

Enhanced Smoke Alarms: UL Safety Standards 217 and 268

Sean DeCrane
Underwriters Laboratories
Manager, Industry Relations



UL's Founder William Henry Merrill



William Henry Merrill

1866-1923

He was a skilled and highly trained Boston electrical inspector hired by the Chicago Underwriters Bureau to resolve problems with automatic fire alarms in the city of Chicago in 1893.

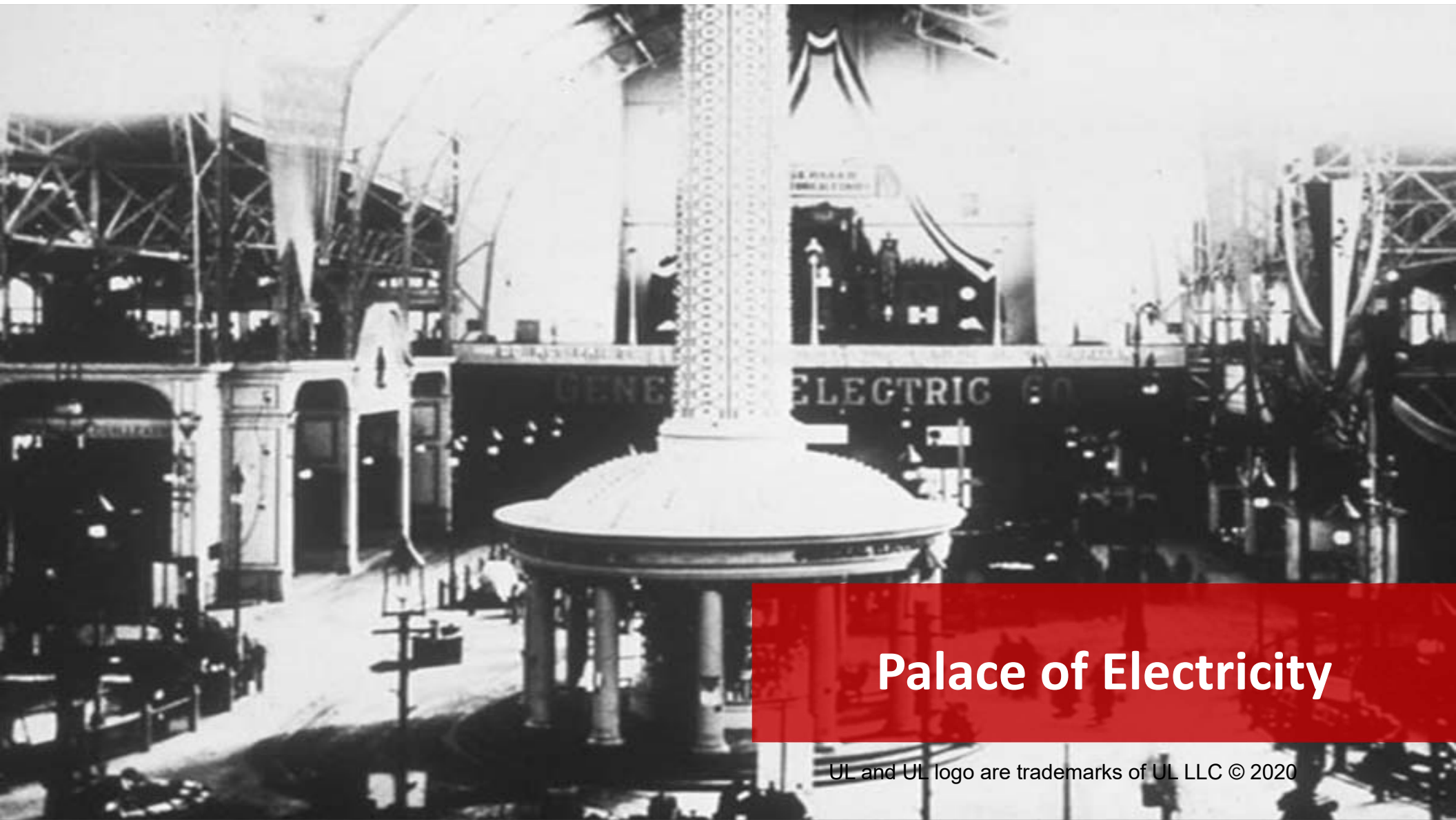




1893 Chicago World's Fair

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ELECTRICITY BUILDING, NORTH FRONT



Palace of Electricity

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Underwriters Electrical Bureau - 1894

The location was a small one room laboratory above Fire Patrol Station #1 on Monroe St. in downtown Chicago, IL.



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Underwriters Laboratories

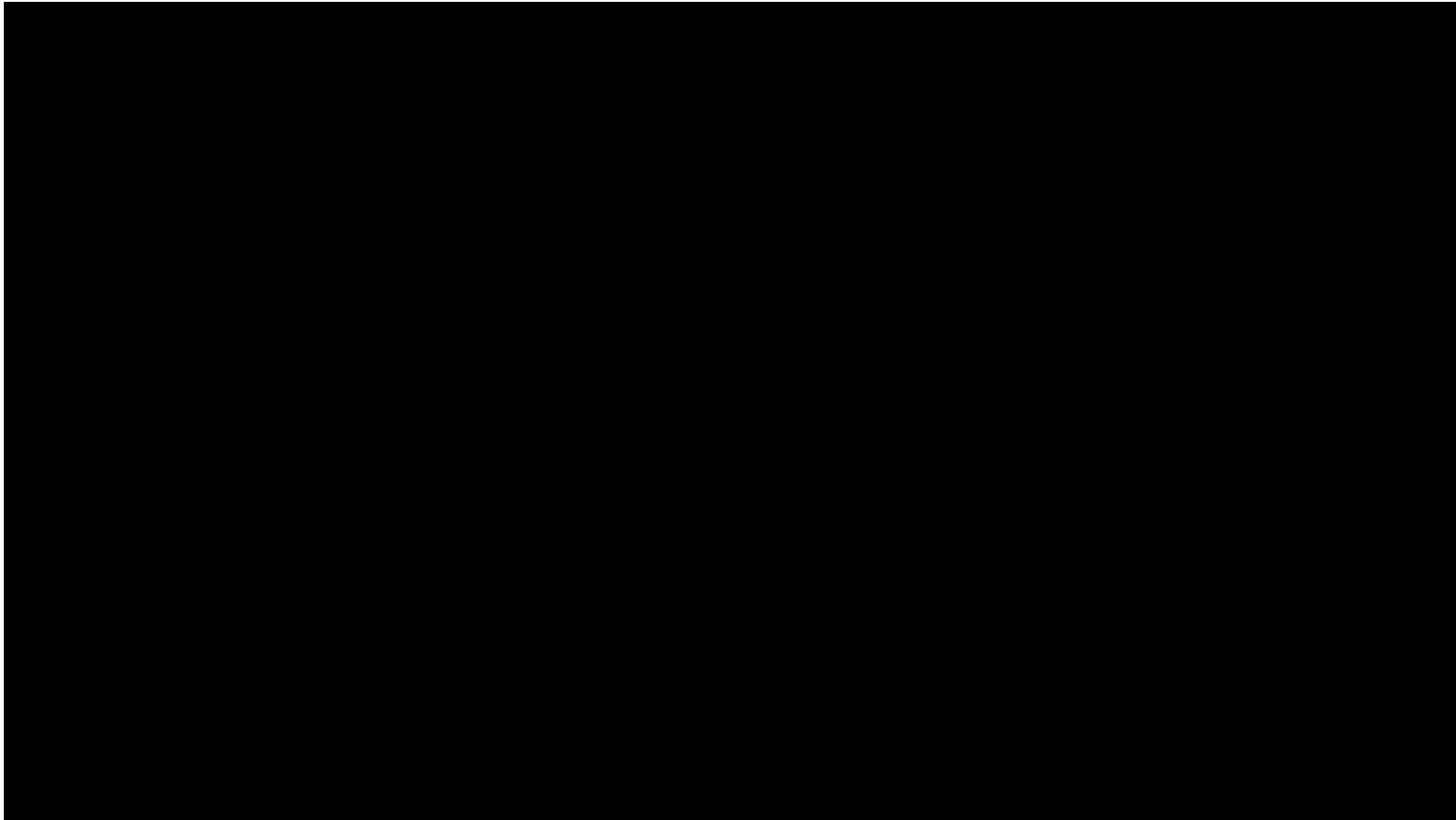
To promote safe living and working environments through the application of safety science and hazard-based safety engineering.



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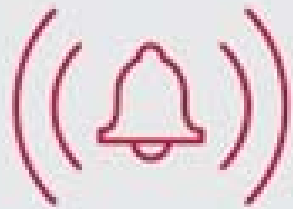
Underwriters Laboratories

Empowering Trust



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Enhanced Standards – Effective May 2020



UL 217 – SMOKE ALARMS –

independent, self-contained device with a smoke sensor, alarm-sounding appliance, commonly used in residential settings



UL 268 – SMOKE DETECTORS –

typically intended for use with a control panel as part of fire detection within the system



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UL operates
in more than
143
COUNTRIES



and across
more than
20
INDUSTRIES

UL HAS ENHANCED TRANSACTION SECURITY FOR:



500+ banks
20+ payment
schemes

60+ mobile network operators
50+ governments/
transport operators



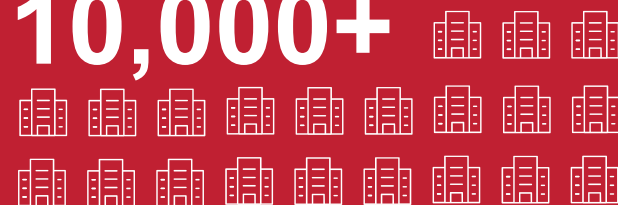
UL has helped to set
MORE THAN
1,600

standards defining safety,
security, quality and sustainability



**Science and
global expertise**

UL software is used by
10,000+



**ORGANIZATIONS in
OVER 10 INDUSTRIES**



UL'S SUSTAINABILITY CERTIFICATIONS are referenced in
900+

sustainable product specifications or
purchasing guidelines around the globe

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UL SERVES

1 OUT OF 3
Fortune 500 companies



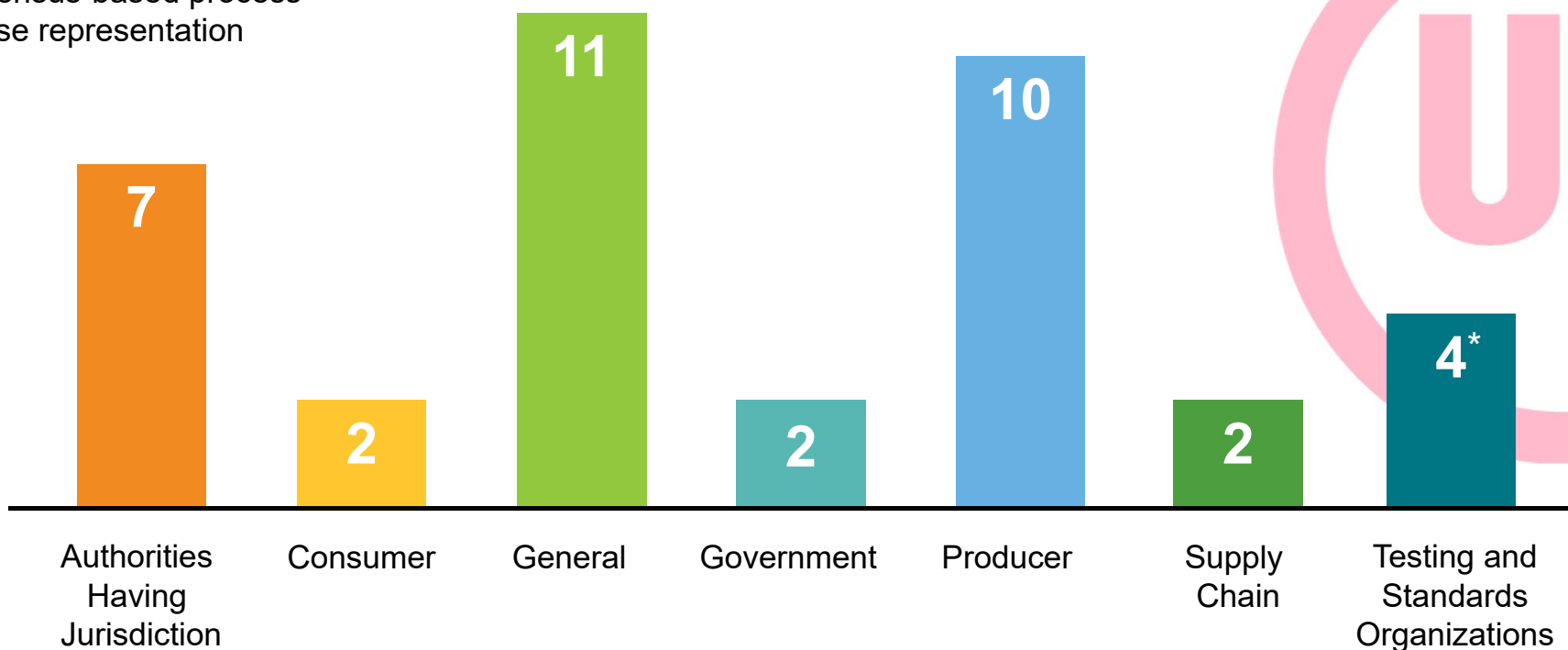
UL Global Security & Brand Protection

For over 20 years, UL has taken an aggressive stance against IP crimes through a comprehensive program

UL Standards Technical Panel (STP)

- Consensus-based process
- Diverse representation

NUMBER OF VOTING SEATS HELD



*UL holds one voting seat in this category

A full list of roster members is publicly available at this link: http://csds.ul.com/STPinfo/Roster_list.aspx

How Did We Get Here?



NBS GCR 75-51

Titled – Detector Sensitivity and Siting Requirements For Dwellings

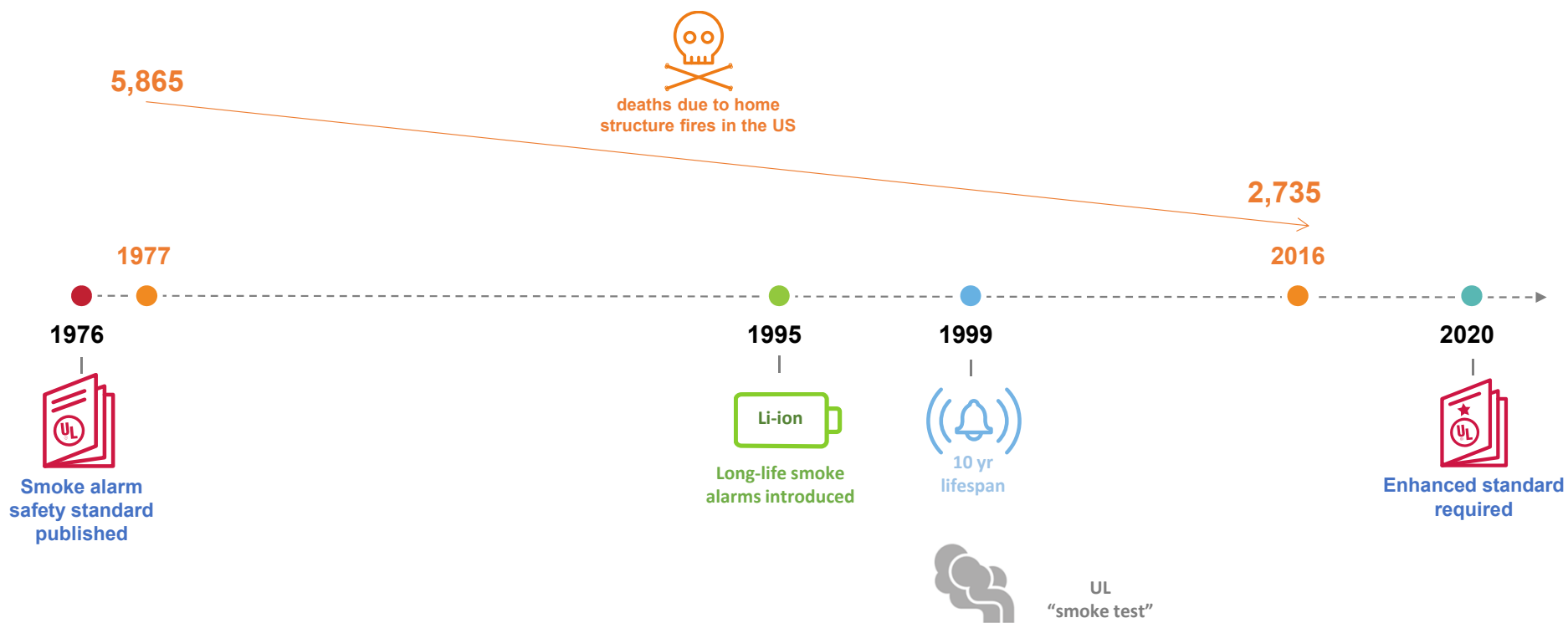
- ✓ Commonly referred to as the “Dunes Study”
- ✓ Conducted in 1975 - 1976
- ✓ Some Key Conclusions

Helped shape the fire science communities understanding related to

- smoke alarm performance
- and
- escape time needed during fires



Timeline of Smoke Alarms



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Nuisance Alarming and Disabled Smoke Alarms

3 OUT OF **5** HOME FIRE DEATHS

EITHER HAD NO SMOKE ALARM PRESENT
OR NO WORKING SMOKE ALARM PRESENT

 **NFPA** AND THE **CPSC**

CITE THE LEADING REASON FOR A SMOKE ALARM TO
BE DISABLED IS BECAUSE OF COOKING NUISANCE



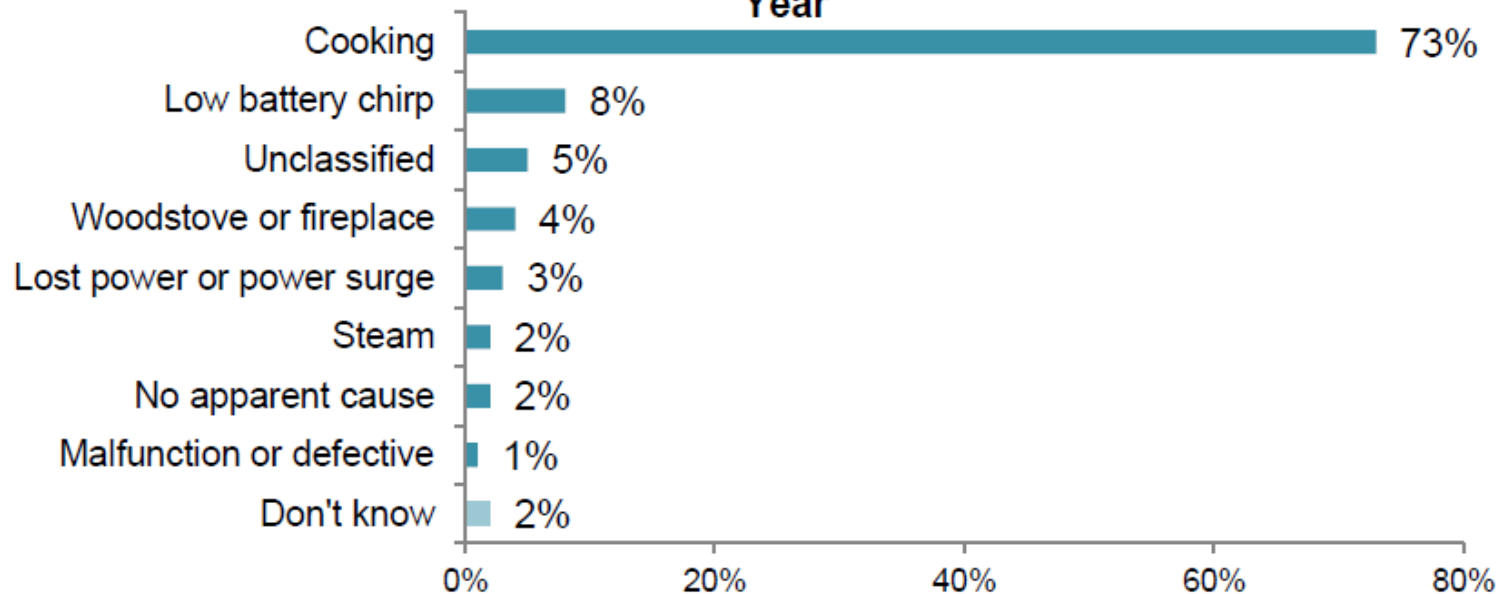
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Common Nuisance Sources

Marty Ahrens March 2014 Report, titled "Smoke Alarms in U.S. Home Fires"

- Steam Nuisance alarms account for no more than 2% of nuisance alarms (down from 5% in 2004)
- Cooking Nuisance alarms account for 73% of nuisance alarms (up from 69% in 2004)

Figure 12. Reasons Given for Smoke Alarm Activations in Past Year



Source: Harris Poll National Quorum. National Fire Protection Association -- Smoke Alarms. 2010.



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Literature Review

- **CPSC Pilot Study in Homes**

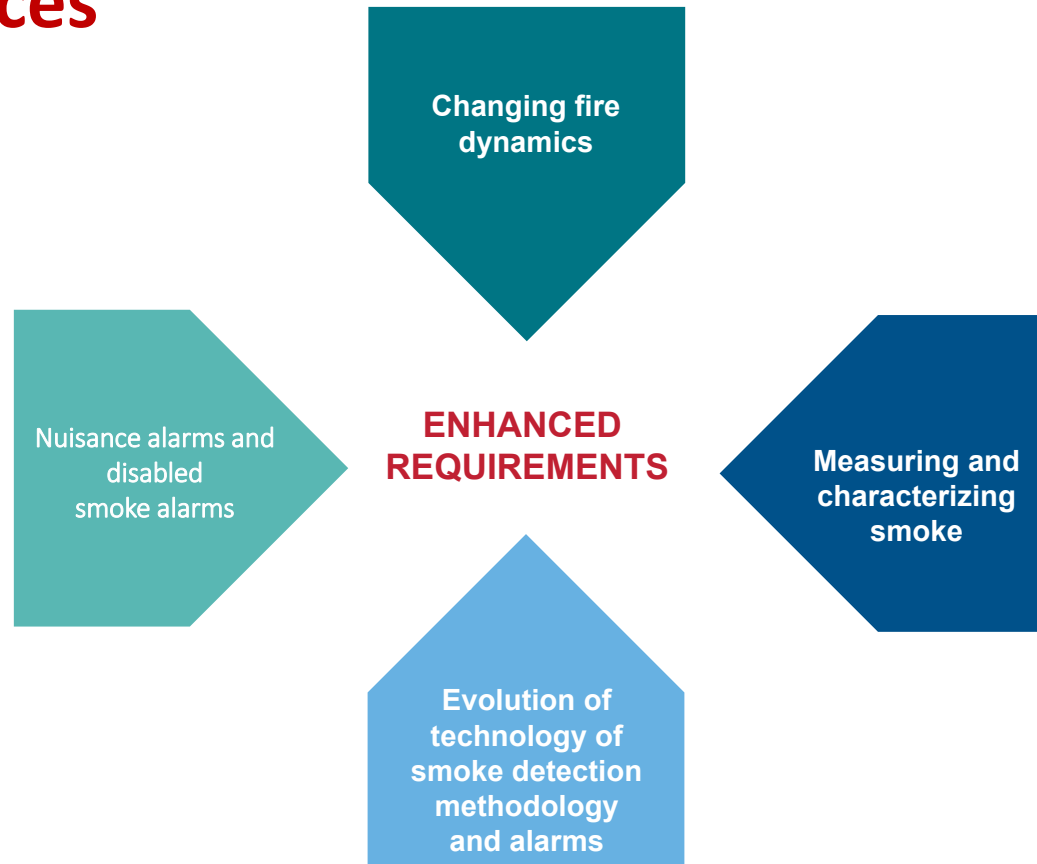
- Smoke alarm distance with respect cooking appliances influenced activation during normal cooking (nuisance activation).
 - **Both ionization and photoelectric smoke alarms activated; however, ionization smoke alarms were more susceptible to cooking nuisance alarms.**

- **NIST Research**

- Food items tested by NIST included: Toasted bread, bagel, Fried bacon, Broiled Hamburger, Fried Hamburger, Stir fry vegetables, Baked pizza, Grilled cheese sandwich
 - **Both ionization and photoelectric smoke alarms activated during normal cooking; ionization smoke alarms more susceptible to toasting bread; photoelectric to pan frying hamburgers.**



Converging Forces



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NIST Technical Note 1455-1

Titled - Performance of Home Smoke Alarms, Analysis of the Response of Several Available Technologies in Residential Fire Settings

✓ Commonly referred to as the “Dunes II Study”

✓ Some Key Conclusions

1. Smoke alarms to be installed in every bedroom and every level of the home
2. Bedroom doors should be closed when sleeping
3. Recommended the use of multiple station smoke alarms
4. Reduction in escape times
5. Additional research was needed to understand the fuel sources that were causing the reduced escape times.



Empowering Trust™

Changing Fire Dynamics

1978



approx
17 min

*Natural materials
and furnishing*

2018



approx
3 min

*Synthetic materials
and open floor plans*

Escape times in a home fire have decreased from approximately **17 minutes** to approximately **3 minutes** over the last 40 years, due to changes in materials and floorplans in modern homes.

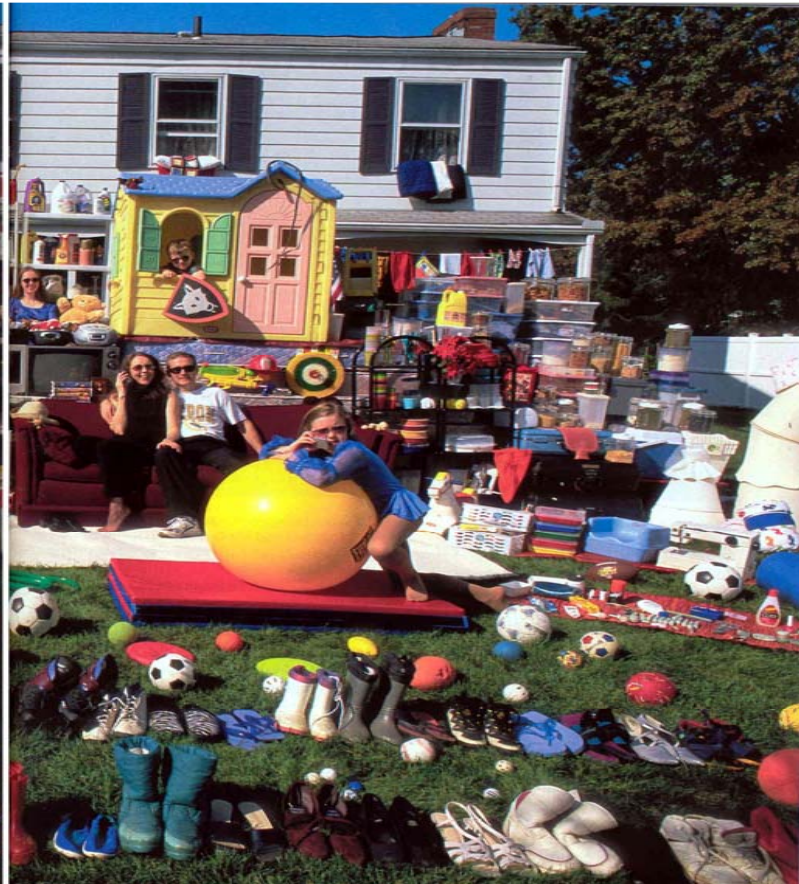


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Comparison of modern and legacy home furnishings

<https://ulfirefightersafety.org/research-projects/comparison-of-modern-and-legacy-home-furnishings.html>

Higher Fuel Load



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Increased Fuel Loads - Experiment



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Comparison of Room Furnishings

Natural Room

Synthetic Room



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Modern Furniture



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Enhancements to Requirements and Testing



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Smoke Characterization Project Summary

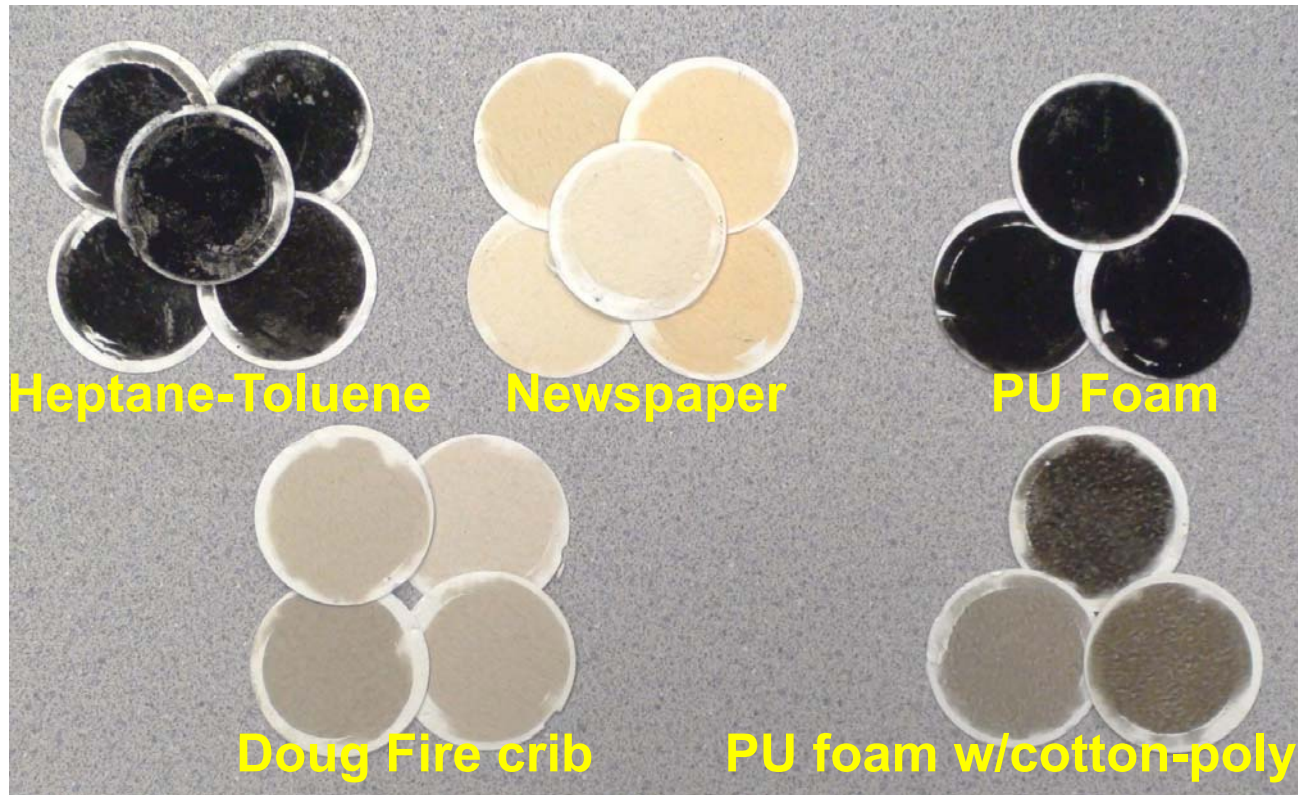
Polyurethane Foam:

- Faster Ignition
- Generated greater heat and smoke release rates than natural materials
- Generated smaller sized particles than most UL 217 test materials
- Accumulated smoke comprised of smaller particles than for the UL 217 test materials
- Produce darker color smoke than UL 217 newspaper or wood
- Prevalent in residences (mattresses, upholstered furniture, etc.)



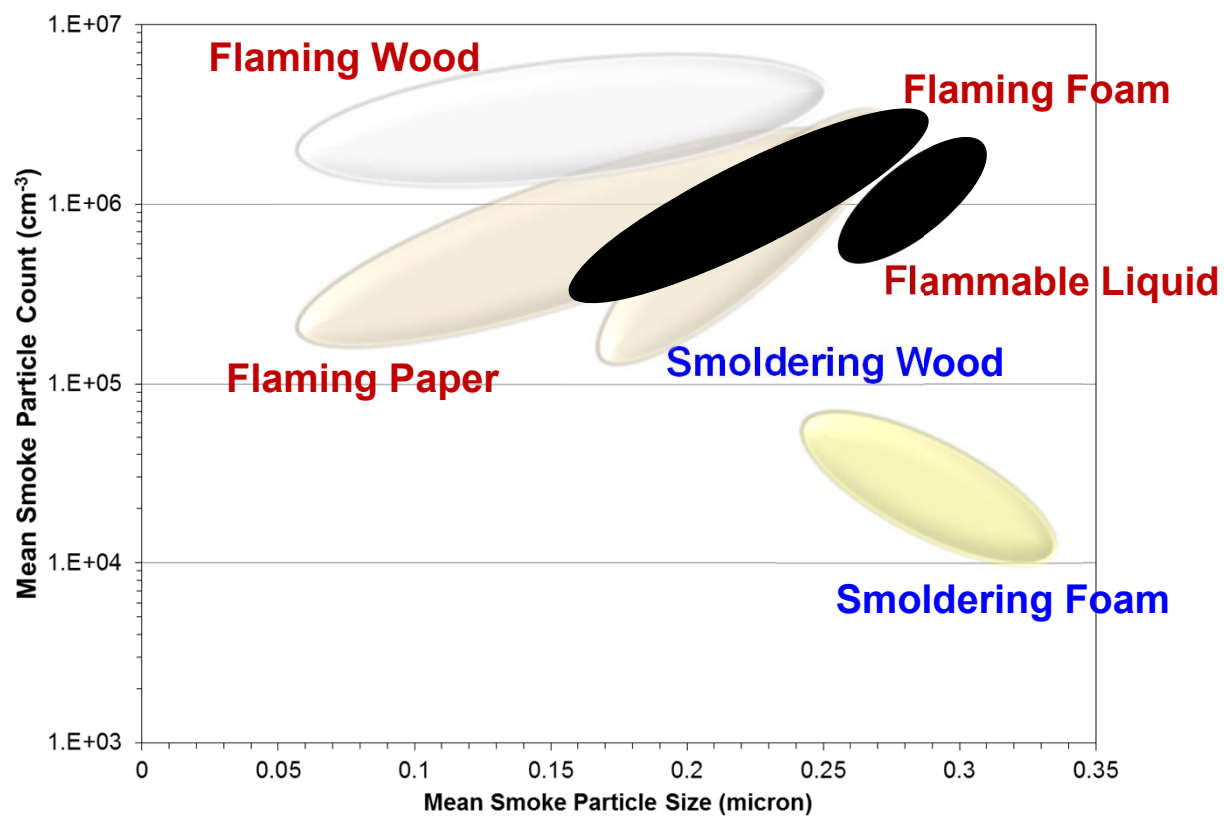
SMOKE CHARACTERIZATION PROJECT SUMMARY

ANSI/UL 217, ANSI/UL 268 FIRE TEST ROOM



Smoke Characterization Project Highlights

UL 217/268 Fire and Foam Signatures





• Standards and Technology

- Performance-based, technology agnostic
- Sensing technology and innovation
- Reliability and repeatability



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Messaging – What Does the Public Hear



A nonprofit organization of dedicated professionals devoted to fire safety through education and code enforcement

POSTS COMMENTS

NEOFPA
North Eastern Ohio
Fire Prevention Association

50 YEARS
1964-2014

Home | News | Events | Inspector Resources | **Public Fire Safety** | Contact | RFA | Store | Members | Search this website Search

Photoelectric Smoke Alarms Save More Lives

- Install wired or wireless interconnected smoke alarms for greater protection!

click for more information

18,000 Counterfeit Smoke Detectors Recalled
Recently the Atlanta (GA) Fire Rescue Department was forced to recall more than 18,000 smoke alarms after... [more]

Announcements
Northeast Ohio Firefighters Receive Awards from the State Fire Marshal

Fire Safety Tips
Smoke Alarms
The Basics

Photoelectric smoke alarms should be placed, at a minimum, on every floor level including the basement, inside every sleeping room, and outside of every sleeping area of all dwellings.

Interconnected photoelectric smoke alarms, either wired or wireless, should be strongly considered. With interconnected alarms, when one smoke alarm sounds, all other smoke alarms in the home [more...]

More safety tips →

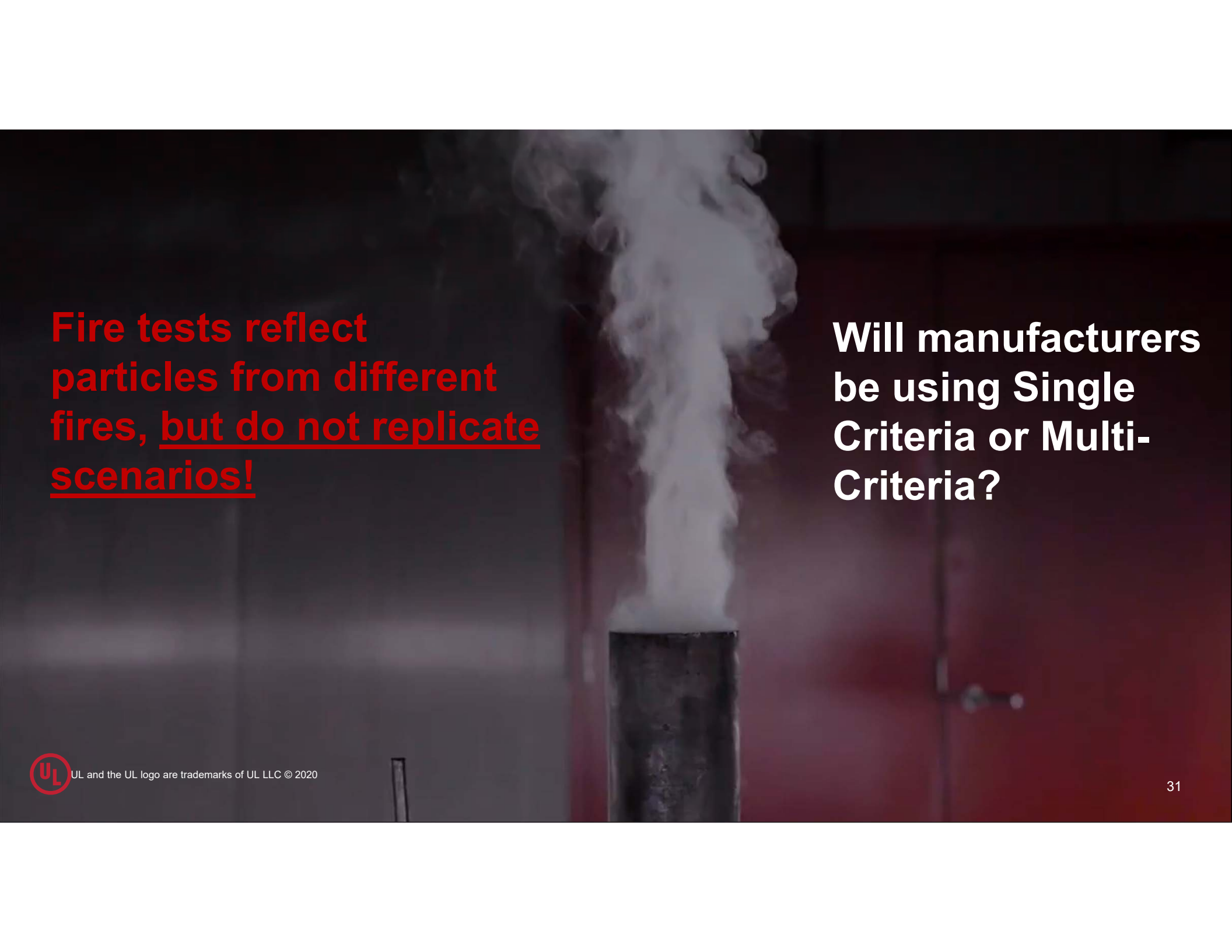
Hazards & Violations
Links
Photo Galleries
Member Resources
Smoke Alarms

Join NEOFPA!
To join or renew your membership, download and submit this form: [Membership Form 2018 \(297 downloads\)](#)

About NEOFPA
The NEOFPA's mission is to



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Fire tests reflect particles from different fires, but do not replicate scenarios!

Will manufacturers be using Single Criteria or Multi-Criteria?



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But How Will Alarms Perform?

Research Objectives

- How will new tests affect current smoke alarms.
- What is the potential performance enhancement for new smoke alarms.
- Can a single nuisance test represent the broad range of cooking scenarios?



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NIST Technical Note 1947

A Study on the Performance of Current Smoke Alarms to the New Fire and Nuisance Tests Prescribed in ANSI/UL 217-2015

Thomas G. Cleary

This publication is available free of charge from:
<https://doi.org/10.6028/NIST.TN.1947>

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

But How Will Alarms Perform?

Summary

- Ionization alarms performed well when subject to flaming PU Foam.
- Photoelectric alarms performed well when subject to Smoldering PU Foam.



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NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

But How Will Alarms Perform?

NIST Technical Note 1947

- No current smoke alarm would meet the new requirements
 - Three model photoelectric alarms came closest
- An across the board change to comply with UL 217/268 would “.... Significantly improve the overall performance...”
- New fires and nuisance tests “... make it challenging for manufactures to meet the requirements by simply using a combination of photoelectric and ionization sensor,”



But How Will Smoke Alarms Perform? NIST Technical Note 1947

“it is concluded that smoke alarms meeting the performance criteria in ANSI/UL 217-2015 would demonstrate significantly improved overall performance by expanding range of fire scenarios alarms must respond to while requiring greater resistance to nuisance alarms than a wide range of currently available models.”



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NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

Approximate Number of Standard Revisions

How many revisions were incorporated into the standard between the 5th and 8th edition of ANSI/UL 217 and ANSI/UL 268?

251

- Revisions to the standard-most requiring testing, or engineering assessment

800+

- Total Revisions



Additional Key Changes to ANSI/UL 217 and ANSI/UL 268

- ✓ Multi-Criteria
- ✓ End-of-Life
- ✓ Alarm Silence
- ✓ Wireless Supervision
- ✓ Firmware Updates
- ✓ Flaming PU Foam after Cooking Nuisance
- ✓ Polyurethane (PU) Foam
- ✓ Cooking Nuisance Alarm Requirements

UL, LLC - Effective date for the 8th edition of ANSI/UL 217 is May 2020.



UL 217

STANDARD FOR SAFETY

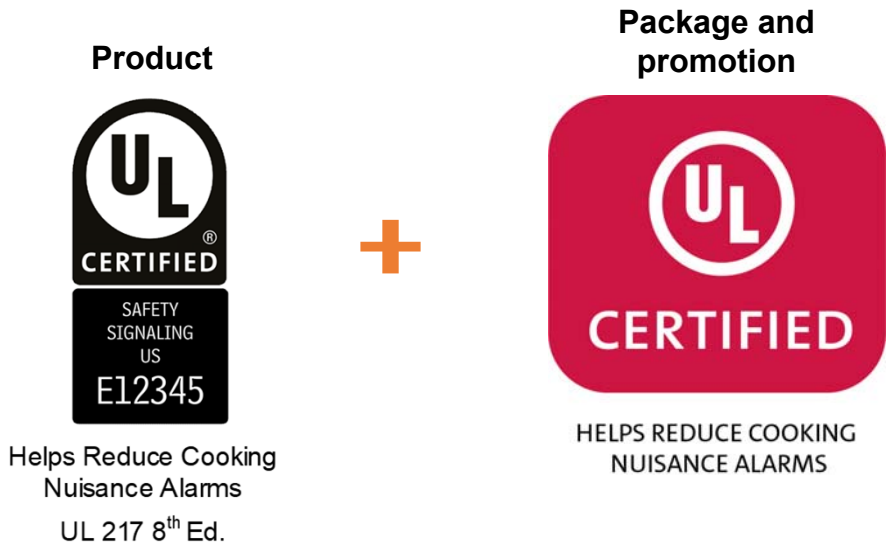
Smoke Alarms



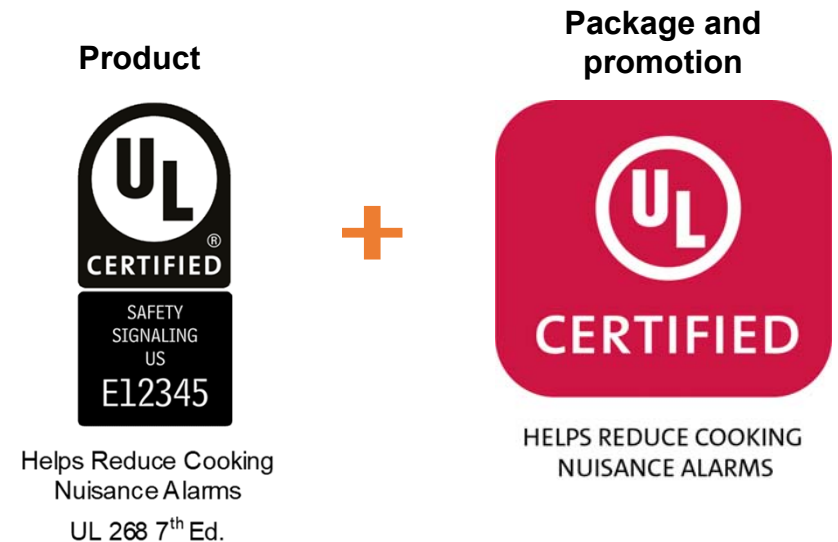
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Enhanced Product Certification Mark and Promotional Marking

SMOKE ALARMS CERTIFIED BY UL TO UL 217 8TH EDITION



SMOKE DETECTORS CERTIFIED BY UL TO UL 268 7TH EDITION



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Key Messages for the Public and Actions You Can Take



smokealarms.ul.com

A man in a red shirt is installing a smoke alarm on a ceiling. A woman in a blue shirt is looking up at him. The background shows a staircase and a doorway.

UL

SAFETY STANDARDS FACTS & TIPS PRESS CENTER RESOURCES

SMOKE ALARMS SAVE LIVES.
IT'S IMPORTANT THAT THEY
WORK WHEN YOU NEED
THEM TO.

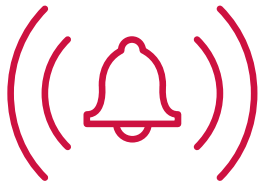


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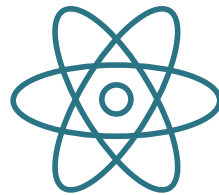
Governor's Island



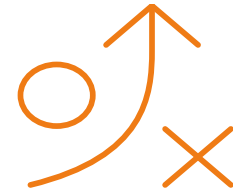
Key Messages for the Public



Working smoke alarms
will continue to provide protection
through the end
of their 10-year life span



At the end of the 10-year span,
install an alarm with enhanced
technology



Have an escape plan
and act on it when a
smoke alarm sounds



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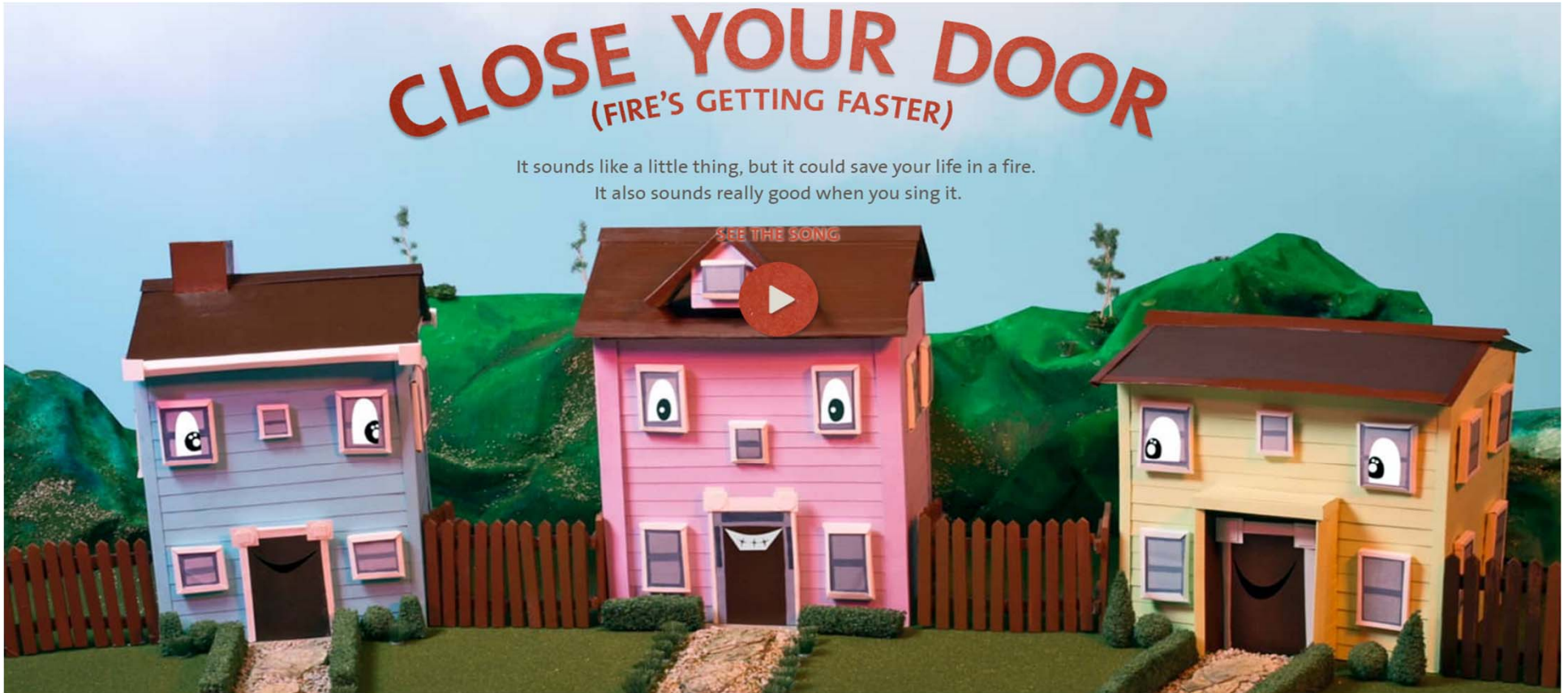
www.closeyourdoor.org

CLOSE YOUR DOOR

(FIRE'S GETTING FASTER)

It sounds like a little thing, but it could save your life in a fire.
It also sounds really good when you sing it.

SEE THE SONG



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Best Case Success Story

4 y/o Child Saved and Successfully Revived After a Successful Transitional Attack that was Initiated from the Front Yard



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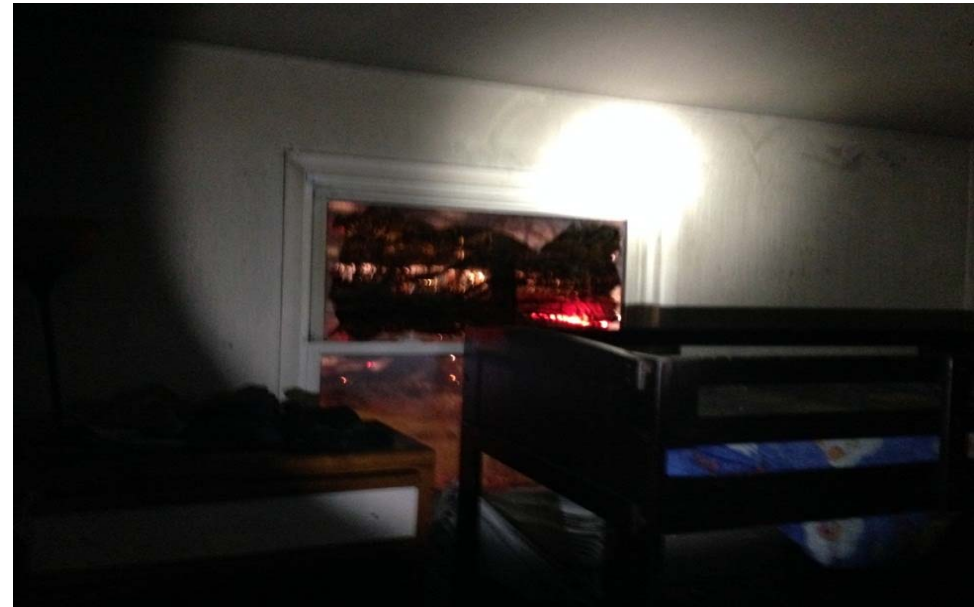
Isolation Saves Lives

Even Hollow Core Doors Help!

Hollow Core Door



Bedroom with Child



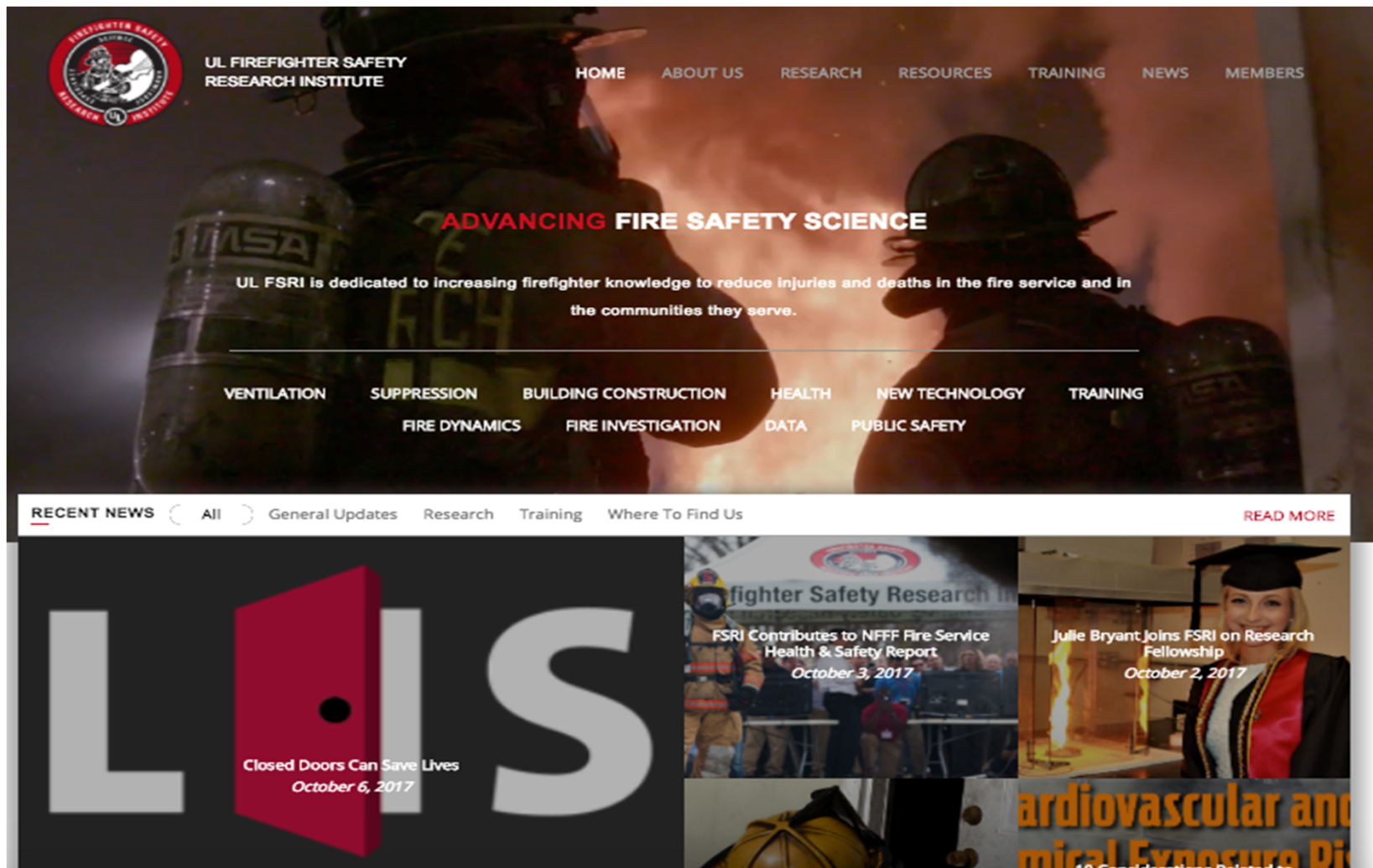
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UL Offers Potentially Life-Saving Tip For Home Fire Safety: Close Before You Doze



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ULfirefightersafety.org



Additional Resources

Additional Scientific Resources:

1. **UL FSRI Comparison of Modern and Legacy Home Furnishings** <https://ulfirefightersafety.org/research-projects/comparison-of-modern-and-legacy-home-furnishings.html>
2. **Smoke Characterization Project Report**
<https://www.nfpa.org/-/media/Files/News-and-Research/Archived-reports/smokecharacterization.ashx?la=en>
3. **Cooking Nuisance**
https://library.ul.com/wp-content/uploads/sites/40/2015/06/Characterization-of-Smoke-Alarm-Nuisance-Sources-from-Cooking-Events_Final.pdf



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Thank You

Sean DeCrane

Sean.decrane@ul.com



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