



CITY OF MEDFORD

INTEROFFICE MEMO



FIRE DEPARTMENT

TO: Mike Dyal, City Manager

FROM: Dave Bierwiler, Fire Chief

DATE: July 11, 2007

RE: Residential Fire Sprinklers and Access Issues

Executive Summary:

On June 30, 2005, the City of Medford adopted the 2004 Oregon Fire Code (OFC). This brought the City into compliance with the statutory requirements set forth by Oregon State Fire Marshal (OSFM) to adopt and enforce the Oregon State Fire Code. This Code enhanced safety criteria related to fire department access, allowing residential structures to be built in geographic areas:

- where access is received by road grades exceeding 10%,
- when only one access route is available to areas exceeding 30 homes, or
- when the furthest point of a home is more than 150 feet from approved fire department access.

Under the law, the OFC allows the builder to request an "alternate method of fire protection" for the proposed home to address inadequate fire department access. The two most common alternatives to excessive grade, recognized by the fire department include:

- Reducing the street grade to 10% or less,
- Or the installation of residential sprinklers

Other alternatives accepted by the Fire Chief are permitted, as long as they meet the intent of the law.

The standard was developed based upon nationwide research that included the National Fire Protection Association and United States Fire Administration data bases. A local Fire Chief and City Officials do have latitude to deviate from the standard, as long as their deviation meets the "reasonableness standard". They must be able to justify why local conditions are significantly different than those that existed for the nationally researched and adopted standard, which was subsequently adopted by the State of Oregon. Developers and contractors may propose an alternative method of fire protection which would be objectively evaluated and permitted if it met the criteria for fire and life safety protection as intended by the OFC.

The Municipal Fire Code – Previous, Current, Future:

1. On June 30th of 2005, the City of Medford adopted the 2004 Oregon Fire Code (OFC) thus incorporating it into the City's Municipal Code. Adoption of the 2004 OFC brought the City in compliance with the statutory requirements of the Oregon State Fire Marshal (OSFM) to adopt and enforce the State Fire Code. The requirement to adopt and enforce the latest fire code is found in the Oregon Administrative Rules (OARs). **Fire and Life Safety is not a land use issue.**

Reference Note (1) Under ORS 476.030 and 476.120, the State Fire Marshal is responsible for promulgating rules and regulations which establish minimum standards for the protection of life and property from the dangers of fire. (2) To meet this responsibility and to promote uniformity, the State Fire Marshal shall assure that locally adopted fire codes in both exempt and non-exempt jurisdictions are consistent with minimum state fire code standards. Therefore, in adopting a fire code, local governmental subdivisions will: (a) Adopt by reference the fire code promulgated by the State Fire Marshal; or (b) Adopt a code that is consistent with state fire protection statutes and, is equal to or more stringent than, the fire code promulgated by the State Fire Marshal.

Prior to June 30, 2005, the City utilized the 1994 Oregon Uniform Fire Code (UFC.) The UFC was less stringent than the OFC, because as a whole, fire codes, like the Uniform Building Code (UBC), are in a constant state of revision and development. Each new fire code is based on past history, the latest in technological advancements, and emerging best practices in fire and life safety protection. These codes are revised on a three year cycle.

On April 1, 2007, the Oregon State Fire Marshal adopted the 2007 Oregon Fire Code. The Medford Fire Department is still operating under the 2004 OFC, but the Medford Fire Marshal is currently in the process of preparing to adopt the 2007 OFC (including City of Medford amendments,) as required by the OSFM.

As a part of the process for adopting and implementing the current fire code (2004 OFC), the Medford Fire Marshal and Fire Inspectors attended formal training in management and enforcement of the fire code. When the Oregon State Fire Marshal adopts a new code, it includes "amendments" specific to the State of Oregon. These amendments are included in the OFC and are listed as Oregon "amendments" which cities (including Medford) must enforce, as minimum standards.

Citizen and Business Community Concerns with the Current Fire Code:

Adoption of the 2004 OFC has many positive elements that the average citizen, if he or she were aware of them, would likely support. This is because the fire code is based upon fire and life safety protection, and incorporates the most current research and advances in safety and protection. The OFC incorporates protective features that prevent and/or limit the potential death risk to occupants and property damage to structures and their contents, based on the results of accumulated national research

Adoption of the 2004 OFC has brought about concerns by some of the local developers and contractors who conduct business in the City of Medford. One of their expressed concerns is the fire code requirement that certain residences be equipped with fire sprinklers. **This only occurs** when sprinklers are considered as an alternative solution to fire department access criteria. The primary concern expressed to the fire department is the additional financial impact on development.

Some developers and contractors have stated that they did not know that a code revision had occurred, and that alternatives to access problems would now be required. The Fire Code is a dynamic set of rules, like the Building Code. Changes occur regularly and unfortunately, some people fall under new criteria as it is adopted. The fire code is a statutory mandate promulgated by the State of Oregon and the City is required to enforce it through its fire department.

Our current procedure is:

- A site plan is submitted to the City.
- The Fire Department is a part of the site plan review.
- If access problems are noted, the Building Department requires the developer to submit a form, "Alternative access approval" approved by the Fire Department.
- Upon approval, the Building Department may issue the permit.
- The alternative requirement for access is recorded on the title and documented for the plat.

10 Percent Grade & Access Routes (Streets) - What Has Changed?:

2. Prior to the June 30th 2005 adoption of the OFC, and except for rare circumstances, developers and contractors were not usually required to include fire sprinklers in the construction of residential dwellings. The previous code placed the "in excess of 10 percent grade requirement" solely and directly in the hands of the local fire chief. The 1994 UFC stated – *"The gradient for a fire apparatus access road shall not exceed the maximum approved by the chief."* However, while the 2004 OFC, too, recognizes that *"The grade of the fire apparatus access road shall be within the limits established by the fire code official based on the fire department's apparatus."* The OFC, drawing upon the National Fire Protection Association (NFPA) states *"Fire apparatus access roads shall not exceed 10 percent in grade."* Notwithstanding, there are exceptions to this requirement, but and only if – *"special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety requirements."* It should be noted that the OFC is "minimum" requirement. See Reference Note 3 and 4.

Reference Note 3. The fire code, by definition, represents a "minimum" standard which is required to be enforced (statutory mandate). The language that covers this is as follows – **"101.3 Intent.** *The purpose of this code is to establish the minimum requirements consistent with nationally recognized good practice for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures and premises and to provide safety to fire fighters and emergency responders during emergency operations.*" The code states "consistent" with nationally recognized standards. The origin of the 10 percent grade is the National Fire Protection Association (NFPA) and now by reference is an OFC requirement.

Reference Note 4. The OFC allows an exception “Grades steeper than 10% as approved by the Fire Chief” – *“NFPA 1141 Sec. 5.2.4.1. Grades steeper than 10 percent shall be permitted by the authority having jurisdiction where mitigation measures can be agreed jointly by the fire department and the road engineering department.”* The mitigation measure that is commonly accepted is alternative fire protection. The alternative in most cases is to provide a residential fire sprinkler system. The intent is not to forego the requirement, but rather to ensure that effective fire protection and safety is provided. The OFC specifically addresses modifications and the intent of a modification – **“104.8 Modifications.** *Whenever there are practical difficulties involved in carrying out the provisions of this code, the fire code official shall have the authority to grant modifications for individual cases, provided the fire code official shall first find that special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety requirements. The details of action granting modifications shall be recorded and entered in the files of the department of fire prevention.”*

Who Determines What Access Road Grades Are or Can Be?:

The Medford Fire Department utilizes data supplied by the City’s Public Works Department, Engineering Division, to precisely identify road grade. The fire department access road grade requirement is applied only to roads that are classified as arterials and collectors, but it can include “local” roads when those roads are the primary, or the best response route to an affected residential dwelling.

1994 UFC vs. 2004 OFC, What’s the Difference / How is it Applied?

The difference between how the 1994 UFC was applied compared to how the 2004 OFC code is applied is significant. Regarding apparatus access roads exceeding 10 percent grade, the UFC was very generic in its scope while the OFC is now very specific, even referencing a nationally recognized standard (*NFPA 1141 – See Reference Note 4, above*)

Several developers, contractors, and attorneys have asked, since the Fire Code states “Grades steeper than 10% as allowed by the Fire Chief “, why won’t the fire department waive the requirement to provide a fire sprinkler system. Under the previous Fire Code, this waiver was *somewhat* permissible because the UFC stated a general requirement in Section 902.2.2.6 - *“The gradient for a fire apparatus access road shall not exceed the maximum approved by the chief.”* Specific language appears in the OFC where it states – in Section D103.2 – *“Fire apparatus access roads shall not exceed 10 percent in grade. **Exception:** Grades steeper than 10 percent as approved by the fire chief.”* The difference is the OFC lists what is recognized as a national standard and also states that to deviate from the standard there must be a very good reason. The Fire Chief has authority to waive the requirement, but only under very specific criteria. 2004 OFC Sec. 102.9 states “Where there is a conflict between a general requirement and a specific requirement the specific requirement shall be applicable.” See Reference Note 4.

The fire code does not address financial constraints or the belief that grades in excess of 10 percent are not fair. It should be noted, there are reasons besides access grade which trigger the requirement for alternative methods of fire protection. These include:

- Where the first story of the exterior walls of a building or facility is located more than 150' from approved fire apparatus access road (2004 OFC 503.1.1)
- In developments of one- or two-family dwellings where the number of dwelling units exceeds 30 which do not have at least two separate and approved fire apparatus access roads (OFC D107).
- In multi family developments with greater than 100 dwelling units that do not have more than 2 separate and approved Fire Department approved access route

How Are Other Municipalities / Fire Departments Applying the 2004 International Fire Code?

In January of 2005, a document titled "*Oregon Fire Code Metro Code Committee, Fire Code Application Guide*" was prepared to clarify several code interpretation and enforcement issues. In part, the purpose of this document was – "*to provide good faith guidance to building officials, contractors, business owners, the public, and fire marshals on local interpretations and practices that are considered to be in compliance with the Oregon Fire Code*" (2004 International Fire Code.) Included in this document is the interpretation and application for access roads that exceed 10 percent in grade. This guide was prepared for and utilized by several municipalities and government agencies such as the Oregon State Fire Marshal, the cities of Gresham, Hillsboro, Portland, Lake Oswego, as well as several fire districts such as Tualatin Valley Fire & Rescue, Clackamas County, etc.

How Many Medford Developments Projects Have "Triggered" the Alternative Method of Fire Protection Mandate?

During the period of July 2006 through June 2007, the fire department has reviewed approximately 330 Land Development projects. There were 79 instances where there were possible access issues, where the structure placement was in excess of 150' of an approved Fire Department access point, or where there was a single fire department access point for 30 or more dwellings. In addition to this, there were 10 projects that were identified as having fire department access routes where the road grade exceeded 10 percent.

In cases that the building construction has already occurred, 11 permits were issued for residential fire sprinkler systems. These 11 instances where an alternative method was requested were due to there being more than 30 dwelling units with a single access or where the structure was greater than 150 feet from approved fire department access point.

In some cases where the 150 foot rule is exceeded, an approved fire department turn around was installed.

In cases where a single access road was the reason for an alternative, a second access road was then installed.

In many of the previously mentioned 79 instances, construction has not yet begun.

In the Vista Point sub-division there is only one approved fire department access, in addition to the access road grade on Bordeaux being greater than 10 percent. The developer did not request an alternative method of fire protection and subsequently appealed the Fire Department's decision to require an alternative method. The appeal was upheld. This results in approximately 80 dwellings with a single approved fire department access route.

The focus of this report will now change to address specific statements brought before the Medford City Council.

On Thursday, July 5, 2007, a letter was submitted to the Council by Ms. Dreyer of the Huycke law firm on behalf of Home Builders Association of Jackson County, The Chamber of Medford/Jackson County, and the Rogue Valley Association of realtors. The letter was submitted during public comment in regard to Fire Department access requirements.

The following is the fire department response to the concerns listed in that letter. We have documented our response for the reader to independently review our findings to confirm our information.

The Dreyer letter dated June 20, 2007, is directly quoted in each of the following statements (in black). The results of the fire department's research is below each statement (in blue).

Statement 1:

“More importantly is the question of whether this street grade standard should be utilized at all”...

What the Research Shows:

The Oregon Fire Code established the street grade standard at a maximum of 10%. Section 104.1 of the OFC states “...modifications to this code shall not be less stringent than the minimum fire code adopted by the State Fire Marshal... (and) shall be in compliance with the intent and purpose of the code and shall not have the effect of waiving requirements specifically provided for in this code.”

Oregon Fire Code Metro Code Committee states in their Fire Code Applications Guide:

“GRADE: Fire apparatus access roadway grades shall not exceed 10 percent. Intersections and turnarounds shall be level (maximum 5%) with the exception of crowning for water run-off. When fire sprinklers are installed, a maximum grade of 15% may be allowed. The approval of fire sprinklers as an alternate shall be accomplished in accordance with the provisions of ORS 455.610(5). (OFC D103.2)”

This Guide has been approved and adopted by 15 different Jurisdictions representing over 25 cities.

Reference:

Fire Code Applications Guide, Oregon Fire Code-Metro Code Committee, Rev. 1/05

Statement 2:

“ ... as there is, at best, marginal evidence that sprinklers increase safety or reduce property damage, and the costs of the sprinklers far exceed their potential benefit.”

What the Research Shows:

Scottsdale, Arizona Municipal Reports – 15 Year Study

Lives Saved

In the 15 years covered by the Study there were 598 home fires. Of the 598 home fires, 49 were in single-family homes with fire sprinkler systems:

- There were no deaths in sprinklered homes.
- 13 people died in homes without sprinklers.
- The lives of 13 people who would have likely died without sprinklers, were saved

Less Fire Damage

There was less damage in the homes with sprinklers:

- Average fire loss per sprinklered incident: \$2,166.
- Average fire loss per unsprinklered incident: \$45,019.
- Annual fire losses in Scottsdale (2000-2001) were \$3,021,225 compared to the national average of \$9,144,442.

Reference:

www.homefiresprinkler.org/FS/Scottsdale15.htm

Since the 1975 introduction of the residential sprinkler standard 13D by the National Fire Protection Association (NFPA), residential sprinkler systems have proven themselves as life safety systems. According to the Residential Fire Safety Institute, there are now at least 270 communities in the United States with regulations requiring residential sprinkler systems. (Note that these jurisdictions can encompass more than one city).

Reference:

www.firesafefhome.org

Statement 3:

“Technological Innovations: technological innovations in building techniques such as advanced heating and electrical systems, fire resistant building materials, escape windows, and interconnection smoke alarms, have dramatically reduced the number of fatalities from fire over the past 20 years.”

What the Research Shows:

While there have undoubtedly been technical advances in the past 20 years that have saved lives, on average more than 3,000 people die annually in residential structure fires. The fires are more likely to be caused by the occupants' actions than a flawed structure. Four out of five fire deaths occur in homes. The majority of victims are children and the elderly. An average of 100 firefighters dies annually, most fighting residential fires.

References:

<http://www.usfa.dhs.gov/statistics/national/residential.shtml>

<http://www.cdc.gov/ncipc/factsheets/fire.htm>

<http://www.usfa.dhs.gov/media/press/2005releases/061605.shtml>

<http://www.nfpa.org/itemDetail.asp?categoryID=955&itemID=23674&URL=Research%20%20Reports/Fire%20statistics/Fire%20service&cookie%5Ftest=1>

“Opponents of residential sprinklers assert that residential fire deaths are a function of a home’s age and that new homes are safe without sprinklers. On the surface, these arguments seem to make sense, but further analysis paints a different picture.

Most residential fire deaths result from fires caused directly or indirectly by people and are not related to a home’s age. Fire-safety experts know that socioeconomic status, occupant density and occupants’ age and mobility are far more likely to contribute to fire deaths than a structure’s age. Also, the speed by which a fire spreads in a home is generally a function of contents and room geometry, not age of the building.”

References:

<http://www.iafc.org/displayindustryarticle.cfm?articlenbr=33502>

Causes of fire:

- Smoking is the leading cause of fire related deaths
- Cooking is the leading cause of residential fires

Reference:

<http://www.cdc.gov/ncipc/factsheets/fire.htm>

U.S.F.A. Residential Fire Statistics

Year	Fires	Deaths	Injuries	Direct Dollar Loss In Millions	\$ Loss per Fire
1996	428,000	4,080	19,300	\$4,962	\$11,593
1997	406,500	3,390	17,775	\$4,585	\$11,279
1998	381,500	3,250	17,175	\$4,391	\$11,510
1999	383,000	2,920	16,425	\$5,092	\$13,295
2000	379,500	3,445	17,400	\$5,674	\$14,951
2001	396,500	3,140	15,575	\$5,643	\$14,232
2002	401,000	2,695	14,050	\$6,055	\$15,100
2003	402,000	3,165	14,075	\$6,074	\$15,109
2004	410,500	3,225	14,175	\$5,948	\$14,490
2005	396,000	3,055	13,825	\$6,875	\$17,361

Source: National Fire Protection Association Fire Loss in the U.S. During 2005 Abridged Report.

References:

<http://www.usfa.dhs.gov/statistics/national/residential.shtm>

Fires in residences have taken a high toll of life and property. In 2005 there were:

- 396,000 residential fires
- 3,055 civilian fire deaths
- 13,825 civilian fire injuries
- \$6.9 billion in property damage

Source: National Fire Protection Association Fire Loss in the U.S. During 2005 Abridged Report.

Studies by the Federal Emergency Management Agency's United States Fire Administration indicate that the installation of residential fire sprinkler systems could have saved thousands of lives; prevented a large portion of those injuries; and eliminated hundreds of millions of dollars in property losses.

References:

http://www.usfa.dhs.gov/citizens/all_citizens/home_fire_prev/sprinklers/

- The U.S. has one of the highest fire death rates in the industrialized world. For 1998, the U.S. fire death rate was 14.9 deaths per million people.
- Each year, fire kills more Americans than all natural disasters combined.
- Fire is the third leading cause of accidental deaths in the home; at least 80 percent of all fire deaths occur in residences.

Reference:


<http://www.ohsep.louisiana.gov/factsheets/FactsonFire.htm>

Table 2 shows the Fire death rate difference between Medford Fire Department, the State of Oregon, and Nationwide Statistics. Our fire death rate from 1995-2004 is wholly unacceptable. Our fire death rate has not been decreasing, but rather it has increased.


Table 2

The Problem-Medford

- **2000-2004 Statistics**
 - 249 structure fires in residential occupancies
 - 9 fatalities
 - 31 civilian injuries
 - 6 firefighter injuries
 - \$4,400,405 in residential property loss/damage
- **Average Fire Death Rate (1995-2004)**
 - 12.0 per million (Oregon)
 - 14.6 per million (U.S.)
 - 19.4 per million (Medford + Rural)
- **In Oregon, One and Two Family Dwellings Account:**
 - For 86% of all residential fire deaths
 - For 82% of the estimated residential fire dollar loss



Fairmount Fire



Statement 4:

“Most fire fatalities occur in homes without working smoke detectors: according to the U.S. Fire Administration, from 2001-2004, only 3.7% of residential fire fatalities were reported as occurring in homes with working smoke alarm system;”

What the Research Shows:

This statement has been proven as misquoted by the U.S. Fire Administration, it appears the HBA has received erroneous data.

USFA states in their rebuttal of the NAHB’s misquote “...Review of Recent Sprinkler Data” published May 22, 2007:

“There is absolutely no statement of such kind (in) the (referenced) USFA report”.

Reference:

The United States Fire Administrations review of Recent Sprinkler Data, Press Office, U.S. Department of Homeland Security, Washington D.C, May 22, 2007

Actually the National Fire Data Center stated in “Fire in the United States 1992-2001”:

“Smoke Alarm Performance in 2001:

- Smoke alarms were present in 62 percent (unknowns apportioned) of homes that had reported fires; this is eight percentage points higher than in 1998.
- Alarms also were present in 54 percent of homes that had a fatality.
- In one-third of all fire death cases, the alarm operated, a troublesome statistic since alarms are purported to save lives”.

Reference:

Fire in the United States 1992-2001, U.S. Fire Administration/National Fire Data Center, Thirteenth addition, October 2004

Closer, here in Oregon, our own Office of State Fire Marshal’s report stated on page 10:

- 38% of home fire deaths occurred in homes with *working* smoke alarms.
- 6 out of 26 fire deaths in Oregon were in residences with no smoke alarm.
- 20 out of 26 fire deaths in Oregon were in residences with smoke alarms, either present and working or present and non operational.

Reference:

2006 Annual report addressed as 90 Years of Service to Oregon.

Statement 5:

“Fire fatalities have reduced dramatically: according to the Centers for Disease Control, from 1979 to 2001, the fire death rate per million persons (FDPM) dropped by 58%; this trend is expected to continue as new housing stock replaces old;”

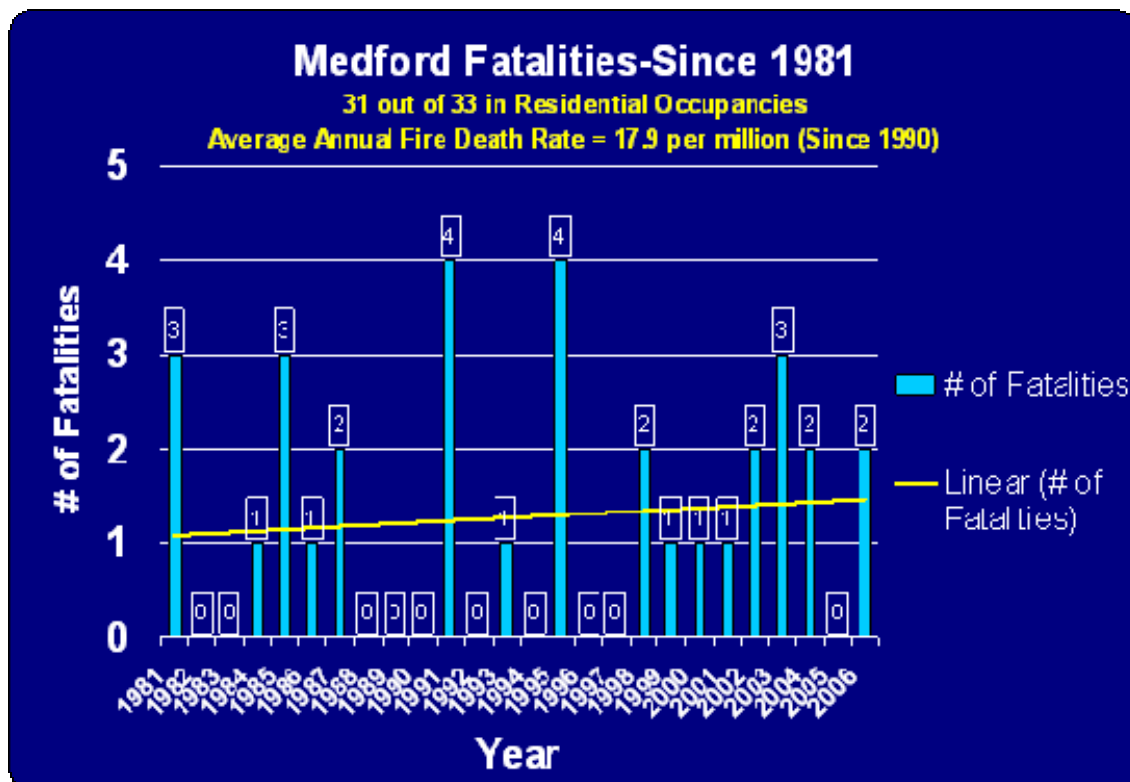
What the Research Shows:

The 58% in this statistic is all fire deaths. Total residential fire deaths annually were reduced by the smoke detector codes implemented in the 1980’s, however, since have continue to range from 3,000 to 4,000 per year.

- The U.S. has one of the highest fire death rates in the industrialized world. For 1998, the U.S. fire death rate was 14.9 deaths per million population.
- Each year, fire kills more Americans than all natural disasters combined.
- Fire is the third leading cause of accidental death in the home; at least 80 percent of all fire deaths occur in residences.

Closer here in Medford we have seen an increase not a decrease. Our records show an increase in fire deaths since 1981, see Table 1.

Table 1



References:

<http://www.usfa.dhs.gov/statistics/national/residential.shtm>
<http://www.ohseplouisiana.gov/factsheets/FactsonFire.htm>

Statement 6:

“Installation of sprinklers is costly: a conservative cost for installation sprinklers is \$2.50 per square foot or \$6,000 for a 2400 square foot house.”

What the Research Shows:

Residential sprinkler systems in Scottsdale were recently quoted as costing builders \$0.55–\$0.75 per square foot and there are now well over 40,000 sprinklered homes in the city. Clearly, a competitive marketplace greatly reduces sprinkler costs.

Design approaches such as using combined plumbing-sprinkler systems to serve both domestic and fire-protection needs (multipurpose systems) are being pursued in some jurisdictions to minimize the cost and impact of sprinklers on new home construction. Multipurpose systems, permitted by NFPA 13D, are particularly well suited to entry-level homes because they add minimal cost to the plumbing installation.

Recent audits of sprinkler costs for homes in the 1,000–1,200 square-foot range showed that the added cost of materials related to sprinkler protection was \$0.25–\$0.30 per square foot and the sprinkler installation required less than eight hours of additional labor.

While no cost increase is inconsequential when dealing with affordable housing, the significant fire-safety benefits gained by installing sprinklers for such a small cost (in the \$4/month range on a 30-year mortgage, not including any insurance credit) certainly appears to be money well invested.

For sprinklers in larger homes, the impact on the owner’s monthly payment isn’t much different. For example, a \$3,000 sprinkler system in a \$300,000 home with a 6.5 percent mortgage, a five percent credit on a \$2,000/year insurance bill and a combined federal/state income tax rate of 33 percent, the net cost of fire sprinklers after mortgage-related tax deductions is \$4.37 a month. This represents a 0.23 percent increase in the monthly payment and equates roughly to the cost of a premium beverage at your local coffee shop.

Reference:

<http://www.iafc.org/displayindustryarticle.cfm?articlenbr=33502>

In FEMA’s report FA-43/August 2004-Home Fire Protection Residential Fire Sprinkler Systems:

“Low Cost at the present time, cost of a home sprinkler system is targeted at approximately \$1.00 to \$1.50 per square foot in new construction. It is hoped that the cost will decrease as the use of home fire protection grows. It is also possible to retrofit existing homes with sprinkler systems.”

References:

<http://www.usfa.dhs.gov/downloads/pdf/publications/fa-43.pdf>

Fred Benn's Cost Example: Hayward, CA

Given:

- \$400,000 home (Average price for a 3,000 sq. ft. home)
- Cost to install sprinkler system = \$3,000.00

Cost Breakdown per Month:

- \$3,000 amortized over 30 years at 7.75% +\$20.47

Tax Savings (28% federal and 5% state income taxes):

- From deduction of interest on the loan: - 6.10

Insurance Savings (6 quotes--\$90-165 per year):

- Using middle quote (\$135 per year) - 11.33

Total Expenditure per Month: \$3.04

Conclusion:

“Basically, for the price of a Happy Meal or a Starbucks coffee, your family can be protected by a residential sprinkler system,” Benn commented.

Note: Sprinkler installation costs vary. On average, HFSC estimates the cost of sprinklers in new construction to be between 1 and 1.5% of the total cost of construction. Installation costs are lower where demand is greater. For example, in Scottsdale, AZ, where fire sprinklers are required in new homes, the cost to install residential sprinklers is less than \$0.80 per square foot.

References:

<http://www.homefiresprinkler.org/newsletter/winter04/art11p1.html>

Medford Residential Fire Sprinkler Cost History

Date	Sq. Ft.	\$/Sq. Ft.*
6/03	1477	2.33
11/03	1202	1.74
1//05	2424	1.03
4/05	1200	1.66
2/06	1645	1.35
2/07	2079	1.14
3/07	4105	1.94
3/07	2536	2.12
3/07	1500	1.38
3/07	8000	1.45
3/07	1856	1.61
6/07	1372	2.64

**Based on Building Permit Valuations*

According to the U.S. Department of Commerce, Office of Applied Economics Technology Administration, Building and Fire Research Laboratory, National Institute of Standards and Technology Gaithersburg, Maryland 20899 Study:

“This report designs and applies a comparative life-cycle cost analysis to multipurpose network and stand-alone fire sprinkler systems designed in compliance with NFPA 13D. The life-cycle costs of the systems are studied in each of three NIST-designed prototypical house floor plans: a 3,338 sq. ft. (310 sq. m) two-story colonial with basement, a 2,257 sq. ft (210 sq. m) three-story townhouse, and a 1,171 sq. ft (109 sq. m) single-story ranch.....”

Table 3-13 on page 39 shows prices start at 42 cents per square foot up to 97 cents. *This is before the installer and the building contractor place their markup on the system. Mark up and profit margins vary depending on the builders / contractors sense of profit over safety.*

References:

Economic Analysis of Residential Fire Sprinkler Systems by Hayden Brown

Statement 7:

“Sprinklers make homes less affordable: for each \$1,000 added to the price of a home, another 250,000 potential homebuyers are priced out of the market;”

What the Research Shows:

There is a basic question that must be asked when it comes to the price of housing in America. “What drives the price of a new home?” In many if not most markets, the answer is simply what the market will bear, with sales prices rising and falling based on what buyers will pay. In such markets, costs associated with sprinklers are absorbed into the price by adjusting other costs or builder markup.

One source of cost data associated with the widespread installation of residential sprinklers is Scottsdale, Arizona, which became one of the first major U.S. jurisdictions to require residential sprinklers. Scottsdale’s data provides an excellent case study to show the effects of a community’s decision to require residential sprinklers on system cost, life safety, property protection and the local fire-protection infrastructure.

Scottsdale, Arizona Municipal Reports – 15 Year Study

Lives Saved:

In the 15 years covered by the Study there were 598 home fires. Of the 598 home fires, 49 were in single-family homes with fire sprinkler systems:

- There were no deaths in sprinklered homes.
- 13 people died in homes without sprinklers.
- The lives of 13 people who would have likely died without sprinklers, were saved

Less Fire Damage:

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- Average fire loss per unsprinklered incident: \$45,019.
- Annual fire losses in Scottsdale (2000-2001) were \$3,021,225 compared to the national average of \$9,144,442.

Reduced Water Damage: Only the sprinkler closest to the fire will activate, spraying water directly on the fire. 90% of fires are contained by the operation of just one sprinkler. According to the Scottsdale Report, there was less water damage in the homes with sprinklers:

- Sprinkler systems discharged an average of 341 gallons of water/fire.
- 2,935 gallons of water/fire were released by firefighter hoses.

Cost: Recent technology breakthroughs make sprinklers more affordable and easier to install in homes. On a national average, they add only 1% to 1.5% of the total building cost.

- In Scottsdale, the average cost is less than \$.80 per square foot.

Reference: www.homefiresprinkler.org/FS/Scottsdale15.htm

Residential Fire Sprinklers For Life Safety An Economic and Insurance Perspective

February 25, 2001

By: *Buddy Dewar*, National Fire Sprinkler Association

Executive Summary

A review of current economic literature, specifically *elasticity of demand* research conducted by third parties not associated with the stakeholders of this issue, clearly indicates that a 1% increase in the cost of the construction of a new home caused by installing a fire sprinkler system will not cause the potential homebuyer to no longer afford the new home. The two decisive factors that dictate what value home at the high limit a potential homebuyer can purchase are the amount of available income for housing and the current mortgage interest rate.

Fire sprinkler systems can be installed in any value house. Therefore, the potential homebuyer, regardless of the amount of income available for housing, or the mortgage rate, can purchase a new home containing a life safety residential fire sprinkler system. There is a propensity for homebuilders to oppose any government mandate that drives up the cost of construction. Homebuilders are speculating what the future sales market will be when they commence construction. The finished product is available for sale many months after construction begins. This forms the foundation for the want to minimize cost drivers when the substantive concern should be changes in the mortgage rates.

The cost to repair fire structural damage will always be more expensive than water damage caused by fire sprinklers. The potential liability losses from fire will always be greater than the potential water damage losses from fire sprinklers. Recognizing the property and liability savings resulting from the installation of fire sprinklers, all major insurance companies provide for reduced insurance rates for all occupancies including single-family homes. To look singularly at and focusing on water damage without analyzing the potential fire losses had the fire sprinkler system not been present is a misrepresentation.

The many myths shadowing fire sprinkler systems need to be understood. Each fire sprinkler operates independently, not the total flooding of buildings as frequently portrayed in movies. The odds of an inadvertent or accidental discharge of a fire sprinkler have been reported by one national testing laboratory to be in the millions to one.

Insurance companies consider water damage in the amount of the insurance reduction it provides for various occupancies. Some commercial properties can receive as much as a 75% reduction in its insurance rates. This author receives a 10% reduction for the fire sprinkler system installed in my single family home. Both these figures were derived after considering water damage repair costs; again fire damage is always greater than sprinkler water damage.

The National Institute of Science and Technology reports a potential 82% reduction in fire deaths should fire sprinklers be installed in all residential occupancies. Accordingly, the potential owner must be afforded fire sprinkler protection for their family. Those homebuilders who do not install affordable fire sprinklers are at the peril of the legal system as they know or should have known the life safety benefits of residential fire sprinkler systems.

Statement 8:

“Cost of installing sprinklers more than doubles property damage costs: nationwide, the cost of installing sprinklers for new construction more than doubles the cost of property lost to residential fires on an annual basis”

What the Research Shows:

While it is unclear what the writer is conveying with this statement, our research found the following information:

The National average residential fire dollar loss in 2005 is \$17,424

The Average cost of installing residential sprinklers for a 2000 sq. ft. home in 2005 is \$3,500

When you subtract the cost of the sprinklers from the dollar loss you would have saved \$13,924 per residential fire incident.

Statement 9:

“Sprinklers do not reduce fire department needs or costs: mandatory sprinklers are not likely to reduce fire”;

What the Research Shows:

A structure fire in an unprotected residence continues to grow. The atmosphere can become toxic within 3-5 minutes after ignition. The fire department rarely will be able to put water on the fire within 10 minutes after ignition. If flashover occurs, it is highly unlikely that anybody still in the structure will be able to survive. A structure fire in a residence takes a lot of water and manpower to extinguish and overhaul. When all is said and done, there is usually considerable damage to both the structure and the contents. Because the fire in an unprotected residence was not contained in its initial stages, more manpower is required for an extended duration for suppression and overhaul purposes.

- For a structure fire in an unsprinklered residence:

Average Manpower for Extended Duration

- 15.5 personnel
- 60.1 man-hours
- Mutual aid required for other normal responses
- + Overtime crews
- + Overtime investigation

When a structure fire occurs in a residential occupancy equipped with fire sprinklers, the initial response is to send several fire engines and supporting personnel. With the fire sprinkler system controlling the fire early and preventing more severe damage, soon all but one of the apparatus are available to respond to other calls.

- For a structure fire in a sprinklered residence

Average Manpower

- 3 Personnel
- Man-hours
- No overtime crews
- Units available for another response
- Possible short duration overtime Investigation

References:

Medford Life Saver Program estimates

Statement 10:

“Sprinklers cause water damage; water damage is a substantial problem with sprinklers. A standard residential system is designed for two sprinkler heads to supply 13 gallons per minute (or 260 gallons of water into a room in 10 minutes)”;

What the Research Shows:

The scenes in Hollywood showing all the sprinkler heads activating at the same time throughout the structure, flooding an entire occupancy, are misleading. It takes heat to set a sprinkler head off, 155 - 200 degrees F. 93% of all fires that occur in homes are quickly controlled by a single sprinkler head, flowing 13-25 gallons per minute. Without fire sprinklers, fire continues to grow exponentially. The fire department arrives 5-10 minutes later, and puts hundreds to thousands of gallons on the out-of-control fire. Much more water is put into the suppression efforts with the delayed response, and the uncontrolled fire destroys much of the contents of the house. Tests conducted by Los Angeles Fire Department and the US Fire Administration showed that damage caused by water in a sprinklered fire is substantially less than damage caused by fire department hose streams in an identical unsprinklered fire and far less than damage is caused by a fire which escapes early detection and suppression. In a residence equipped with fire sprinklers, almost all the items can be saved.

Loss records of Factory Mutual Research show that the probability of a sprinkler discharging accidentally due to a manufacturing defect is only 1 in 16 million sprinklers per year in service. Sprinkler systems are under the same pressure as the plumbing system but are tested at 2-3 times higher pressure during installation.

References:

<http://www.firesafehome.org/sprinklers/firesprinklers.asp#Sprinkler%20Facts>
<http://www.usfa.fema.gov/safety/sprinklers/facts.shtml>

Opponents of residential sprinklers say that sprinklers will leak and cause mold damage, which could make a home uninsurable. However, residential sprinkler systems are no different than residential plumbing. If quality products are used and the system is properly installed, it won't leak. If substandard products are used or workmanship is faulty, leaks may occur.

Sprinklers, piping and fittings are held to a far higher level of quality than are domestic water components and sprinklers must be rigorously tested. Listing tests for sprinklers include 700-PSI hydrostatic strength, 500-PSI leakage resistance, 100,000 cycles water hammer resistance, 35-125° F temperature cycling and freeze performance to -20°F for 24 hours. Sprinkler piping and components are rated for a pressure of 175 PSI, while plumbing water supply systems are rated for only 80 PSI.

References:

<http://www.iafc.org/displayindustryarticle.cfm?articlenbr=33502>

Statement 11:

“Cumbersome maintenance: maintenance of residential sprinklers is more burdensome than maintenance of smoke alarms.”

What the Research Shows:

NAHB asserts that fire sprinkler systems are hard to maintain. There is very little to no maintenance involved in a residential fire sprinkler system.

- Monthly-Visually inspect all sprinklers to insure against obstruction of spray. Sprinklers should never be painted
- Monthly-Inspect all valves to ensure they are open*
- Annually-Verify waterflow alarm activation*

**Not required for multipurpose systems*

Opponents of residential sprinklers say residential sprinkler systems need regular maintenance and question who would perform this service. In fact, residential sprinkler systems are essentially maintenance free. Multipurpose systems have no maintenance requirements at all; stand-alone systems only require an occasional test of the water flow alarm, if provided (not required by NFPA 13D), and perhaps the backflow preventer, if provided (again, not required by NFPA 13D or the IRC when the sprinkler pipe is copper, CPVC, or PEX).

References:

<http://www.iafc.org/displayindustryarticle.cfm?articlenbr=33502>

Let's compare the above maintenance to recommended practices to maintain smoke alarms.

- Test your smoke alarms once a month, following the manufacturer's instructions.
- Replace the batteries in your smoke alarm once a year, or as soon as the alarm "chirps" warning that the battery is low. Hint: schedule battery replacements for the same day you change your clocks from daylight savings time to standard time in the fall.
- Never "borrow" a battery from a smoke alarm. Smoke alarms can't warn you of fire if their batteries are missing or have been disconnected.
- Don't disable smoke alarms even temporarily. If your smoke alarm is sounding "nuisance alarms," try relocating it farther from kitchens or bathrooms, where cooking fumes and steam can cause the alarm to sound.
- Regularly vacuuming or dusting your smoke alarms, following the manufacturer's instructions, can keep them working properly.
- Smoke alarms don't last forever. Replace yours once every 10 years. If you can't remember how old the alarm is, then it's probably time for a new one.

References:

<http://www.nfpa.org/categoryList.asp?categoryID=278&URL=Research%20%20Reports/Fact%20sheets/Fire%20protection%20equipment/Smoke%20alarms>

**Smoke alarms fail most often because of missing, disconnected or dead batteries.
Nuisance activations were the leading cause of disabled smoke alarms.**

References:

<http://www.nfpa.org/categoryList.asp?categoryID=278&URL=Research%20%20Reports/Fact%20sheets/Fire%20protection%20equipment/Smoke%20alarms&cookie%5Ftest=1>

Statement 12:

“No evidence that sprinklers save lives: there is no evidence that residential sprinklers save lives as there have been no studies comparing fire sprinklers with smoke alarms versus smoke alarms alone; and”

What the Research Shows:

Case studies show that residential fire sprinklers save lives and reduce property damage

Scottsdale, AZ (15 Year Study)

- Over 50% of houses sprinklered
- 13 lives saved
- Over \$20 million in property loss prevented
- Average fire loss was:
 - \$2,166 in fire sprinklered residences
 - \$45,019 in non-fire sprinklered residences

Prince George’s County, MD

- Ordinance Enacted in 1992
- Residential Sprinkler System Reported Fire Incidents: 117
- Residential Sprinkler Activations: 143
- Total Fire Loss: \$ 401,220.00
- Potential Fire loss: \$ 38,230,000.00
- Reported Lives Saved: 154
- Injuries Reported (All minor in nature): 7

Opponents of residential sprinklers suggest that smoke alarms are good enough to protect the public and that residential sprinklers aren’t justified. Everyone agrees that smoke alarms save lives and are largely responsible for the dramatic reduction in fire death rates in the U.S. over the past 30 years. However, smoke alarms are only alerting devices; they do nothing to stop the spread of fire or to protect property or firefighters.

Two issues related to sole reliance on smoke alarms are of concern. As smoke alarms age, their reliability declines. This concern prompted smoke alarm manufacturers to begin stamping an expiration date on each unit indicating a 10-year replacement cycle.

The questions before us are how many alarms will actually be replaced at 10-year intervals and what will happen to the reliability of alarms that are not replaced? Although an estimated 96 percent of U.S. homes with telephones now have at least one smoke alarm, it is estimated that the devices didn’t work in roughly 25 percent of fires in smoke alarm-equipped homes.

In contrast, residential sprinkler systems can have a life expectancy of 50 years and require essentially no maintenance, particularly for multipurpose systems. With these systems, if the domestic water is turned on, the sprinklers are on. With the combination of sprinklers and smoke alarms, homeowners get the best of both technologies.

The other issue relates to the waking effectiveness of smoke alarms. In a study completed in 2006, only 58 percent of a test group of children, ages 6-12, awakened when a standard smoke alarm sounded; only 38 percent of the test group successfully evacuated.

This data is consistent with fire death statistics, which show that the young and the elderly—those least capable of self-preservation, even if a smoke detector awakens them—are roughly twice as likely to die in a fire than individuals in other age groups. We need residential sprinklers to close this gap.

References:

<http://www.iafc.org/displayindustryarticle.cfm?articlenbr=33502>

An estimated 890 lives could be saved each year if all homes had working smoke alarms.

References:

<http://www.nfpa.org/categoryList.asp?categoryID=278&URL=Research%20%20Reports/Fact%20sheets/Fire%20protection%20equipment/Smoke%20alarms&cookie%5Ftest=1>

Smoke detectors, as good as they are, are not able to save everybody. Based on the information above, we would still be losing more than 2,000 lives annually even if smoke detectors were installed in all homes.

Smoke detectors have proven their importance in homes, but fire experts across the country are beginning to see their limitations as the only intervention strategy. First, there is mounting concern about maintenance: it is reported that in one-fifth of all houses with detectors, those detectors are not operational.⁸ This is principally because owners don't replace batteries in battery operated detectors. Second, many homes are inadequately protected; often with only one detector when two or more are needed. This is especially true for larger homes.⁹ Third, it is increasingly clear that smoke detectors "won't last forever" and that detectors should be replaced every 10 years.

One door-to-door survey in Connecticut found that 39 percent of all dwellings needed additional detectors.¹⁰ Equally as important, the 8 percent of occupancies that don't have detectors are the ones most likely to have fires.¹¹ In fact, they have nearly half the home fires and a much larger share of fire deaths. Most fire deaths take place in residences without working detectors.¹²

Additionally, smoke detectors – which clearly do save lives when properly installed and maintained – have had a less dramatic impact on either property loss or the cost of fire service.¹³ With a properly installed and working smoke detector, occupants are provided early warning. However, unless residents are able to extinguish a small fire, the blaze continues to grow. The fire department must expend the resources to fight the fire. Therefore, many fire officials, faced with increasing pressure on municipal budgets as well as high fire loss statistics, are coming to the conclusion that smoke detectors alone are not the answer to the country's residential fire problem.

Everyone agrees that smoke detector usage must be maintained and extended, but to achieve further meaningful progress in fire protection and safety, we also need an additional intervention. That intervention – already available to us – is wide scale installation of the fast response residential fire sprinkler system.

Sprinklers have been used in industrial buildings for many years, and in the last 25 years have become increasingly required for both new commercial construction and renovation. Originally introduced as a property protection device, sprinklers are now seen clearly as a way to save lives, protect property, and help control against increases in the future cost of fire service and protection as well.¹⁴

These benefits, transferred to the residential sector, could clearly achieve dramatic advances in fire protection and life safety.

Smoke detectors do what their name implies. They provide early detection, and thus warning, of the fire, however, they take no action on the fire itself.

References:

<http://www.nfsa.org/info/reducing.html>

Statement 13:

“The public disfavors sprinklers: in a national study of consumers, 89% said they felt smoke alarms did an adequate job and 28% do not want sprinklers at all, even if they were provided free of charge”

What the Research Shows:

Does the public want sprinklers? Opponents of residential sprinklers suggest the general public opposes residential sprinklers, but a recent poll, conducted by Harris Interactive of over 1,000 adults, revealed that:

- 45 percent of homeowners say a sprinklered home is more desirable than an unsprinklered home.
- 69 percent of homeowners say having a fire-sprinkler system increases the value of a home.
- 38 percent of homeowners say they would be more likely to purchase a home with fire sprinklers than without. The reason this number isn't higher appears tied to an unfounded fear of water damage: 48 percent of homeowners cite water damage as the reason they would not want a sprinkler system.

The results of this survey support the assertion that the general public is aware of and has warmed up to the idea of residential sprinklers. With the International Building Code now requiring all new multi-family dwellings to be sprinklered, public support for residential sprinklers will continue to grow as future homebuyers move from sprinklered apartments into new homes.

References:

<http://www.iafc.org/displayindustryarticle.cfm?articlenbr=33502>

Summary

Developers and contractors cite several reasons why they are generally opposed to any mandate, or requirement, to include fire sprinklers in residential developments. The most common reasons given are as follows:

1. Increased cost to develop a property.
2. Increased cost results in competitive disadvantage with other developers.
3. The belief that fire sprinklers are ineffective at extinguishing fire and saving lives.
4. The belief that water damage from the sprinkler would be more extensive than the fire.
5. The belief that accidental discharges will cause massive property damage.
6. The belief that a smoke detector provides a sufficient level of fire protection.
7. The belief that modern construction materials are inherently more fire safe.
8. The belief that the fire insurance industry does not support or advocate the use of residential fire sprinklers.

Items 1 and 2 - It does cost more money to construct a home with fire sprinklers. It costs between \$1.00 and \$1.50 per square foot of a buildings gross size.

Items three through six are false. Empirical data shows that these are simply “myths, fears and misconceptions” about fire sprinklers. (See Reference Note 4.)

Item seven is both true and false, it is true that modern building materials are safer in many respects than previous materials. They do tend to be more fire safe, but conversely, once these materials do ignite, they burn hotter, spread faster, and are much more hazardous to life. Additionally, it's not just the structural components of a building that can burn, it is also the contents that are placed in them.

While the concerns and the opinions of local developers and contractors are real, and while the fire department sympathizes with the developers and contractors in these matters, the Medford Fire Department is required by law to enforce the fire code.

Reference Notes:

3. Under ORS 476.030 and 476.120, the State Fire Marshal is responsible for promulgating rules and regulations which establish minimum standards for the protection of life and property from the dangers of fire. (2) To meet this responsibility and to promote uniformity, the State Fire Marshal shall assure that locally adopted fire codes in both exempt and non-exempt jurisdictions are consistent with minimum state fire code standards. Therefore, in adopting a fire code, local governmental subdivisions will: (a) Adopt by reference the fire code promulgated by the State Fire Marshal; or (b) Adopt a code that is consistent with state fire protection statutes and, is equal to or more stringent than, the fire code promulgated by the State Fire Marshal.
4. The fire code, by definition, represents a "minimum" standard which is required to be enforced (statutory mandate.) The language that covers this is as follows – "**101.3 Intent.** *The purpose of this code is to establish the minimum requirements consistent with nationally recognized good practice for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures and premises and to provide safety to fire fighters and emergency responders during emergency operations.*" The code states "consistent" with nationally recognized standards. The origin of the 10 percent grade is the National Fire Protection Association (NFPA) and now by reference is an IFC requirement.
5. The IFC makes reference to the fire chief allowing grades steeper than 10 percent – "**NFPA 5.2.4.1.** *Grades steeper than 10 percent shall be permitted by the authority having jurisdiction where mitigation measures can be agreed jointly by the fire department and the road engineering department.*" The mitigation measure that is commonly accepted is alternative fire protection. The alternative in most cases is to provide a residential fire sprinkler system. The intent is not to forego the requirement, but rather to ensure that effective fire protection and safety is provided. The IFC specifically addresses modifications and the intent of a modification is – "**104.8 Modifications.** *Whenever there are practical difficulties involved in carrying out the provisions of this code, the fire code official shall have the authority to grant modifications for individual cases, provided the fire code official shall first find that special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety requirements. The details of action granting modifications shall be recorded and entered in the files of the department of fire prevention.*"
6. Scottsdale, Arizona Municipal Reports – 15 Year Study www.homefiresprinkler.org/FS/Scottsdale15.htm
Lives Saved
In the 15 years covered by the Study there were 598 home fires. Of the 598 home fires, 49 were in single-family homes with fire sprinkler systems:
 - There were no deaths in sprinklered homes.
 - 13 people died in homes without sprinklers.
 - The lives of 13 people who would have likely died without sprinklers, were saved**Less Fire Damage**
There was less damage in the homes with sprinklers:
 - Average fire loss per sprinklered incident: \$2,166.
 - Average fire loss per unsprinklered incident: \$45,019.
 - Annual fire losses in Scottsdale (2000-2001) were \$3,021,225 compared to the national average of \$9,144,442.**Reduced Water Damage**
Only the sprinkler closest to the fire will activate, spraying water directly on the fire. 90% of fires are contained by the operation of just one sprinkler.
According to the Scottsdale Report, there was less water damage in the homes with sprinklers:
 - Sprinkler systems discharged an average of 341 gallons of water/fire.
 - 2,935 gallons of water/fire were released by firefighter hoses.**Cost**
Recent technology breakthroughs make sprinklers more affordable and easier to install in homes. On a national average, they add only 1% to 1.5% of the total building cost.
 - In Scottsdale, the average cost is less than \$.80 per square foot.