NFPA RESEARCH

What's going on with unwanted alarms?

Summary of NFPA's June 3, 2016 C&E Educational Session

June 2016

Marty Ahrens

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Judging by the turnout at NFPA's educational conference session on Monday, June 13, 2016, a lot of people are concerned about unwanted alarms. When this session was proposed, we identified the following four objectives:
- Discuss the impact of the unwanted fire alarm issue on the fire service and the public,
- List at least three strategies that could help mitigate the problem of unwanted alarms,
- Identify competing goals that must be resolved before finding a more comprehensive solution, and
- Describe the changes to the UL standard on smoke detectors related to unwanted alarms.

Because of the many groups involved, we knew that we needed an interdisciplinary panel. We knew that other stakeholders, such as consumers and property managers, have important perspectives. Time constraints forced us to narrow our focus. I am grateful to all who helped make this session happen, including those who suggested perspectives and representatives for the panel, particularly Amanda Kimball, Bill Burke, and Richard Roux. Of course, the biggest thank you goes to the panel members.

The panel

- Marty Ahrens introduced the topic and moderated the panel.
- Jay Hauhn, of the Central Station Alarm Association (CSAA) spoke about the fire service and CSAA partnership.
- Monica Colby, of the Rapid City, South Dakota Fire Department presented her findings from a localized study on the cause of unwanted alarms.
- David Kerr, of Plano, Texas Fire Rescue, discussed the use of the Fire Protection Research Foundation (FPRF) Risk Management Tool in Plano, Texas.
- Anthony Apfelbeck, of the City of Altamonte Springs, Florida Public Safety described the testing two hypotheses to reduce unwanted alarms.
- Tom Hammerberg of the Automatic Fire Alarm Association (AFAA) provided the fire alarm industry perspective.
- Pravinray Gandhi of Underwriters Laboratories (UL), speaking on behalf of David Mills, provided an update on UL standards smoke alarms and smoke detectors.

Introduction

We know today's buildings and furnishing burn faster than in the past. How do we detect a fire in its earliest stages to provide enough escape time while reducing unwanted alarms? What level of response (occupant and fire department) is desirable? We already see that many fire alarms are ignored. Even the fire service can become complacent. If the fire service delays or doesn't respond to activations, will the public believe that detection is important? In their survey of unreported residential fires, the Consumer Product Safety Commission (CPSC) found that fire

departments went to only 3.4% of home fires in 2004-2005. Clearly, many people are handling small fires successfully on their own.

In 2009, the International Association of Fire Chiefs (IAFC) issued a position statement, "[Eliminating Unwanted and Nuisance Fire Alarm Activations](#)." The IAFC submitted [41 proposals](#) for the 2013 edition of NFPA 72® National Fire Alarm and Signaling Code. Their concerns led to an interdisciplinary 2011 summit on the subject sponsored by the USFA, IAFC and NFPA. The Summit led to NFPA and IAFC's free *[Fire service guide to reducing unwanted fire alarms](#)* and to the Fire Protection Research Foundation's (FPRF's) *[Risk based decision support in managing unwanted alarms.](#)*

Fire detection operation has often been treated as binary -- the activation was or was not due to a fire. In practice, there is a continuum that extends from malfunctions where the cause may not be obvious, to activations from non-fire triggers such as dust or steam and from cooking smoke. If the cook is already dealing with the burning food, the activation may be considered a nuisance even if the activation was appropriate. In some cases, the smoke alarm or detector may provide a pre-fire warning. Perhaps the wrong burner on the range was turned on or there is an overheat condition developing. Someone on site needs to act immediately, but the fire department may not be needed. When an activation occurs due to a very small fire, the occupant often handles the situation so that the fire is out before the fire department arrives. While the detection was successful, a full structure fire response was not needed. One might say that operation in response to an already blazing fire that requires a full response is actually less of a success.

We need more and better data. In an [NFPA project examining the incident types assigned by three large fire departments](#) with the narratives and the actions taken in their National Fire Incident Reporting System (NFIRS) data, Kinsey and Ahrens found very little consistency in the coding of false alarms. The two researchers themselves often disagreed on the most appropriate code. In addition, burned food was sometimes called a fire, sometimes excessive heat, sometimes a smoke scare or smoke removal, and sometimes a false alarm.

We also need more information on the root cause of unwanted alarms. Repeat offenders are a small part of the problem.

The panel members provided additional background and findings from their own research.

Fire Service and CSAA Partnership

Jay Hauhn, Executive Director of the [Central Station Alarm Association](#) provided some additional background. In 2009, IAFC President Chief Jeff Johnson asked the CSAA to "help IAFC identify false dispatch reduction solutions." This led to a committee of four fire chiefs and four CSAA members. Part of the problem is the wide range of systems out there, some of which were installed decades ago. The Committee identified seven areas of "opportunity and submitted 33 proposals: (The IAFC submitted some additional ones on their own.)

1. Allow verification of alarm in which the monitoring center would call the premises before the call was dispatched.
2. Require maintenance contracts in facilities with chronic false alarms.
3. Standardize minimum settings for waterflow.
4. Address the keypad fire button issue, a chronic cause of unwanted alarms.
5. Require point ID to facilitate data gathering.
6. Notify the authority having jurisdiction (AHJ) of system faults.
7. Make air handling detection supervisory only.

A few of the Committee's proposals were accepted in principle; none were accepted completely. Some proposals were felt to be under the purview of other codes. It was clear that no single approach would solve the problem. Some proposals are made in several cycles before acceptance. It can then take several more years for the new code to be adopted at the local level.

A localized study on the cause of unwanted alarms

Monica Colby, Fire and Life Safety Specialist of the Rapid City, South Dakota Fire Department presented the results of her report, *Unwanted Alarm Analysis of Rapid City Fire Department 2014.* Her focus was on alarms in which the fire department had not been needed, so that confined cooking fires (Incident type 113 in the National Fire Incident Reporting System (NFIRS)) that the occupant had already handled and did not need fire department assistance were considered unwanted *for the fire department.* The early warning was often very useful to the occupant. She examined narratives and developed her own coding scheme. Eighteen percent of their unwanted alarms were cooking fires with no damage or rescue. Nineteen percent were related to either construction or service. Sixty percent of the unwanted alarms were reported by a monitoring company with no one on the scene providing additional information. In 31%, the monitoring company reported the alarm and someone on scene provided additional information before the fire department arrived. In contrast, 90% of the fires had someone on the scene providing information before fire department arrival.

The Rapid City Fire Department is considering a 90 second verification delay to allow an occupant time to address the situation and/or requiring two detection devices or a sprinkler to activate before alerting the fire department. They hope to find a way that detection could provide a local "heads up" so that the occupant can address the situation without triggering a full evacuation or a fire department response. When they are notified of a general fire alarm activation in a sprinklered building, they send one unit with no lights or sirens. Would a no lights/no siren approach make sense for all unverified alarms? More fire departments need to do this type of research.

The Use of FPRF Risk Management Tool in Plano, Texas

David Kerr, Deputy Chief and Fire Marshal of Plano, Texas Fire Rescue spoke about how he used the FPRF's risk management tool to help determine the protocol for the response to

automatic fire alarms in Plano. Over a five-year period, Plano had 7,174 automatic fire alarms responses, excluding those to single-family homes. Twenty were real fires. Only two required fire department extinguishment.

This tool was developed in response to the needs identified at the summit and the need for better data to help fire departments make these decisions and focuses on commercial property only. (Apartments are included.) Local data can be used for many variables. Approximately 5,000 calls are required, although these can span several years. National data are used for some fields and can be used as the default if sufficient local data are not available. Dollar values are assigned to all parameters, including civilian and firefighter deaths and injuries as well as direct and indirect losses. It calculates the average cost per fire for the baseline response and three different options when verification fails:

1. Send a full response.
2. Don't send any response, or
3. Send a reduced response.

Based on the results, Plano is now running a single engine cold on all fire alarm responses. An engine and truck run cold on all waterflow alarms. Plano has also adopted a 90 second delay ordinance incorporating the requirements from NFPA 72®. The FPRF has been working to streamline the tool and make it easier to use. We need more fire departments to test it. Contact Amanda Kimball (akimball@nfpa.org) of the FPRF if you are interested in obtaining a copy of the tool.

Testing two hypotheses to reduce unwanted alarms

Anthony Apfelbeck, Fire Marshal and Building Official for the City of Altamonte Springs, Florida, discussed the results of two different approaches to reduce unwanted alarms. He noted that there has been very little data on mitigation methods and their impact. Florida has a statewide existing inspection, testing and maintenance (ITM) system with alarm contractor licensing. Systems must have ITM that meets the requirements of NFPA 72®.

Seminole County has eight jurisdictions with seven fire departments. They first tested the hypothesis that earlier intervention by fire prevention bureaus and earlier notification of business owners would result in reduced automatic alarm responses. The Operations Crew notified the owner directly of the need to conduct maintenance. This served as a legal notice of a code violation. The Fire Prevention Bureau was notified at the first fire alarm response.

In the 12 months before the program was implemented, they averaged 226 automatic alarms per months. Twelve months later, they averaged 230 alarms per month. In short, there was no impact.

The second hypothesis, tested only in an unincorporated county and two cities, postulated that the implementation of a fee for response to nuisance alarms would encourage greater levels of ITM and would therefore reduce the number of automatic alarm responses. Warning letters with

no fee were sent for the first two responses in a 365-day rolling period. A few of $100 was imposed at the third response. The fee increased up to $500 for six or more responses. In the 12 months before this was implemented, they averaged 140 alarms per month. Twelve months after, they averaged 146 alarms per month, and in the last 12 months, 144 alarms per month. Again, no impact was seen.

It was noted that both approaches might be more effective in jurisdictions that did not have ITM programs already in place. He summarized these findings in the May 2015 edition of *Florida Fire Service* article "Two Hypotheses to Reduce Unwanted Automatic Alarms" (posted with permission.)

Unwanted alarms -- the fire alarm industry perspective

Tom Hammerberg, Director of Industry Relations for the Automatic Fire Alarm Association, provided the fire alarm industry perspective. The equipment is not the problem if the system has been properly designed and applied, installed and maintained. Property owners need to take more responsibility for their systems. They could provide better training for staff, be more careful in selecting contractors, and learn more about their responsibilities in regard to their system. Some designers are not fully qualified and need more training. Designers should also take more responsibility for the design and participate actively during installation and testing rather than just assuming that the contractor will meet the code. With low-bidders getting the job, some installers are not fully qualified and need more training. Property owners should verify contractors' qualifications and the overall cost, not just the cost of the installation. Both installers and ITM technicians should be certified by the National Institute for Certification in Engineering Technologies (NICET). Code provisions are often not enforced by local authorities. Better enforcement is needed more than new requirements. Local authorities need more training. The AFAA offers free webinars and free membership to AHJs.

We also do not have enough specific information about the root causes of unwanted alarms. We need better teamwork between stakeholders, more research, and better reporting of alarms by stakeholders.

Unwanted alarms – smoke alarm and detector update

Pravinray Gandhi, Director of Corporate Research at UL, presented an update on *UL 217, Standard for Smoke Alarms* and *UL 268, Standard for Smoke Detectors for Fire Alarm Systems* on behalf of David Mills, Principal Engineer, Initiating/Indicating Devices. The 8th edition of the standard has revisions and/or new requirements that pertain to reducing nuisance alarms. These revisions include but may not be limited to (i) firmware upgrades; (ii) surge immunity; (iii) end of life requirements; and (iv) smoke alarm cooking nuisance tests. Software or firmware may be updated subject to testing and compliance by UL. Provisions have been made for surge immunity using a combination wave test from IEEE C62.41, *Guide on the Surge Environment in Low Voltage Power Circuits.* Smoke alarms must operate in normal situations without nuisance activations and must pass sensitivity tests. Because performance can shift as a device ages, the

product life is capped at 10 years. Provisions were included for smart or remote devices to interact with smoke alarms to temporarily hush devices that are harder to reach.

In addition to over 800 changes included in the 8th Edition of UL 217, the standard also includes new flaming and smoldering polyurethane foam tests. These requirements were developed by UL's Standards Technical Panel (STP) Task Group (TG) to improve smoke alarm responsiveness to a broader range of particle size and distribution. These tests in combination with the cooking nuisance test requirements reached STP consensus and were added to the Standard in an effort to reduce nuisance alarms. UL also initiated a nuisance research project titled, " Characterization of Smoke Alarm Nuisance Sources from Cooking Scenarios" to study smoke characteristics and smoke levels during cooking events as they are one the more common nuisance sources for smoke alarms. Based on this research, the smoldering smoke test has been removed and replaced with a cooking nuisance test. The threshold for alarming has been set at 1.5% OBS/ft. in this cooking nuisance test.

Discussion

Several relevant points were raised during the discussion with the audience. Some of these are presented here.

We know something about the increasing frequency of unwanted alarms. We do not know if the *rate* of unwanted alarms is actually increasing or if the frequency is a function of more systems in place.

When assessing the qualifications of a company, the qualifications of the individual workers matter as much as the contractor's qualifications.

Should the fire department run "hot" or "cold" to an unverified automatic alarm? Fire departments might find it helpful to have guidelines.

It was also suggested that industry specialists ride with fire departments to calls from commercial alarm systems. This could help the fire service understand more about the causes of these calls and could help industry better understand the fire department perspective.

In addition to the need to build on the research already done, audience members suggested other avenues for future research, including the learning more about the frequency of ITM, and how information is communicated to dispatch. What is the impact of Point ID? Would better ventilation/stricter ventilation requirements reduce unwanted alarms due to cooking?

Is there a way to safely determine which activations require a full evacuation and fire department response and which do not?

What's happening with NFPA 72®?

Although Richard Roux, staff liaison to NFPA 72®, was not present, he provided input into the pre-conference article in the May/June issue of *NFPA Journal*, The Unwanted Conundrum. While the IAFC was disappointed that their proposals were not more enthusiastically embraced, the Technical Committee had heard and understood the concerns. The 2013 edition included changes in Chapter 10 "Fundamentals" that required fire alarm system providers and supervising station and operators to report certain system problems to the AHJs. ITM personnel qualifications were updated. Several changes in Chapter 26, "Supervising Station Alarm Systems" relating to alarm signal verification, content and restoration were also related to unwanted alarms. New requirements in Chapter 29, "Single- and Multiple-Station Alarms and Household Fire Alarm Systems address resistance to common nuisance sources.

The 2016 edition is well underway. Many changes relating to unwanted alarms have been incorporated, including requirements relating to manual and automatic initiating devices and alarm signal verification.

Closing thoughts

The fire service needs to manage its resources and   ensure public safety. When someone on-site reports that there is no emergency, should any response be sent? What if the information given is wrong? How many resources should be sent to unverified alarms in the various occupancies? Whether at work, out and about, or at home, the public resents unnecessary disruption. When unwanted alarms are common, people may not heed the one that warns of a true emergency. In some cases, the smoke alarm or detector sounds in response to something that will become dangerous unless the occupant takes immediate action. Once that action is taken, any danger has passed. At this time, relatively few facilities have systems and protocols that allow for such distinctions in communicating the alarm.

Several speakers, and Dick Roux, remarked that there is no one cure for unwanted alarms. As Dick said in the *NFPA Journal* article, "Reducing unwanted alarms continues to be both an equipment and a people issue." Each year, fire kills thousands of people. The early warnings provided by smoke alarms and detectors are critical to saving lives. We need a concentrated interdisciplinary effort to reduce the unwanted alarms and ensure that these warnings are taken seriously.

Other resources:

- Slides from our June 13, 2016 C & E presentation: M34 - Unwanted Alarms -- Impact and Mitigation
- "The Unwanted Conundrum" from the May/June 2016 issue of *NFPA Journal.*
- NFPA's and IAFC's free *Fire Service Guide to Reducing Unwanted Fire alarms*
- Fire Protection Research Foundation's *Risk-Based Decision Support in Managing Unwanted Alarms*
- *Fire Alarm Response and Management Summit - Proceeding Summary, May 2011*
- NFPA's 2011 report: *Unwanted Fire Alarms*

- Fire Protection Research Foundation's 2015 Report: *Smoke Alarm Nuisance Source Characterization: Experimental Results*
    - Slides from Joshua Dinaburg's June 13, 2016 C & E presentation on subject: M19 - A New Nuisance Smoke Alarm Test--Development and Impact
- NFPA 72®: National Fire Alarm and Signaling Code

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