Second Meeting of the National Residential Fire Sprinkler Initiative

Summary of Meeting, June 30 and July 1, 2004

United States Fire Administration

Emmitsburg, MD

By

James A. Milke, Ph.D., P.E.
Meeting Facilitator

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Background

A second meeting of interested parties in residential sprinkler systems was held in Emmitsburg, MD. The principal intent of the meeting was to share thoughts and review the progress of the collective group of participants and their organizations toward increasing the proportion of U.S. homes protected by residential sprinkler systems. Meeting attendees represented a wide range of fire protection organizations and had a diverse set of backgrounds (see Appendix A for a list of attendees).

Recent Progress

Reviews of current program areas and future plans to encourage the increased use of residential sprinkler technology in U.S. residences were presented and discussed. The program areas and future plans were related to the four initiatives developed at the first meeting in April 2003 on the National Residential Fire Sprinkler Initiative, including:[1]

- Develop aggressive strategy for advocating residential sprinkler systems in occupancies the Federal government influences or supports financially, especially manufactured housing or health care facilities.
- Based on research, data and proof of concept, advocate localized fire suppression in high fire risk areas (e.g., kitchens) for retrofit applications.
- Provide advocacy and informational support among partners, State and local decision makers, finding a common agenda on behalf of the protected public.
- U.S. Fire Administrator continue to support research and development and associated programs aimed at advances in residential fire sprinkler technology for the increased acceptance of residential fire sprinkler systems.

An overview of the accomplishments over the last year, ongoing activities and future efforts pertaining to each of the initiatives addressed at the first meeting is presented in the subsequent sections of this report.

1. Develop aggressive strategy for advocating residential sprinkler systems in occupancies the Federal government influences or supports financially, especially manufactured housing or health care facilities

The two following ongoing activities where identified as relating to this initiative, both being conducted by U.S. Fire Administration (USFA) staff:

[1] Milke, J.A., "National Residential Fire Sprinkler Initiative- Summary of Meeting April 9-10, 2003," United States Fire Administration, Emmitsburg, MD, May 5, 2003.

- Federal Fire Working Group

  A meeting of the Federal Fire Working Group including representatives from several agencies of the Federal government who influence construction practices or maintain residential facilities was convened to discuss the merits of residential sprinklers. The agencies represented included Department of Housing and Urban Development, Department of Health and Human Services, Veterans Administration, Department of Defense, Consumer Product Safety Commission (CPSC) and USFA. There was widespread acknowledgement of the benefits provided by residential sprinklers. However, none of the attendees from the other agencies appeared able to direct a change in their agency's policy or regulations that would mandate residential sprinklers in residences within their purview. A possible tact to encourage a widespread change in policy at the Second Meeting[2] was to consider proposing an adaptation of the hotel/motel act for residences within the purview of Federal agencies.

- College campus fire safety:

  There are several videos available as well as a magazine, *Campus Fire Watch*, that addresses the issue of sprinklers in both on-campus (e.g. dormitories) and off-campus dormitories (apartments and fraternity and sorority housing). One of the noted challenges is to have residential sprinklers installed at privately owned, off-campus housing, including fraternity and sorority houses. Nationally, all 16 fire deaths of college students were reported to have died last year in privately owned, off-campus housing. Some states (NJ being the first) have adopted policies of providing residential sprinkler protection in all student housing.

  NIST has a project investigating the benefits of sprinkler protection for sleeping rooms and day rooms in dormitories. The study on day rooms has been completed (NISTIR 7120), with the report on sleeping rooms expected in the 3rd quarter of 2004. The sponsor for this effort is USFA. Reports from NIST are available at www.fire.nist.gov.

2. Based on research, data and proof of concept, advocate localized fire suppression in high fire risk areas (e.g., kitchens) for retrofit applications

[2] To avoid confusion, where the outcome of a particular meeting was discussed at the Second Meeting of National Residential Fire Sprinkler Initiative, the latter meeting is referred to as the "Second Meeting".

NIST has initiated a research project with support from USFA and HUD (as well as a contribution from NIST) to investigate localized residential fire suppression systems. The research effort has four principal tasks:

- Characterize kitchen fire hazards
- Investigate "passive" and "active" fire protection systems for kitchens
- Conduct full-scale experimental evaluations of candidate fire protection systems
- Identify design limitations for single sprinkler retrofits for kitchens

Relative to the first task, kitchens are the:

- Leading area of origin of
    - Number of residential fires, being 31% of residential structures
    - Number of residential burn injuries
- 3rd most frequent area of origin for residential fire deaths

According to the experience of a local contractor who specializes in residential sprinkler systems, 90 percent of the sprinkler activations of the systems installed by that company have been in the kitchen. Conducting a survey with multiple contractors or jurisdictions from around the country to expand this experience base would provide additional information concerning the need for automatic suppression capabilities in kitchens.

The fire characteristics of kitchen fire scenarios were explored in the NIST project. Passive fire protection strategies for kitchens were explored, including:

- Spacing of hazards
- Wall, cabinet and appliance coverings
- Materials comprising appliances
- Coatings, i.e. intumescent paints that were shown to significantly reduce the heat release rates of materials in bench scale testing.

In full-scale fire experiments, while intumescent paints delayed fire spread, similar upper layer smoke temperatures were measured in the kitchen with and without intumescent paint.

Active protection strategies explored in the research effort included:

- Range Hood Systems (dry and wet chemical)
- Localized Suppression Systems: single low flow sprinkler in kitchen (including pendent and sidewall sprinklers).

The dry chemical system was able to extinguish the test fires, though flames needed to impinge on the device in order to activate the system. The pilot flame was extinguished in some tests and the area protected by the system was limited to the stove top.

The wet chemical system also extinguished the test fires within seconds of auto-ignition and prior to full pan fire development. However, a potential for re-ignition was present and the area protected was limited to the stove top as with the dry chemical system.

The single sprinkler suppressed fires, though a larger fire was required to activate the sprinklers as compared to the dry and wet chemical range units. Another positive aspect of the sprinkler option was that it was able to provide protection for the entire kitchen area.

Future research plans include examining design options and limitations for retrofitting a single sprinkler in a kitchen, including topics such as a continuation of the assessment of sprinkler performance and assessing the characteristics of the water supply.

3. Provide advocacy and informational support among partners, State and local decision makers, finding a common agenda on behalf of the protected public

Numerous efforts were described by several of the meeting participants that relate to this initiative. Most of the efforts were ongoing, though some had been completed within the last year and some are planned to be initiated in the near future. An overview of these efforts is provided in this section, organized alphabetically by the lead organization for the effort.

American Fire Sprinkler Association (AFSA)

AFSA is developing a training program on the installation of residential sprinklers. This course is intended for sprinkler contractors to help them facilitate a transition from the commercial to the residential market. AFSA has also developed a program for residential developers and homebuilders.

Home Fire Sprinkler Coalition (HFSC)

HFSC is developing an educational program, "Built for Life," for homebuilders that will be funded by FEMA grant money which they received last month. This program will be a national education program geared for a variety of markets,

especially bigger markets. The objective of the program is to provide sprinkler protection in model homes in at least 10 states. Target states for the program include MD, CT and FL. The education program consists of a kit including a videotape and information package for builders (another kit is already available for consumers). The information is also to be disseminated through advertisements, including TV, print media, direct mailings and their web site.

HFSC has a 900 sq. ft. booth for show demonstrations at National Association of Homebuilders (NAHB) conferences and similar venues. Recently, most home builders and contractors have had a positive attitude toward this display (this is a noticeable change from the negative response received in the early years when HFSC first exhibited at the NAHB meeting).

HFSC has developed a good relationship with the Habitat for Humanity (H4H) to encourage the installation of residential sprinklers in their projects.

International Association of Fire Chiefs (IAFC)

The Fire and Life Safety section of the IAFC has initiated a public education effort on the merits of residential sprinklers. The IAFC/Fire and Life Safety Section has taken the position that selling/encouraging the concept of residential sprinklers will get a better response than through mandates.

National Fire Protection Association (NFPA)

Chris Dubay has been active in making presentations at American Water Works Association (AWWA) meetings on backflow and sprinklers. Meeting attendees are noted as being increasingly receptive to the presentations. Copies of the presentations have been requested by various magazines for publishing.

NFPA and National Fire Sprinkler Association (NFSA) have been working together on a joint NFPA/AWWA committee to rewrite AWWA Manual 31, which addresses flow and cross-connection requirements, backflow, standby fees and other topics addressing domestic supplies for residential sprinkler systems (Dubay is Chair of the committee). Balloting of the proposed revisions to Manual 31 is expected in 2005.

National Fire Sprinkler Association (NFSA)

A resource document *Residential Sprinklers: A Step by Step Guide for Residential Communities* has been completed by the NFSA. The document is available in printed form from the NFSA or via their Web site: www.NSFA.org. The

document is intended to provide assistance to local fire chiefs when proposing ordinances mandating residential sprinklers, including case studies and information resources.

Residential Fire Safety Institute (RFSI)

RFSI continues to advocate residential fire safety/sprinklers through the Operation Life Safety newsletter, public presentations and their website. RFSI's principal focus is to assist in the development of ordinances.

A two-year project was started last fall to examine fire incident data for cases where at least one residential sprinkler operated. Approximately 60 incidents are now included in their database from fire incidents in a wide variety of residential buildings. The sprinkler system designs in the fire incidents collected have been based on NFPA 13, 13D and 13R. The final report for the project will be made available on the National Association of State Fire Marshals, RFSI and USFA websites.

RFSI has made presentations at NAHB and American Association of Retired Persons (AARP) meetings and continues to develop a relationship with these organizations.

Scottsdale Fire Department

As of July 1, 2004, a total of 46,000 single-family homes will have residential sprinkler protection, representing about 55 percent of the homes in Scottsdale, AZ. A report is under development that will document the 20 years of experience of the widespread implementation of residential sprinklers. Communities near Scottsdale have recent formed a coalition to develop ordinances for future developments.

Plans are being developed for a downtown revitalization that may pose a significant challenge to the implementation of residential sprinklers throughout Scottsdale. Incentives in the form of tax rebates are being considered to help encourage residential sprinklers to be installed in this area.

A good relationship has been developed with the local water department in Scottsdale. Such good relationships with other municipal departments were noted as being invaluable in order to develop a base of support for residential sprinklers in the community.

The current cost estimate for the installation of a residential sprinkler system in Scottsdale is about $0.70 per sq. ft., with the cost of protecting custom homes being about $1.00 per sq. ft. The design requirements for the system are consistent with NFPA 13D, except for the mandate to protect garages because of the relatively high frequency of fires that originate in the garage. Also, a local bell, mounted on the exterior of the home was required.

Society of Fire Protection Engineers (SFPE)

SFPE has endorsed the pending legislation, HR 1824, (Fire Incentive Act of 2003) and continues to monitor proposed legislation, both nationally and locally. SFPE has issued a press release on the proposed legislation and has received inquiries on the legislation from the media.[3]

Several SFPE chapters have worked with H4H to assist with the design and installation of residential sprinklers in H4H projects.

USFA

Posters for a public education campaign on the benefits of residential sprinklers are under development with USFA support. Preliminary designs were displayed which referred to sprinklers as the homeowners "best friend" and used familiar icons to indicate "life", "loved ones", and "property". The preliminary poster designs were critiqued at the meeting, with suggestions encouraging that families be highlighted and perhaps consider mothers as the principal audience.

USFA has attended meetings with the following group of allied professionals:

1. Charlie Dickinson met with participants at the Metro Chiefs conference in Calgary, Canada. They voted unanimously to support residential sprinklers.

2. USFA staff members attended the Public-Private Fire Safety Council meeting in Washington, DC. NAHB and USFA representatives debated the statistics presented by the other organization. Despite the debate, a decision was made to meet again and continue the dialogue. One point of concern for NAHB is the difficulty they may have with their constituency if they go on record as promoting residential sprinklers. Such a position could imply that the homes being built are not "safe". A possible

[3] Multiple organizations are involved in monitoring proposed legislation being considered by Congress. Of particular current interest is the Sprinkler Tax Initiative Legislation, HR1824. This proposed bill would amend the Internal Revenue Code of 1986 to classify automatic sprinkler systems as 5-year property for purposes of depreciation.

alternative approach in presenting this information to NAHB and their constituents would be to justify the installation of residential sprinklers as a response to the hazard posed by the contents, which is independent of the structure.[4]

3. USFA sponsored a panel discussion at a meeting of the Prevention Advocacy Resources and Exchange (PARADE). A good exchange of information was provided at the meeting, with a positive response received.

4. The USFA also was involved in another meeting of significance at the main office of the American Insurance Association in Washington, DC. USFA provided input to a front page article about residential sprinklers for the Association newsletter. The Association has been supportive of residential sprinklers. As part of a data collection effort, Association members offered to start collecting data on water damage from flooding, i.e. from hot water heaters, sprinklers, and other sources. One of the meeting attendees noted that State Farm Insurance has built a "smart house" that has addressed some of the water damage claim issues that they are encountering.

5. USFA staff attended a meeting with the American Institute of Architects. Avenues for disseminating information were explored, with the short-term result being the availability to provide a display at the annual conference in May 2005. The Institute appeared particularly interested in applications involving the preservation of historic or archival materials.

6. USFA staff met with representatives of AARP. Statistics on residential fires were provided to AARP. An article for the AARP magazine is under development.

The NFA has several existing courses which refer to residential sprinklers, others are under development, and still more are in the proposal stage. The identified courses include:

Existing courses
Plans Review for Inspectors
Fire Inspection Principles
Principles of Fire Protection: Structures and Systems.

[4] On several occasions during the meeting, attendees identified that an increasing proportion of homebuilders supported residential sprinklers. It was reported that one homebuilder in Illinois was giving out information about sprinklers, with 35 percent of purchasers electing the option of installing residential sprinklers.

Courses under development
Changing American Family at Risk
Residential Fire Sprinklers: A Community Approach to Enhanced Fire and Life Safety.

Courses may be offered via a distance mode in the near future, either in total, or perhaps as a pre-course assignment.

A pilot offering of a course, *Fire Protection Systems for Incident Commanders,* (scheduled to be offered in the near future) contains information on residential sprinklers. Over 400 applications were received for the 50 available participant slots for the pilot.

USFA (through the Fire Grants Program) is supporting conversion of an SFPE/ International Fire Marshals Association course, *Principles of Fire Protection and Engineering* to a distance format. The course addresses residential sprinklers in parts of two modules in the course,

4. U.S. Fire Administrator continue to support research and development and associated programs aimed at advances in residential fire sprinkler technology for the increased acceptance of residential fire sprinkler systems

The research topics being conducted at National Institute of Standards and Technology (NIST) include:

- Sprinkler Activation Under Sloped Ceilings: The objective of this project is to evaluate the impact of sloped and beamed ceilings on the activation of residential sprinklers. This project has consisted of conducting experiments and numerical simulations with the Fire Dynamics Simulator (FDS) model. Two ceiling slopes were investigated. The results obtained from the research include:
    - The sloped ceiling decreased activation times, except if the fire source burner was placed in the corner.
    - Beams increased the sprinkler activation times and temperatures at an elevation of 5 ft above the floor.
    - FDS predicts activation times within 4 to 26 % of the measured values.

  The final report for the effort is available (NISTIR 7079) (Sponsor: USFA)

- Computational Fluid Dynamics Modeling of Residential Sprinklers: The objective of this project is to characterize residential sprinklers in terms needed for FDS

input (droplet size, velocity vector) and demonstrate the performance of sprinklers via simulations with FDS. (Sponsor: USFA and NIST)

- Residential Sprinkler Design Criteria: The objective of this project is to investigate "a single sprinkler design option" for residential sprinkler systems in an effort to optimize the design requirements and encourage the further use and installation of residential sprinkler systems. Current challenges include water authority issues, water supply limits, and concerns over increased water requirements. A single sprinkler design option which handles most residential fires is under investigation. (Sponsor: USFA)

Future Directions

Several action items were identified as being important for the continued improvement in the perceptions and acceptance rate of residential sprinklers. These action items were discussed as supplementing the ongoing activities noted in the previous section. The action items are organized in the following five categories.

Water supply/system design

Water supply for residential sprinkler systems continues to be a significant point of consideration. Efforts to reduce the required water supply (i.e. low flow systems) are continuing by NIST. The required water supply to meet recently adopted 0.05 gpm/ft^2 design density requirement may be greater than the prior 18/13 gpm requirements in cases where extended coverage sprinklers are used.

Backflow valves are needed for some applications and not for others, as a result of each region having their local standards established by the local water works association. Development of cost-effective means to supplement the domestic water supply needs to be encouraged. Information on the use of wells, including assessing the adequacy of the supply systems from the well, needs to be developed.

In situations where piping needs to be installed in unheated areas, antifreeze systems are currently the only acceptable option. However, antifreeze systems are expensive, requiring the use of a backflow preventer. Also, where an ethylene glycol-based antifreeze solution is used, compatibility with piping materials is a significant problem. Research into the performance of dry systems is needed to assess whether a dry system could be a viable option to the antifreeze system.

A compilation of the characteristics of meters, pressure reducing valves and backflow preventers needs to be formulated and made available in information kits for designers. NFPA, AFSA and NFSA agreed to coordinate activities to expand any existing material on this issue and also to make any resulting document available.

Cost-Benefit Analysis.

The previous cost-benefit analysis for residential sprinklers was conducted over 20 years ago. This study needs to be updated with current cost figures and also with actual performance data from fire incidents. Considering that few residential sprinkler systems had been installed when the previous report was done, an updated cost-benefit analysis could rely on data from actual installations and experiences. The experience at Scottsdale was identified as a valuable resource. A related new project was initiated at NIST last month (supported by USFA). The focus of that cost-benefit analysis is to compare a more traditional sprinkler system with a multipurpose system version.

Concerning the limited area systems, e.g. for kitchens, the report from last year's suggested that a proof of concept report be developed on these systems. Such a proof of concept paper should be assembled with the information that can be compiled at this point.

Collaboration of the Organizations

Collaboration of the organizations attending the meeting was noted as being very valuable. As such, another meeting of the organizations in the future would be very useful. The group of organizations represented could be expanded to include additional organizations such as:

- American Society of Plumbing Engineers
- AWWA
- Habitat for Humanity
- NAHB
- National Realtors Association

As an increasing number of H4H homes are being protected with residential sprinklers, tracking the performance of residential sprinklers in these homes would appear to be a valuable resource if pursued. As the construction of the homes is often covered by local news reports, the residential sprinkler system could be presented as a highlight. Further, any sprinkler activations in these homes could be included in a database.

Continued work with the insurance industry was proposed in two areas. First, the Insurance Services Office does not acknowledge the installation of residential sprinklers that protect a major portion of community homes. Second, concerns for water damage from false activations and mold claims appear to be growing. The National Volunteer Fire Council (NVFC) offered to study the issue of insurance recognition for residential sprinklers and concerns for water damage.

Education

Educational institutions should be sought out as an ally. As an example, a display on residential sprinklers could be provided at the annual Fire and Emergency Services Higher Education conference. A sprinkler initiative should be included in *Firefighter 1* and *Firefighter 2* training. Information to colleges and universities to include information on residential sprinklers in architecture and engineering curricula would also be beneficial.

USFA Position Statement

In order to maintain a leadership position in the national debate on residential sprinklers, the collaborating organizations indicated that continued strong advocacy statements from the Administrator are very beneficial to help support the activities of the collaborating organizations when they are advocating sprinklers. Frequent mention of this advocacy statement from the USFA is beneficial and as such including it in annual reports, such as the *Fire in the USA* series would also be very helpful.

Appendix A. Attendees

Name	Organization	E-mail
Jim Milke (moderator)	UMD	milke@umd.edu
Alex Furr	USFA	Alex.Furr@dhs.gov
Larry Maruskin	USFA	Larry.Maruskin@dhs.gov
Woody Stratton	USFA	Woody.Stratton@dhs.gov
Kerry Bell	UL	Kerry.M.Bell@US.UL.com
Jim Dalton	NFSA	dalton@nfsa.org
Christian Dubay	NFPA	cdubay@nfpa.org
Jim Ford	Scottsdale Fire Dept., AZ	Jim_Ford@Rmetro.com
Chris Jelenewicz	SFPE	cjelenewicz@sfpe.org
Gary Keith	HFSC	gkeith@nfpa.org
Dan Madrzykowski	NIST	madrzy@nist.gov
Steve Muncy	AFSA	smuncy@firesprinkler.org
Roy Marshall	RFSI	rfsirlm@netins.net
Alan W. Perdue	IAFC	aperdue@co.guilford.nc.us
Robert Timko	NVFC	btimko@msn.com
Ben Vincent	FM Global	Bennie.vincent@fmgobal.com
Bill Webb	Congressional Fire Services Institute	bwebb@cfsi.org

Appendix B. List of Abbreviations

AARP	American Association of Retired Persons
AFSA	American Fire Sprinkler Association
AWWA	American Water Works Association
CPSC	Consumer Product Safety Commission
FDS	Fire Dynamics Simulator
H4H	Habitat for Humanity
HFSC	Home Fire Sprinkler Coalition
IAFC	International Association of Fire Chiefs
NAHB	National Association of Homebuilders
NFPA	National Fire Protection Association
NFSA	National Fire Sprinkler Association
NIST	National Institute of Standards and Technology
NVFC	National Volunteer Fire Council
RFSI	Residential Fire Safety Institute
SFPE	Society of Fire Protection Engineers
USFA	U.S. Fire Administration