Compiled Fire Sprinkler Responses

Contents

Newer Homes are Safer

Use the following as a general statement to highlight home builders' commitment to safety. The article, "Home Building and Fire Safety", which NAHB contributed to the Fire Protection Engineering magazine can also be used to promote the home builder's point of view.

The National Association of Home Builders is a firm believer in safe, affordable homes. Our members have a vested interest in the safety of their products both during the building process and after the house becomes someone's home.

For that reason, home builders are active participants in the codes and standards development process, helping to make sure that each advance in building science and technology is weighed for the appropriate balance of safety, efficiency and cost to help ensure that each code cycle results in advances that improve homes without pricing them out of reach.

The home builder acts as a consumer advocate, offering counterpoint to code change proposals that benefit particular brands or products.

And when it comes to advances in fire safety technology, our members are proud to produce homes built to building codes designed to keep their occupants safer than homes built in previous generations.

1) Age of Homes—What the Data Shows

Use the following to emphasize that the data collected shows that fire fatalities are highly concentrated in older homes.

The federal government's primary source of data on residential fires is the National Fire Incident Reporting System (NFIRS). The NFIRS is based on local fire departments voluntarily reporting information on fires in a standard format to the U.S. Department of Homeland Security. The NFIRS data, which members of the fire service often use to support their claims, does not distinguish the age of the home involved. This greatly reduces the value of NFIRS for analyzing policies like building codes that target new construction.

In states where the age of affected homes has been matched with national fire data, fatalities are heavily concentrated in those older homes.

2) Age of Homes—Correlation between Age and Fire Fatalities

Use the following to rebut comments denying there is a significant correlation between the age of a home and the probability of fire fatalities. The comments below were in response to the statement that older housing tends to have a disproportionate share of poorer, less educated households. You may see the following report cited:

- *NFPA "The Case for Fire Sprinklers in One- and Two-Family Dwellings" Revised 2014*

That any relationship between older housing and higher death rate is attributable to a disproportionate share of poorer, less educated households is merely an assertion with no evidence to support it. The

NFPA report neither presents nor cites any statistics relating characteristics of occupants to age of the home and differential fire death rates.

According to NFPA's U.S. Home Structure Fires Fact Sheet the leading causes of unintentional home structure fires are 1) cooking equipment, 2) heating equipment and then 3) electrical distribution and lighting equipment. As far as electrical fires are concerned: "A strong relationship between housing age and the rate of electrical fires has been observed, with housing over 40 years old having the strongest association with electrical distribution fires. As of 2013, the median age of one- and two-family housing was over 35 years. With more than half of the housing stock older than 35 years, electrical issues become an increasingly larger player in residential fires." (See FEMA's One- and Two-Family Residential Building Fires (2011-2013); P. 4.)

Newer homes are much less likely to experience heating equipment fires due to new homes having new appliances with safety features, clearances, vents and chimneys in accordance to current code. The reliability, lower cost of use along with balanced airflow providing adequate comfort also mean that supplemental heaters are not necessary in new homes. In light of these reasons, the heating equipment fires that accounted for more than twice the number of electrical fires can primarily be associated with older homes.

3) Comparison to Homes with Sprinklers—Fire Safety

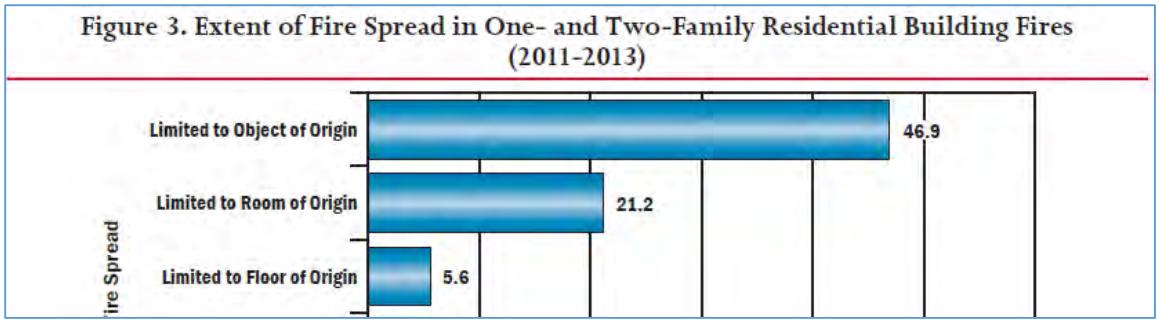
Use the following to rebut comments meant to show that jurisdictions which have enacted fire sprinkler mandates have a better fire safety record since they went into effect.

Data that shows newer homes are safer in jurisdictions where sprinkler mandates are in force agrees with the fire data that NAHB has matched with the age of affected homes. Fatalities are heavily concentrated in older homes whether or not these newer homes have fire sprinklers installed.

4) Comparison to Homes with Sprinklers—Fires Confined to One Room

Use the following to rebut comments stating that fires in sprinklered buildings are usually confined to the room of origin.

This is true for fires in all one- and two-family homes whether they are sprinkled or not:



Reproduced from One- and Two-Family Residential Building Fires (2011-2013), FEMA; P. 5

State Adoptions

Use the following to highlight how unpopular fire sprinkler mandates are across the country.

It's general knowledge that the mandate to install fire sprinkler systems is not being widely adopted across the U.S. In fact, 48 states currently do not have the fire sprinkler mandate in their state codes for one- and two-family detached homes, and the majority of states also do not allow local jurisdictions to adopt stricter requirements than those that were adopted at the state level.

Modern Homes Compared to Older Homes

Use the following to rebut comments which use UL reports to criticize "today's modern homes". You may see the following reports and websites cited:

- *"Structural Stability of Engineered Lumber in Fire Conditions" 2008*
- *http://newscience.ul.com/articles/modern-residential-fires*

See also Age of Home.

When listing factors that impact residential fires, the UL studies ignored the hundreds of code changes that have improved passive fire resistance, heating and electrical equipment since the 1970s. A better way to determine whether newer homes are safer is by evaluating national fire data in the real world. In states where NAHB has looked at such data and matched it with the age of affected homes, fatalities are heavily concentrated in older homes.

The UL studies either looked at the conditions mentioned individually, or used experimental rooms based on guesses about important differences between older and newer homes. Many of the differences were in room furnishings rather than in construction of the rooms themselves, so the results are not particularly informative about issues of construction.

1) Home Size and Geometry

Use the following to rebut comments stating that since homes built today are larger with floor plans that are more open, they are less safe in a fire.

The conclusions made in the UL study are pure conjecture and not based on any experiments or real world fire data. Since fire experts agree that most fatalities are caused not by the fire itself but by the toxic gases it emits, one could just as easily state that more volume in a house offers the occupants more breathable air and therefore more time to get out. The report in no way proves the opposite.

2) Lightweight Construction (Engineered Lumber)

Use the following to rebut comments stating lightweight wood components fail faster in a fire.

Wood I-joists are often mentioned in the context of "new homes" as if they are something not found in homes built a generation ago. However, they were first developed 50 years ago and have been used in home building since at least the early 1970s.

According to UL's report Analysis of Changing Residential Fire Dynamics and Its Implications on Firefighter Operational Timeframes, research demonstrated that a single layer of 1⁄2-inch gypsum wall board on the bottom of the unprotected floor assembly adds on average approximately 20 minutes to the time before collapse. This is a standard method of passive fire protection and applies to both legacy and modern construction.

The discussion on lightweight components is typically focused on unfinished basements, because the floor joists may be exposed while the home is occupied. Since most fire start in a finished space, unprotected floor joists rarely come into play with regards to fire spread. (See table below.)

Table 4. Leading Areas of Fire Origin in Nonconfined One- and Two-Family Residential Building Fires (2011-2013)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	18.3
Bedrooms	12.7
Common room, den, family room, living room, lounge	6.7
Attic, vacant spaces	5.7
Exterior wall surfaces	5.5
Laundry area	5.1
Vehicle storage area: garage, carport	5.0

Source: NFIRS 5.0.

Reproduced from One- and Two-Family Residential Building Fires (2011-2013), FEMA

3) Furniture

Use the following to rebut comments stating that newer homes have furniture that burns faster than "legacy" furniture.

The UL research this claim is based on compares modern home configurations to "legacy" configurations from approximately 50 years ago. The same "modern" furniture is very likely found in older homes, because furniture gets replaced over time.

Pointing to the characteristics of a home that is "stuck in time" in all aspects, with the same furniture and without the floorplan being opened up or added on to, is deceiving. It would be more useful to compare new homes with the older housing stock as it exists today.

Thirty years ago, homes were already filled with furniture that was made from synthetic materials, and yet there have been significant improvements to the fire safety of homes over the past few decades leading to a dramatic and continued decrease in fire incidents, injury, death and property loss.

Smoke Alarms

Use the following to highlight the effectiveness of smoke alarms.

The effectiveness of smoke alarms cannot be underestimated. According to NFPA (see Michael J. Karter, Jr., *Fire Loss in the United States During 2014*, NFPA, Quincy, MA, September 2014), since the time that smoke alarms have been required in dwellings, there has been a significant drop in the number of reported fires, injuries and fatalities in the United States. Since 1980, the number of fires has dropped by 50 percent and fatalities have dropped by about the same margin, all during the same time period where the population increased and where smoke alarms were required in the model codes but sprinklers were not. And smoke alarms continue to become more effective with ongoing technical advances.

Such improvements include the proliferation of 10-year integral batteries, which substantially lengthen the interval between low-battery signals. Batteries in these units also cannot be used in other devices, which eliminates the possibility of the battery being removed to power other electronic devices. There is also continued research aimed at improving the detection logarithm to greatly reduce false alarms from cooking. All these improvements are still unfolding, and can be expected to further reduce the number of fatalities.

According to NFPA (see Marty Ahrens, *Smoke Alarms in U.S. Home Fires*, NFPA, Quincy, MA, September 2015), three out of five home fire deaths resulted from fires in properties without at least one working, battery-operated smoke alarm. Hardwired, interconnected smoke alarms are installed in new homes, which are more likely to operate and alert occupants to a fire. As for the remaining existing homes, ensuring every home in the U.S. had at least one working smoke alarm would save close to 900 lives each year.

Survivability/Risk of Fire Death

Use the following to rebut comments on the chances of surviving a home fire when smoke alarms are present. The comments below were in response to the statement that the chances of surviving a home fire when smoke alarms are present (99.45%) is based on "chances of survival," which is not the same as "risk of fire death".

See also Smoke Alarms.

The above argument simply highlights a different view of the issue. It is, in fact, correct to say that the survivability, when a large or small fire occurs is 99.45% with at least one operating smoke alarm. The difference highlighted by the SFC response is that its data is based on the number of *reported* fires. (See Table 4-1, John R. Hall, Jr., *U.S. Experience with Sprinklers*, NFPA, Quincy, MA, June 2013.) Furthermore,

this data includes fires that occurred in apartment buildings, so that it should not be considered for new, one- and two-family homes.

1) Number of Fire Deaths in the U.S.

Use the following to rebut the comments such as "In 2013 there were 2,800 civilian fire deaths."

There have been significant improvements to the fire safety of homes over the past few decades, leading to a dramatic, continued decrease in fires, injury, death and property loss. As fire safety professionals know, fire deaths have decreased by over 60% since 1960 (50% since 1978), while the death rate based on population size has decreased by well over 70%.

2) Percent of Fire Deaths That Occur in the Home

Use the following to rebut the comment that 80% of fire deaths occur in the home.

This is taken from NFPA's report Smoke Alarms in U.S. Home Fires. The figure of 80 percent is inaccurate and irrelevant to single-family homes. 1) The figure is based largely on multifamily properties. 2) NFPA artificially inflates the figure by throwing out cases where the sprinklers didn't operate (or where it's unknown if they operated), even if the sprinklers were installed rigorously to code.

Cost

Use the following to rebut comments on the cost of fire sprinkler systems. However, it is often more effective to have local data to quote in a response. The comments below were in response to the statement that claimed the cost of fire sprinklers makes up between 1% and 5% of a home's total cost.

The report Home Fire Sprinkler Cost Assessment from the Fire Protection Research Foundation shows that the average cost of a sprinkler to a builder is six thousand dollars (see table below showing national data). Thousands of dollars in extra cost is more than many home builders' customers can bear. In fact, just a $1,000 increase in home prices keeps more than 200,000 households out of the market nationally. The $1.60 per foot may sound low to the uninitiated who don't understand how many thousand square feet of space the code requires to be covered by sprinklers in the typical home.

	2008 Cost		2013 Cost	
	$/Sprinklered ft^2 [4]	Total Cost[5]	$/Sprinklered ft^2	Total Cost
Mean	$1.61	$6,316	$1.35	$6,026
Median	$1.42	$5,843	$1.22	$5,000
Minimum	$0.38	$2,386	$0.81	$1,695
Maximum	$3.66	$16,061	$2.47	$21,000

Reproduced from *Home Fire Sprinkler Cost Assessment*, Fire Protection Research Foundation, September 2013.

It is simply inaccurate to say this is about 1 percent of total construction cost. That would imply an average construction cost of $600,000 per home. Given that construction cost is about 62 percent of the final price of the home (see NAHB's Cost of Constructing a Home), this in turn implies a home priced at roughly $970,000. In other words, the cost of an average sprinkler system is about 1 percent of total construction cost *for a home priced at nearly $1,000,000*.

In the extreme, the report sponsored by the Fire Protection Research Foundation shows that the cost of a sprinkler system can be as high as twenty-one thousand dollars. This maximum cost undoubtedly represents an unusual case. But building codes, once adopted, apply to all new construction, even the unusual cases.

1) Property Damage Reduction

Use the following to rebut comments stating that fire sprinklers reduce property damage by 70% or more.

This is largely irrelevant, given how much sprinkler systems cost. Any conceivable reduction in property losses can at best go a small way to offsetting these costs (see Using NIST's New Web Tool to Compare Sprinkler Costs and Benefits). In addition, the 70 percent figure is inconsistent with NFIRS data. NAHB has tried tabulating these data and can't get close to 70 percent even by following NFPAs practice and basing it largely on multifamily properties. In fact, depending on the year, NFIRS data show slightly greater loss of property in homes that have sprinklers.

2) Insurance Discounts

Use the following to rebut comments stating that installing a fire sprinkler system saves on home insurance costs.

The 2008 Fire Protection Research Foundation Home Fire Sprinkler Cost Assessment report investigated insurance savings. It found that discount percentages ranged from 0 to 10% among all companies and agencies surveyed, with an average saving of $22 off the annual premium. This is small relative to the up-front cost of a sprinkler system.

3) Effect on Housing Market

Use the following to rebut comments on the effect of fire sprinkler mandates on housing demand. You may see the following reports cited:

- *NFPA, "Comparative Analysis of Housing Cost and Supply Impacts of Sprinkler Ordinances at the Community Level" 2009*
- *Fire Protection Research Foundation, "Home Fire Sprinkler Cost" 2013*

Undeniable economics dictates that increased cost for a product lowers demand. Higher cost housing means more people are removed from the marketplace of potential purchasers. On top of this economic fact, most buyers not only do not perceive sprinklers as a benefit but rather see them as a liability.

The comments below were in response to the statement that highlighted the experience of Prince George's and Montgomery Counties in Maryland.

This isn't particularly relevant or conclusive. The results are for two atypical counties in the Washington, D.C. metropolitan area where impacts of sprinklers were being obscured by many other things happening in the state of Maryland at about the same time: implementation of inclusionary zoning, seven-figure increments in impact fees, substantial new farmland protection legislation, the governor taking actions to stall large developments in the state, etc. With so many things in flux, it's not surprising that a study would find it difficult to tease out a significant impact of any one factor in the area.

The 2008 Fire Protection Research Foundation Home Fire Sprinkler Cost Assessment report investigated insurance savings. It found that discount percentages ranged from 0 to 10% among all companies and agencies surveyed, with an average saving of $22 off the annual premium. This is small relative to the up-front cost of a sprinkler system.

Accidental Fire Sprinkler Discharge

Use the following to rebut comments that the likelihood of an automatic sprinkler operating in the absence of a fire (and not due to freezing, mechanical damage, corrosion, or deliberate sabotage) is one per year per 16 million in use. You may see the following report cited:

- *NFPA Journal article, "Unexpected Discharge of Fire Sprinklers" 2000*

Unexpected water discharge due to defective sprinkler heads may be rare. However, as stated in the NFPA Journal article, "Unexpected Discharge of Fire Sprinklers," a fire sprinkler system is also subject to unexpected discharge due to freezing, mechanical damage, corrosion and deliberate sabotage. We don't know how often these problems which lead to water damage occur, so the "one per year per 16 million" statistic is irrelevant. The manufacturers of these systems may claim that they are not responsible for these types of unexpected discharge, but none of these problems could happen on a system that is not installed in the first place.

From the NFPA Journal article:

Freezing – Although special types of sprinkler systems are available for use in areas subject to freezing, most sprinkler systems are wet pipe systems, meaning that the piping is normally filled with water. If a system or even a small portion of a system is exposed to freezing temperatures, water in the piping can turn to ice, expanding in volume and producing thousands of pounds of pressure. Such pressures can break fittings, but can also force open the valve caps of sprinklers, resulting in apparent accidental discharge or leakage when the system subsequently thaws.

Mechanical Damage – The frame, the seat and the operating mechanism (solder link or glass bulb) of an automatic sprinkler together form a sealed unit that is expected to maintain its integrity, but also to operate efficiently if a fire ever threatens its protected area. The sprinkler parts are joined somewhat like a coiled spring, holding the energy needed to activate when released by heat from a fire. Mechanical impacts to sprinklers can result in damage and separation of parts. Although it is obvious that a large force can immediately open a sprinkler, it is less obvious that a smaller impact can do the same thing over time. For this reason, it is important that sprinklers be carefully handled during the installation process, and that the proper wrenches be used during their installation. Special wrenches are often required by the manufacturers' literature to reduce the possibility of slippage that can damage the sprinkler operating mechanism, potentially resulting in a release of parts weeks or months later. Building renovations can also result in impacts of sprinklers, leading to an inadvertent discharge or leakage at a later date.

Corrosion – Corrosion can result in a weakening of parts, and a subsequent release of water. This can occur among very old sprinklers, or sooner with sprinklers installed in a harsh environment. Many fire codes require enforcement of NFPA 25 - *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. This standard requires that the building owner replace sprinklers that exhibit corrosion, loading or other damage.

Deliberate Sabotage - Deliberate acts of sabotage must also be considered when investigating the reasons for sprinkler discharge. Vandalism and insurance fraud have been found in the past to be motivations for tampering with sprinklers.

Concluding Statement

Use the following as a general statement to conclude your response.

It is a sad irony when Americans cannot afford to be safe. Families who cannot qualify to purchase homes due to the increased costs from well-meant, but expensive and ultimately unnecessary safety features will remain in housing that is less safe, because it’s built to less stringent code requirements. These older homes can have outdated appliances, space heaters, faulty wiring, or other characteristics that might lead to a greater risk of a fire starting, or a lack of smoke alarms and egress windows installed to today’s codes which increase the chances of dying in that fire.