

## Residential Sprinkler Talking Points

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- The United States has one of the highest fire death rates with nearly 30 deaths per million persons, while other industrialized nations are half that.
- Over the last few decades residential sprinkler systems have become both supported by fire and life safety officials and opposed by home builders, developers and many homeowners.
- Residential construction and content compositions have changed radically over the last 20 years. Hardwood construction and nails to form joints has given way to lightweight construction and glue to form joints.
- While new lightweight construction methods meet the required strength and engineering standards, that all changes when attacked by fire.
- Residential contents have moved away from natural products to synthetics such as polypropylene and polyethylene. This results in fires that release greater heat levels under construction and fail more quickly after being exposed to fire.
- Smoke detectors do not protect those who cannot easily escape without assistance, such as the elderly, children, the disabled and the intoxicated. Even when homes are equipped with smoke detectors they may be disconnected, disabled or inoperative according to studies.
- Residential sprinkler systems are designed to protect the occupants during their egress or confine the fire to the room of origin, limiting fire spread and reducing the probability of flashover.
- In tests, Lung found the convective heat flux dropped from 12,000 Btu/min in 20 seconds after sprinkler initiation in a small compartment fire. There was also a drop in gas temperature from 450° F to 100° F in three minutes of sprinkler operation.
- The main toxic hazards during a residential fire are carbon monoxide, hydrogen cyanide, deficient oxygen levels, and hydrogen chloride according to scientific studies performed.
- The volumetric flow rate of these toxic gases decreases under sprinkler spray, thus smoke will more slowly fill the room after the sprinkler system has begun.
- While ventilation by response personnel will reduce generated gases, opening a window to ventilate an under ventilated fire may improve air quality but it will also likely increase heat release rates and intensify the fire.
- Sprinkler systems serve to both improve the air quality and decrease heat release.
- Another life threatening condition that sprinklers can protect both occupants and fire fighters from is flashover.
- With today's synthetic materials, flashover can occur in many cases prior to the fire department being called, it is often reported by callers as a muffled explosion followed by a high volume of flame and products of combustion, the moment when a fire is usually discovered by non-occupants.
- Flashover occurs when all available fuels become involved and the fire is burning at its maximum potential. This is accomplished by temperatures between 700° and 1,200° F.

- The fuels available in today's fires have much higher heat release rates. A piece of wood with a fuel magnitude of 3,050 grams will flashover in 420 seconds. A smaller 1,950 gram polyethylene sample caused flashover in 530 seconds and represents 62% of the wood sample mass but yields only a 20% slower flashover.
- Flashover normally ends the search and rescue efforts by firefighters as an unprotected person cannot survive post-flashover conditions.
- Flashover will cause the failure of the heavy personal protective equipment worn by firefighters within seconds.
- As newer structures become more energy efficient and are tighter, the heat from fires is being better contained, increasing the risk of flashover occurring.
- Residential sprinklers are generally designed to protect an area no larger than 12X12 and use between 13 and 18 gallons per minute when opened by fire.
- Fatal fires typically originate in bedrooms, kitchens or living rooms and their causes are typically smoking, electrical malfunctions or misuse of heating devices. Installing sprinklers in these rooms alone could provide an increased level of protection above having no system installed.
- Studies indicate that the death rate in the United State could be lowered 80% with the use of residential sprinklers.
- Data suggests that a 90% reduction in fire deaths and 95% reduction in injuries can be accomplished where residential sprinklers have extinguished or controlled fires while giving an internal alarm.
- Homes equipped with both smoke detectors and fire sprinklers experienced 100% fewer civilian fatalities, 57% fewer injuries and 32% property loss when compared to homes equipped with only smoke detectors.
- Sprinkler systems and smoke detector combinations are of more value and offer greater protection to older and less mobile populations. This will be paramount in the future and the size of the older population increases.
- Between 2004 and 2008 rural fire deaths were twice the national average, likely due to lack of working smoke detectors, insufficient volunteer staffing, equipment and training and prevention programs in the fire service.
- In the study of the Meridian Bank Building in Philadelphia, fire destroyed eight floors of a high rise office building resulting in the deaths of three career firefighters. During the fire interior operations were abandoned and an exterior fire fight followed. It was thought that since floors 22 through 28 had been consumed by fire the building might collapse, however fire burned to the 30<sup>th</sup> floor which was the first fully sprinklered floor above the floor of ignition, where 10 heads extinguished the fire.
- In this case 10 sprinkler heads did what 12 alarms of fire department resources was unable to do and extinguished a fire that many thought would bring down a 38 story building.
- In the Scottsdale, Arizona study, sprinklers were around \$1.14 per square foot when the residential sprinkler ordinance was first enacted; however the price is now .59 cents per square foot due to market competition.
- In sprinklered residential occupancies only one or two sprinkler heads will be necessary to activate.

- Fire Department manual hose streams generate more water damage than an installed sprinkler system, <30 gpm vs. >300 gpm
- Accidental activations due to manufacturing defects in sprinkler heads occurred in only 1:16,000,000 heads.
- Homeowners with comprehensive sprinkler coverage see an average reduction of 8% in insurance premiums.
- Studies indicate that housing development is not impeded by fire sprinkler requirements and stress the life saving potential.
- Leeth and Ruser (2003) assign a value of life to be between 2.6million and 4.7 million which is a mean average of 3.8 million..
- Disregarding the life risk it is suggested that residential sprinklers may be uneconomical.
- Based on the assumption that residential sprinklers are designed to primarily save lives to calculate their value while ignoring their primary purpose is counterintuitive.
- Where government involvement by mandating residential sprinkler systems can reduce the overall cost of installation through market competition. Costs lowered by market completion would ultimately increase the present value of net benefits in every home.

Material culled from an article in the International Fire Professional, Jan 2014, by Deputy Chief David A. Green as a white paper to the International Institution of Fire Engineers, UK.