



U.S. CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, D.C. 20207

Summary of Meeting

**“Arc-Fault Circuit Interrupters (AFCIs): Getting the Word Out”**

September 23, 2003

These comments are those of the CPSC staff, have not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

The U.S. Consumer Product Safety Commission (CPSC) staff held a meeting on Arc-Fault Circuit Interrupters (AFCIs) on September 23, 2003, at CPSC headquarters in Bethesda, MD. The purpose of the meeting was to solicit ideas for better acquainting the public with the benefits of AFCI protection for electrical circuits and ways to increase consumer awareness that AFCI devices, when combined with good wiring practices, offer the best electrical protection available to reduce deaths and injuries related to home wiring hazards. A copy of the final meeting agenda is attached as Appendix 1. A total of 54 outside attendees and 16 CPSC employees participated in the one-day event. A list of attendees is contained in Appendix 2.

Summary

There was general consensus at the forum that more efforts are needed to acquaint both consumers and professionals with the safety benefits of AFCIs.

Fire marshals stressed that government officials need to better educate not only consumers but also other government authorities at all levels, as well as private sector groups. This includes state/local government building officials, regulators, fire chiefs, electrical inspectors, as well as community, safety and health officials. Private sector groups include the insurance industry, trade associations, home inspectors, architectural/engineering firms, and safety advocacy groups.

A homebuilder pointed out that builders would respond to requests by homebuyers to have AFCIs installed in new and remodeled homes but added that most consumers are not familiar with the devices. Others suggested that homebuilders should be encouraged to offer homebuyers optional electrical safety packages that include AFCI protection.

A marketing consultant provided strategies for getting the word out. One suggestion was to speak to the public as a single voice with a straightforward, simple message about AFCIs and the fire statistics that point out the need for this type of

protection. Training and educating the messengers (including state fire marshals, insurance agents, home inspectors, realtors, electrician apprentices as well as manufacturers) was also stressed. Another suggestion was to consider changing the name for the category of AFCI devices to avoid confusion with other protective devices, such as the GFCI, which protects against the risk of electric shock.

The marketing consultant went on to explain that a whole host of vehicles for disseminating AFCI information should be used, including the CPSC clearinghouse, CPSC and other web sites, bill stuffers, library materials, magazine articles, and home improvement TV shows. He encouraged expanding to other markets for AFCI applications, including historic buildings, stores, offices, museums, libraries, places of worship, schools, and college dormitories.

A major home improvement retailer suggested a coordinated industry-supported marketing campaign and a reduced price structure by manufacturers.

Other suggestions included reduced fire insurance premiums for adding AFCI protection and AFCI requirements as part of securing FHA and FNMA home loans.

The AFCI industry was urged to provide electricians with technical assistance for troubleshooting the causes of AFCI trips.

CPSC, USFA, NFPA and other of sources of home fire statistics were challenged to gather better evidence of electrical wiring fire data, including more detailed reporting of causal factors (e.g., code violations, old wiring, overloaded circuits, etc.).

The Executive Director of the Electrical Safety Foundation International (ESFI), a private sector organization that provides general electrical safety information for the home, school and workplace, indicated that ESFI could serve as a host for interested parties to come together and agree on some uniform messages about AFCIs that would be informational and educational for consumers.

The meeting concluded with the CPSC staff indicating that all of the information provided by interested parties at the meeting will be considered. CPSC staff agreed to develop a draft plan for promoting AFCI technology.

Attached as Appendices 3, 4, 5, and 6 are the PowerPoint slides presented by forum participants from Underwriters Laboratories, Eaton Cutler-Hammer, Square D Company, and the National Association of State Fire Marshals, respectively. State Farm Insurance presented a new, made-for-TV video produced by the company regarding fire safety in the home, including a segment on AFCIs.

## Appendix 1

### **Meeting on “Arc-Fault Circuit Interrupters (AFCIs): Getting the Word Out”**

Purpose of Meeting: To hold a public forum to solicit ideas for better acquainting the public with the benefits of AFCI protection for electrical circuits and ways to increase consumer awareness that AFCI devices, when combined with good wiring practices, offer the best electrical protection available to reduce deaths and injuries related to home wiring hazards. AFCIs are new electronic technology designed to prevent electrical fires by sensing unseen electrical arcing. AFCIs are particularly important where wiring may have degraded with age. The goal is to develop strategies that can be implemented by the electrical/fire safety community to assist consumers in evaluating electrical safety protective devices for use in their homes.

- 9:00 – 9:30 Welcome and Introductions  
Review Emergency Evacuation Procedures  
Opening Statement – Chairman Hal Stratton  
Introductions – Forum moderator: Bill King  
Introduce CPSC staff (H. McLaurin, E. Edwards, A. Trotta, D. Lee, S. Wolfson and others)  
Each presenter state name, title and org.  
Plan for meeting  
Morning session for presenters; audience may submit a comment in writing to the moderator if it is pertinent to the discussion. Otherwise, hold comments for afternoon discussion.
- 9:30 – 12:00 Presentations
- Briefly review history of AFCIs (Dave Dini, Senior Research Engineer, Underwriters Laboratories Inc.)
  - Overview of AFCIs in the Marketplace (Brendan Foley, Eaton Cutler-Hammer & Alan Manche, Square D)
  - Fire Prevention Views (Walt Smittle, NASFM)
  - Insurance Industry Perspective (Jack Jordan, State Farm Insurance)
  - Electricians’ Perspective (Palmer Hickman, Int’l Brotherhood of Elec. Workers)
  - Retailers’ Perspective (John Istwan, Lowe’s Home Improvement Warehouses)
  - Marketing/Public Relations Perspective (Wess Smith, AmeriTel Consulting Group)
- 12:00 – 1:30 Lunch (on your own). Video clips of examples of AFCI outreach materials will be shown on a continuous basis during this break.

1:30 – 3:15 Audience discussion led by Bill King with assistance from Hugh McLaurin, Linda Edwards, Andrew Trotta, Doug Lee and Scott Wolfson. Audience to include private home inspectors, industry trade associations, safety advocacy groups, home builders, contractors, other government agencies (USFA, local government officials), media, safety foundations, architectural/engineering firms, and consumers.  
List ideas during discussion for an action plan.  
Summarize ideas (e.g., consumer info, trade school curriculum, improved product identity, etc.)  
Next step (meeting report, future progress report)

3:15 – 3:30 Closing Statements from CPSC Staff

Appendix 2  
List of Attendees

Non-CPSC

Tarry Baker	Broward County FL Board of Rules and Appeals
J. Robert Boyer	Edwards Systems Technology
John Brewer	U.S. Department of Transportation
Steve Campolo	Leviton Mfg. Co., Inc.
Aaron Chase	Leviton Mfg. Co., Inc.
Michael Clendenin	Electrical Safety Foundation International
Ronald Cole	Frederick County MD Government
Richard Cripps	Association of Home Appliance Manufacturers (AHAM)
David Dini	Underwriters Laboratories Inc. (UL)
Matthew Dobson	National Association of Home Builders
Joseph Engel	Eaton Cutler-Hammer
Brendan Foley	Eaton Cutler-Hammer
John Goodsell	Hubbell, Inc.
Miles Haber	Monument Construction, Inc.
Steve Hanly	Fire Protection Research Foundation (FPRF)
Tom Hayden	Prince George's County MD Fire Department
Palmer Hickman	International Brotherhood of Electrical Workers
Lori Holtzman	The Pringle Electrical Mfg. Co.
David Ho	Associated Press
Charles Huber	Federal Aviation Administration
John Istwan	Lowe's Home Improvement Centers
Jack Jordan	State Farm Insurance
Clive Kimblin	Eaton Cutler-Hammer
David Kolker	Leviton
Amy LeBeau	National Fire Protection Association (NFPA)
Alan Manche	Square D Company
Robert McCarthy	U.S. Fire Administration, FEMA, DHS
Carole Milazzo	National Association of State Fire Marshals (NASFM)
Rodney Miller	The Pringle Electrical Mfg. Co.
Greg Monty	UL
Wayne Morris	AHAM
Rick Mulhaupt	FPRF
Sean Oberle	Product Safety Letter
Paul Orr	UL
Robert Polk	NASFM
Thomas Potter	Texas Instruments
Earl Roberts	Reptec Inc.
Dennis Roth	Intertek Testing Services
Emilio Rouco	National Electrical Contractors Association (NECA)
Ned Schiff	Technology Research Corporation
Marce Schulz	AmeriTel Consulting Group
David Shapiro	International Association of Electrical Inspectors

Joel Solis	Air Conditioning & Refrigeration Institute
Vickie Hodges Smith	State Farm Insurance
Wess Smith	AmeriTel Consulting Group
Walter Smittle	NASFM
Steven Spivak	University of Maryland
Karen Suhr	NASFM
Gilbert Thompson	Baltimore County MD Government (ret)
Daniel Threikel	National Electrical Manufacturers Association
John Wafer	Eaton Cutler-Hammer
John Whelan	Bureau of National Affairs
John Young	Siemens Energy & Automation

CPSC

Chairman Hal Stratton (portion of morning session)  
Commissioner Thomas Moore

CPSC staff

William H. King, Jr.  
Hugh McLaurin  
Erlinda Edwards  
Douglas Lee  
Andrew Trotta  
Scott Wolfson  
Patricia Semple  
James Fuller  
Jacqueline Elder  
Scott Heh  
Terry Karels  
Edward Krawiec  
Eric Criss  
Duane DeBruyne

## ***Arc-Fault Circuit Interrupters***

***David A. Dini  
Sr. Research Engineer  
Underwriters Laboratories Inc.***

## **What is Arcing?**

***Arcing – A luminous discharge of electricity across an insulating medium.***

# What is Arcing?



# Arc-Fault Damage



This is an example of damage to an electrical wire caused by arcing. The temperatures created by the arcing got so hot, it not only burned away the wire insulation, it soldered two of the copper wires together.





# What is an AFCI?



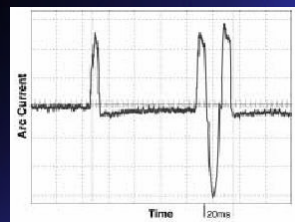
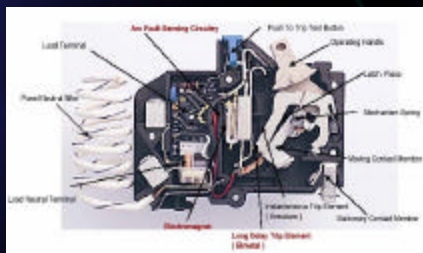
## Arc-Fault Circuit Interrupter (AFCI)

A device intended to mitigate the effects of arcing faults by recognizing characteristics unique to arcing and de-energizing the circuit when an arc-fault is detected.

## How Did the AFCI Come About?



In the early 1990's several circuit breaker manufacturers independently approached UL with their concept for an enhanced circuit breaker with arc-fault protection capabilities.



## How Did the AFCI Come About?



At about the same time CPSC contracted with UL to study emerging technologies for detecting and monitoring conditions that could cause electrical wiring system fires.

**U.S. Consumer Product Safety Commission**

## How Did the AFCI Come About?



### UL/CPSC Report Recommendations –

Arc-fault detection, once fully developed, appeared to be very promising as a technology to significantly reduce the risk of fire beyond the scope of present conventional overcurrent protection.

# How Did the AFCI Come About?



## Research & Standards Development



# How Did the AFCI Come About?



UL 1699  
Standard for Safety  
Arc-Fault Circuit-Interrupters

100 Years of public safety  
since 1890

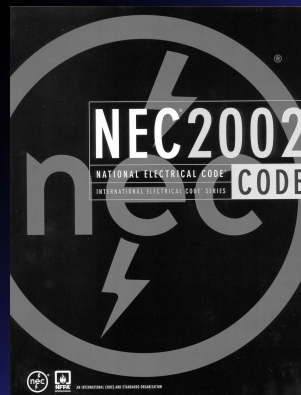
The image shows the cover of a UL standard document. It features the UL logo at the top left, followed by the title 'UL 1699 Standard for Safety Arc-Fault Circuit-Interrupters'. On the right side, there is a vertical strip of five small black and white photographs showing various electrical testing scenarios. At the bottom left, there is a circular logo with the number '100' and the text 'Years of public safety since 1890'.

AFCI Test Table						
Tests	Branch/feeder AFCI	Combination AFCI	Outlet circuit AFCI		Portable AFCI	Card AFCI
			With feed	Without feed		
<b>Carbonized path arc ignition test</b>						
NM-B insulation	X	X				
<b>Carbonized path arc interruption test</b>						
SPT-2 insulation	X	X				
NM-B insulation	X	X				
<b>Carbonized path arc cleaning time test</b>						
SPT-2 Insulation		X	X	X	X	X
<b>Point contact arc test</b>						
SPT-2 insulation	X	X	X	X	X	X
NM-B insulation	X	X				
<b>Unwanted tripping tests</b>						
Load condition I – inrush current	X	X	X	X	X	X
Load condition II – normal operation arcing	X	X	X	X	X	X
Load condition III – non-sinusoidal waveform	X	X	X	X	X	X
Load condition IV – cross talk	X	X	X			
Load condition V – multiple load	X	X	X	X	X	
Load condition VI – lamp burnout	X	X	X			
<b>Operation inhibition</b>						
Masking	X	X	X	X	X	X
EMI filter	X	X	X	X	X	
Line impedance	X	X	X			

# AFCIs and the NEC



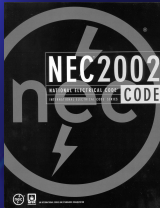
## National Electrical Code (NEC)



# AFCIs and the NEC



## 2002 NEC Sec. 210-12(b)



**(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter listed to provide protection of the entire branch circuit.**

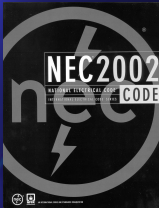
# Listed AFCIs



## Listed Branch/Feeder Type AFCIs

<b>CUTLER-HAMMER INC, SUB OF EATON CORP</b>	Arc Fault Circuit Interrupters, Branch/Feeder Type
<b>GENERAL ELECTRIC CO</b>	Arc Fault Circuit Interrupters, Branch/Feeder Type
<b>SIEMENS ENERGY &amp; AUTOMATION INC DISTRIBUTION PRODUCTS DIV</b>	Arc Fault Circuit Interrupters, Branch/Feeder Type
<b>SQUARE D CO</b>	Arc Fault Circuit Interrupters, Branch/Feeder Type

## AFCIs and the NEC



**440.65 Leakage Current Detection and Interruption (LCDI) and Arc Fault Circuit Interrupter (AFCI).**

**Single-phase cord-and-plug-connected room air conditioners shall be provided with factory-installed LCDI or AFCI protection.**

## AFCIs and the NEC



### Cord Type AFCIs and LCDIs



# AFCIs and the NEC



## Bedrooms



## Room Air Conditioners



# AFCIs



## Other Uses Proposed for AFCIs ?

## Other Uses Proposed for AFCIs ?



- **All Dwelling Unit Living Areas**



- **Living room**
- **Dining room**
- **Great room**
- **Den**

## Other Uses Proposed for AFCIs ?



- **Service Replacement / Upgrade**





## Other Uses Proposed for AFCIs ?



- **Dormitory rooms**
- **Lodging / Hotel rooms**



## Other Uses Proposed for AFCIs ?



- **Assisted living**
- **Daycare**



# Proposed Uses for Cord AFCIs and LCDIs?



- Fans



- Portable heaters



## Electrical Fire Prevention

AFCI's - An Important Step in Circuit Protection

### The Problem:

Residential Electrical Fire Statistics (annual):

**591 DEATHS**

**\$1 Billion in Property Losses**

**73, 500 Residential Electrical Fires  
(83% Caused by Electrical Arcing)**

Source: NFPA & NFIRS data

# The Drive for a Solution

## 1993 Electronics Industry Association NEC Proposal

An attempt to reduce the incidence of electrical fire by requiring the manufacturers of circuit breakers to lower lowering the magnetic setting of circuit breakers.

**PROBLEM:** Nuisance tripping on everyday events

## CPSC/UL Study - Electrical Industry Challenge

“Technology for detecting and monitoring conditions that could cause electrical wiring system fires”

Provide new technology

Goal: Reduce risk of electrical fire

Directed to Manufacturers, Inventors, etc

### Conclusions

The electrical arc is a major cause of electrical system fires

Most Promising Technology: Arc-fault detection and mitigation

**EAT•N** | Cutler-Hammer

# Result

- AFCI's were added to bedroom receptacle circuits in the 1999 National Electrical Code (NEC) with a delayed implementation until January 2002
- The 2002 NEC contained a modest expansion to other circuits in bedrooms

**EAT•N** | Cutler-Hammer

## Practical Experience

- AFCI's have been commercially available since January 1997 - nearly 7 years.
- There have been positive identification of circuit mis-wiring (grounded neutral) and cases of arc detection and fire protection.
- Approximately 6 million units have been installed across the country.
- Approximately 25 Billion hours of operational experience.

**E•T•N** | Cutler-Hammer

## Enhanced Protection

**Commercially available AFCI's provide protection beyond standard breakers and fuses:**

- Complete protection of fixed wiring faults
- Protection against parallel arcing at any point in the circuit including connected cords and appliances.
- Protection against ground faults at any point in the circuit.
- Mitigates the effects of glowing connections such as:

**E•T•N** | Cutler-Hammer

## Enhanced Protection

Currently available AFCI's provide protection beyond standard breakers and fuses:

Aluminum branch wiring

GLOWING WIRE NUTS

Back-wired push-in receptacle

"Hot" plugs

OVERHEATED EXTENSION CORDS

Glowing contact with copper wire

AND OTHERS!!

EAT•N

Cutler-Hammer

## The Problem:

Where do Electrical Arcing Fires Start?	Percentage of Deaths
•Kitchen - 22%	17%
•Bedroom - 15%	23%
•Living/Family Room/Den - 9%	25%
•Laundry - 9%	5%
•Attic - 6%	3%
•Crawl Space - 6%	3%
•Garage - 4%	2%
•Other Areas - 23%	22%

EAT•N

Cutler-Hammer

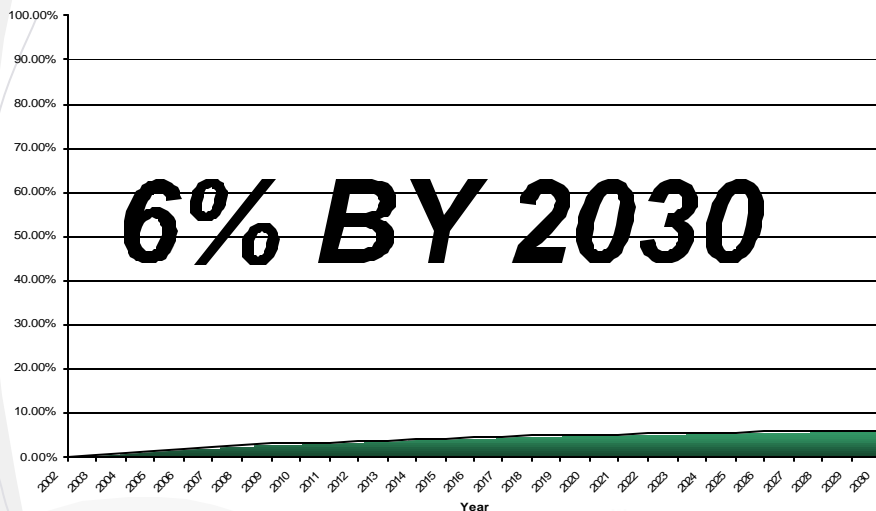
## The Problems:

Percentage of Residential Electrical Fires That are ***NOT***  
Addressed by the 2002 NEC:

**85%**

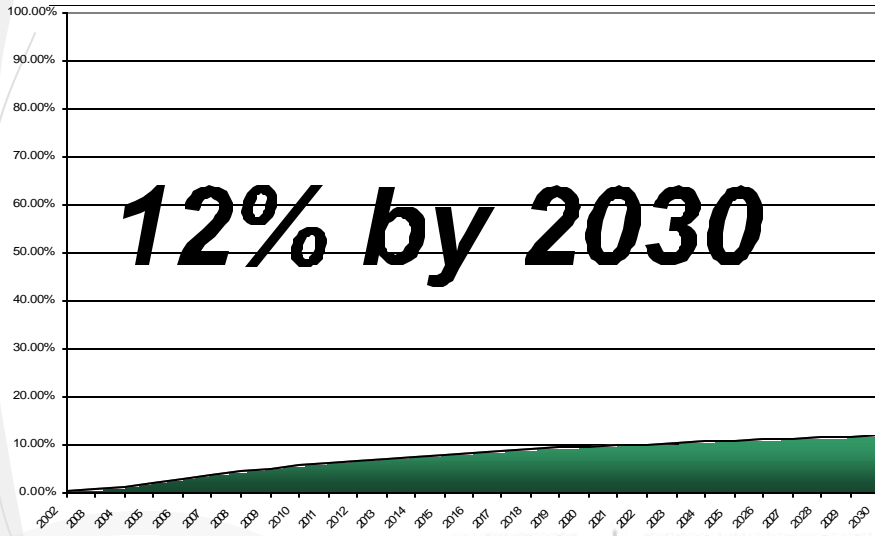
**EAT•N** | Cutler-Hammer

**% of 15 and 20 Ampere Residential Circuits Protected by AFCI  
if 2002 Code is Not Expanded**



**EAT•N** | Cutler-Hammer

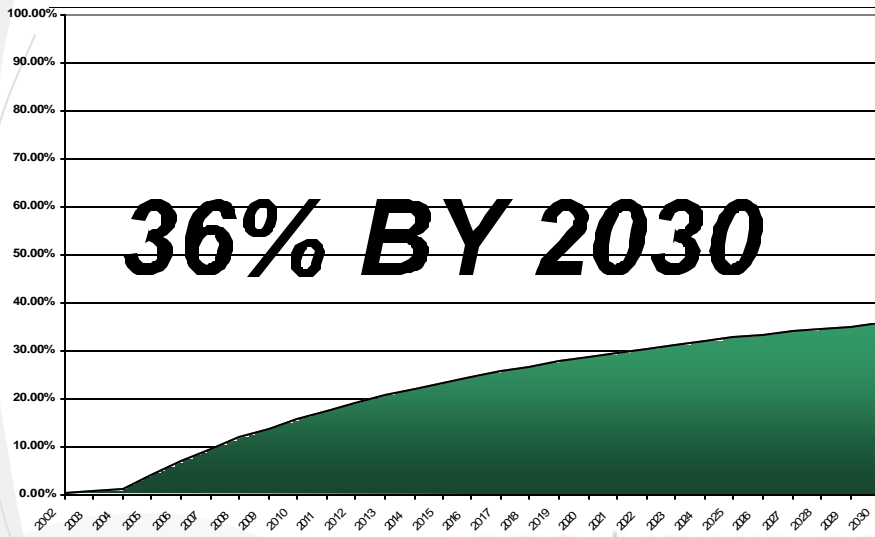
**% of 15 and 20 Ampere Residential Circuits Protected by AFCI if NEC is Expanded to Include 2002 Provisions to Service Change-outs**



**12% by 2030**

**EAT•N | Cutler-Hammer**

**% of 15 and 20 Ampere Residential Circuits Protected by AFCI if Code is Expanded to All 15 and 20 Amp Circuits in New Construction**

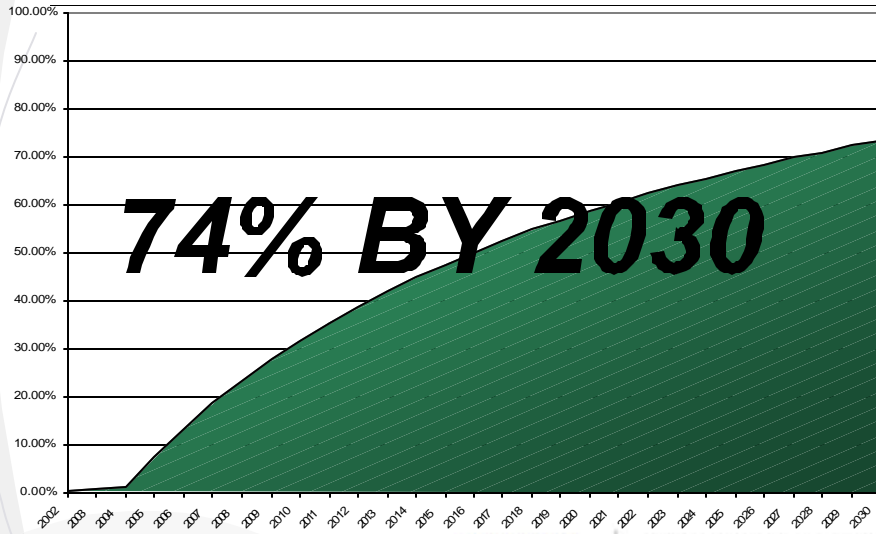


**36% BY 2030**

**EAT•N | Cutler-Hammer**



**% of 15 and 20 Ampere Residential Circuits Protected by AFCI if Code is Expanded to include All 15 and 20 Amp Circuits in New Construction and Service Change-outs**



**EAT•N** | Cutler-Hammer

## Conclusion:

**ONLY BY ACCELERATING THE USE OF THIS PROVEN TECHNOLOGY INTO ADDITIONAL CIRCUITS, AND EXISTING HOMES CAN WE HAVE ANY HOPE OF REDUCING THE LOSS OF PROPERTY AND LIFE.**

**EAT•N** | Cutler-Hammer

**Thank You!**



## Enhancing Electrical Safety with 100 Years of Innovation



**Fused safety switch**

**Circuit breaker**

**Ground fault circuit interrupter**

**Current limiting circuit breaker**

**AFCI circuit breaker**

**Arc flash circuit breaker protection solutions**



## A Historical Perspective

- 1980s – Research & Development Activities
- 1992 – CPSC initiated the “Home Electrical System Fire Project” with UL
  - EIA initiated a fact-finding study with UL to determine the available fault current for residential receptacles
- 1993 – EIA introduced NEC proposal for 1996 NEC
- 1996 – Multiple proposals introduced for 1999 NEC
- 1998 – 1999 NEC published – bedroom receptacle protection
- 1999 – UL 1699 AFCI Standard Published
- 2000 – FAA looking to AFCI for aircraft wiring protection
- 2001 – 2002 NEC published – bedroom outlet protection





## Educational Forums

- **Contractors**
- **Electrical Inspectors**
- **Building Officials**
- **NFPA – World Safety Conference & Expo**
- **IEEE**
- **Demonstrations**
- **Literature & Publications**
  - How they work
  - Trouble shooting circuits



3



## Why do AFCIs trip?

**The AFCI trips because it is doing its job:**

- Thermal trip - Due to overload
- Magnetic trip - Short circuit or high in-rush
- Ground fault (including inadvertent grounded neutrals)
- Arc fault
- Improper installation of AFCI



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## What have we found?

- An appliance plug damaged by impact repeatedly caused tripping of the AFCI until the problem was discovered.
- A room air conditioner that had developed a defect tripped the AFCI.
- An AFCI installed in a new building tripped repeatedly until damage caused by a nail through insulation was discovered and corrected



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## What have we found?

- An AFCI installed as a retrofit in an older building tripped as soon as it was turned on. The installing electrician found the problem with extensive evidence of arcing in an old lighting fixture.
- A damaged lamp with line-to-ground arcing was found when an AFCI was installed in an existing circuit. The AFCI tripped when the circuit was first energized after the installation.
- An AFCI tripped when retrofitted into an existing circuit. Examination of the circuit disclosed that wire insulation had burnt back exposing bare conductors near their connection to a receptacle. The exposed wires had been arcing through the charred insulation.



6



## Technical Assistance Reports

- 4 cases were unresolved. There was no known attempt to resolve the cause of tripping.
- 1 was an application problem in which equipment of two manufacturers was mixed on the job. The AFCI worked fine and continues to do so.
- 6 were resolved by reading the instructions. The callers had not understood how the AFCI was to be used.
- 1 was a bad appliance, a room air conditioner.



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## Technical Assistance Reports

### **23 were wiring problems as follows.**

- 1 Problem at a connector in which wires were too close
- 4 Crossed neutrals
- 7 Shared neutrals
- 9 Grounded neutrals
- 2 Shared neutrals also grounded



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## Keys for Enhancing Electrical Safety



### Education

- Fundamentals
- Technology

### Square D's Continued Commitment:

- 1) Enhance today's technology
- 2) Support education





Ask your electrician about AFCIs.

This year,  
38,000 homeowners  
will wish they had.

A public service program from  
The Electrical Fire Safety Task Force  
National Association of State Fire Marshals



## Fire Data

73,500 Electrical Fires (Annually)

591 Deaths

2,247 Injuries

1 Billion in Property Damage



## Fire Facts

- Every 82 seconds a residential fire occurs in the United States.
- About every 15 minutes an electrical fire occurs in the United States.

## Solution 1

- To save lives and protect property, the National Electrical Code Committee adopted a change to the 1999 Edition that became effective January 1, 2002, requiring that “all branch circuits that supply 125-volt, single phase, 15- and 20-ampere receptacle outlets installed in bedrooms shall be protected by an arc-fault circuit interrupter(s).”

## Solution 2

- The National Electrical Code 2002 Edition was modified to specify the following: “All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter listed to provide protection of the entire branch circuit. (NEC 210-12 (B))

## Solution

- NASFM’s position is the technology in the NEC does not go far enough in solving the electrical fire problems.
- The National Electrical Code CMP 2 is in the process of considering AFCI technology expansion.
  - Dwellings – “all living areas”
  - Other Occupancies

# What Causes Arc-Faults?

- ✓ Loose or improper connections, such as electrical wires to outlets or switches
- ✓ Frayed or ruptured appliance or extension cords
- ✓ Pinched or pierced wire insulation, such as a wire inside a wall nipped by a nail or screw or a chair leg setting on an extension cord
- ✓ Cracked wire insulation stemming from age, heat, corrosion or bending stress
- ✓ Overheated wire or cords
- ✓ Damaged electrical appliances
- ✓ Wires or cords touching vibrating metal
- ✓ Electrical wire insulation chewed by rodents

# The Hard Facts of Electrical Fires

Area of Origin	Fires	Civilian Death	Civilian Injuries	Direct Property Damage (in Millions)
Kitchen	15,900 (21.7%)	95 (16.0%)	79 (21.3%)	\$144.2 (13.8%)
Bedroom	11,200 (15.2%)	131 (22.1%)	597 (26.6%)	\$198.6 (18.9%)
Laundry rm. or area	6,600 (9.0%)	24 (4.0%)	130 (5.8%)	\$59.3 (5.7%)
Living room, family room or den	6,200 (8.5%)	141 (23.9%)	351 (15.6%)	\$133.0 (12.7%)
Attic or ceiling/roof assembly or concealed space	4,600 (6.3%)	18 (3.0%)	60 (2.7%)	\$82.5 (7.9%)
Crawl space or substructure space	4,000 (5.5%)	24 (4.0%)	88 (3.9%)	\$55.7 (5.3%)
All others	24,800 (33.8%)	159 (26.8%)	542 (24.1%)	\$374.6 (35.8%)
<b>Total (100%)</b>	<b>73,500</b>	<b>591</b>	<b>2,247</b>	<b>\$1,047.9</b>

Source: National estimates based on National Fire Incident Reporting System and National Fire Protection Association survey

## What is an arc fault?

This is an example of damage to an electrical wire caused by arcing. The temperatures created by the arcing got so hot, it not only burned away the wire insulation, it soldered two of the copper wires together.



## Cost

- The cost to install AFCI circuit breakers in a new home is approximately \$100. This cost estimate is based on replacing two conventional circuit breakers with AFCI circuit breakers. While the code requirement is to apply the AFCI to only the bedroom circuits, consideration must be made to include AFCI protection to other circuits.

## Cost Benefit Analysis

A cost-study analysis by US Consumer Product Safety Commission in March 2003, if an AFCI is installed in homes 10 years old, homeowners could expect a cost-effectiveness benefit of \$530 for each \$175 spent to retrofit or install the AFCI device.

US CPSC Memorandum, Subject: Economic Considerations – AFCI Replacements, Terrence R.; Karels, EC, March 10, 2003.

## The Future

- The future of this technology will not diminish but will only expand to greater uses.
  - Automobiles
  - Aircraft
  - Other occupancies
  - All living areas of homes

## Get the Message Out

- NASFM Media Kit to all SFMs
- Media Kit to Fire Service Organizations
- Power point training kit for SFMs on AFCI technology for training fire departments
- Greater role of U.S. CPSC in dissemination of information on AFCI to fire service organizations and SFMs
- Public utilities (electrical) consumers information in billings about AFCIs