for the fire protection specialist that conducts system plan reviews is \$40,000 to \$60,000 per year, so the committee uses the assumption of a \$50,000 salary for purposes of cost recovery. The Human Resources Department has furnished the committee with a multiplier of .32 for the cost of benefits to add to the salary number. This represents the average cost to the city of all benefits, including insurance, vacation, sick leave, etc. The Finance Department has studied the support functions of the city as a fraction of the city's overall budget. The support functions include the City Manager's Office operation, Human Resources, Budget & Finance, Purchasing, and other departments that don't directly serve the public, but are critical to the city's operation. These functions represent 16 percent of the city's budget. Next, the group determines the cost of office space, furniture, utilities, automobiles, uniforms, and other items necessary for the plan reviewer to function. Using normal amortization criteria and actual cost of goods, along with market rent costs applied to the square footage of the reviewer's office, the group calculates the value of these items at \$28,000 per year.

The committee then went through the same exercise for the person who would actually take the permit application and issue the permit.

Once the gross costs were developed for all personnel involved in the permitting and plan review process, the steering committee needed to know how much time each person involved would actually dedicate to this program – it was likely that no one would be working on it full time, but some kind of reasonable calculation was necessary. The homebuilder and the building official, along with the city’s planning director, projected the number of homes that would be constructed during the next 12-month period. They divided the gross number of homes into categories according to size, type (condominium, townhouse, one- and two-family) and whether the homes would be tract homes with a limited number of floor plans, or custom homes in need of individual reviews for each. The outcome was that a total of 1,750 homes would be constructed, 250 townhomes with 10 different floor plans, no condominiums, 1,250 tract homes, and 250 custom homes. Of the 1,250 tract homes, it was estimated that there would be 50 different floor plans. The average size townhome would be 1,500 square feet, the average tract home would be 2,800 square feet, and the average custom home would be 3,500 square feet. Using these projections, it was determined that it would require approximately 583 hours of administrative time to issue the permits (20 minutes for each). When calculating the amount of time for plan reviews, it was estimated that a custom home would require two-and-a-half hours to review the initial drawings; for town homes, one-and-a-half hours for each floor plan, plus 20 minutes to verify water supply, elevation changes, and other variables for each additional town home; and for tract homes, it was estimated that each floor plan would require two hours to review, and each additional home with the same floor plan would require an additional half hour to verify water supply and other variables.

The calculations can be illustrated as follows:

RESIDENTIAL PLAN REVIEW TIMES			
Type Structure	Initial Review	Additional Floor Plans	Total Time
Townhouses	10	240	$(10*1.5)+(240*.33) = 94.2$ Hours
Tract Homes	50	1200	$(50*2)+(1200*.5) = 700$ Hours
Custom Homes	250	0	$250*2.5 = 625$ hours
Total	310	1,440	1,419.2 Hours

Using the total of 1,419 hours, we can see that this is approximately 68 percent of a full-time employee's time. And, using 583 hours for an administrative person to issue permits, this is about 28 percent of a full-time employee's time. Using these figures, we can calculate the estimated cost of permitting and reviewing plans for residential sprinkler installations:

TOTAL COST OF PERSONNEL:		
Plan Review Specialist		
Salary	\$ 50,000	
Benefits	\$ 16,000	(\$50,000*.32)
Support Functions	\$ 8,000	(\$50,000*.16)
Misc. (auto, furn., etc.)	\$ 28,000	
Total	\$102,000	
Amount for Project	\$ 69,360	(\$102,000 *.68)
Administrative Assistant (Permit Clerk)		
Salary	\$ 30,000	
Benefits	\$ 9,600	(\$30,000*.32)
Support Functions	\$ 4,800	(\$30,000*.16)
Misc	\$ 3,000	
Total	\$ 47,400	
Amount for Project	\$ 13,272	(47,400 *.28)

According to this calculation, the total cost of issuing the permit and reviewing sprinkler plans is \$82,632. While this is good information to have, it's of limited value when determining a reasonable permit fee. Using the cost of personnel, taxpayers are funding the plan review specialist at almost \$50 per hour, and the Administrative Assistant at about \$20 per hour. Based upon these figures, the cost to conduct plan reviews and issue permits is as follows:

PLAN REVIEW COSTS INCLUDING PERMITTING				
Type Structure	Initial Floor Plan		Additional Floor Plans	
Townhouse	\$95	(\$50*1.5)+\$20	\$36.50	(\$50*.33)+\$20
Tract Home	\$120	(\$50*2)+\$20	\$45	(\$50*.5)+\$20
Custom Home	\$145	(\$50*2.5)+\$20	n/a	n/a

Inspection Subcommittee:

A separate subcommittee was appointed to assess the options available for conducting inspections at the construction sites. This committee was made up of a homebuilder, the building official, a plumbing inspector, a fire inspector, and a neighborhood representative. After considerable discussion, it was determined that, to be able to assure a high level of compliance, two inspections would be necessary for each system; a "rough-in" inspection to assess piping assembly, assure the piping is secured to the structure, etc.; and a final inspection to see that the system is finished properly, escutcheons in place, no painted heads, etc. The subcommittee decided to leave the actual inspection criteria up to the staff, but in order to evaluate the costs of the program, the amount of time and the number of inspections must be known.

The subcommittee evaluated the advantages of inspections conducted by the fire department and by the plumbing inspectors. It was perceived that the fire inspectors had a higher level of competence in the fire protection system arena. However, they would probably not be able to meet the expectations of the homebuilders and contractors regarding response time for inspections without adding personnel. The normal response for the fire inspectors to a request for inspection was 48-72 hours, but the plumbers responded with next-day service. The subcommittee advised the steering committee that, with relatively little training, plumbing inspectors could become very competent to conduct the fire sprinkler inspections in dwellings, and could perform the inspections in conjunction with their plumbing inspections. This would result in a significant savings to the jurisdiction, and the quality of the program would remain intact. The decision was to place inspection responsibility with the plumbing inspection staff.

After consultation with plumbing and fire inspectors, the subcommittee estimated that the additional time for the sprinkler inspection would be approximately 30 minutes per system. Using a similar formula to determine the actual cost of personnel and equipment as was used for plan review and permitting, it was determined that the city's cost to conduct an on-site inspection of a sprinkler system would be \$35; two inspections for each system would add \$70 to the city's cost.

Cost Summary:

Based upon the data and the assumptions by the experts on the committees, the cost of administering the program would be between four and eleven cents per square foot, depending upon what size and type of unit. To simplify the overall permitting system, it was determined that full cost recovery could be achieved by charging \$200 for a permit for an original floor plan up to 2,000 square feet; an additional

charge of \$50 for each additional 1,000 square feet was deemed appropriate and would recover all costs. For replicated floor plans, the actual costs are significantly lower. The plan review time would be about 25 percent, but the inspection time would remain the same. The result is that the actual cost would be about half for duplicate floor plans. Furthermore, it was determined that the difference in cost between townhomes, custom homes, and tract homes wasn't enough to justify creating three permit fee schedules and creating additional confusion. Using the recovery rate agreed upon (75%), the following fee schedule was developed:

	First 2,000 Sq. Ft.	Additional 1,000 Sq. Ft.
Original Floor Plan	\$150	\$50
Duplicate Floor Plans	\$100	\$35

The logic behind the fees for duplicate floor plans is that, upon examination, the cost to conduct a cursory plan review and two inspections was about 65% of the cost of the original floor plan.

Water Supply:

The city of Cashville owned the water utility, and the relationships between city departments was, by and large, excellent. The Water Department's fees included an impact fee based upon the meter size. This was a logical policy, as larger meters typically indicate higher water use, so charging higher impact fees for higher water users met the goal of the city. However, the steering committee determined that, if a home were equipped with a meter one size larger than standard, extended coverage sprinklers could be used in most areas of the city, effectively reducing the overall cost of the system. One problem: the impact fee cost more than the savings that could be achieved. After considerable discussion, the Water Department agreed that residential sprinklers, if installed in all homes in the city, would, in fact, reduce the overall water demand on the system. Based upon that consideration, the Water Department agreed to forgo the additional impact fee for the larger meter so long as all homes were being sprinklered.

Communications Plan:

An important component of the stakeholders' recommendations, if not the most important component, was the communications plan. In order to avoid misunderstandings and miscommunications, and to assure everyone with an interest had the opportunity to hear about the program and ask questions, the

steering committee devised a communications plan. It was determined that different audiences would be interested in different components of the implementation, so the recommendation was to develop three different programs.

For those contractors planning and installing residential sprinklers, a seminar was developed to provide information about permit application procedures, requirements for drawings submittals, how to request an inspection, what would constitute failure, etc. – all of the information contractors should know about how they would be treated by the city staff would be included. These seminars would be delivered by a team of city representatives including the fire department and the plumbing inspection agency. In addition, the regional fire sprinkler association partnered with the local chapter of the Plumbing & Mechanical Contractors' Association to offer classes on the actual planning and installation of residential fire sprinkler systems.

For homebuilders and general contractors, a presentation was developed that could be delivered at luncheons or other meetings. This presentation included information on how the plan review would be conducted and how this could impact the turn-around times for their overall plans. This presentation pointed out ways that homebuilders and general contractors could avoid delays by making sure the plans submitted had all of the necessary information, and that they were fully compliant with the new sprinkler requirements. Also covered in this presentation was the inspection process, assuring the homebuilders that, because the sprinkler inspection was simply an extension of the plumbing inspection, the only delay should be the amount of time to actually conduct the inspection. However, it was again mentioned that the way to avoid delays due to disapproval of a system is the same as any other system installation (electrical, HVAC, etc.), and that is to be sure the system is code compliant. While every new program will need some time to iron out any wrinkles, every effort has been made to avoid a negative impact on the homebuilders. This presentation would be given by someone on the steering committee or city staff familiar with the program.

For neighborhood meetings, business group meetings, civic clubs, and similar organizations, a third presentation was developed. This presentation would speak to the enhanced safety that the residential sprinkler requirement would bring to the community, then speak to the actual implementation process. The process of bringing all interested parties together to construct the implementation plan should help the city government avoid most problems associated with new programs. This presentation would highlight the collaboration between the organizations, and compliment the leadership of each of the organizations that participated. A high-

level description of the implementation would be presented, ending with a question-and-answer session.

These three presentations, delivered to as many audiences as possible, were critical to the success of the program. Including representation from all of the stakeholders in the development of the program was necessary to validate the effort; communicating the actual outcome to affected parties was essential for success.

In Cashville, residential sprinkler systems are being installed in all new homes, they are recovering much of the cost of implementation through permit fees, and the process is running very smoothly. The steering committee now meets quarterly to review any complaints or problems with the process and to offer suggested revisions for improvement.

Moderation City, Michilvania

Moderation City, or “MC” as it’s known, is a medium-size city with all of the normal attributes, services, and issues. In MC, the citizens expect a robust fire response, but don’t fully understand the value of fire prevention efforts, including residential sprinklers. However, two years ago, after a hard-fought campaign by the fire department, city leaders, and the sprinkler industry, MC citizens voted to require residential sprinklers in all newly constructed homes. To allow for a transition period in which to build the necessary infrastructure, the requirement didn’t go into effect for two years. It was felt that this would allow ample time for the government, contractors, and homebuilders to prepare for implementation. During the campaign for sprinklers, the proponents committed to implementing a regulatory scheme that would be low cost, but effective. One specific commitment was to avoid hiring additional city staff.

The MC Mayor appointed a team of city staff to develop the implementation strategy. The staff members included the Fire Chief, the Building Official, and a person from the City Administrator’s office. After meeting several times to identify issues in need of attention, the staff team decided that the best approach was to assemble a stakeholders group to collaborate on the various challenges associated with the implementation. Because of time constraints, the stakeholders group was kept relatively small, with only participants representing industries that would be directly impacted by the implementation. The stakeholders group was made up of representatives from the homebuilders’ association, sprinkler contractors’ association, and the plumbers’ association. As the meetings with the stakeholders progressed, a major cost issue was identified – water impact fees for larger water meters. The group agreed to invite the local water provider to the meetings, but

because they weren't initially involved, and the project was well underway, they felt overlooked and under-appreciated. The discussions with the water provider were less than successful; the group was able to achieve only minor concessions to offset some fairly significant impact fees.

The stakeholders agreed that permits were needed to be able to track the plans and installations, and permit fees became a controversial issue. The homebuilders argued that the building permit was based upon the value of the structure, including sprinklers, so they didn't want to be charged an additional fee. The fire sprinkler companies were accustomed to paying permit fees and agreed that the additional service required some kind of revenue source for funding. The plumbers stayed neutral, although they tended to side with the homebuilders as they were not accustomed to acquiring a separate permit. The outcome of the initial discussions about permit fees was to put it on hold and move to a discussion about plan review and inspection to determine the actual cost of the program.

Due to the commitment to avoid hiring additional city staff, the stakeholders agreed that third-party contractors would be utilized for plan review and inspection. The sprinkler contractors wanted recognition for their state license and professional qualifications in lieu of having their plans reviewed. Others in the group disagreed, and it was decided that, regardless of a person's qualifications, plans would be reviewed and inspections would be conducted to assure that systems being installed met the standards adopted by MC.

The group next considered the advantages and disadvantages of the different business arrangements available to them. Should MC contract directly with the plan review and inspection company(ies)? Or should the homebuilders or installers be required to engage these companies and report to MC? The city representatives believed that they could better manage the process if the plan reviewers and inspectors contracted directly with the city; the homebuilders and installers agreed, as that was one less process they'd have to manage. However, this brought the group back to the funding issue. The city had not budgeted any additional money to implement the program, so the city representatives felt that the permit fees should cover the entire cost of the program; the homebuilders didn't want to saddle the homeowner with that additional cost along with the cost of the sprinkler installation.

The stakeholders were at impasse. The Mayor and City Council would have to make the decision. It was presented as an "either/or" situation – either they could add funding to the departments issuing permits and overseeing the reviews and

inspections, or they could tell the staff to create a fee structure that would recover the entire cost of implementation. The elected leadership decided that, because existing city staff would be used to issue permits and oversee the system, the city would absorb that cost, but the permit fees should fund the actual work (plan review and inspection) of the third parties. The group then set about the work of determining the cost of reviewing plans and conducting inspections. The group developed two different Requests for Proposals, one for plan review, and one for inspection. During the discussion, the group decided that, while one company might possess the qualifications to do both, it was likely that a better price and potentially better service could be achieved if at least two companies were involved. Of course, there was no reason that one company couldn't submit proposals on both components of the project.

The qualification criteria were determined through researching other communities' policies, considering the current policies for commercial sprinkler systems, and reviewing the positions of several trade associations. The group decided that, in order to be qualified to conduct plan review, the person doing the work would need to possess a Level III certificate from the National Institute for Certification in Engineering Technologies, or be a licensed Professional Engineer in the discipline of fire protection, or equivalent. To be considered qualified to conduct sprinkler inspections, a person would need to possess a Level II certificate from the National Institute for Certification in Engineering Technologies, or an appropriate certification from the International Code Council, the National Fire Sprinkler Association, American Fire Sprinkler Association, or equivalent.

After a Request for Proposals, responses, and a selection process, MC signed contracts with an engineering firm for plan review and a third-party inspection firm for the sprinkler inspections. The engineering firm will charge a flat fee of \$175 for each residential sprinkler system plan review of a dwelling up to 2,500 square feet. For units larger than 2,500 square feet, an additional charge of \$50 per 1,000 square feet or portion thereof will be charged. Should plans be rejected, a re-review fee of one half the original fee will be charged. The inspection firm will charge \$85 per dwelling unit for each inspection, including any required reinspection. So a single-family dwelling of under 2,500 square feet will generate a cost of \$345 (\$175 for plan review, plus two inspections, rough-in and final, at \$85 each). This assumes the plans are approved on the initial submittal, and the system passes both inspections. Based upon the direct cost to the city, MC adopted a permit fee structure identical to the charges from the third-party contractors. A basic permit fee is \$345 plus \$50 per 1,000 square feet or portion thereof beyond 2,500 square feet. If a plan is rejected, an additional fee is required with the resubmittal equal to the original fee,

minus \$170 (the inspection fee), times one half [for a unit under 2,500 sq. feet, the resubmittal fee would be $(\$345-\$170) \times .5 = \$87.50$]. If, upon inspection, the system is found deficient and an additional inspection is required, the inspection fee must be paid upon request for the reinspection. To allow for flexibility in scheduling and for the convenience of the installing contractors, MC decided to allow contractors to establish escrow accounts with the city, whereby they could deposit funds that would be drawn upon by the city for permit fees and inspections.

Oversight of the program, including the issuing of permits and collection of fees, was assigned to the Fire Department. This was primarily because of the prior discussions about the building permit and what it did and did not include. The stakeholders decided that the Building Department was overseeing the overall building permitting and inspection system, and it would be most appropriate for the Fire Department to oversee this specific component of the construction project. It was further determined that the Fire Department would manage the third-party plan review contract, and the Building Department would manage the third-party inspection project. In this way, communications would be ongoing between the departments, and each would have a role in the final approval process.

In Moderation City, sprinkler systems are being installed in new homes, and the city leadership is satisfied that an appropriate amount of oversight is being provided by the third-party contractors. The commitment to avoid hiring additional city staff has been kept, and the city staff have absorbed the additional workload, albeit with some deterioration in overall service. Both the Fire Chief and the Building Official believe they could improve on the quality of service if they had additional staff to oversee the third-party contractors, but they don't have budget authority to hire new personnel. Overall, the system seems to be working well, but it's difficult to be sure, as the stakeholder group is no longer meeting.

Pfrugalton, Florizona

The final city in this study is Pfrugalton, Florizona. The state of Florizona is a "mini-maxi" state, and adopted the 2009 International Residential Code with the requirement for residential sprinklers intact. The regulations go into effect 90 days after adoption, and local jurisdictions are required to apply the state regulations as written. Pfrugalton is a small but growing jurisdiction of about 12,000 people. They have a volunteer fire department with no fire prevention division, and one building inspector for new construction and renovations. Pfrugalton requires builders to have their plans reviewed by a qualified third-party plan reviewer, and submit a letter from the reviewer with their plans in order to obtain a building permit; the building inspector then inspects the construction as it progresses.

The mayor of Pfrugalton, upon learning of the new code requirements, decides to have lunch with the local homebuilders association president and the building official. They discuss the new residential sprinkler requirement and explore a few options about its implementation. After considering his options, the mayor decides to continue with the current system, which has served his community well over the years. The building official will develop reasonable qualifications for third-party reviewers of residential sprinkler systems, and will secure adequate training so he can become competent in inspecting them.

After talking with the Fire Chief and several of his peers in neighboring jurisdictions, the building official decides that, in order to review residential sprinkler plans for his jurisdiction, the reviewer will need to be either a NICET Level III technician or a registered Fire Protection Engineer. The reviewers will be required to submit a letter stating the findings of their review and any deficiencies in the plans. Should a reviewer become complacent, or if the reviewer is found to be overlooking deficiencies, the building official is authorized to refuse future submittals from them.

The building official decides to take a course offered by the U.S. Fire Sprinkler Association for Authorities Having Jurisdiction. Upon completion of the course, he is able to assess the plan reviews that come into his office, and to inspect installations for compliance with NFPA 13D and the International Residential Code.

Initially, the system instituted seemed to work smoothly, although many objected to the process. Homebuilders didn't like the additional cost of plan review; the plumbers and sprinkler contractors felt left out of the discussion, and had many ideas to contribute; the homebuyers and citizens were confused about when sprinklers were required in dwellings, what they cost, and how they worked. Overall, the implementation in Pfrugalton worked, but much improvement could have been made.

Appendix A: Incentivizing the Installation of Residential Sprinklers

Some jurisdictions don't have the authority to require sprinkler systems in residential dwellings. This may be due to a legislative prohibition, recognition that the community isn't ready to impose the requirement, or some other reason. There are, however, developments where the installation of residential sprinkler systems would greatly enhance the overall community's safety and reduce the need for reactive fire response even though there is no regulatory requirement. In these cases, some code officials or other public safety officials will develop a package of incentives to offset the cost of the sprinkler installation, creating a "win-win" for the community and the developer.

When identifying appropriate incentives for residential sprinklers, it's necessary to review the benefits (and weaknesses) of these systems. The residential sprinkler standard (NFPA 13D) was developed to provide a solution to the residential death and injury problem at a lower cost than a typical commercial sprinkler system. From NFPA 13D:

"Recognizing the need to reduce the annual life loss from fire in residential occupancies (about 50 percent of total loss of life by fire), the Committee on Automatic Sprinklers appointed a subcommittee in May 1973 to prepare the Standard on the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes."

Although these systems have a very positive impact on property loss, they are primarily intended to reduce the loss of life from fire; therefore, the standard doesn't require many spaces in a home to be covered by the sprinkler system. Areas that do not require coverage include attics, closets, most bathrooms, and some under-floor areas. And, the required duration of the water supply to the system is seven to ten minutes, depending upon the supply arrangement.

Highlighting these issues is not intended to discourage incentivizing developers and builders to install sprinklers, and it is not intended to promote modifications to the national standard to make it more restrictive. It is simply to provide some balance to the thought processes necessary for reasonable, appropriate incentives. According to the latest report from Scottsdale, Arizona, where about half of the homes are sprinklered, the property loss from fire is about a third of the national average, and life loss is nonexistent in sprinklered homes. These data appear to be consistent with information available from other sources. Based upon this, it is clear that residential sprinkler installations will improve a community's fire safety environment, so finding the appropriate incentives to offset the cost of their installation could be a net benefit to the citizens served.

The Fire Protection Research Foundation (FPRF) completed a study in 2010 of incentives offered in 16 jurisdictions. The purpose of the study was to identify "common" incentives being offered, and to quantify the value of those. This was a follow-on report to their study of the cost of installing residential sprinkler systems. In the latest study, it is reported that the average value of an incentive package of the 16 jurisdictions studied is \$3,365. This includes \$145 for the first year's value of homeowner incentives (reduced property tax, special financing options, etc.); \$1,945 for builder-oriented incentives (reduced fees, reduced fire ratings, etc.); and \$1,271 for developer-oriented incentives (increased hydrant spacing, reduced fire flows, etc.). Based upon this report, it's likely that an incentive program can be assembled that will offset most, if not all, of a residential sprinkler system installation. The following discussion of common incentives should provide for a reasonably complete discussion about the efficacy of each incentive based upon the conditions in a specific community.

Incentives for Homeowners:

- **Property tax reduction:** The portion of property taxes (or other funding methods) that are used for fire protection can be easily identified in any jurisdiction's budget. Developing a formula that can be used to provide for a reduction in taxes paid for fire response will be logical in many communities. If a community expects the fire response need to be reduced by some percentage by installing residential sprinklers, the amount of taxes that go to fire response activities might be reduced by a like amount.
- **Financing incentives:** At least one state has instituted a grant program whereby individual grants are made available to those who install

residential sprinkler systems. This is an innovative concept that essentially rebates a portion of property taxes, an amount determined by the local fire commission or fire district.

- Insurance cost reduction: While not technically an incentive that a jurisdiction can offer, homeowners should know that they may enjoy fire insurance savings of up to 10 percent of their premium. The FPRF study indicates that the average is about 7 percent in the communities they studied. This incentive will recur every year for the life of the home, and can be shown to be very valuable over time.

Incentives for Homebuilders:

- Reduced water service impact fee: This incentive is based upon the philosophy that less water will be necessary for fire suppression when a sprinkler system is present. If an entire subdivision is sprinklered, pipe sizes can be reduced, pumping capacity can be reduced, and the overall cost to the community for water service to the subdivision is less. This savings can be passed along to the builder by reducing the impact fees associated with service.
- Reduced fire impact fee: Similar to the reduction in water impact fee discussion, this incentive is based upon the philosophy that residential sprinklers will significantly reduce (but not eliminate) the need for manual fire suppression, thus a reduction in the impact fee is logical.
- Reduced building permit fees: At least one jurisdiction provides for a substantial (40%) reduction in building permit fees for homes built with sprinkler systems. While it's difficult to tie this reduction to a specific savings to the jurisdiction, the theory is that the installation of sprinkler systems will result in a safer community, and fire will be less of a financial burden on the community. Because the commercial building permits in the jurisdiction cited fund more than the actual cost of administering that program, the excess revenue is applied to the residential sprinkler incentive.
- Reduced fire ratings for building assemblies: Because there are very few requirements for passive fire protection in one- and two-family dwellings, the only significant savings available is in the rated separation between the garage and the living space and, where required, exterior wall ratings. The value of the separation between the garage and the living space isn't significant, but it may add enough to the overall incentive package to

make it worthwhile. Some jurisdictions allow this incentive only if the garage is also sprinklered. In some cases, the offsetting costs are comparable, thus it loses its effectiveness as an incentive for installing the basic residential system. Exterior wall ratings will be addressed under “Developer Incentives”.

- Eliminate the requirement for rescue/egress windows: This has become an item of much debate in the fire service community. When attempting to provide incentives for residential sprinklers, one thought is that the systems are specifically intended to provide enough time for occupants to escape in case of fire, thus negating the need for rescue/escape windows in sleeping rooms and other habitable spaces. While this argument is logical, many in the fire service find it difficult to agree to such an incentive because of the inherent feeling that people need a way out, and firefighters need a means to rescue fire victims. It’s a very emotional argument, one that should be vetted with all involved before including it in a package.

Incentives for Developers:

- Increased spacing of fire hydrants: Typical current policies require hydrants to be spaced 300 to 500 feet apart. A common incentive is to allow an increase of 50 to 100 percent, reducing the number of required hydrants by up to half. In the majority of cases where a fire grows out of control in a sprinklered home, there will be no need for fire hydrants; occasionally, tank water will be needed to complete extinguishment, but most of the time the fire department activities will be limited to overhaul and cleanup. When a fire does grow beyond the capability of a sprinkler system (attic fire, exterior fire), the time to establish a water supply from a hydrant that is 500 more feet from the fire would amount to the time it takes to drive the apparatus an additional 500 feet; the time to hook up, etc., should be the same.
- Decreased fire flow requirements: Historically, commercial occupancies have enjoyed a reduction in required fire flow of up to 50 percent when equipped with sprinkler systems. This seems logical, as those systems are full coverage systems. When applying this logic to residential sprinkler systems, consideration should be given to the fact that they are partial coverage systems with limited water supply requirements. It may be appropriate to provide for some reduction in fire flow; how much depends upon the response capability of the fire department, the ability

to provide water volume from other sources, and the separation distances between homes. A single dwelling may be an acceptable loss; however, if a reduction in fire flow is combined with a reduction in exterior wall ratings for homes in close proximity, it could result in the loss of several homes during a single event.

- Reduction in building setbacks: Reducing the exterior wall ratings for homes located in close proximity can result in fairly substantial savings. This incentive should be considered in light of the fact that wall ratings are required only when the structures are built closer than five feet to a property line. Eliminating the fire resistance requirement would allow for homes to be constructed closer than 10 feet apart, possibly abutting each other (zero lot line developments) if they were equipped with residential sprinklers. Granting relief from the setback requirements is very attractive to developers, as they can develop more lots from the same acreage; however, consider that these sprinkler systems are not full coverage systems, and any decisions should weigh all the information appropriately.
- Increased zoning densities: Where zoning ordinances restrict the number of homes per acre or other unit of measurement, the density may be increased if all homes in the subdivision are sprinklered. This will allow more lots per acre of land, providing similar, and possibly superior, advantages to the developer as reducing building setbacks.
- Reduction in required road width: Streets and roads are some of the most expensive components of most developments. A reduction in width of only a foot or two will result in substantial savings for the developer. The Fire Protection Research Foundation report states that the average savings in the jurisdictions in their survey was over a \$1,000 per lot. When considering an allowance for reducing road width, however, other issues need to be contemplated. How is parking to be managed? If homes are constructed very close to the street, with little room for parking in the driveway, we should assume automobiles will be parked on both sides of the street. What is the available width under that scenario? How will garbage trucks, snow removal equipment, and other heavy machinery access the area? All of these issues can be resolved, but a comprehensive solution should be developed.

For any incentive being considered, a long-term but innovative outlook should be used. Installation, maintenance, upkeep, and enforcement are all considerations for many of the incentives mentioned, as well as for the residential sprinkler systems

themselves. Fire department considerations will include apparatus size and configuration, staffing, response times, and overall response capability. Residential sprinklers are the next revolution in fire safety, but we must not overlook the need for a level of redundancy in our community fire protection system.

As new developments are built, new, innovative incentives will be developed. The key to success is to be sure that a diverse stakeholder group weighs in on any incentive under consideration. Homeowners, elected and appointed leaders, homebuilders, developers, and fire service representatives must all have a voice in the process.

Appendix B: Best Practices

Success in implementing a residential fire sprinkler requirement will depend on many areas of preparation. There is a considerable amount of work, especially detailed background work, that may not be seen on the surface but is what may lead to success. One important area that cannot be over emphasized is communication and information.

Today, when people need information the first place they turn to is the Internet. A good web site that is easy to navigate and provides the right amount of information will go far in helping the design professional, the sprinkler installer and the building industry accomplish a well-prepared plan that, when reviewed, meets all of the specifications of the jurisdiction. These individuals want to be able to keep their work on a schedule; clear and thorough details available ahead of time will help them achieve their goals as well as reduce the need for you to have to tell them directly.

Clearly articulating your specific requirements in an accessible fashion will increase consistency. Well-thought-out charts, text explanations and diagrams can reduce mistakes and reinforce concrete expectations. The following section highlights some best practices in accessible requirements.

Policy Issues:

[Interpretations and Applications \(click here\)](#)

This is a comprehensive document presenting how the city of Scottsdale interprets the sprinkler standards. This best practice should be strongly considered for any implementation plan. Recognize however, that these are policy statements and the Interpretations & Applications document evolved over many years of managing a residential fire sprinkler requirement. It would be difficult to initially develop all these policies since many of them come about after much thought, planning and in some cases problem solving. Jurisdictions planning an implementation could opt to review this document and use the interpretations that are appropriate for their community. The Scottsdale document is arranged following the NFPA 13D and 13R sections, which can serve as an effective outline.

Stakeholder Involvement:

The California State Fire Marshal involved stakeholders in a series of task forces designed to acquire participation from all areas affected by a residential fire sprinkler requirement. The California implementation is on-going, with January 1, 2011, as the implementation date. California's reports offer an excellent model to others who are implementing a residential sprinkler requirement.

California's task force process is a best practice example for implementing complex change. It is a powerful strategic approach to a successful residential fire sprinkler requirement. State officials have provided a good example of documenting their work, including conclusions and recommendations resulting from their meetings. The task force reports are available for use by other jurisdictions and are available on the State Fire Marshal's website.

[California Residential Fire Sprinkler Installation Task Force Final Report and Recommendations \(click here\)](#)

[California Residential Fire Sprinkler/Training and Education Task Force Final Report and Recommendations \(click here\)](#)

[California Residential Fire Sprinkler/Water Purveyor Task Force Final Report and Recommendations \(click here\)](#)

Another example of using a task force to build consensus can be found in the experience of Prince George's County, Maryland. Prince George's County identified residential fire sprinklers as a method to reduce risk to their residents. In October 1986 Fire Chief M. H. "Jim" Estep established a task force of key stakeholders with the mission to determine current risk and to determine if a residential fire sprinkler requirement was right for Prince George's County. The task force agenda established a very aggressive work approach that produced a report by February 1987. The task force report led to legislation that amended the Prince George's County Building Code requiring "Quick Activation Sprinkler Systems" in all newly constructed residential dwelling units, motels and hotels. The legislation phased-in a fire sprinkler requirement, with the final phase requiring fire sprinklers in new one-and two-family dwellings by January 1, 1992. The following quotation from the report speaks to the benefit of participation by stakeholders, which resulted in a safer outcome for future residents.

“It was evident and heartening throughout this endeavor that a common interest in the safety of the citizens of Prince George’s County was of mutual concern to private and public sector representation alike. At the same time, every avenue of potential cost reductions associated with any potential sprinkler legislation was examined for possible application in an effort to develop realistic and equitable standards.”

The International Association of Fire Chiefs with the National Fire Sprinkler Association produced an excellent resource titled [Residential Fire Sprinklers: A Step-By-Step Approach for Communities, Second Edition \(click here\)](#). While this guide focuses on the organizing of the stakeholder group that helps to get the ordinance passed, it provides superb guidance that can be used at any step of the process, including activities after passage of the ordinance.

Plan Review and Inspection:

[Plan Review Flow Chart \(click here\)](#)

Flow charts are an excellent visual representation of how a process will go given the real-world variables. These diagrams posted on the Austin, Texas, website provide a good idea of how the reader should act in regard to what is needed. It also provides the opportunity for the organization that posted the diagram to carefully think through a business process in order to provide it in graphic representation.

[Common Plan Check Notes and Requirements \(click here\)](#)

Plan check notes are a way to communicate to the permit holder specific and additional detail that will be required of the AHJ. In this case from Napa, California, anyone who is considering installing a residential fire sprinkler system is provided with a compilation of potential requirements so that they can be considered ahead of time. This is similar to the Scottsdale use of documented interpretations; it just becomes the action of how it is written and included on plans after they are reviewed.

[Express Residential Fire Sprinkler Design Guide \(click here\)](#)

Prince George’s County, Maryland, worked with the U.S. Fire Administration and the National Association of Home Builders to create a design guide that would provide a simplified method for designing and laying out residential fire sprinkler systems. The simplification has been achieved by pre-engineering key features of the design. The guide includes a preliminary discussion of sprinkler coverage area, water flow, and water pressure. After this overview of the essentials, the guide is divided into

two sections: Hydraulic Worksheet – where calculations are performed on a sheet enabling the installer to account for pressure losses in the system and ensure that adequate water flow and water pressure are available at the most remote sprinkler; and Sprinkler Target Zones – which eliminate the need to determine precise locations for sprinklers and substitute “target zones” where sprinklers can be placed to provide adequate coverage.

[Residential Fire Sprinkler Systems: Plan Submittal and Inspection Requirements \(click here\)](#)

This document posted on the Warrington Township, Pennsylvania, website offers a best practice in concrete direction for what is expected beyond the NFPA 13D standard for residential fire sprinkler systems. This is a good start for any jurisdiction needing a model for describing its internal requirements.

[Residential Fire Sprinkler Plan Review Checklist \(click here\)](#)

This best practice from Encinitas, California, takes a fill-in-the-information approach.

[Residential Fire Sprinkler Plan Review Checklist \(click here\)](#)

Similar to the Encinitas checklist, Henderson, Nevada, adds some introductory comments and explanations on what to expect.

[Minimum Requirements For Fire Sprinkler Plan Review Submittal Checklist - Yakima, Washington \(click here\)](#)

[Plan Submittal And Inspection Requirements – San Mateo, California \(click here\)](#)

[Inspections of Residential Fire Sprinkler Systems – Maine State Fire Marshal \(click here\)](#)

[Residential Fire Sprinkler Systems – Warrington Township, Pennsylvania \(click here\)](#)

[Installation of Residential Fire Sprinkler Systems – Pioneer Fire Protection Standard \(click here\)](#)

This guideline specifically describes the elements that will be evaluated in an inspection. This is a very thorough document that goes into detail of the NFPA 13D Standard.

[Residential Inspections – Montgomery County, Maryland \(click here\)](#)

Permitting:

[Fire Service Fee Schedule *\(click here\)*](#)

San Bernardino, California, like many communities, has provided specific information on its web site to identify fees and costs associated with residential fire sprinkler systems and other permitted and inspectable work. As with other items identified previously it is helpful to provide as much information as possible to increase the potential for a successful project. Many of the design and engineering professionals deal with different jurisdictions and as they are anticipating expenditures when planning work they need readily accessible reference sources to identify their costs. The easier they can find information the better. The San Bernardino fee schedule is very straightforward in its approach.

[Permit Application – Altamonte Springs, Florida *\(click here\)*](#)

Fees:

[Ordinance Establishing A Schedule Of Fees For Fire Prevention Inspections And Reviews Within The Boundaries Of The Oswego Fire Protection District *\(click here\)*](#)

This document from Oswego, Illinois, provides the legislative approach to establishing the fee schedule. This is accomplished through the jurisdiction's legislative process. Note that in this ordinance it provides for the AHJ to waive a fee where appropriate. This is an important consideration in planning your business process because at some point the need to waive a fee will come up and if it is not clearly identified as something that can be done, then you may be required by law to require a fee from someone who would otherwise not be required to do so. You will need to have assistance in this area of planning from the legal or finance staff within the government.

[FM Fee Schedule *\(click here\)*](#)

This web page from Fairfax County, Virginia, provides an explanation for fees as well as links to the authority to charge the fees. The Fairfax County Fire Marshal's Office web site is a best practice for transparency and the priority to communicate and make available information helpful to residents and businesses in the county. It is simple and straightforward but has many links to information and the format is intuitive.

[Building Permit Fee Changes Explanation \(click here\)](#)

This explanation was chosen to show how officials in Aurora, Colorado, explain their reason for implementing a fee structure. If it is necessary to establish fees or other authorization and it must be done through the jurisdiction's legislative process, consider this in planning the implementation. These are critical path considerations that may be out of your control and may take considerable time to go through the process.

Appendix C: Sample Checklists

Note: To download checklists in Word, click [here](#)



Jurisdiction Name Here

Residential Sprinkler System Plan Review Checklist

Applicant: _____ Phone: _____
 Project Address: _____ File/Permit# _____

Approved	Approved With Comments	Not Approved	Required Information:	Comments:
			Identification and contact information of designer, owner, contractor	
			Location, including street address	
			Scale of plan, legibility	
			Complete floor plan showing all walls, partitions, and potential obstructions	
			Full height building section	
			Elevation at point of water connection and changes between connection and discharge point(s)	
			Dimensioned site plan with water supply, structure location, etc.	
			Water supply specifications (volume, pressure, flow characteristics)	
			Alternative water supply components, if provided. (Well pump, gravity or pressure tank, calculations for size, etc.)	
			Location and arrangement of all devices (meters, backflow preventers, etc.)	
			Basis of design (13-D, P2904)	
			Type of piping and materials (steel, CPVC, PEX, etc.)	
			Make, model, type of sprinklers	
			Location of all valves and fittings	
			Antifreeze specifications and locations, if provided	
			Insulation specifications (where provided to prevent freezing)	
			Location and spacing criteria for all sprinklers	
			Hydraulic calculations (computer generated or prescriptive method)	
			Piping supports	
			Reference nodes matching hydraulic calculations	
			Flow test/pressure data used for hydraulic calculations	

Reviewer: _____ Date: _____



Jurisdiction Name Here

Residential Sprinkler System Inspection Checklist

Applicant: _____ Phone: _____
 Project Address: _____ File/Permit# _____

Approved	Approved With Comments	Not Approved	Rough-in Inspection <input type="checkbox"/>	Final Inspection <input type="checkbox"/>	Comments:
			Meter size matches plans	Owner's Instructions Present	
			Underground piping matches plans (size, length, material)	All heads located according to plans, no obstructions	
			Piping supports adequate & in accordance with listings	No Leaks	
				All valves open	
				Monitoring in place (if required by 7.1.2)	
				Escutcheon plates in place	
				Insulation in accordance with plans to prevent freezing	
				Antifreeze solution is factory mixed, adequate for installation	
				Type of sprinklers match plans	
				Notification sign at water supply shut-off	

Inspector: _____ Date: _____

Revised 12/12/10



Jurisdiction Name Here
Residential Sprinkler System Permit Application

Permit Number: _____ Date: _____

Site Address: _____ Tenant/Building Name _____

Applicant Is: Architect/Engineer Contractor Owner Other (Describe) _____

Property Owner

Name _____ Phone: _____

Address: _____ City _____ State ____ Zip _____

Contractor

Name _____ Phone: _____ License Number: _____

Address: _____ City _____ State ____ Zip _____

Architect/Engineer

Name _____ Phone: _____ Registration Number: _____

Address: _____ City _____ State ____ Zip _____

Type of Work

Check only one: New Addition Alteration/Remodel Repair/Maintenance

Permit Fee: \$ _____

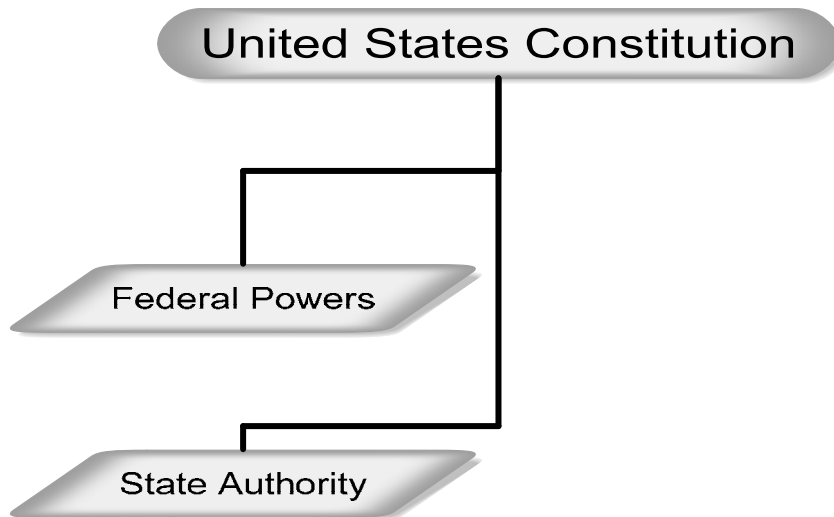
Applicant Signature: _____

Approved by: _____

Conditions of permit: _____

Appendix D: Legal Authority for Code Compliance

In the United States, model codes are developed through a consensus process and are typically used as a basis for local or state adoption. These model regulations include building codes, fire codes, electrical codes, plumbing codes, and a myriad of other codes intended for adoption. The two primary model code organizations are the International Code Council® and the National Fire Protection Association®. These organizations utilize volunteer experts to develop rational, cost-effective regulations to ensure a reasonable level of safety in the built environment. However, none of these model codes can be enforced without government action. The responsible governmental jurisdiction (municipality, county, state or agency) must go through the legislative and rulemaking process before they become enforceable. The benefits of using model codes as the basis for regulations include a level of consistency for designers, engineers, and builders, and a contribution to economy of scale for the production of building materials and equipment. In addition, the use of model codes provides an opportunity for uniform training programs for regulators at all levels. So how do these model regulations become enforceable, and what is the legal basis for your authority?



The U.S. Constitution grants certain powers to the Federal Government; however, it also reserves all rights to states that are not specifically granted to the federal government. This is a general statement, and there are exceptions; however, construction codes, fire codes, and similar regulations have historically been relegated to the states.

State laws tell us who is authorized to enforce code compliance. The state governments are constitutionally the ultimate authorities having jurisdiction. The legal basis originates in the ***Tenth Amendment to the United States Constitution***: “The powers not delegated to the United States by the Constitution, nor prohibited by it to states, are reserved to the states exclusively, or to the people.” The Tenth Amendment made no mention of the constitutional standing of cities or counties – because they have no constitutional standing. Powers of local governments are only those powers delegated by the states. State constitutions and statutes define the relationship among the state, counties, and municipalities through their respective constitutions and statutes.

Typically, a state will provide for one of three types of regulatory systems:

- Statewide adoption of minimum code requirements. In these states, no local government may adopt regulations that are less restrictive than the state minimum; however, they are authorized to adopt more restrictive regulations based upon the community’s needs.

- Statewide adoption of code requirements and a prohibition of any local amendments. In these states, there is no authority for any local jurisdiction to amend the state regulations in any way. These states are often referred to as “mini-maxi” states. Another form of this type of system is one where local jurisdictions can petition the state for permission to amend the code based upon specific attributes of the community.
- Home Rule states, whereby the state doesn’t adopt any codes, but permits local jurisdictions to adopt regulations appropriate for their community. In some states this authority is given to municipalities but not counties; in others counties may adopt regulations for unincorporated areas; in still others, the counties’ authority may supersede the municipalities. In one state, fire districts are given overriding authority to adopt and enforce building and fire regulations, superseding the authority of municipalities and counties.

The adopting jurisdiction (state, county, fire district/authority or municipality) will provide for administrative authority to the code official who will manage compliance. In the International Residential Code this authority resides in Chapter 1 Administration; Section R104 Duties and Powers of the Building Official. The Administration chapter also will provide for the establishment of a building safety department and specifically identifies some of the functions that will need to occur as a process of business, such as appointment of a building official and staff deputized to perform the duties described in the code. Model codes such as NFPA 1 and the International Fire Code provide similar authorities in their Administration Chapter. The administrative chapters of the model codes are the most amended sections, as different states have different methodologies relating to the granting of authority to carry out regulatory activities.