Enhanced Smoke Alarms: UL Safety Standards 217 and 268

Sean DeCrane
Underwriters Laboratories
Manager, Industry Relations

Empowering Trust™

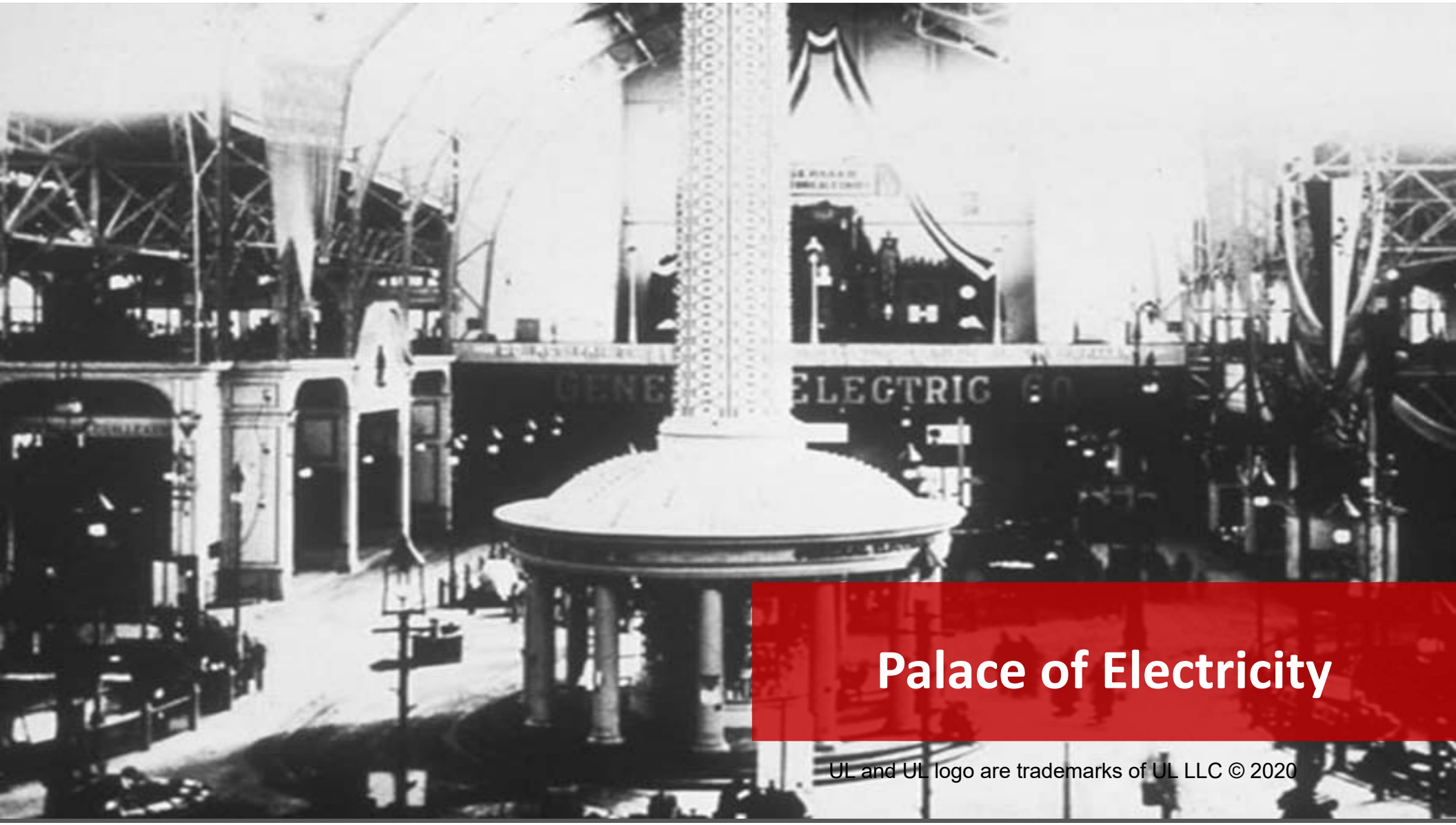
UL's Founder William Henry Merrill

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



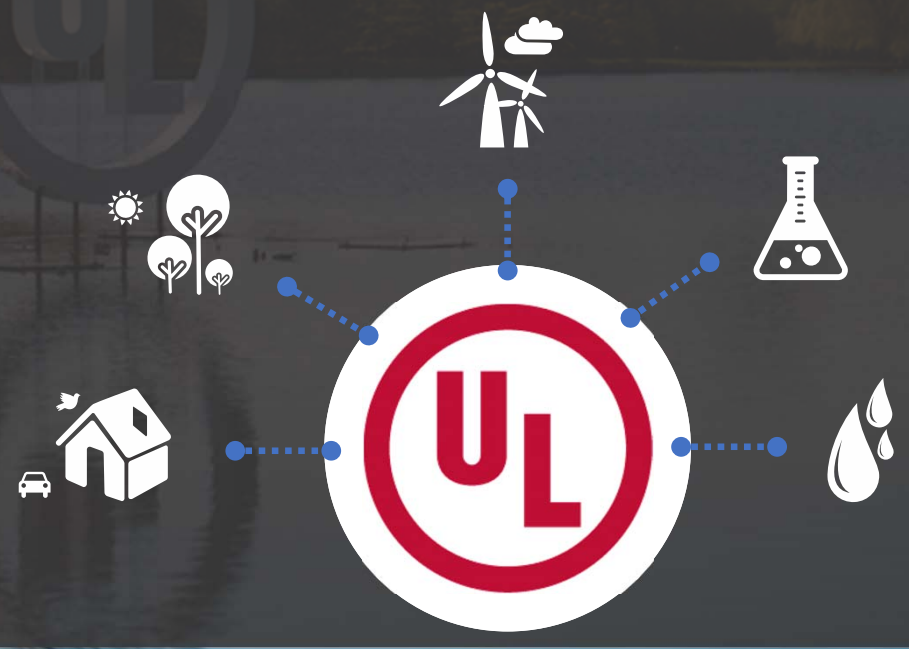
Palace of Electricity

Underwriters Electrical Bureau - 1894

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

Underwriters Laboratories

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



Underwriters Laboratories
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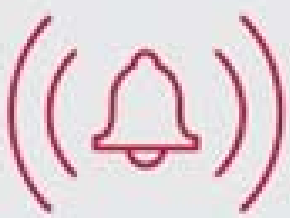
Enhanced Standards – Effective May 2020



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

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

UL SERVES

1 OUT OF **3**

Fortune 500 companies

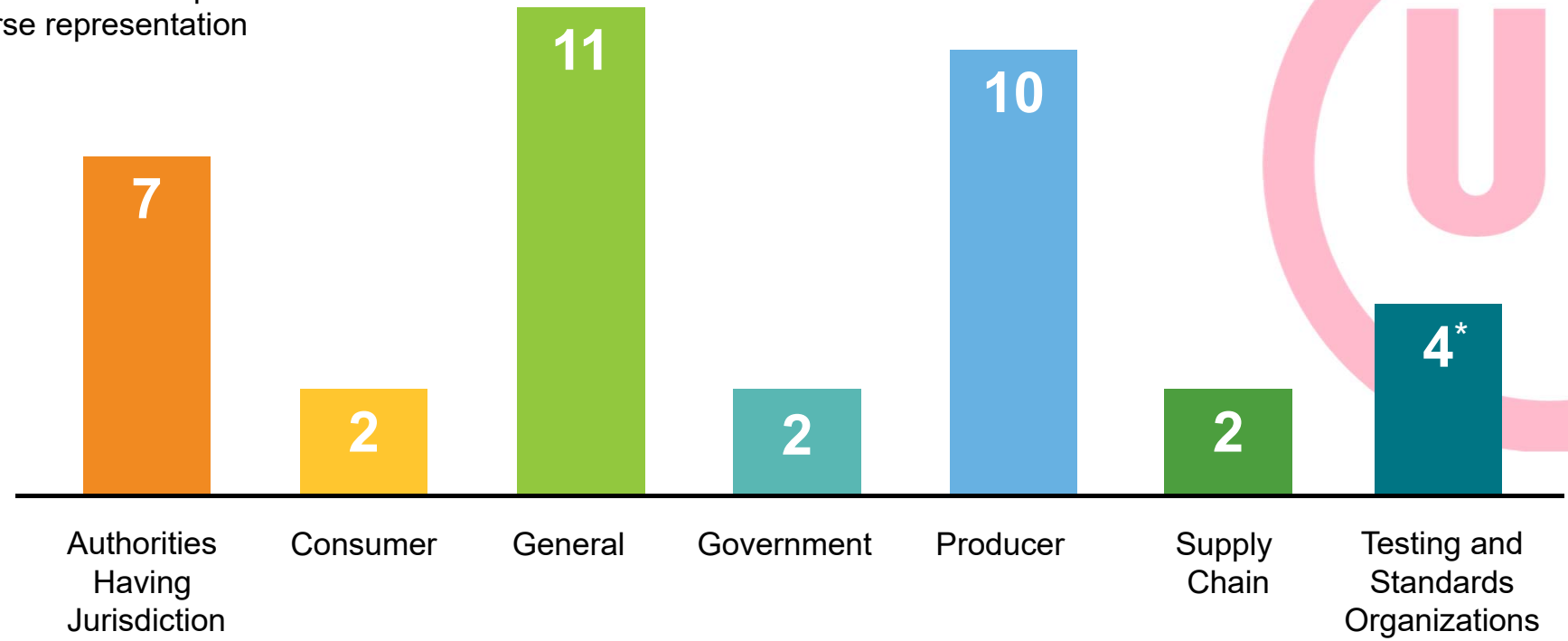
UL Global Security & Brand Protection

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

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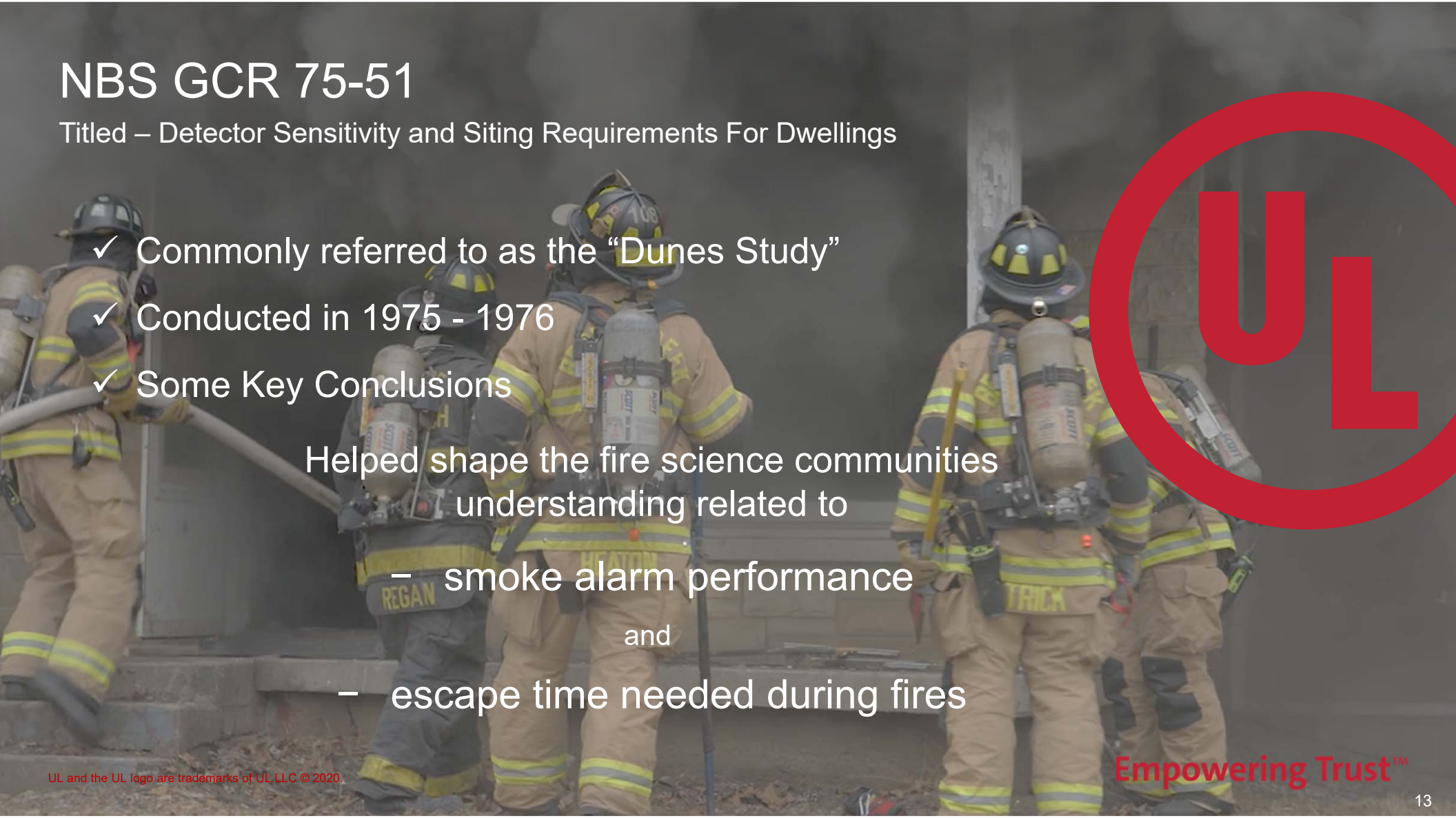
How Did We Get Here?

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

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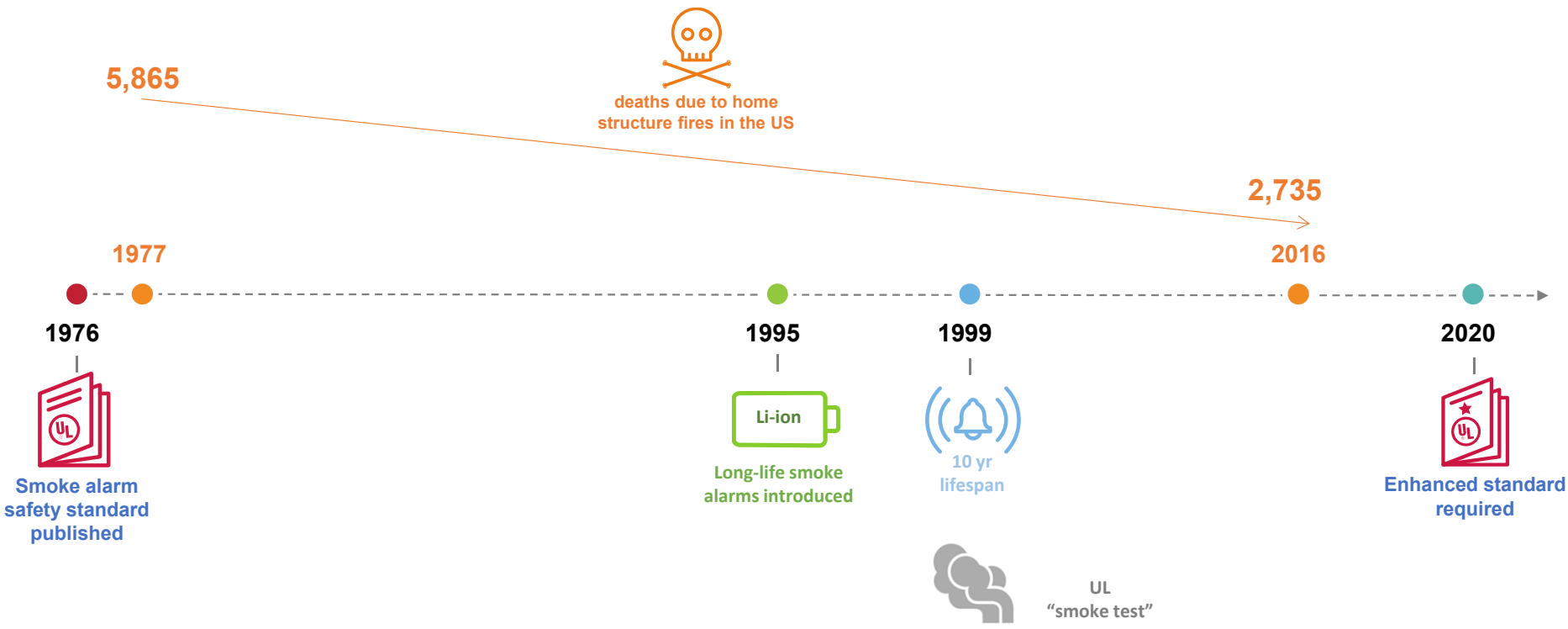
Timeline of Smoke Alarms



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

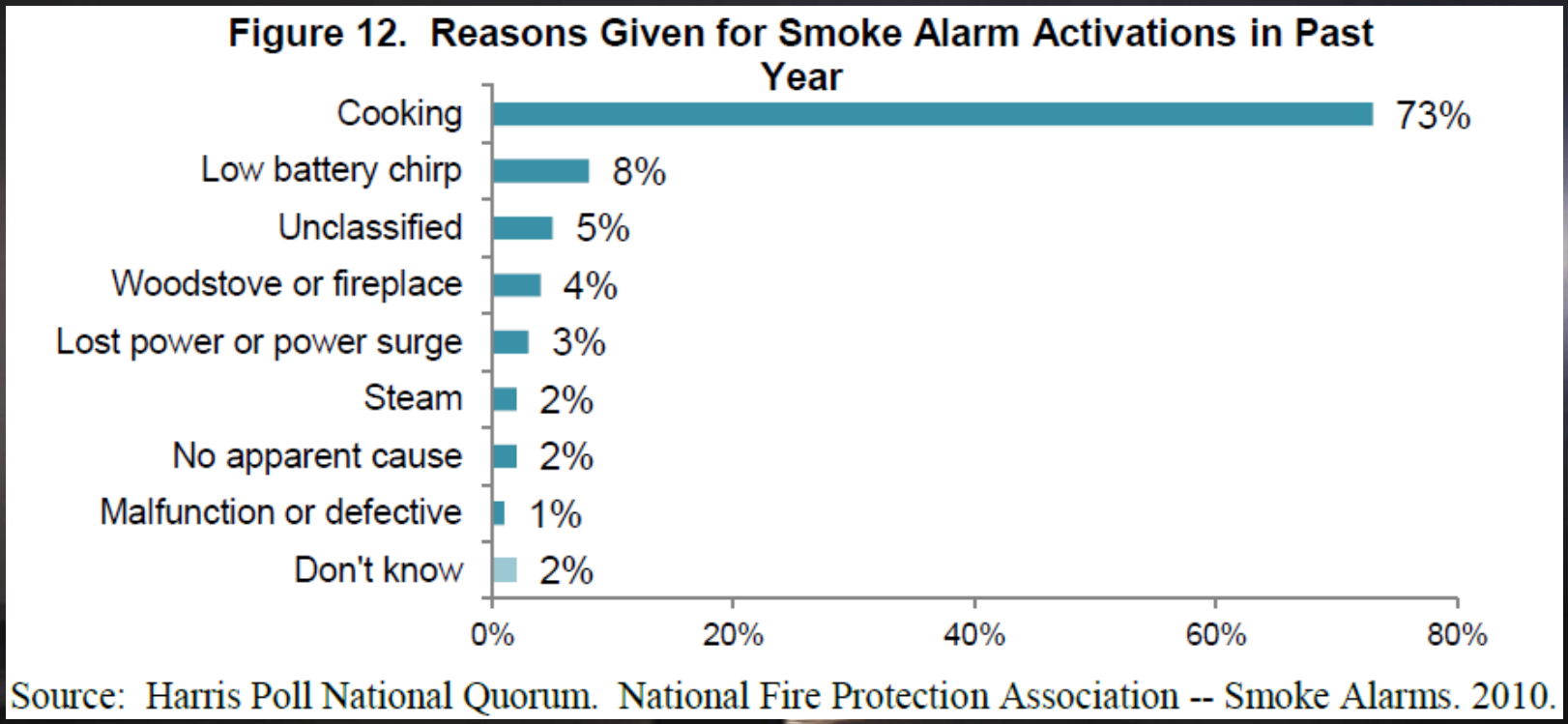
NFPA AND THE CPSC

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

Common Nuisance Sources

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

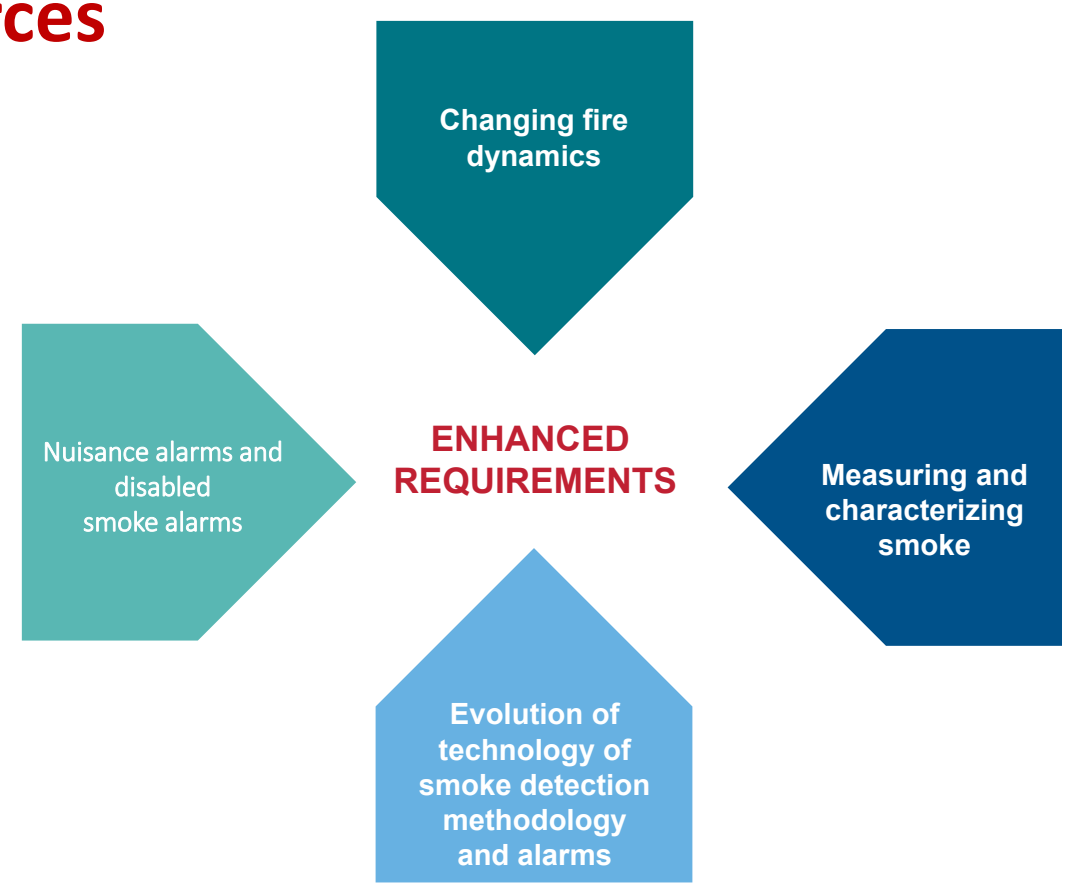
- Steam Nuisance alarms account for no more than 2% of nuisance alarms (down from 5% in 2004)
- Cooking Nuisance alarms account for 73% of nuisance alarms (up from 69% in 2004)



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



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.

Changing Fire Dynamics

1978

approx 17 min

Natural materials and furnishing

2018

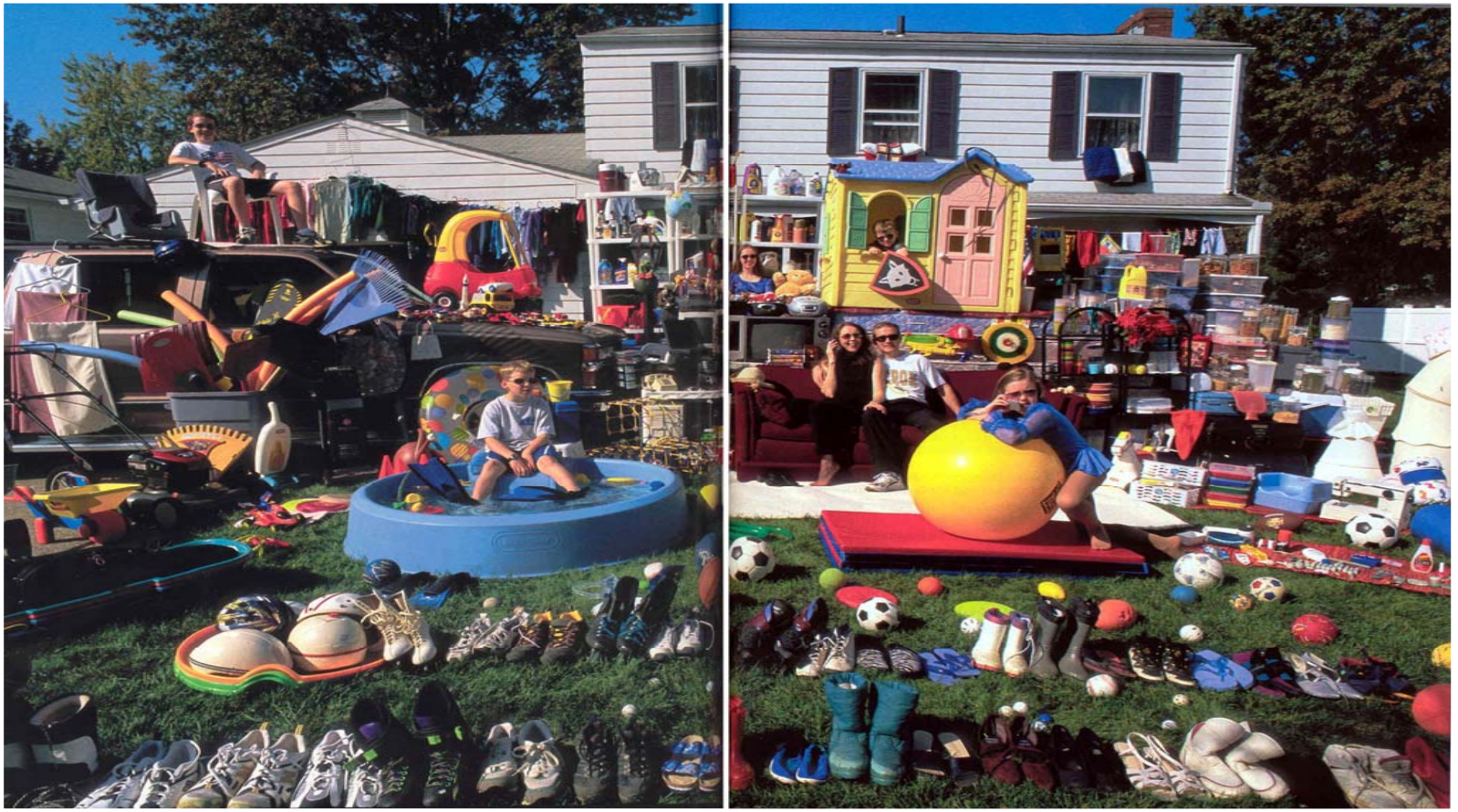
approx 3 min

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.

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

Higher Fuel Load



Increased Fuel Loads - Experiment

Modern Furniture

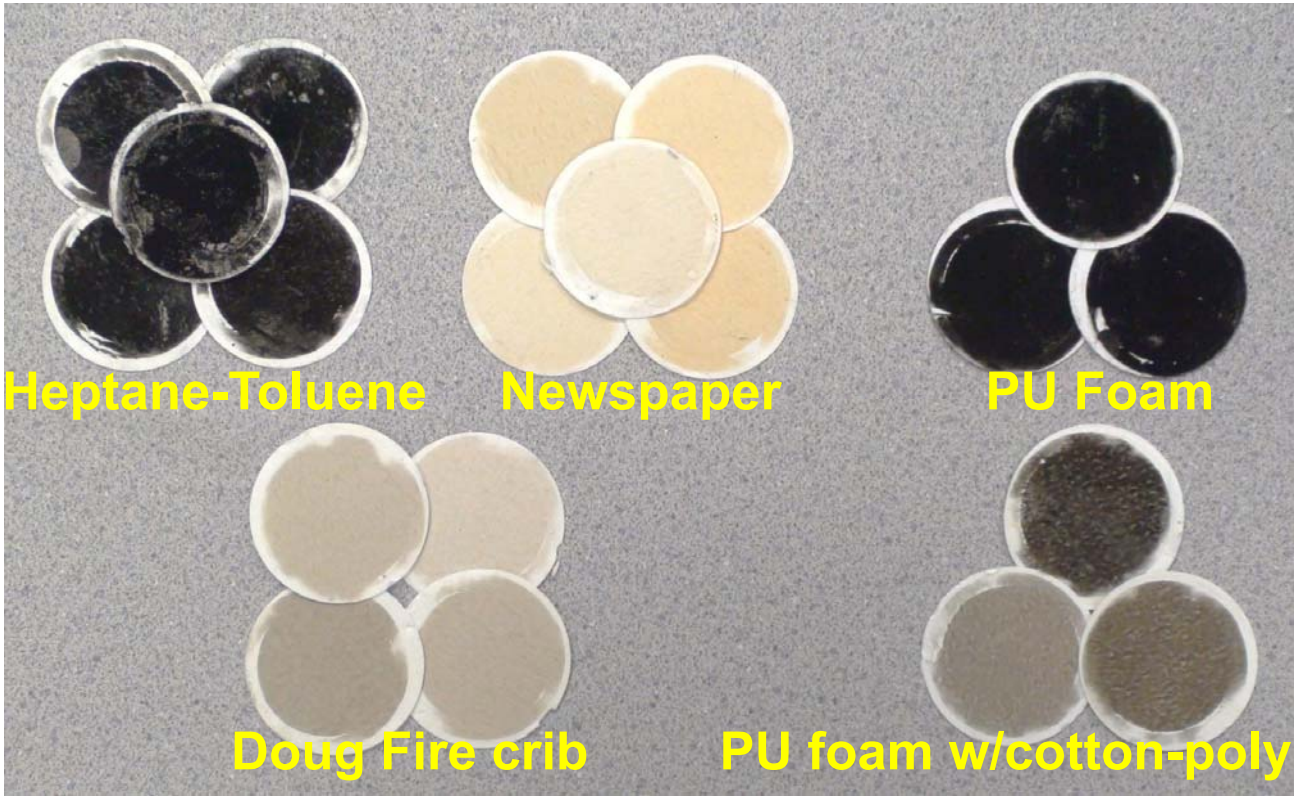
Enhancements to Requirements and Testing

Smoke Characterization Project Summary

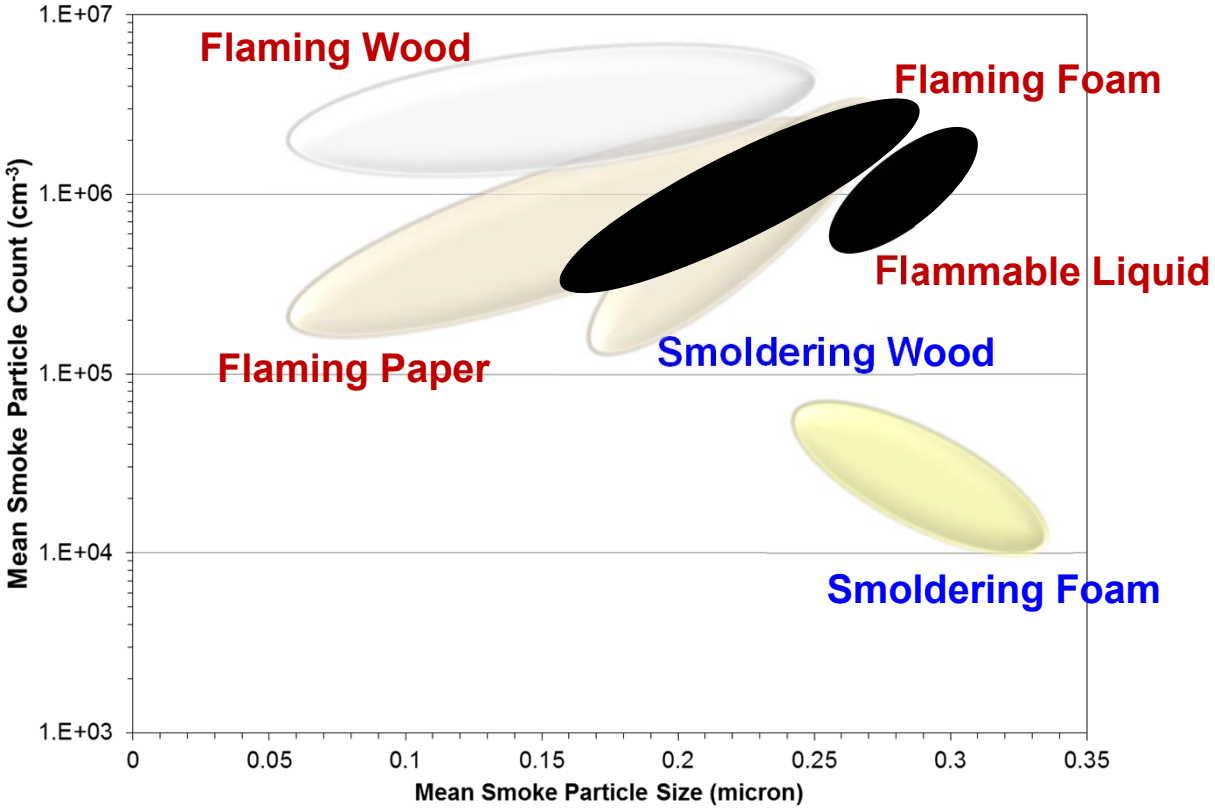
Polyurethane Foam:

- 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

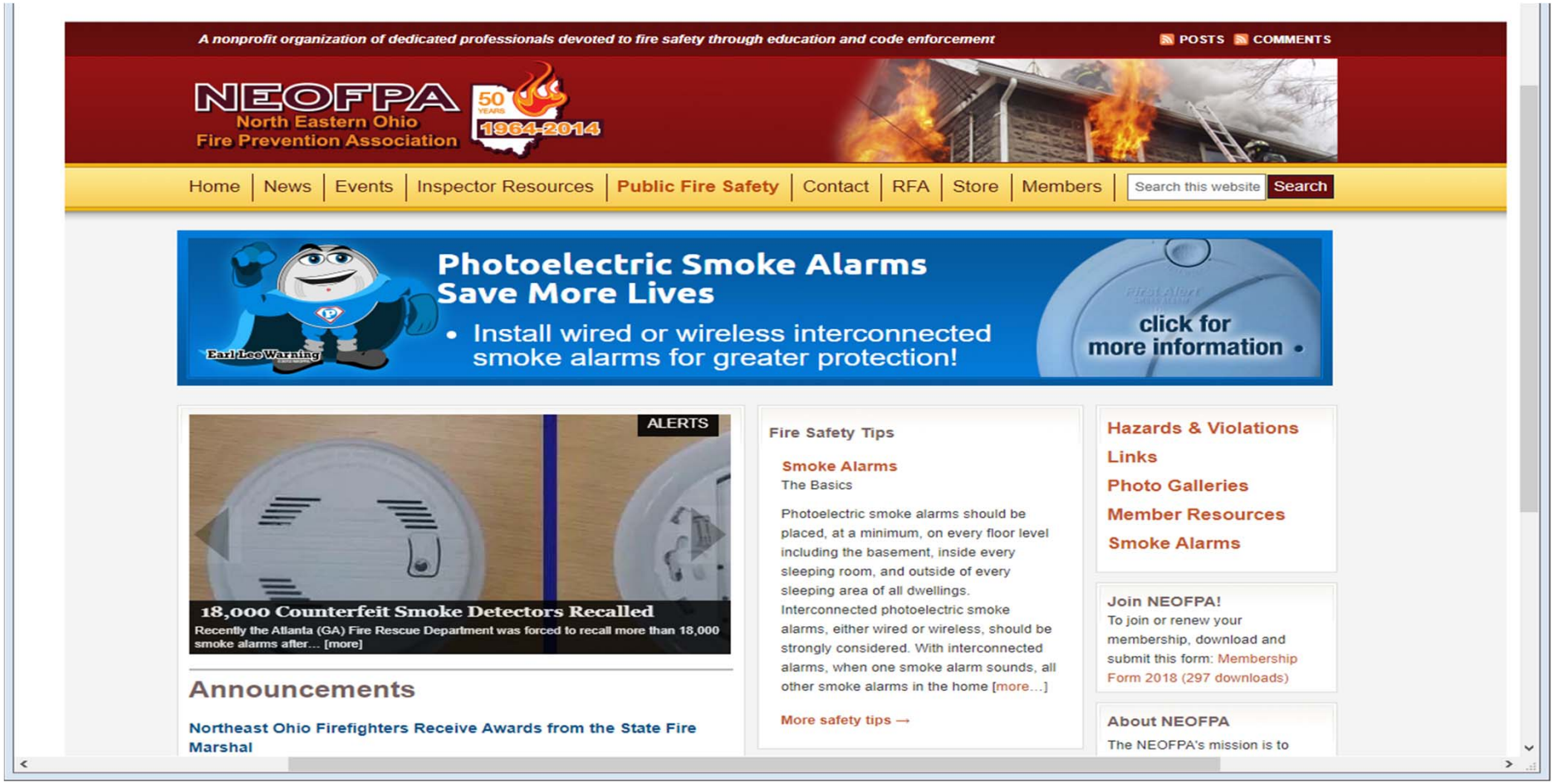


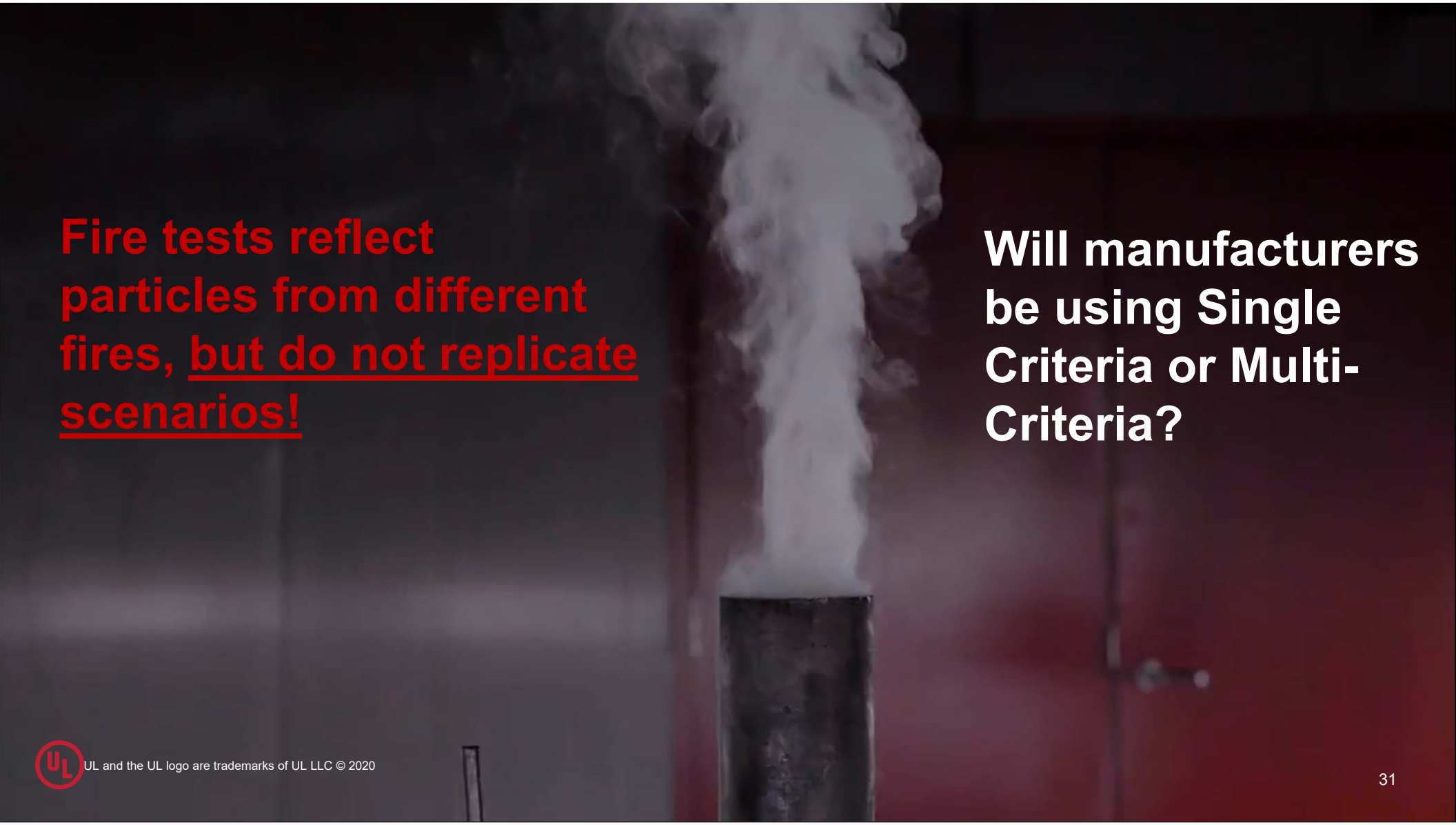
Smoke Characterization Project Highlights
UL 217/268 Fire and Foam Signatures



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

Messaging – What Does the Public Hear

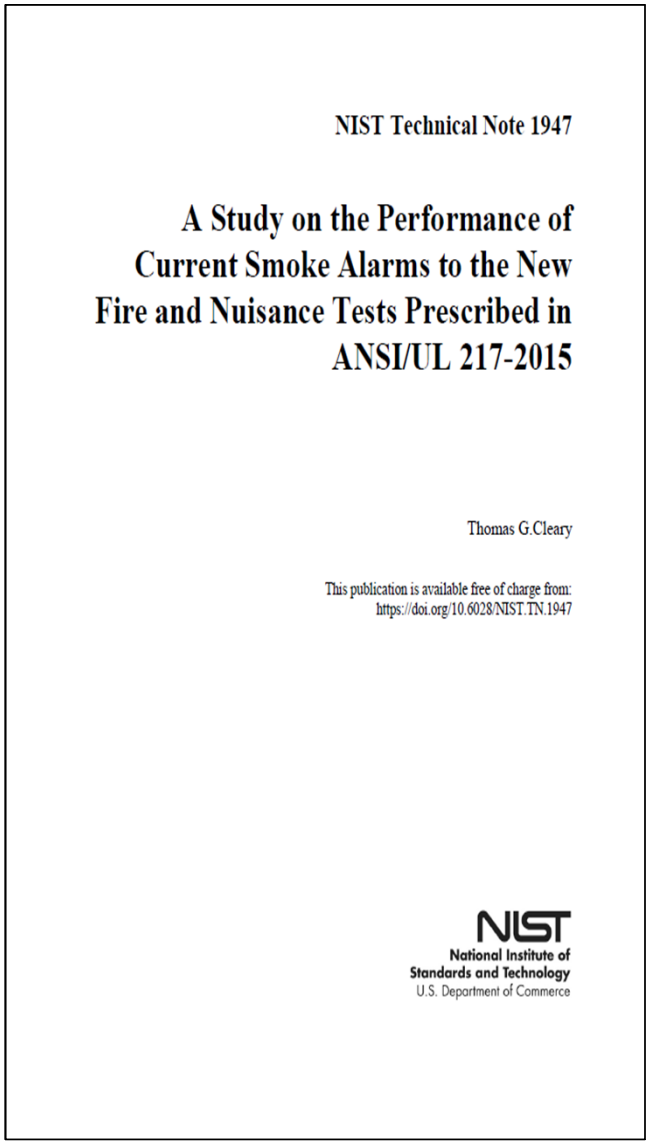




But How Will Alarms Perform?

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?



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
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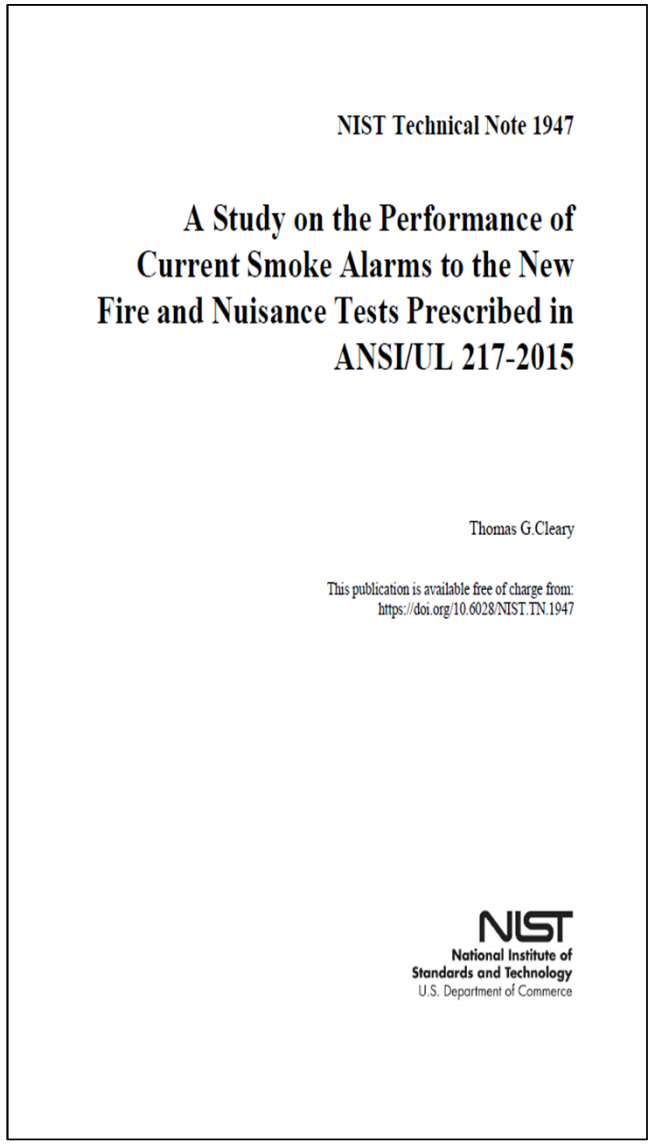
But How Will Alarms Perform?

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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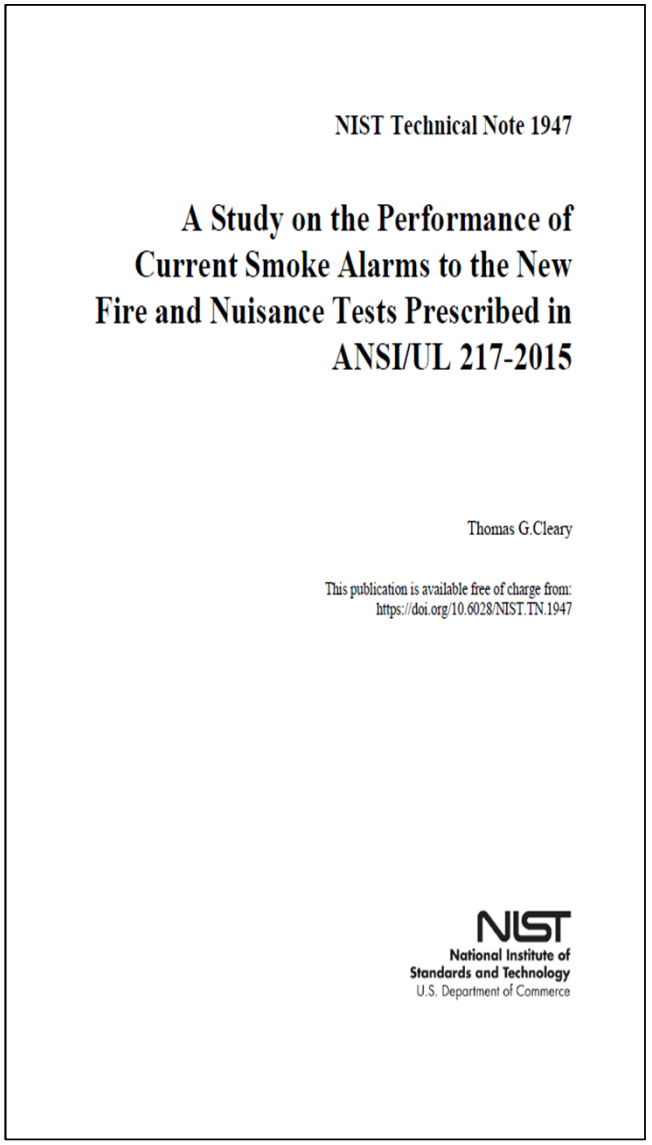
But How Will Alarms Perform?
NIST Technical Note 1947

- 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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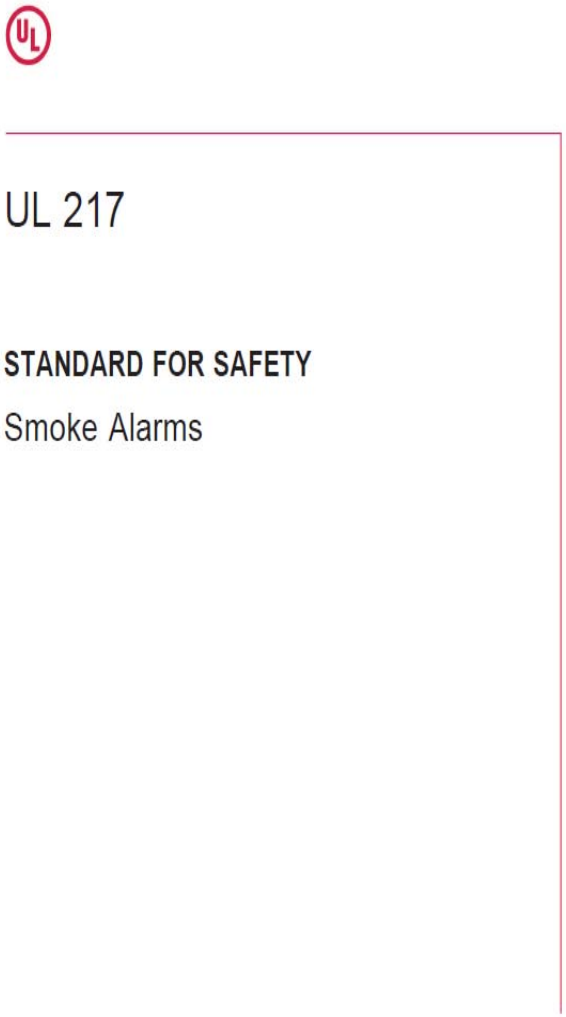
Approximate Number of Standard Revisions

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.

Enhanced Product Certification Mark and Promotional Marking

SMOKE ALARMS CERTIFIED BY UL TO UL 217 8TH EDITION

Product

Helps Reduce Cooking Nuisance Alarms

UL 217 8th Ed.

+

Package and promotion

HELPS REDUCE COOKING NUISANCE ALARMS

SMOKE DETECTORS CERTIFIED BY UL TO UL 268 7TH EDITION

Product

Helps Reduce Cooking Nuisance Alarms

UL 268 7th Ed.

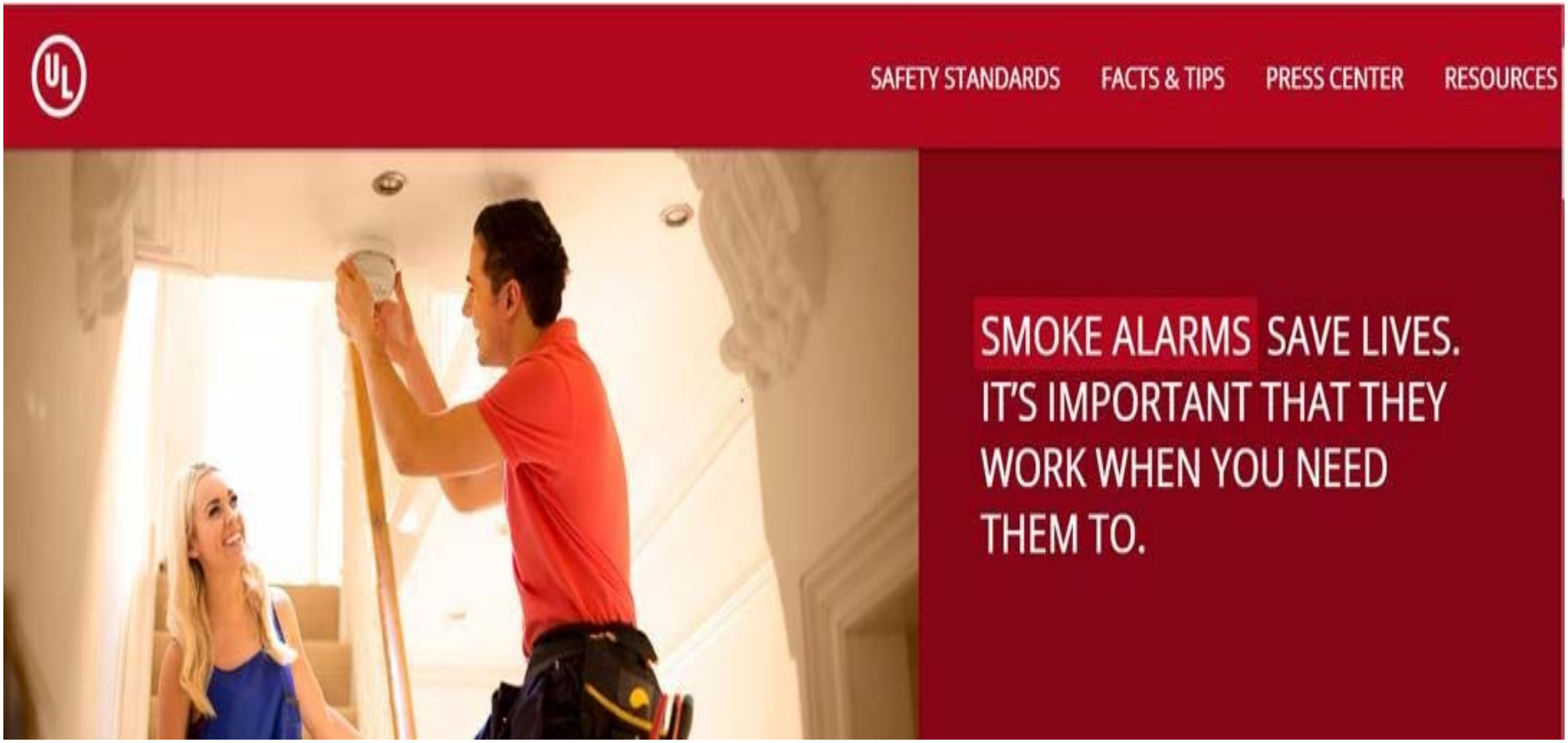
+

Package and promotion

HELPS REDUCE COOKING NUISANCE ALARMS

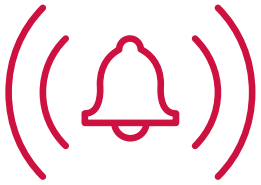
Key Messages for the Public and Actions You Can Take

smokealarms.ul.com

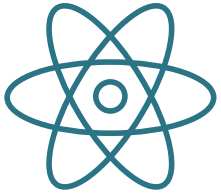


Governor’s Island

Key Messages for the Public



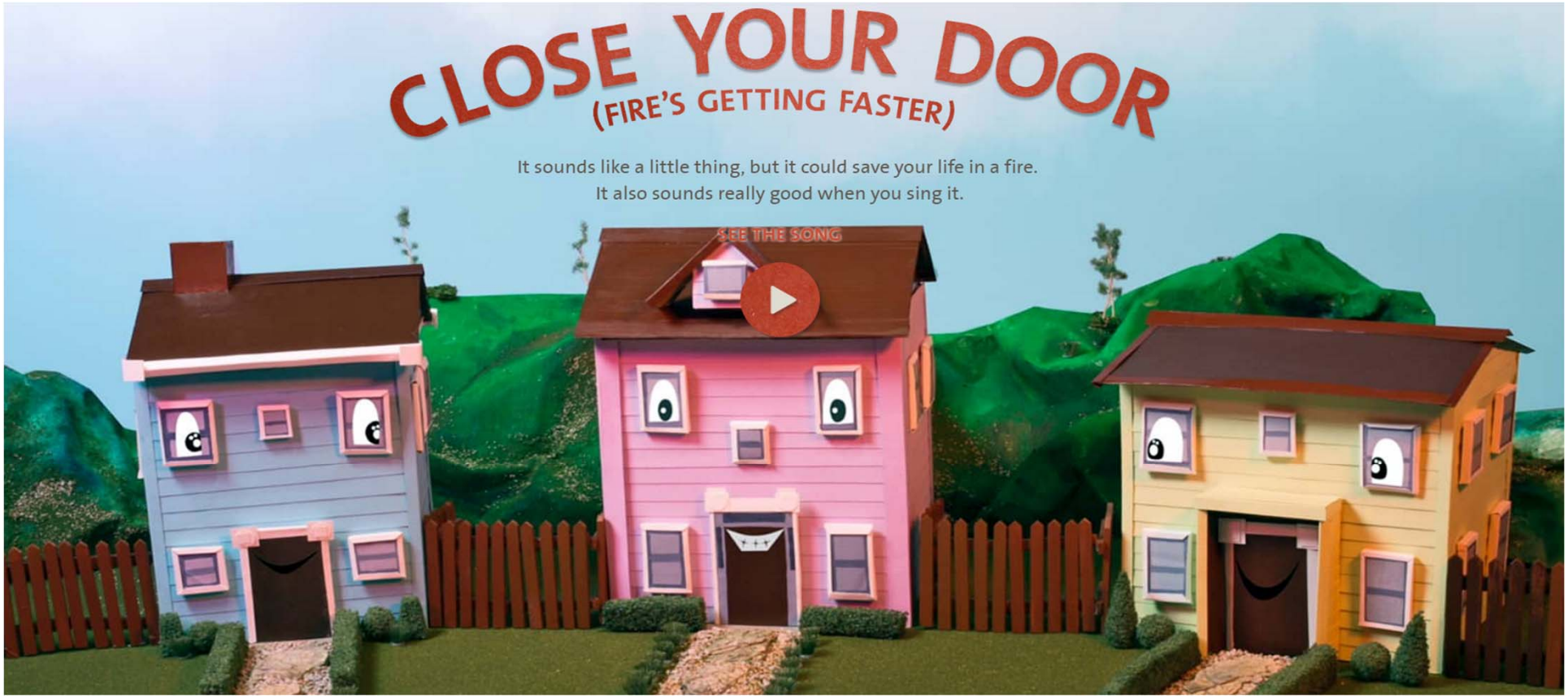
Working smoke alarms
will continue to provide protection
through the end
of their 10-year life span



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

www.closeyourdoor.org



Best Case Success Story

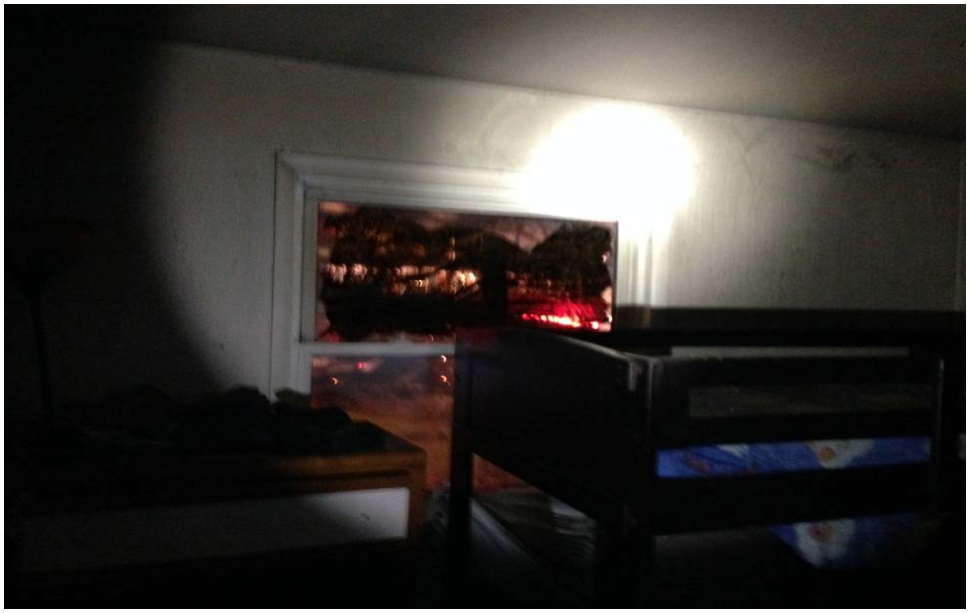
4 y/o Child Saved and Successfully Revived After a Successful Transitional Attack that was Initiated from the Front Yard

Isolation Saves Lives

Even Hollow Core Doors Help!

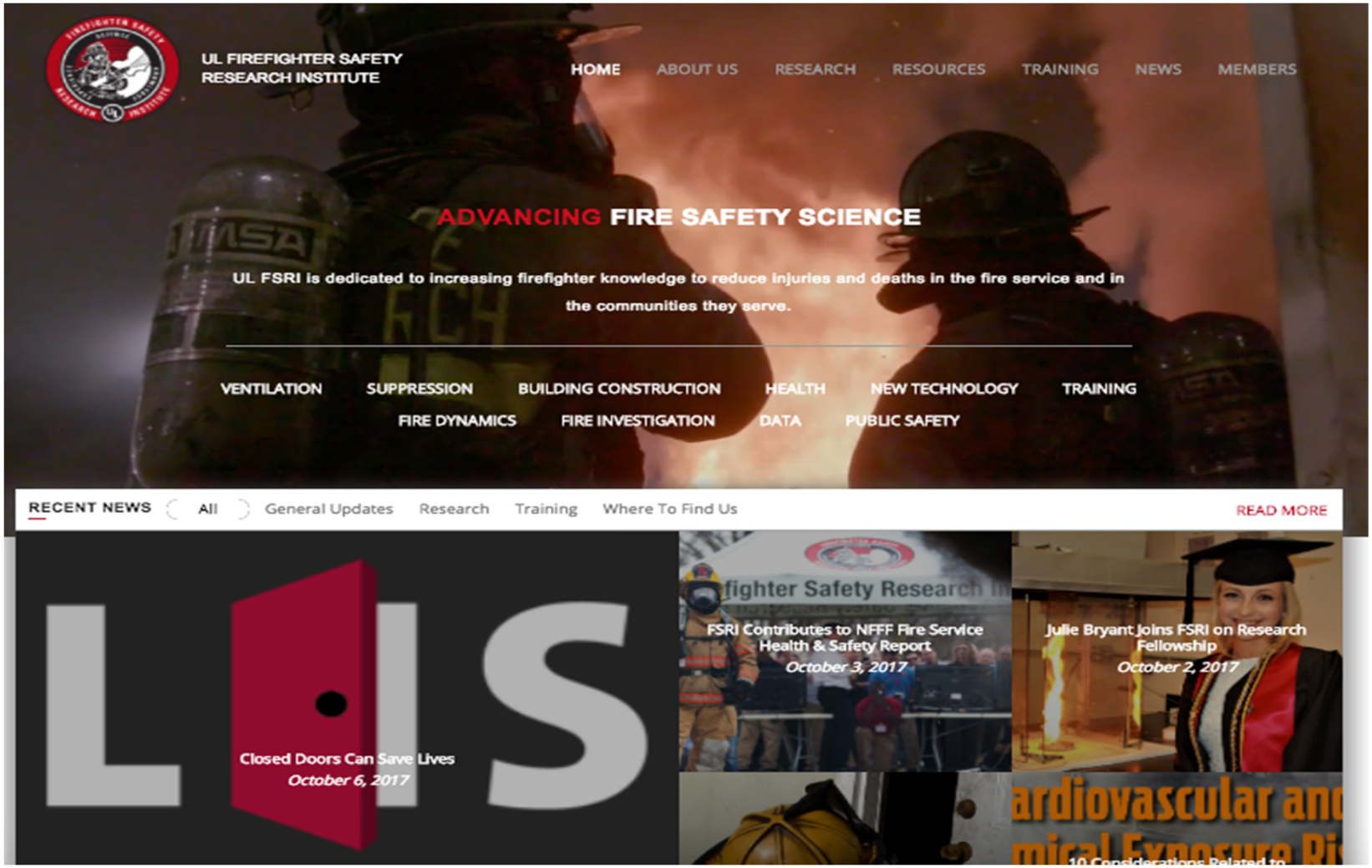
Hollow Core Door

Bedroom with Child



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

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

Thank You

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