

Incentives for the Use of Residential Fire Sprinkler Systems in U.S. Communities

Final Report

Prepared by:

Newport Partners LLC



THE
FIRE PROTECTION
RESEARCH FOUNDATION
Research in support of the NFPA mission

FIRE RESEARCH

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FOREWORD

The use of residential fire sprinkler systems in new U.S. homes is becoming increasingly common due to building codes and ordinances, as well as recognition of the life safety benefits which these systems provide. As a mechanism to expand the installation of fire sprinkler systems in homes, the presence of “incentives” in a jurisdiction can potentially have a considerable impact on the building market and the overall cost of a sprinkler system.

To evaluate the nature and impact of incentives, this research identified, characterized, and estimated the approximate value of sprinkler system incentives found in communities across the U.S. In-depth interviews were conducted with 16 communities that each offered one or more incentives to encourage the use of sprinkler systems in new single-family homes. Incentives were categorized as Financial Tradeoffs, On-Site Design Flexibility, and On-Site Design Flexibility, while the beneficiaries of different incentives were the homeowner, builder, or developer. Overall, this research demonstrates that incentives have good potential to increase the use of residential sprinkler systems. The communities included in this study and their collective incentives help to establish a “toolkit” which other jurisdictions can draw from, as they consider strategies to encourage the use of residential sprinklers to improve life safety systems in new homes.

The Research Foundation expresses gratitude to the National Fire Protection Association for its sponsorship of the project, and to the project technical panelists listed on the following page.

The content, opinions and conclusions contained in this report are solely those of the author.

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EXECUTIVE SUMMARY

Many states in the U.S. are currently in the process of adopting model building codes which would require residential fire sprinklers in new townhomes and one- and two-family dwellings. In other states and jurisdictions, codes with mandatory sprinkler provisions may not be adopted, or sprinkler provisions may only apply to larger homes or townhomes, or homes located a substantial distance from water sources considered adequate and reliable by the local fire department. In these areas where sprinkler systems for all new homes may not be required by code or a local ordinance, incentives to encourage the use of residential fire sprinklers have the potential to impact the building market. While the life safety benefits of residential sprinklers are well documented, the ability to offset some of the costs for sprinkler systems can be a key tool in increasing their use in new homes.

The objective of this research study was to identify, characterize, and estimate the approximate value of sprinkler system incentives which are in place in various communities in the United States. A wide variety of incentives, such as builder credits, reduced property taxes, and the ability to use narrower roads, were identified in 16 communities. These communities were selected based on the research team's knowledge of the housing industry, and are not intended to be all-inclusive of jurisdictions with incentives. The incentives within these communities varied in their focus, the magnitude of their financial impact, and in terms of which stakeholder group directly benefited (developer, builder, or homeowner). Incentives are generally categorized as Financial Tradeoffs (e.g., reduced impact fee, reduced property taxes), On-Site Design Flexibility (e.g., reduced fire ratings for building assemblies), and Off-Site Design Flexibility (e.g., spacing fire hydrants further apart, allowing longer dead-end streets).

The financial value of different incentives to developers, builders, and homeowners varied, and some communities offered incentives only targeting one group, like builders, but not the others. Based on the estimated value of individual incentives which were found across the 16 communities, reasonable expectations of what a representative or "typical" incentive value would be in a community which offers an array of incentives were developed. These estimated values, broken out by the group directly receiving the benefit, are presented below.

**Table: Estimated Value of Incentives, assuming a Community offers
“Typical” Incentives Identified in the Study**

Estimated Incentives Value	Estimated \$ Value per Building Lot
Homeowner-Oriented Incentives	\$145*
Builder-Oriented Incentives	\$1,949
Developer-Oriented Incentives	\$1,271**

*Homeowner incentives are annually recurring (e.g. reduced property taxes). This figure is the average value in Year 1.

**Does not include value of reduced cul-de-sac widths (\$10,752 per cul-de-sac) or increased dead-end street length.

These estimates for the homeowner-oriented and builder-oriented categories are generally averages of a few types of incentives which were identified across different communities, which all benefit the same stakeholder group. In the case of the builder-oriented incentives, three different types of financial incentives which were found in different communities were averaged together, since it would be unlikely to find more than one of these trade-offs offered in a single jurisdiction. A value for a different type of incentive – reduced fire ratings for building assemblies – was then added to this average value because a jurisdiction could reasonably offer this type of incentive along with a financial incentive. In order to keep the estimates of incentive value straightforward, no attempt was made to translate the value of an incentive to an indirect beneficiary.

When comparing the estimated value of builder-oriented incentives to a typical cost of a fire sprinkler system for a new single-family home, the value of the incentives (\$1,949) which a community might reasonably offer offset about one-third of the system cost (\$5,888). This comparison is intended to provide a context for the value of incentives when they are offered in a jurisdiction. It is based upon averages of incentive values where they were identified, and the circumstances in any given community will be unique. It is also possible that builders would derive an indirect benefit from other categories of incentives which could further offset the cost of sprinklers. For instance, a builder may derive some financial benefit from a developer-oriented incentive passed down to the builder, or a homeowner-oriented incentive used as a marketing tool to help sell the home. However, the estimation of such indirect benefits is beyond the scope of this study and not included in the \$1,949 figure or the 33% cost offset.

Collectively, the incentives studied in the 16 communities provide a diverse set of options which can be considered by other jurisdictions that seek to encourage the use of residential sprinklers. Incentives can target development practices, opportunities to alter the construction of the home, or modify fees or taxes in ways which will benefit developers, builders, and/or homeowners. Future research should identify the most influential types of incentives as well as the most impactful stakeholder group to target with incentives. As the body of knowledge and implementation of sprinkler incentives grows, they can become an increasingly effective mechanism to improve life safety in homes.

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I. INTRODUCTION

Residential fire sprinklers are becoming more commonly installed in new U.S. homes, based on model building codes like the 2009 International Residential Code (IRC) and NFPA 5000. Model codes and the jurisdictions which adopt them recognize the life safety benefits which residential fire sprinkler systems provide to residents.

Even before residential fire sprinklers became a mandatory requirement in national model building codes like the 2009 IRC, numerous communities throughout the country have seen sprinklers commonly installed in new homes. The use of sprinklers in these areas is typically the result of either local building code requirements or ordinances which require sprinklers, or incentives which encourage the voluntary use of sprinklers in homes.

Currently, many states in the U.S. are in the process of considering model code adoptions which would require residential fire sprinklers in new townhomes and one- and two-family dwellings. Some states have already completed this process (e.g., CA, MD). In other states and jurisdictions, codes with mandatory sprinkler provisions may not be adopted, or the sprinkler provisions may only apply to certain building types such as larger homes or townhomes. In these areas where sprinkler systems for all new homes may not be required by code or a local ordinance, the issue of incentives is particularly important. Incentives which encourage the use of residential sprinklers, particularly in areas where they are not required, can have a significant impact on how frequently sprinklers are used in new home construction.

The objective of this research study was to identify, characterize, and estimate the approximate value of a wide variety of sprinkler system incentives which are in place in various communities in the United States. The findings of this study are intended to essentially create a “toolbox” for communities considering the use of incentives. This toolbox will help communities to understand the variety of potential incentive types, the details of their implementation, and the resulting value from their application.

II. STUDY SCOPE

This research is focused on incentives or trade-offs for residential fire sprinklers as they are currently found in communities as of February through May 2010 and available to new, single-family detached homes.

Within this study, an “incentive” or trade-off is considered to be some form of benefit which originates from state/local government, the local water utility, or a non-profit group, which directly results from the use of residential sprinklers in a project and would otherwise not be available to the developer, builder, or homeowner. In the case of avoided extra costs, such as a waived sprinkler system permit fee when sprinklers are used, such avoided costs are characterized as incentives only if sprinklers are *required* in the jurisdiction. The rationale for characterizing these scenarios as incentives is that the builder *must* use fire sprinklers, and this waived fee is essentially a cost reduction to the builder that the community does not necessarily need to offer. And in some cases, such incentives may accompany the introduction of a sprinkler ordinance to dampen the impact of the new requirements. Conversely, avoided extra costs when sprinklers are used *voluntarily* (e.g. they are not mandated) are not characterized in this study as incentives, because these costs would otherwise not be incurred if sprinklers were not used. This type of scenario was rarely encountered in conducting this research, but the distinction is made to be clear on what types of offers were categorized as “incentives” in this study. The terms “incentives” and “trade-offs” are used interchangeably in the research as well.

While other types of incentives for residential fire sprinklers besides those characterized in this report frequently exist, this research focuses on those incentives which a jurisdiction can consider to encourage the use of sprinklers. Therefore things like homeowner insurance discounts are not covered. Likewise, while residential fire sprinklers offer clear community-scale benefits in terms of life safety and assisting the fire service in its mission, such benefits are not directly characterized in this study.

It is important to note that this research does not attempt to evaluate the appropriateness of the incentives which were identified. It is assumed that responsible professionals in the fire service, building industry, planning departments and other involved groups have weighed the effectiveness of particular incentives, and regard them to be safe and appropriate to apply under the right circumstances.

It should also be noted that this characterization is performed at a specific point in time, on an issue – residential sprinklers - which is in the process of rapid change. Thus, the incentives described for the communities reflect the state of affairs as they existed in the timeframe of February through May 2010. Future developments may change the nature of incentives in some of the communities. For instance, the prospect of state adoption of building codes such as the 2009 International Residential Code (IRC) could potentially introduce a situation in which incentives for the voluntary use of sprinklers would be re-evaluated as sprinklers become mandatory. Anecdotally within this study, some communities were found to restrict the use of incentives to only voluntary installations, while others still offered incentives even when sprinklers were mandated. In other states, incentives may become even more important to encourage sprinkler use as some states consider legislation which would restrict the ability of jurisdictions to adopt codes or ordinances which require sprinkler systems. In summary, the reader is cautioned to keep in mind that the landscape of incentives for residential fire sprinklers could look different a few years into the future.

III. METHODOLOGY

To provide balanced and objective information on the subject of incentives for residential fire sprinkler systems, the research project followed a specific methodology. Key elements of the methodology are described below.

A. Community Selection

The selection of communities/jurisdictions which were contacted as part of this research originated from industry knowledge about areas which may offer incentives for sprinklers. Thus, the “leads” for potential communities to include in the study were sourced from individuals familiar with residential fire sprinklers, such as staff from the fire service, industry associations, and building departments.

The community selection and the resulting findings on incentives are not intended to represent a random sample, but rather an indication of the various types of incentives for residential sprinklers found in the marketplace along with an estimate of their value. The list of selected communities is also not intended to be all inclusive; rather it represents a subset of those communities which have some type of incentives for

sprinklers. Likewise, no attempt to estimate the percentage of U.S. communities which currently offer sprinkler incentives was made as part of this study.

Communities “selected” for analysis in the study needed to have some type of incentive or trade-off available when residential fire sprinklers are used in a project. Many other pieces of complimentary information about the community and its incentives were subsequently gathered and assessed as well.

B. Data Collection and Characterizing Incentives

The primary sources for information on residential fire sprinkler incentives were the communities and jurisdictions contacted as part of this research. Within a given community, the research team typically engaged staff from the planning department, building department, local fire service, assessor’s office, and/or local home building association to better understand and characterize available incentives.

Initial contact and data collection with the communities was guided by an interview guide. This guided the discussion and allowed the research team to collect numerous layers of information about a community and any incentives, such as:

- Whether the community has a residential sprinkler ordinance
- What types of projects are eligible for the incentive(s)
- What are the exact terms of the incentive(s)
- What are the minimum requirements for the sprinkler system in order to qualify for the incentive(s)
- Whether there are limitations on the incentive(s), such as a maximum dollar value for a credit
- The department or organization which established the incentives
- The extent to which the incentives are used by developers, builders, or home buyers

The interview guide developed for this project is attached to this document in Appendix A. This guide was designed to touch on important characteristics of incentives which

will be of interest to other jurisdictions considering similar approaches for encouraging sprinkler systems.

In terms of the data collection format, most contact with stakeholders was conducted by phone. Email contact was also used to a small extent for follow-up information needs. Additionally, the research team reviewed relevant documents such as ordinances, calculations for property taxes, sample building plans, development regulations, public records, and incentive terms as necessary to gather details on incentives.

C. Estimating and Assigning the Value of Incentives

The overall goal of the incentive valuation was to provide a sense of magnitude of the value of incentives to different stakeholder groups. In examining various incentives for the use of sprinklers, it is clear that the financial benefit of different incentives will accrue to different parties. Developers will directly receive benefits for some trade-offs (e.g., narrower roads), builders will directly receive the benefit for other incentives (e.g., waived water system connection fee), and homeowners will also experience benefits in some cases (e.g., property tax reduction). The value of incentives in this research is presented in terms of which entity is expected to directly receive the benefit. However, because the impact of a benefit to one group like the developer to a downstream entity like a builder is very unpredictable, no attempt was made to accrue all benefits to a single party. In other words, the value of various trade-offs was assigned to the assumed entity who will benefit, and assumptions about how benefits to one group may translate to another group can be made beyond the scope of this study. This approach was selected to yield a transparent and understandable set of findings which should be useful to communities considering the use of incentives.

Also, the value of incentives in this research was distilled down to a common metric (e.g., \$/building lot) to the extent possible. However, in some cases the nature of an incentive made it infeasible to convert its value to a particular metric. For example, a cul-de-sac with a smaller radius results in some excavation and paving savings per cul-de-sac, but assigning this value to a “per lot” basis throughout an entire development would be problematic and require broad assumptions about the size of the development and number of cul-de-sacs. In cases like this, an incentive may be presented in terms of a slightly different metric in the interest of transparency and usefulness of the information.

D. Estimating Sprinkler System Costs

As the main objective of this study is to characterize sprinkler system *incentives*, the estimate of sprinkler system costs is only presented to put the value of incentives into a context. For example, if a community has incentives which are worth roughly \$500 per house to a home builder, a natural question to ask is how this value compares to the cost of installing the fire sprinkler system.

Sprinkler system costs in this study are estimated based on \$1.61 per sprinklered SF, as it was determined from prior research in the Fire Protection Research Foundation's *Home Fire Sprinkler Cost Assessment Study*¹. This cost figure is based on 30 different system designs from 10 builders from across the U.S., different housing types, different piping material, and different water supply sources for the sprinkler system. The \$1.61/sprinklered square foot figure also includes all costs to the builder associated with the sprinkler system including design, installation, and other costs such as permits, additional equipment, and increased tap and water meter fees (to the extent that they apply). The \$1.61/sprinklered square foot figure does not include any credits or incentives which might have been available, so it is not discounted with any of the incentives which might be captured in this study.

This cost metric was combined with the size of the average new single-family home (2,438 SF) in the U.S. to estimate a typical sprinkler system cost. This new home size does not include square footage in a basement, which *would* be included in "sprinklered square footage." So a new sprinklered square footage was calculated assuming that the home would have two stories, with a basement whose square footage would be equal to that of the first floor of the home. The total sprinklered square footage of 3,657 was then multiplied by the \$1.61/sprinklered square foot to arrive at a representative sprinkler system cost to the builder.

More detail on this analysis is provided in Section VI below.

IV. RESIDENTIAL FIRE SPRINKLER SYSTEM INCENTIVES

Based on the study design described above, numerous jurisdictions were found to have incentives in place for the use of residential fire sprinklers. Incentives are generally

¹ Fire Protection Research Foundation, "*Home Fire Sprinkler Cost Assessment Study*." September 2008. Incentives for the Use of Residential Fire Sprinkler Systems in U.S. Communities

categorized within this research as Financial Tradeoffs, Onsite Design Flexibility, or Offsite Design Flexibility. The specific incentive types which fall under these categories are listed below.

Financial Tradeoffs

1. Reduced or waived fees
2. Reduction of property taxes
3. Special financing options

On-Site Design Flexibility

4. Reduced fire ratings for building assemblies

Off-Site Design Flexibility

5. Reduced requirements for fire hydrants in a development
6. Reduced requirements for minimum road width
7. Reduced requirements for fire flows
8. Reduced requirements for cul-de-sac width
9. Increased allowable dead-end street length
10. Other

Financial tradeoffs include incentives such as reduced property taxes, a reduced permit or utility connection fee for the builder, or special financing to support the use of fire sprinklers. Financial tradeoffs typically apply to a particular house (as opposed to the overall development), and generally accrue to its builder or homeowner.

On-site incentives generally consist of reduced fire ratings for building assemblies which are possible when fire sprinklers are installed in a residence.

Off-site incentives are defined as opportunities which revolve around land development which would not generally apply to a single building site. This category includes items like the opportunity to use fewer fire hydrants or downsize water distribution systems due to lower fire flow requirements. In the process of estimating the value of developer-oriented trade-offs, it is generally assumed that construction is taking place in a new residential subdivision, as opposed to standalone lots. The financial benefit of off-site incentives typically accrues to the land developer.

The map in Figure 1 below illustrates the 16 the locations covered in this study.



Figure 1: Locations of jurisdictions with fire sprinkler incentives which were included in the study.

Table 1 below summarizes each of these communities and which types of incentives were identified in a jurisdiction. Following this table, a summary of each jurisdiction characterizes the type of incentive, its structure, and its background in the jurisdiction.

	Community	<i>A. Reduced or waived fees</i>	<i>B. Reduced fire ratings for building assemblies</i>	<i>C. Reduction of property taxes</i>	<i>D. Special Financing Options</i>	<i>E. Reduced requirements for fire hydrants in a development</i>	<i>F. Reduced requirements for minimum road width</i>	<i>G. Reduced requirements for fire flows</i>	<i>H. Increased allowable dead-end street length</i>	<i>J. Other Misc</i>
1	Altamonte Springs, FL	✓				✓	✓			
2	Baltimore County, MD									✓
3	Chesterfield County, VA					✓	✓		✓	
4	Elk Grove, CA					✓	✓			
5	Fairfax County, VA						✓			
6	Goodyear, AZ					✓	✓	✓		
7	Gorham, ME									✓
8	Hartford, VT					✓	✓			
9	Lake Forest, IL		✓			✓	✓	✓	✓	
10	Montpelier, VT			✓						
11	Moraga-Orinda Fire District, CA			✓			✓			
12	Orange County, CA	✓								
13	Scottsdale, AZ					✓	✓	✓	✓	✓
14	Spring Lake Park, MN				✓					
15	State of Illinois			✓						
16	Wilsonville, OR	✓								

Table 1: Summary of Incentives by Jurisdiction

Jurisdiction: Altamonte Springs, FL

Incentive Type: Financial Tradeoff and Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduced or waived fees
- Reduced requirements for fire hydrants in a development
- Reduced requirements for minimum road width

Residential Sprinkler Ordinance or Code Requirement? Yes, in certain areas of the jurisdiction. The city has classified four specific areas as activity districts. Fire sprinkler systems are required on new single-family homes built within the four activity districts. Sprinkler systems are required on homes outside the activity districts if they are larger than 3,500 SF.

Financial Tradeoff:

- Reduction of building permit fees
- Reduction in water connection fees
- Reduction of the fire portion of the fire and rescue services impact fees

Onsite Design Flexibility: None

Offsite Design Flexibility: Spacing between fire hydrants is allowed to be increased and roadway widths can be narrowed.

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Fire sprinkler systems are not required in all new single-family homes in Altamonte Springs, FL. However, all residential buildings within the activity districts are required to have a fire sprinkler system. Outside of these districts, a single-family home is required to have a sprinkler system only if it is larger than 3,500 SF. The incentives can be used regardless of whether sprinklers are required or not.

The incentives allow building permit fees, water connection fees, and the fire portion of the fire/rescue impact fees to be reduced. Building permit fees are calculated as 1.75% of the value of construction. For sprinklered homes, this fee is discounted by 40%. Water connection fees use a base fee of \$600. This fee is also discounted 40% for sprinklered homes. The fire/rescue impact fee is \$172 and is reduced by 25% when the home includes a sprinkler system.

The installation of sprinklers in homes allows the space between fire hydrants to be increased from 500 feet to 800 feet. Road widths are permitted to be narrowed as well.

The incentives tend not to see much use outside of locations where sprinklers are required. This is because there simply is not much building outside the activity zones. Also, the design of the incentives does not serve to completely offset the added cost of installing a sprinkler system.

There is no other funding that offsets the loss in revenue associated with the reduced fees. However, it was noted that in Altamonte Springs, fees generated from commercial properties tend to oversupply their portion of what it costs to provide them services. Thus, if some properties oversupply their portion of revenue, it allows more flexibility for other types of properties.

The incentives themselves are disclosed to builders at the time of building permit application. The Fire Marshal / Building Official maintains a schedule detailing these incentives, and it is this schedule that is made available to the builder. In order to receive the incentives, sprinkler systems must be installed in all homes that have been proposed as part of the project. There is no maximum dollar amount that can be realized on a per-incentive or cumulative basis.

The fee reduction incentives were established by the City Council in 1986. During this time, the city had decided that there would be four activity zones where denser development would be allowed. Fire sprinklers would be required in these areas. In 2002, the incentive for fire hydrant spacing was added to the Land Development Code. The delay in adding the incentive for hydrant spacing was due to the fact that there was no consensus model for how the incentive should be offered. Prior to its inclusion, the hydrant spacing incentive was only offered on a case-by-case basis, until there was satisfactory guidance for its application.

Jurisdiction: Baltimore County, MD

Incentive Type: Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Other – Static water source alternative

Residential Sprinkler Ordinance or Code Requirement? No

Financial Tradeoff: None

Onsite Design Flexibility: None

Offsite Design Flexibility: Option to install residential fire sprinklers as an alternative to providing a static water source for fire suppression in rural areas, where there is no municipal water supply system.

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Within Baltimore County, any new development including ten or more homes in an area where there is no municipal water supply is required to include a static water source that can be used for fire suppression purposes. Typically a large (~12,000 gallon) buried fiberglass tank is used for this purpose. However, the county now offers the option to install fire sprinkler systems in these homes as an alternative to the static water source. Sprinkler systems must be designed in accordance with NFPA 13D.

The incentive has been in place for the last six or seven years. It was added by the Chief Fire Protection Engineer as an exception in the Baltimore County Fire Prevention Code. In the years since it has been offered, the option to use fire sprinklers instead of the static water source has been taken advantage of by at least one developer.

Jurisdiction: Chesterfield County, VA

Incentive Type: Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduced requirements for minimum road width
- Reduced requirements for fire flows
- Increased allowable dead-end street length

Residential Sprinkler Ordinance or Code Requirement? No

Financial Tradeoff: None

Onsite Design Flexibility: None

Offsite Design Flexibility: Narrower street widths, reduced fire flow, and longer dead-end streets

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Fire sprinklers are not required to be installed in new single-family homes in Chesterfield County. The incentives noted above are offered on a case-by-case basis and have been in place for about two or three years. Their establishment was part of a collaborative effort by the county's Building Official and Fire Marshal.

Within the county, standard width for private roads is 24 feet while aerial apparatus access roads require a width of 26 feet. Both these roads can be reduced to a width of 20 feet in projects that feature sprinkler systems. The inclusion of sprinklers in homes also allows the fire flow to be reduced from 1,500 GPM to 1,000 GPM. Dead-end streets can be extended from a length of 150 feet to maximum length of 200 feet.

These incentives have not been written into local building code or development regulations, nor are they documented in other municipal regulations or policies. The incentives apply to townhome projects, as well.

Jurisdiction: Elk Grove, CA

Incentive Type: Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduced requirements for fire hydrants in a development
- Reduced requirements for minimum road width

Residential Sprinkler Ordinance or Code Requirement? No

Financial Tradeoff: None

Onsite Design Flexibility: None

Offsite Design Flexibility: Increased hydrant spacing and narrower street widths

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

These incentives have been offered on a case-by-case basis for the last four years. The Fire Marshal was granted permission by the Fire Chief to negotiate these incentives with developers at his discretion.

The hydrant spacing incentive allows for the distance between hydrants to be increased from the standard spacing of 500 feet. The degree to which the spacing can be increased depends on the layout of the sub-division. The decision to offer the increased hydrant spacing and to what extent, are made during the project's planning phase.

Road widths can be reduced from their standard width of 40 feet. In fact, they can be narrowed by up to half, or by as much as 20 feet. However, certain parking restrictions are placed on the narrowed streets so that the homes can still be accessed by an ambulance.

Meanwhile, residential fire sprinkler systems are actually required if the dwelling unit has over 4,999 SF of living space or if the home itself is larger than 5,999 in total square footage. The location of homes in some of the more rural areas will also prompt a sprinkler requirement due to the fact that no fire hydrants are located nearby.

While reduced fire hydrant requirements and reduced road width incentives are not as popular with low-density developments, most high-density projects take advantage of them. There are currently four projects that are in the development phase in Elk Grove that will be utilizing these incentives.

Jurisdiction: Fairfax County, VA

Incentive Type: Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduced requirements for fire flows

Residential Sprinkler Ordinance or Code Requirement? No

Financial Tradeoff: None

Onsite Design Flexibility: None

Offsite Design Flexibility: Reduction in the required fire flow

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

This incentive has been in place since 1970 and is documented in the Public Facilities Manual. Fire sprinkler systems are not required in newly constructed single-family homes in Fairfax County, so this provision offers developers a benefit if they chose to sprinkler the homes.

The incentive provides for a 50% reduction in fire flow rates for residences with fire sprinklers. Thus, the fire flow requirement for new single-family homes is reduced from 1,000 GPM to 500 GPM when a sprinkler system is properly installed.

Jurisdiction: Goodyear, AZ

Incentive Type: Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduced requirements for fire hydrants in a development
- Reduced requirements for minimum road width
- Reduced requirements for cul-de-sac width

Residential Sprinkler Ordinance or Code Requirement? Yes, for certain size homes and homes in certain locations.

Financial Tradeoff: None

Onsite Design Flexibility: None

Offsite Design Flexibility: Increased distance between hydrants, narrower street widths, and smaller cul-de-sacs

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Fire sprinkler systems are required to be installed in Goodyear if a single-family home is 5,000 SF or larger. In addition, if the home is to be between 3,500 and 4,999 SF and it is not located within an appropriate distance to a public water source, a sprinkler system must be installed. The incentives noted above are only offered if a sprinkler system is not required.

There is no specific information on the use of these incentives, but most builders and developers within Goodyear are regarded to be agreeable to using sprinklers and tend to utilize them when building homes, based on feedback from the fire marshal.

The ordinance that brought the incentives into place was passed in 1986 and is available to all builders in the City of Goodyear. The incentives themselves are documented in the Engineering Department's Design Standards and Policy Manual.

Prior to the incentives being established, the city's Planning & Zoning and Engineering Divisions met with local developers to gather input on how to design incentives that would encourage the installation of fire sprinkler systems in new single-family homes. Several public hearings were held, as well. Overall, the city experienced relatively little opposition.

Jurisdiction: Gorham, ME

Incentive Type: Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Other – Static water source alternative

Residential Sprinkler Ordinance or Code Requirement? Yes, there is an ordinance in the town's Land Development Code which states that in sub-divisions without access to municipal water, the developer must provide a static water source for fire suppression purposes. In lieu of the static water source, all homes included in the project can be equipped with a fire sprinkler system.

Financial Tradeoff: None

Onsite Design Flexibility: None

Offsite Design Flexibility: Fire sprinkler systems can be installed in each of the homes as an alternative to a static water source

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Fire sprinkler systems can be included in sub-divisions that do not have access to a municipal water source as an alternative to the developer providing a static water source for fire suppression purposes. The fire sprinkler option is often much more cost effective than providing one or more static water sources for a sub-division. This option also eliminates the need to dedicate land to a static water source(s).

The incentive was incorporated into the Land Development Code in 1987. At that time, the area was seeing large-scale development in outlying areas where there was no public water supply. In an effort to ensure that these homes had adequate fire protection, the Fire Chief proposed the fire sprinkler option.

In the beginning, most developers continued to provide static water sources, but within the last ten years, only two water sources have been included in new sub-divisions. Now, about 95% of all new sub-divisions pursue the sprinkler option.

Jurisdiction: Hartford, VT

Incentive Type: Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduced requirements for fire hydrants in a development
- Reduced requirements for minimum road width

Residential Sprinkler Ordinance or Code Requirement? No, although it was noted to be the official policy of the Town Planning Commission to require sprinklers in new single-family homes that are located ≥ 500 feet from a hydrant.

Financial Tradeoff: None

Onsite Design Flexibility: None

Offsite Design Flexibility: Reduced requirements for hydrant spacing and narrower road widths

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Sprinkler systems are required to be installed in single-family homes that are more than 500 feet from a fire hydrant. Otherwise, their inclusion is optional. The incentives noted above are available to all developers and can be used regardless of whether or not the sprinkler installation is optional. As part of the incentive, hydrant spacing is allowed to be increased to 1,000 feet from 500 feet while the road width is allowed to be reduced by 3 feet to a width of 21 feet.

The incentive was put into place about ten years ago. While there is no official ordinance that mandates sprinklers to be installed in new single-family homes 500 or more feet away from hydrants, it has been recognized as official policy within the Town Planning Commission.

Jurisdiction: Lake Forest, IL

Incentive Type: Onsite Design Flexibility and Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduced fire ratings for building assemblies
- Reduced requirements for minimum road width
- Reduced requirements for fire flows
- Reduced requirements for cul-de-sac width
- Increased allowable dead-end street length

Residential Sprinkler Ordinance or Code Requirement? No

Financial Tradeoff: None

Onsite Design Flexibility: Reduced fire ratings

Offsite Design Flexibility: Reduction of street widths, reduced fire flow requirements, smaller cul-de-sacs, and lengthening of dead-end streets

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Fire sprinklers are not currently required in new single-family homes in Lake Forest as there is no ordinance or code requirement mandating them. However, if a particular project's plans do not conform to appropriate setback requirements or the proposed density exceeds an allowable level, then sprinkler systems will be required for the project. Each project is evaluated individually by the Planning & Review Board. The Board decides on a case-by-case basis which projects should receive what mix of trade-offs or incentives to offset the added cost.

For reduced fire ratings, the local code requires a 1-hour minimum fire rating between the residence and the garage, and a 1-hour minimum fire rating between the ceiling of the garage and any living space above. If both the residence and the garage contain sprinklers, there does not have to be any rating on walls, doors, or ceilings separating the residence from the garage area. Thus, in cases where the garage and house are sprinklered, walls between the garage and adjacent living space which typically would have 5/8" Type X gypsum wallboard on both sides could instead use a standard 1/2" gypsum panel. And the garage ceiling could also use standard gypsum panels instead of a 1-hour rated assembly, which will typically involve a double layer of 5/8" Type X gypsum wallboard on the underside of the ceiling framing.

The minimum street width is 23 feet curb-to-curb and 20 feet driveable. If a private road has five or fewer homes on it, then it must be developed at the 23 / 20 feet width. But if there is more than five homes, there is an option to establish an 18 / 15 feet width and not go to 23 / 20 feet, so long as all the homes on that road are sprinklered.

The fire flow standard for homes 3,600 SF or smaller is 1,000 GPM. If the home is sprinklered, this would be reduced to 500 GPM. However, Lake Forest has many homes larger than 3,600 SF which require increased fire flows. For instance, a 20,000 SF home would require 4,000 GPM. If a house larger than 3,600 SF is equipped with a sprinkler system, the stated fire flow requirement can be reduced by 75%, but to no lower than 1,500 GPM.

Cul-de-sacs have a standard radius of 54 feet. If homes are sprinklered, the radius can be reduced between 2-4 feet. Meanwhile, for dead-end street length, the standard distance is nothing longer than 100 feet, but if the homes along the street are all sprinklered, the road can be extended to reach a total length of 300 feet.

The process to establish these incentives began about five to seven years ago with the Fire Marshal initiating a dialogue with the Planning & Review Board to educate them on the benefits of residential fire sprinkler systems. Local builders were initially against this, but in time, however, they began to see how the right mix of incentives could serve to offset the added costs.

Jurisdiction: Montpelier, VT

Incentive Type: Financial Tradeoff

Incentives that meet study requirements? Yes

- Reduction of property taxes

Residential Sprinkler Ordinance or Code Requirement? Yes

Financial Tradeoff: Property tax reduction

Onsite Design Flexibility: None

Offsite Design Flexibility: None

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

Residential fire sprinkler systems are required to be installed on all new single-family homes in Montpelier. The property tax reduction is a 10% discount on the municipal taxes levied on the value of the building itself. While this incentive is associated with all building types, it saves single-family homeowners about \$175 to \$500 per year.

The tax break remains in place if the property, equipped with a fire sprinkler system, is sold to a new owner. In addition, there is no time limit on how long one can benefit from the incentive. The homeowner does not need to reapply for the tax break in subsequent years as long as the system inspection records are provided and/or the city is granted access to inspect the system, as requested.

The city's previous Fire Chief conceived of the incentive program. The City Council was pro-sprinkler at the time and this helped play a large role in implementing the property tax discount.

Jurisdiction: Moraga-Orinda Fire District

Incentive Type: Financial Tradeoff and Offsite Design Flexibility

Incentives that meet study requirements? Yes

- Reduction of property taxes
- Reduced requirements for fire flows

Residential Sprinkler Ordinance or Code Requirement? Yes

Financial Tradeoff: Property tax reduction

Onsite Design Flexibility: None

Offsite Design Flexibility: Reduction of the minimum fire flow requirement

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

The Moraga-Orinda Fire District includes the City of Orinda, the Town of Moraga, and the unincorporated community of Canyon. Fire sprinkler systems have been required in the jurisdiction since 2007. The Fire District allows for a reduction of a fire flow tax and a reduction in the minimum flow requirement if homes are outfitted with a sprinkler system.

The fire flow tax is a type of property tax that is used to cover the cost of firefighting and other emergency medical activities. A reduction in the fire flow tax is offered to residents living in homes with a fire sprinkler system. The fire flow tax is due on an annual basis, so the benefit of the reduced tax recurs annually. The fire flow tax amount is determined by first calculating the improved parcel fire risk factor from a specific formula stated in the ordinance, and then applying this figure to a rate of \$0.06 per unit of risk. The presence of a home fire sprinkler allows the tax to be reduced by one-half.

Another tradeoff was also noted in the Moraga-Orinda Fire District. In certain instances, the minimum flow requirement of 1,000 gallons per minute may not be attainable. At the discretion of the Fire Department, a lower flow rate can be negotiated if a sprinkler system is installed.

Information regarding the use of the reduced fire flow alternative is not specifically tracked. However, it is believed that it is used about one-half dozen projects per year. This number is rather low as compared to previous years as overall construction activity is down considerably.

Jurisdiction: Orange County, CA

Incentive Type: Financial Tradeoff

Incentives that meet study requirements? Yes

- Reduced or waived fees

Residential Sprinkler Ordinance or Code Requirement? Yes, for some jurisdictions

Financial Tradeoff: Reduced permit fee for sprinkler installation

Onsite Design Flexibility: None

Offside Design Flexibility: None

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

The county offers an incentive to install fire sprinkler systems in circumstances where they are required and where their inclusion is only voluntary. The incentive has been in place for at least ten years. Some jurisdictions within Orange County require sprinkler systems to be installed, while others do not. There is a permit fee associated with their installation and as a result of the incentive the county now waives this fee.

The typical cost of the sprinkler installation permit fee is understood to be around \$600-\$700 per single-family home and would include both the plan review and the actual inspection.

In 2009, approximately 250 newly constructed single-family homes took advantage of the incentive. The vast majority of these installations were in homes where a sprinkler system was required.

Jurisdiction: Scottsdale, AZ

Incentive Type: Offsite Design Flexibility

Incentive that meets study requirements: Yes

- Reduced requirements for fire hydrants in a development
- Reduced requirements for minimum road width
- Reduced requirements for fire flows
- Increased allowable dead-end street length
- Other – Reduction in means of access and no meter needed in sprinkler only applications

Financial Tradeoff: N/A

Onsite Design Flexibility: No meter needed for sprinkler only applications; fire break options

Offsite Design Flexibility: Longer maximum dead-end parking aisles; lower fire flow/reduced main size; as part of code – reduced minimum street widths; increased hydrant spacing; increased maximum cul-de-sac length; reduction in means of access.

Standards Required: NFPA 13D or 13R as applicable. Several of the flexibilities above are only available in fully sprinklered developments. Fire inspectors and deputy fire marshals must inspect.

Administration: State or local government; fire department; non-profit

Presence of Sprinkler Ordinance: Yes.

Description of Incentives and their Application:

All homes in Scottsdale are required to install fire sprinklers. However, Scottsdale still provides incentives via design flexibility through their code and through the Design Standards and Policies.

Several onsite incentives are available to builders and developers including fire breaks and meter requirements. A fire break (removal of plant life) is required onsite. However sprinklers or fire rated assemblies may be considered as replacements for fire breaks. This incentive does not provide much financial benefit, but does offer some landscaping flexibility. Finally, a water meter is not required on a water service line only used for sprinklers.

Scottsdale also offers off-site incentives in the form of design flexibilities. Turn-around for emergency vehicles at the end of dead end fire lanes are required in situations where the fire lane exceeds 150 feet in length. This is extended to 300 feet in length for sprinklered structures. The grade of fire apparatus access roads also is given some flexibility for sprinklered structures, increasing from 12% max to 15% max. For fully sprinklered developments, fire flow requirements can be reduced from 1000 GPM to 500 GPM (along with a main size reduction from 8 inches to 6 inches).

Scottsdale has also adjusted their code to reflect the fact that sprinklers are required by ordinance. For example, minimum street widths have been reduced; fire hydrant spacing has been increased; and maximum cul-de-sac length has been increased. A density increase of 4% was also enacted. Changes in the code that apply to all construction are generally not considered as “incentives,” as they are now the norm. However, these adjustments to local development regulations in a jurisdiction which

now requires sprinklers are presented as a potential model that can be used in other communities.

Scottsdale also allows for only one means of access to single-family residential developments (instead of two) unless fire code officials determine that a second means of access is necessary. Fire inspectors and deputy fire marshals inspect the installation of sprinklers currently. The Deputy Fire Chief estimates that 90% of developments use the design flexibilities provided.

The Scottsdale sprinkler ordinance, recognized as the pioneering sprinkler ordinance in the country, has been in effect since 1985, and has been well documented in several studies including the Reese-Carr Study in 1986, and a 10-year study performed by Jim Ford (Deputy Fire Chief) in 1995. Incentives have made their way into the code and Design Standards and Policies gradually since the introduction of the sprinkler ordinance. While Scottsdale's incentives are steadily converting into standard practices, these measures provide a helpful model to show a range of development and design options which sprinklers afford.

Jurisdiction: Spring Lake Park, MN

Incentive Type: Financial

Incentive that meets study requirements? Yes

- Special financing options

Financial Tradeoff: Zero-interest loan

Onsite Design Flexibility: N/A

Offsite Design Flexibility: N/A

Other (if applicable): N/A

Standards Required: NFPA 13D or 13R, as applicable, are required for sprinkler installations in this jurisdiction. The installation requires a certified designer and is inspected by a fire marshal.

Administration: The incentive program is administered through a non-profit fire department.

Presence of Sprinkler Ordinance: No

Description of Incentives and their Application:

Spring Lake Park Fire Department offers a \$4,000 zero-interest loan for the installation of a sprinkler system. The incentive applies to new and existing single family homes, multifamily homes, and institutional buildings and is available to the homeowner.

The incentive is promoted through community events and open houses, and the most interested people tend to be homeowners who have experienced some type of fire event. The fire department receives two to four applications a year, and the incentive is administered on a first-come first-served basis until the loan funding has been used up.

The sprinkler loan incentive has been in place since 2001. In Minnesota, all cities are required to carry a certain amount of insurance, which is held in a statewide pool. At the end of each year, any surplus from the insurance fund is given back to the cities. The fire department convinced the city managers of Spring Lake Park, Blain, and Mounds View to use any surplus to fund the sprinkler loan incentive budget. Because they are paid back by the recipient, the loan pool is gradually replenished. And because the loans are funded through the insurance surplus, the cities do not need to set aside funds in their budgets for the incentives.

Although there are design flexibilities available for multifamily structures, allowing tradeoffs for things such as hydrant spacing, these incentives are not extended to single-family homes. The jurisdiction also waives the \$75 permit fee for the sprinkler installation. However, as this is always waived for homes with sprinkler installations – and no sprinkler requirement exists – this waived fee is essentially an avoided extra costs which does not fit under the definition of incentives for this study.

Jurisdiction: State of Illinois

Incentive Type: Financial Tradeoff

Incentives that meet study requirements? Yes

- Reduction of property taxes

Residential Sprinkler Ordinance or Code Requirement? No

Financial Tradeoff: Property tax reduction

Onsite Design Flexibility: None

Offside Design Flexibility: None

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government or independent contractor

Description of Incentives and their Application:

While residential fire sprinkler systems are not required by the State of Illinois, the statewide grant program incentive serves to encourage their installation. The program, established from legislation signed into law in 2008, allows fire protection district trustees the right to award monetary grants to the owners of single-family homes when they install a fire sprinkler system. In effect, the grants are a return of the portion of property taxes that a property owner has paid.

Under this program, the fire protection districts are charged with setting up and administrating the program as trustees will determine the grant amounts based on an understanding of the direct impact that sprinkler protected homes will have in their districts. Thus, each district could potentially offer a different per home grant amount.

It is hoped that, in time, the state could provide funding for this incentive so that fire districts under certain financial constraints could provide a more meaningful grant amount.

The incentive can be attributed to the advocacy efforts put forth by the head of the Illinois Association of Fire Districts. It was signed by the governor in 2008.

Jurisdiction: Wilsonville, OR

Incentive Type: Financial Tradeoff

Incentives that meet study requirements? Yes

- Reduced or waived fees

Residential Sprinkler Ordinance or Code Requirement? No

Financial Tradeoff: Credit applied to water system development fees

Onsite Design Flexibility: None

Offside Design Flexibility: None

Standards Required: Residential fire sprinkler systems are required to be installed according to NFPA 13D

Administration: Local government

Description of Incentives and their Application:

The basis for the city's decision to offer the incentive can be attributed to the fire department's concern that a large planned sub-division was located too far from reliable water sources. This was communicated to the city and authority was granted to the Community Development Director to negotiate an incentive in return for an agreement that would require the installation of fire sprinklers in each of the sub-division's new homes. Fire sprinkler systems are not required to be installed in new single-family homes in Wilsonville and there are no formal incentives offered to encourage their installation.

This incentive has only been negotiated for one project. It is important to note that this project is quite large – 2,300 units to be built in several phases over 7 – 12 years. Costa Pacific, the master developer, has engaged several different homebuilders to build out the community. While the agreement pertaining to the sprinkler incentive was negotiated between the city and the master developer, the incentive applies to all homebuilders participating in building out the development.

At the inception of the agreement, the credit's value was \$1.21 per SF of living space per unit. Adjustments to the credit amount are tied to the annual increase in the Construction Cost Index, and it is currently \$1.34 per SF. The maximum amount of the credit per unit is the full water system development charge of \$6,652. In other words, the total credit cannot be greater than the water system development charge.

The incentive is not currently available in Wilsonville outside the Costa Pacific project.

V. ESTIMATION OF THE VALUE OF INCENTIVES

The overall goal of the incentive valuation was to provide a sense of magnitude of the incentives' value to different stakeholder groups. As discussed in the Methodology section above, different types of incentives will benefit different stakeholders (developers, builders, and homeowners). For the sake of transparency and avoiding layers of assumptions, this study does not attempt to estimate how the value of an incentive for one stakeholder group, like a developer, will cascade down to another stakeholder, like a builder.

The discussions below estimate the value of incentives encountered in this study. For incentive types which were identified in multiple jurisdictions, a blended value which reflects the typical provisions and extent of the incentive is provided. Extended spacing for fire hydrants is an example, where several jurisdictions have this incentive in place. The exact provisions of the incentive varied slightly across these jurisdictions, so in the valuation estimate an average or typical value is used.

Other incentives encountered in this study are quite unique to the jurisdiction where they are utilized. These 'one-off' incentives were typically financial in nature and are valued based only on the way they are offered in a particular jurisdiction.

In the estimates of incentive values, some assumptions are necessary to arrive at a value for a particular measure. Such assumptions are noted below along with the source for any data inputs. It should also be noted that for developer-oriented trade-offs, it is assumed that construction is taking place in a new residential subdivision, as opposed to infill lots or standalone lots.

Reduced or Waived Fees

Altamonte Springs, FL offers reduced fees as part of a group of incentives the city uses to offset the cost of residential fire sprinkler systems. Specifically, the city offers a discount toward building permit fees, water connection fees, and the fire portion of the fire and rescue services impact fee. The cost of a building permit is noted to be about 1.75% of the value of construction and can be reduced by 40% for sprinklered homes. An estimate for the price of a new single-family home in Altamonte Springs was found to be about \$200,000 according to the Seminole County Property Appraisal Office. Using this estimate, the typical cost of a building permit would be around \$3,500. After applying the 40% discount, the fee would be reduced to \$2,100. This provides an incentive value of around \$1,400. Water connection fees use a base cost of \$600 per dwelling and can be reduced by 40%, as well, yielding an incentive value of \$240. The fire and rescue services impact fee is \$172 and can be reduced by 25%, or \$43. Thus, the estimated total benefit of these incentives to a builder would be \$1,683.

In California, Orange County allows the permit fee for home sprinkler systems to be waived. Normally, this permit would cost around \$600 to \$700 per home, and it would include both the plan review and the actual inspection. Therefore, the value of the incentive is roughly \$650.

The home sprinkler incentive offering in Wilsonville, OR is somewhat unique in that it has only been arranged for a single project. However, the project is expected to be at least 2,300 units and thus the number of homes that will take advantage of this incentive is similar to the number that would use it if it were offered on a community-wide basis.

Homeowner's Insurance Discounts

Discounts offered on homeowner's insurance premiums are another type of incentive that can be realized by having a residential fire sprinkler system. In the Fire Protection Research Foundation's 2008 *Cost Assessment* study, insurance companies in a number of locations were surveyed to determine the extent of this benefit.

For the ten communities included in this prior research, the five largest insurance companies (according to market share) were identified. These companies were then asked how large a discount they would offer on a homeowner's policy for a sprinklered home. From this research, it was noted that the average insurance premium discount ranged from about 0 to 10% among all companies and agencies surveyed, with an average annual premium discount of 7%.

While this type of homeowner benefit is not featured in the current study, in many cases it will provide an additional homeowner "incentive".

Wilsonville allows the development's homes to receive a credit, currently stated as \$1.34 per SF of living space, to offset a home's water system development charge. The incentive's value has an upper limit in that it cannot exceed the total water system development charge. This amount was noted to be \$6,652. Assuming a typical living space of 2,278 SF for homes in this project, the value of the incentive is about \$3,053 per home. The typical SF of living space figure was taken from the Fire Protection Research Foundation's "Home Fire Sprinkler Cost Assessment Study" for a typical Wilsonville single-family home.

Reduced Fire Ratings for Building Assemblies

In Lake Forest, walls, doors, and ceilings separating the residence from the garage area are not required to have a minimum fire rating when both the garage and home are sprinklered. In cases where the home and garage are not sprinklered, a 1-hour rated assembly is required between the garage and living spaces adjacent to it or above it.

As a result, homes and garages with sprinklers can use less expensive and fewer gypsum panels in the construction of garage walls and ceilings. Assuming a 22' by 22' garage with 8' ceilings, two walls adjacent to living space, and living space above, the estimated cost savings per house from this incentive was estimated to be \$154. It is important to note that the typical single-family home in Lake Forest is much larger than a single-family home in most other communities. In turn, it is likely that a typical attached garage in Lake Forest would be much larger than the 22' by 22' footprint assumed in this analysis. This dimension, which reflects a modestly sized 2-car garage, was used in the cost estimating to arrive at a representative figure which would be meaningful to other communities. In Lake Forest homes, the value of reduced fire ratings would be higher.

Without sprinklers in the house and garage, the design was assumed to include two layers of 5/8" Type X gypsum on the ceiling and have two garage walls with 5/8" Type X panels on both the inside and outside of the wall. These specifications are based on 1-hour rated assemblies found in the Gypsum Association's "Fire Resistance Design Manual." With sprinklers used in the garage and the home, there would be only one layer of 1/2" drywall on the ceiling and 1/2" gypsum panels on the walls dividing the garage from the home.

Approximate prices for the 5/8" Type X and 1/2" standard gypsum panels were based on a review of the cost of a 4' by 8' panel from several national retailers who supply the products. The cost for 5/8" Type X panel was roughly \$8.10 per panel while the standard 1/2" panel was about \$7.25.

Reduction of Property Tax

Two jurisdictions, Montpelier, VT and the Moraga Orinda Fire District, utilize reductions in a homeowner's taxes to encourage the use of fire sprinklers in homes. The City of Montpelier allows the owner of a single-family home to reduce the assessed structure value by 10% in the calculation of their municipal taxes due. The value of the incentive was found to be \$210 per home, and it is a recurring benefit which occurs each year. This amount is applied as a credit on the owner's municipal property tax bill.

To arrive at the figure of \$210, the median assessed structure value of a single-family home was estimated for Montpelier. This was \$150,000, based on an estimate from the city's Assessor's Office. The discount was applied to this figure prior to applying a rate of \$1.40 per \$100 to the discounted assessed structure value. The incentive's benefit remains in place if the property, equipped with a fire sprinkler system, is sold to a new owner.

The fire flow tax in the Moraga Orinda Fire District is based on the structure type, the total SF of the improvement, and whether or not the structure is sprinklered. It is levied on an annual basis. The calculation differs if the home includes a sprinkler system. Thus, the incentive's value was determined by calculating the amount of tax due on a typically sized home that is sprinklered and an identical one that is not. With this approach, the value was found to be about \$37 each year. The size of a newly constructed single-family home was assumed to be 2,140 SF within this calculation, based on data for new single-family homes in the Western U.S., from the U.S. Census Bureau's Characteristics of New Housing for 2009.

Since these incentives provide a *recurring* benefit over a period of time, their values are shown as a first-year value (to allow comparisons with the other incentives) and as a present value, discounted over 30 years (which is more indicative of its true value). The 30-year present value is estimated based on two different discount rates, to show the potential range of long-term values of the incentives.

With the first-year values provided above, the upper and lower bounds of the 30-year present value for the reduced property tax are \$3,031 and \$1,661, respectively. Likewise, the upper and lower bound of the 30-year present value for the reduced fire flow tax are \$541 and \$296, respectively.

The upper bound of the present value range was determined by using a discount rate equal to the average annual return on the benchmark ten-year Treasury note over the past thirty years; while the lower bound was based on a discount rate equal to the 20 year average return of the S&P 500. The different discount rates are intended to illustrate the potential rate of long-term value for these incentives.

Both the first-year values and the 30-year present values for these two incentives are summarized in the next section in Table 2.

Special Financing Options

The City of Spring Lake Park, MN was the only jurisdiction to offer a special financing incentive. This option allowed homeowners to obtain a \$4,000 zero-interest loan to cover the cost of a home sprinkler system's purchase and installation. Given that this financing is in the form of a loan rather than a grant, homeowners must pay back the principal. However, homeowners will realize savings in that there is no cost for borrowing the funds. Therefore, the value of the incentive is estimated based on the interest that a homeowner will not have to pay on a \$4,000 loan. An assumption was made that in the absence of this zero-interest offer, a homeowner would roll the \$4,000 into a traditional 30 year mortgage used to fund a home purchase.

Like the property tax reductions previously mentioned, since this is a recurring benefit over a period of time the value of this incentive is shown as a first-year value and as a 30-year present value. Again, the 30-year present value is presented as a range of values based on two different discount rates.

Based on this analysis, the first-year value of this incentive was found to be \$189 in the form of saved interest. The upper and lower bound of the 30-year present value are \$2,081 and \$1,335, respectively.

In order to calculate these values, an interest rate of 4.75%, from Freddie Mac's Weekly Primary Mortgage Market Survey (taken during the time of this analysis), was used to derive the cost of interest which would be paid on \$4,000 over a 30-year term. The

upper bound of the present value range was determined by using a discount rate equal to the average annual return on the benchmark ten-year Treasury note over the past thirty years; while the lower bound was based on a discount rate equal to the 20 year average return of the S&P 500. The different discount rates are intended to illustrate the potential rate of long-term value for these incentives.

Increased Fire Hydrant Spacing

In considering the information gathered from jurisdictions for this incentive, it was determined that an increase in hydrant spacing of 400 feet was a representative distance. With each of the jurisdictions having standard hydrant spacing of 500 feet, this would result in an “incentivized spacing” of 900 feet. The more distance there is between hydrants, the lower the hydrant cost per building lot because one hydrant covers more lots. The value of the incentive is therefore presented as a reduced cost per building lot.

The value of this incentive was estimated to be \$49 per building lot. In calculating this figure, the cost of a fire hydrant was estimated to be \$2,200. This figure was obtained from a discussion with a residential fire hydrant manufacturer. Also, it was necessary to assume that a standard sized lot would have 50 feet of frontage. This figure was sourced from a Tualatin Valley Fire and Rescue report on fire sprinkler incentives², and is a representative lot width in many residential developments nationwide. In considering both sides of the street, 20 building lots can be covered by a hydrant under standard spacing requirements. This results in a per-building lot hydrant cost of \$110. There can be 36 lots covered by a single hydrant under the incentivized spacing, reducing the per-building lot hydrant cost to about \$61. This translates into an incentive value of \$49 per building lot.

It is worth noting that the incentive’s per-lot value may not hold under certain development scenarios. For example, a road within a sub-division might not extend a full 900 feet from a hydrant. This could be for several reasons. As a result, there would be fewer than the maximum number of lots covered by this hydrant. This would serve to increase the hydrant cost per lot and reduce the value of the incentive.

² “*Study of Cost Implications Associated with a Voluntary Residential Sprinkler System for New Construction*,” Tualatin Valley Fire & Rescue, May 2009. This report provides a comparison between the cost of a sprinkler system and the total value of a number on and off-site tradeoffs, or incentives.

Reduction of Road Width

Of the jurisdictions that offer this type of incentive, several different road width reductions were noted. In light of this, a 4' reduction provides a reasonable estimate. In order to present this incentive on a per-lot basis, the reduction in width is divided by two to account for lots being present on each side of the street. The frontage length of a building lot (50') is multiplied by $\frac{1}{2}$ of the road width reduction (2') to determine the area of road, per building lot, which no longer needs to be paved. This area (100 SF), is then multiplied by an estimated road development cost (\$6.37/SF) to determine the savings from avoided excavation and paving costs (\$637/lot).

The estimated road development cost per SF of \$6.37 was calculated by obtaining the paving cost per single-family lot from the NAHB's 2004 Construction Cost Survey. This cost was divided by one-half the total area of road in front of a building lot, assuming road frontage of 50' and road width of 24', to obtain the cost per SF.

The value of the raw land that is able to remain unpaved as a result of this incentive also serves as a component of the value determination, because this land becomes available to the developer for some other use. It is assumed that the developer is able to make some sort of productive use of the non-paved land, such as additional building lots, open spaces, etc. In calculating an estimate for the value of raw land, a raw lot cost of \$48,769 was obtained from the NAHB's 2004 Construction Cost Survey while a median lot size of 9,114 for new single-family detached homes was obtained from the U.S. Census Bureau's Characteristics of New Housing for 2009. Relevant data was combined to arrive at a raw land cost of \$5.35 per SF, which was in turn multiplied by 100 SF (per lot) to arrive at value of \$535/lot for the value of the additional available land.

Combining these two components of the reduced road width incentive, the estimated value of the 4' width reduction is roughly \$1,172 per building lot.

Reduced Fire Flows

For the localities that offer a reduced minimum fire flow requirement, the most common reduced requirement was found to be 500 gallons per minute (GPM), down from a standard flow rate of 1,000 GPM. For instance, Fairfax County, VA allows minimum fire

flow to be reduced from 1,000 GPM to 500 GPM when fire sprinkler systems are installed in homes. Through discussions with communities offering this incentive, it was determined that a GPM reduction such as this could reasonably result in the water main size being reduced from 8" to 6" in diameter.

The value of this incentive was found to be \$50 per lot. For this calculation, it was assumed that the 2" reduction in water main diameter would result in a cost savings of \$2 per linear foot of pipe. To obtain the per-lot metric, a lot frontage of 50 feet was used. The water main was assumed to serve both sides of a street; therefore lots across the street from each other "shared" the value of this incentive, essentially dividing the value by 2. Both the 50' lot frontage and the \$2 cost savings/lineal foot pipe figures were obtained from the Tualatin Valley Fire and Rescue report referenced above.

Reduced Cul-De-Sac Width

Based on information gathered from jurisdictions offering this incentive, the most common reduction of a cul-de-sac radius was found to be 3 feet. For instance, Lake Forest, IL allows developers to decrease the radius of a cul-de-sac between 2 – 4 feet in exchange for including sprinkler systems in the project's homes.

Unlike some of the previous incentives which have been valued on a per-lot basis, this incentive is valued for a single cul-de-sac. With the three foot reduction noted above, the estimated value was found to be \$10,752 per cul-de-sac. This figure is based on the area of cul-de-sac which would not have to be paved in moving from a 54' radius to 51' radius, allowing for the fact that part of this area would still be paved where the road enters the cul-de-sac. Road paving cost per SF was obtained using the same method as was applied in estimating the value of a reduced road width.

In addition to reduced excavation and paving costs, this figure is also based on the estimated value of raw land of \$5.35 per SF that no longer needs to be paved and becomes available to the developer for some other use. Again, this component of the valuation assumes the developer can make some sort of productive use of the preserved land. The value for raw land was determined using the NAHB and U.S. Census Bureau sources noted above in the discussion on reduced road widths.

Increased Dead-End Street Length

The typical amount of extended dead-end street length found in the study was 125 feet. Similar to the incentive for reduced radii of cul-de-sacs, this incentive is not valued on per-lot basis. Instead, the benefit of the incentive is stated in terms of how many lots can be added as a result of the increased street length. Under a scenario where 125 feet of street length can be added to a dead-end, an additional four lots can be included. This determination assumes that a standard size lot includes 50 feet of street frontage, and that lots are situated on both sides of the extended dead-end. It should be noted that the value of these additional lots would be partially offset by added land development costs, and that the application of this incentive could be limited by some development layouts.

VI. COMPARISON OF INCENTIVES VALUE WITH SPRINKLER SYSTEM COSTS

The purpose of this section is to provide a reasonable estimate of the value of sprinkler incentives to the three main stakeholder groups: developers, builders, and homeowners. Further, the incentives value for builders is compared to a typical cost for a residential sprinkler system, to place the magnitude of incentives' value into a context.

A summary of incentive values, based on the estimates from the previous section, are presented in a series of three tables below. Each table presents an estimate of what could reasonably be assumed to be the total value of incentives for each stakeholder group. The values shown below and the surrounding discussions are intended as examples only, and not intended to show the "right" level of incentives that a community should consider.

Incentives Value to Homeowners

The types of incentives which directly benefit homeowners are all in the Financial Incentives category. While homeowners could potentially benefit *indirectly* from benefits which go to developers or builders, estimating the potential magnitude of these indirect impacts is beyond the scope of this study.

As described previously, homeowner incentives are unique in that they provide a recurring benefit. However, in order to provide an element of comparability, a first-year value is provided for these incentives. Their long-term value over 30 years is also

presented. The long-term value is calculated as the present value of the benefit as it is accrued over 30 years. Two different discount rates are used to show the potential range for the long-term value of the incentive. The higher discount rate (which results in a lower estimated value) uses the average return of the S&P 500 over the last 20 years, while the lower discount rate is based on the average rate of the 10-year Treasury note over the same period of time.

The average value of homeowner-oriented incentives is shown in Table 2 below for each scenario. Note that reductions in home insurance premiums would also add to this value – see text box above. An *average* value is presented because it is unlikely that one jurisdiction would offer all of these different incentives.

Homeowner-Oriented Incentives	Estimated First-Year Value per Building Lot	Estimated Present Value per Building Lot over 30 years – 6% Discount Rate	Estimated Present Value per Building Lot over 30 years– 12% Discount Rate
Reduced property tax	210	3,031	1,661
Reduced fire flow tax	37	541	296
Special financing options	189	2,081	1,335
<i>Average Incentive Value</i>	<i>\$145</i>	<i>\$1,884</i>	<i>\$1,098</i>

Table 2: Summary of Homeowner-Oriented Incentives

Incentives Value to Builders

The types of incentives that would accrue directly to residential builders are a collection of Financial and Onsite Design Flexibility Incentives. Table 3 shows the estimated value of \$1,949 which would directly benefit a builder. In calculating the value of builder-oriented incentives, an average of the three different reduce fee “packages” was used, since it is unlikely that more than one of these incentives would be offered by any one jurisdiction. Instead, it is anticipated that a jurisdiction would likely offer one set of financial incentives, as the communities in this study have done. The onsite design flexibility incentive was then added to the average value of the financial incentives, since it is possible that this incentive could be offered in tandem with a financial incentive.

Builder-Oriented Incentives	Estimated \$ Value per Building Lot
Reduced fees (building permit, water connection, impact fee as found together in one jurisdiction)	1,683
Reduced fees (sprinkler permit)	650
Reduced fees (water system development charge)	3,053
Average of Reduced Fees	\$1,795
Reduced fire ratings for building assemblies	154
Estimated "Typical" Incentive Value	\$1,949

Table 3: Summary of Residential Builder-Oriented Incentives

This value of \$1,949 is simply an estimate of the value of builder-oriented incentives, based on a reasonable evaluation of incentives currently in place in different communities.

Incentive Value to Developers

Incentives attributable to developers include only Offsite Design Flexibility Incentives. Their total value was determined to be \$1,271 from Table 4 below. A total value is used here because jurisdictions could reasonably bundle these incentives, instead of offering them individually. Part of the rationale for this approach is that these incentives do not take revenue away from another party like the planning department in a community; instead they simply reflect development practices which can become feasible when homes have sprinklers installed.

Developer-Oriented Incentives	Estimated \$ Value per Building Lot
Reduced requirements for fire hydrants in a development	49
Reduced requirements for minimum road width	1,172
Reduced requirements for fire flows	50
Total Value of Incentives on a "Per-Lot" Basis	\$1,271*

*Does not include value of reduced cul-de-sac widths (\$10,752) or increased dead-end street length.

Table 4: Summary of Residential Developer-Oriented Incentives

The benefit associated with reduced cul-de-sac width and increased dead-end street length has not been included in the developer-oriented incentive calculation despite the fact that their benefit would be realized there. However, these incentives do not lend themselves to a "per-lot" basis. Thus, the value of the reduced cul-de-sac radius incentive was found to be \$10,752 *per cul-de-sac* and the increased allowable dead-end

street length added five *additional building lots*. As a result, they cannot be added to other per-lot values in determining the total value of developer-oriented incentives.

Value of Incentives Compared to Sprinkler System Installation Costs

The purpose of this section is to provide a comparison between the value of the incentives as they could reasonably be offered, and the cost of the sprinkler system itself. The value calculated for builder-oriented incentives is used in this comparison, since it is builders who directly absorb the cost of the sprinkler system. The average value of incentives offered to builders is \$1,949, based on the communities and incentives researched in this project.

In terms of sprinkler system costs, the average sprinkler system cost from the Fire Protection Research Foundation's "Home Fire Sprinkler Cost Assessment" was \$1.61 per sprinklered square foot. This figure is based on an analysis of 30 homes and sprinkler systems from different regions of the United States. The sprinkler systems included in this study were diverse, and served houses of different sizes, foundation types, and water sources (municipal vs. on-site). The sprinkler systems also varied in terms of their design (standalone and multi-purpose systems were included), their piping materials, and the extent of the home which was sprinklered (a few designs covered garages and attics).

The \$1.61/sprinklered square foot figure also includes all costs to the builder associated with the sprinkler system including design, installation, and other costs such as permits, additional equipment, and increased tap and water meter fees (to the extent that they apply). The \$1.61/sprinklered square foot figure does *not* include any credits or incentives which might have been available, so it is not discounted with any of the incentives which might be captured in this study.

Assuming that the average size of a new single-family home is 2,438 SF³, an estimate for the sprinkler system cost for a typical new home is \$5,888. To arrive at this figure, it was assumed that the new home has two stories and a basement foundation. These assumptions lead to a "sprinklered square footage" of 3,657, because basement areas are sprinklered under NFPA 13D. While other approaches can also be used to develop a typical sprinkler system cost (which may result in higher or lower estimates), this approach was selected because it is based on a typical new U.S. home size,

³ *Characteristics of New Housing for 2009*, U.S. Census Bureau, released on June 1, 2010.
Incentives for the Use of Residential
Fire Sprinkler Systems in U.S. Communities

conservative assumptions regarding basement square footage, and a cost per sprinklered square foot figure which originates from a balanced research study.

When comparing the system cost of \$5,888 to the estimated value of builder-oriented incentives of \$1,949, it is clear that communities offering builder-oriented incentives can significantly offset the added cost of sprinkler system installation. In this example, the estimated value of incentives is 33% of the estimated sprinkler system cost.

VII. CONCLUSIONS

This research report demonstrates that a wide variety of incentives for the use of residential fire sprinklers are being used in different communities in the U.S. These incentives vary in their focus, with some providing direct financial benefits like a reduced fee or property tax. Other incentives provide flexibility in a home's construction which can reduce construction costs, due to the presence of sprinklers. Lastly, "off-site" design flexibility incentives provide flexibility in terms of how a development is built, and affect items like fire hydrant spacing, road width, and the allowable size of dead-ends and cul-de-sacs.

The incentives identified in the 16 communities also vary in terms of the party which directly benefits. Different incentives were identified which directly benefit developers, builders, or homeowners. Often a community's incentives would target just one of these groups. Future research should investigate which types of incentives and which target groups result in the greatest impact on the use of sprinklers in homes.

The estimated values of the incentives which were identified varied widely, from a very small amount to trade-offs worth hundreds or thousands of dollars per building lot. Further, the homeowner-oriented incentives were annually recurring and would offer a significant total value over time. Not all communities offered the same type of incentives, but when estimating a typical value of the incentives which were found across the communities, the values were significant (Table 5). These values assume that a jurisdiction would offer the types of incentives which were identified in a subset of the communities.

Estimated Incentives Value	Estimated \$ Value per Building Lot
Homeowner-Oriented Incentives*	\$145*
Builder-Oriented Incentives	\$1,949
Developer-Oriented Incentives**	\$1,271**

*Homeowner incentives are annually recurring (e.g. reduced property taxes). This figure is the average value in Year 1.

**Does not include value of reduced cul-de-sac widths (\$10,752 per cul-de-sac) or increased dead-end street length.

Table 5: Estimated Value of Incentives, Assuming a Community offers “Typical” Incentives Identified in the Study

Compared to the estimated cost of installing a residential sprinkler system, the builder-oriented incentives were estimated to offset a significant portion (roughly one-third) of this cost. Again, this assumes that a community would offer incentives similar to the ones found in the various communities.

Overall, this research study indicates that incentives have good potential to boost the voluntary use of sprinkler systems in homes. For a variety of reasons, the 16 communities covered in this study have enacted incentives of different forms. These communities and their collective incentives establish a “toolkit” which other jurisdictions can draw from, as they consider strategies to increasing residential fire sprinklers and improving life safety systems in new homes.

APPENDIX A – INTERVIEW GUIDE

CITY, STATE

Sprinkler Incentives	Community Information
Year Enacted: Special Details:	Population: Size: Economic Data:

Overview:

Each interviewee will be asked to provide an overview of the residential sprinkler incentives, if any, which exist in their jurisdiction or community. The conversation will start by identifying the incentives. Next, the interview will explore the details of the incentives, including, the requirements, the extent (jurisdiction and timing), who is eligible, and whether the incentives take the form of cash or tradeoffs. Finally, the interviewee will be asked about the incentive development process, the future plans of the community, and any lessons learned from the experience.

Objective:

The objectives of this research are to identify what incentives have been enacted, the form and extent of those incentives, and how effective those incentives have been. Specific attention will be given to what strategies can best be used by other communities hoping to enact similar incentive programs. Important issues to be covered include the specific structure of the incentives, and whether the incentives were actually implemented by statute, or whether they were implemented as exceptions in certain specific instances.

The end goal of this outreach effort is to develop a list of strategies, best practices and policies to guide community stakeholders through the logistics of implementing a residential sprinkler incentive with a focus on results, broad applicability, and cost effectiveness.

In-Depth Interview Script

Note to Interviewer – it will be impossible to follow the script in exact order. Right off the bat indicate that you’re doing some research for NFPA on residential sprinklers to try to identify how some communities are using various incentives to encourage the use of sprinklers in homes. Then open up the topic of incentives for residential fire sprinklers, let them start talking and try to guide them to the questions we have as the conversation develops.

Date:	
Time:	
Interviewer:	
Contact Info:	

Interviewer Introduction:

Hello, my name is _____, with Newport Partners, and I am conducting research on behalf of the National Fire Protection Research Foundation – NFPA - on residential sprinkler incentives. We are gathering information on various incentives for builders, developers, or homeowners that communities have adopted in order to encourage installation of sprinklers in residential buildings, or to ease the market transition as sprinkler requirements are eventually adopted on the local level. Do you have a few minutes to talk about incentives in your jurisdiction, and are you the right person to talk to about this subject?

- *If the interviewee appears nervous talking to us or want some assurance that we are actually working for NFPA and its non-profit Fire Protection Research Foundation, have them contact the Foundation at _____*

Questions:

Objective: Determine if any sprinkler incentives exist or existed in the interviewee’s community

Are residential fire sprinklers required in your jurisdiction for new single-family dwellings?

- If yes – we can still ask about incentives – but the likelihood of incentives will be low. Ask about any other jurisdictions they might know about without a sprinkler ordinance but with incentives in place.

Do any incentives exist in your jurisdiction or community for installation of residential sprinkler systems? By “incentives”, we’re talking about a variety of possible things – like allowing developers to use narrower roads, fewer fire hydrants or even tighter setbacks; or giving home builders a credit of some type or allowing some leniency in building code requirements; or even giving homeowners a break on property taxes.

Note to interviewer: make sure the respondent has an understanding of what we mean by “incentives” to prevent a quick “no” that might be due to a misunderstanding of what we’re talking about.

- If no – Have any such incentives been in place in the last 10 years?
- Were there incentives considered but not implemented?

Objective: Determine the form of the incentives

Is the Incentive a cash incentive?

- If so, how much?
- How is it measured? Units of \$ per sq foot? How are sq ft defined (sprinklered sq ft? including basement?)
- Who funds the incentive?
- If connected to taxes, is the incentive a rebate, a credit, a deduction?
- Who received the cash, builder, developer, homeowner?

Is the incentive a tradeoff incentive?

- Is it a development-oriented or “off-site” incentive? E.g. narrower roads, steeper road allowances, fewer hydrants, tighter setbacks, etc.
- Is it a site-level incentive? E.g. reduced fire ratings of wall or ceiling assemblies,
- What are the extent of, or limits of, these tradeoffs, if any? (do the tradeoffs eliminate or reduce requirements?) Is there an upper limit on cash? Or sq ft?

Objective: Determine the requirements to obtain the incentives

Are the recipients of the incentive required to comply with a specific standard for sprinkler installation?

- If so, what standard? (NFPA 13D? NFPA 13D with local modifications?)

Did the builder or developer have to install sprinklers in a certain percentage of their homes?

- Or a certain percentage of homes in the development?
- Or could it be done on a house-by-house basis?

Who inspects to ensure that the sprinklers were installed?

- Code official?
- Tax auditor in case of tax credit?
- Special inspector?
- Other?

Objective: Determine the extent and scope of the incentive

Do incentives apply to all residential housing types or just a certain segment like single-family detached?

What Jurisdiction (or how large an area) has access to the incentive?

- Was it the entire city, county, town, etc? Was it only available to a specific development, or in specific areas?
- Was this ongoing or simply a one-time event for a special circumstance?

How long has the incentive been in place?

- For an expired incentive, how long was it in place?

Where is the incentive's availability documented for the public to learn about it?

Did any limits exist on the incentives?

- Cash limits?
- Limits on the number of units or developments?
- Time limits?
- Price of housing limits (only affordable housing can apply, etc)

On whose authority was the incentive established?

- City council?
- Local building department?
- Local fire service?
- Local water utility?
- Other local organization or unit of government?

How widely has the incentive been used?

- Were records kept on the number of incentives awarded/applications received?
- Are those records publically available?
- Did builders/developers take advantage across the jurisdiction?
- Was the incentive used less often as time passed?
- How was the incentive publicized?

How did the process begin?

- Who proposed the idea?
- Who were the major supporters?
- Who were the major opponents?
- How did the idea come about?
- Was a taskforce developed to handle this issue or was it handled in an already standing committee?
- Who was on this taskforce/committee?

Objective: Determine the future of the incentive

Has your jurisdiction adopted the 2009 IRC, including the sprinkler requirements?

- If not, do you expect the jurisdiction to adopt it?
- Or do you expect any other residential sprinkler requirements to be adopted as code?

If so, will the incentives be continued?

What do you think are the most important aspects of a sprinkler installation incentive?

What aspects, if any, do you think didn't work well in your jurisdiction?

Do you have any other general advice, thoughts, or comments on introducing sprinkler incentives?

Objective: Identifying the interviewee and further contacts

Do you mind giving us your title and organization?

How long have you been in your position?

- Please give me a brief overview of your job responsibilities.

Is there someone else I should talk to in your jurisdiction about the sprinkler incentives and their implementation?

- Contact info?

Would it be ok if we contact you again with follow-up questions?

Thank you for your time.