THE FIRE PROTECTION RESEARCH FOUNDATION

Smoke Alarm Nuisance Source Characterization

Project Summary
Last Updated: 7 November 2013

Background

During the revision cycle for the 2010 edition of NFPA 72, *National Fire Alarm and Signaling Code*, the Technical Committee on Single- and Multiple-Station Alarms and Household Fire Alarm Systems (SIG-HOU) became very concerned with nuisance alarms. According to Marty Ahrens in the NFPA report "Smoke Alarms in U.S. Home Fires":

> Half of smoke alarm failures in reported home fires were due to missing or disconnected batteries. Nuisance alarms are the leading cause of occupants disconnecting their smoke alarms. Cooking is the leading cause of nuisance alarms. Ionization and photoelectric sensing technologies are both sensitive to cooking aerosols such as pan frying baking or sautéing. Several studies have shown that ionization type detectors installed too close to a cooking appliance have a higher frequency of nuisance alarms than photoelectric type detectors.[1]

Based on this information, the SIG-HOU Technical Committee added new smoke detection placement requirements to the 2010 edition. The new requirements are intended to reduce nuisance alarms from smoke alarms and detectors installed too close to stationary cooking appliances.

During the development of the 2013 edition of NFPA 72 the SIG-HOU Technical Committee added several new provisions to Chapter 29 to further reduce nuisance alarms.

- 29.8.4(5): Effective 1/1/16 smoke alarms installed between 10' and 20' from a fixed cooking appliance shall be listed for the application.

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[1] Ahrens, Marty. September 2011. "Smoke Alarms in U.S. Home Fires." NFPA Fire Analysis and Research Division.
http://www.nfpa.org/~/media/Files/Research/NFPA%20reports/Fire%20Protection%20Systems/ossmokealarms.ashx

- 29.7.3: Effective 1/1/19 smoke alarms shall be listed for resistance to common nuisance sources.

At present there is a lack of characterization of common nuisance sources for the development of new performance test protocols.

Research Objective

The overall objective is to characterize common nuisance sources for the development of new performance test protocols in ANSI/UL 217 and ANSI/UL 268 product standards in order to meet the NFPA 72-2013 requirements intended to reduce nuisance alarms.

This study is a Phase 1 literature review and a gap analysis.

Project Tasks

Task 1: Perform a literature review of relevant information on the nuisance source characterization including, but not limited to:

- 2013 NIST studies by Tom Cleary and Artur Chernovsky – *Smoke Alarm Performance in Kitchen Fires and Nuisance Alarm Scenarios*
- 2013 study by Tom Fabian (UL) and James Milke and Robin Zevotek (UMD) – Cooking Fire Prevention (SUPDET 2013 presentation)
- 2013 UL study by Tom Fabian – Smoke Alarm Response in One and Two-Story Residential Structures (SUPDET 2013 presentation)
- Foundation study by Hughes Associates (underway) – *Development of Standard Cooking Fire Scenarios and Candidate Test Methods for Evaluating Cooking Fire Mitigation Technologies*
- 2012 University of Maryland study by Jewell Feng and James Milke – *Analysis of the Response of Smoke Detectors to Smoldering Fires and Nuisance Sources*
- 2010 CPSC study by Arthur Lee and Danny Pineda – *Smoke Alarms - Pilot Study Of Nuisance alarms Associated With Cooking*
- 2007 Foundation project by Thomas Fabian and Pravinray Gandhi at UL – *Characterizing Smoke from Residential Materials*
- Any other relevant studies, including those completed outside of the US

Task 2: Based on the findings of Task 1, identify the knowledge gaps related to nuisance source characterization.

Task 3: Develop a test plan to obtain the necessary technical data to fill in the knowledge gaps in order to distinguish between cooking nuisance alarms and actual cooking fire scenarios. The data collected should include detector/alarm locations, smoke and heat buildup rates, particle size(s), gas concentrations and event time durations. Determine whether the characterized nuisance

conditions are sufficiently different to enable differentiation from test fires currently in the UL standards.

Implementation

The research program will be conducted under the auspices of the Fire Protection Research Foundation and will be guided by the Project Technical Panel. The final Phase 1 report will be issued March 2014.