#### Keynote Address: John A. Wafer Eaton Corporation

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Co-sponsored by





National Fire Protection Association The authority on fire, electrical, and building safety

The focus of this symposium is our aging residential electrical systems and the implications for Electrically Initiated Fires.

With an estimated 100 million homes in the United States of which about

70 % are over 20 years old and 50% are at least 50 years old



The question that is often asked is:

What is the safe service life of electrical components and wiring in homes and when should they be replaced?

You appreciate, I'm sure, that this is not an easy question to answer because there are so many variables that affect the "**safe service life**" of an electrical system.

However, it is becoming more and more important that this question is answered.

Each year it is estimated that there are as many as 32,000 fires in homes associated with electrical distribution equipment.

Resulting in statistics in the range of: 220 Deaths 940 Injuries



\$650 - \$700 million in Property Damage

Source: NFPA US Home Product Report, Appliances and Equipment, November 2005

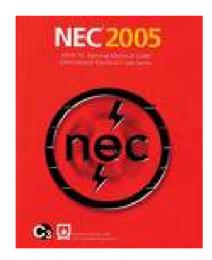
Electrical Distribution Equipment Fires in U.S. Homes					
1999	- 2002 Annual	Average, Unk	knowns Alloca	ated	
ent Involved In				Direct Property Da	

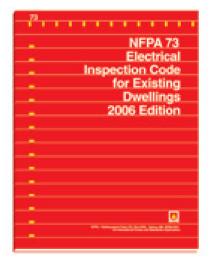
Equipment Involved In Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Fixed wiring, switches, outlets, and receptacles	14,500	(45%)	70	(30%)	280	(29%)	\$313	(46%)
Light fixtures, lamps, light bulbs, and signs	6,900	(21%)	30	(15%)	210	(22%)	\$119	(18%)
Cords and plugs	5,200	(16%)	90	(41%)	330	(35%)	\$121	(18%)
Fuses, circuit breakers, and other overcurrent protection devices	1,500	(5%)	0	(1%)	30	(3%)	\$25	(4%)
Meters and meter boxes	900	(3%)	0	(0%)	10	(1%)	\$13	(2%)
Transformers	300	(1%)	10	(4%)	0	(0%)	\$5	(1%)
Unclassified or unknown-type electrical distribution equipment	2,700	(9%)	20	(10%)	80	(9%)	\$78	(12%)
Total	32,000	(100%)	220	(100%)	940	(100%)	\$674	(100%)

Note: These are percentages of fires reported to U.S. municipal fire department and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections.

Source: NFIRS and NFPA Survey.

The National Electrical Code (NFPA 70) addresses and continues to enhance new construction requirements. However, I am not aware of any code requirements for home inspections as the electrical systems age or when property changes hands. NFPA 73 is available as a guide for existing dwelling inspections.





It is an appropriate time to address, once again, mandatory requirements for re-inspection of our Aging Residential Electrical Systems.

Key questions are:

- What are the scientific facts?
- Do the statistics support requiring mandatory inspections?
- What are the appropriate times when mandatory inspections can be implemented?
- How can we promote the need for inspections at time of upgrades and when there is concern because of the age of the installation?

We have an excellent panel of speakers who will share what they know about this subject.

This year's symposium will focus on **<u>understanding</u>** what we know and don't know about electrical fire initiation and the role of electrical system life.

Next year's conference could focus on **Solutions** as there is a great deal of work going on in this area.

CPSC Studies	Fire Initiation Causes	
Statistics	Aging of Insulation Materials & Cables	
History of Wiring Practices	Performance of Aging Cable Compounds	
Safety Options in Design & Code	Diagnostic Technologies	
Fire Investigation Techniques	Grounding Issues	
Case Studies	Residential Electrical Systems Aging Research Project	

Changes are occurring:

We now use over 4.7 Billion Kilowatt Hours of power annually in the United States.

The amperage requirement for homes continues to grow as they become larger and have more electrical loads.

Our move to a "Digital Society" has increased our dependence on electrical power.

Many new kinds of loads have been introduced that do not have the classical sinusoidal current waveform. Computer power supplies, dimmers etc. introduce harmonics into the system which create some unique demands and effects.

Standby and alternate power sources are being integrated into some systems.

#### Life Style Changes:

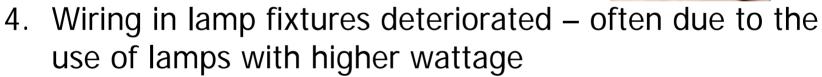
- More homes are empty for long periods.
- Our population is aging.
- More children are often home alone.

#### New System Trends:

- Emergency back up power is becoming more prevalent.
- Green Buildings with sustainable power sources will provide new challenges.

### Aged Electrical Systems Research Application Symposium Issues found in retrofitting older homes with AFCIs

- 1. Poor Wiring Practices DIY, Shortcuts, temporary installations
- 2. Wallboard Screws into NM-B Cable
- 3. Siding Nails into NM-B Cable



- Loose Connections on receptacles and switches glowing connections
- 6. Damaged external conductors
- 7. Grounded Neutrals





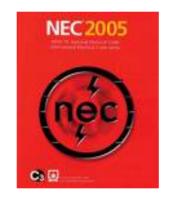
#### **Factors Affecting Electrical Service Life**

III				
理	Water / Humidity Damage	Age-Related Deterioration		
	Corrosion	Stress / Creep / Flow Failures		
PEA	Heat-Related Damage	Excessive Loads		
	Overvoltage	Harmonics		
2	Electrical Surges	Insulation Deterioration		
3	Improper Original Installations	Arcing Faults		
	Improper Additions / Modifications	Loose Connections / Glowing Contacts		
	Poor Workmanship	Physical Damage of Wiring or Devices		



The Home Electrical System Continues to Evolve

There are many safety improvements that have been made through the National Electrical Code.



The 2008 Code which is now in process will incorporate many more.

#### New technologies will help us in the future:

Arc Fault Circuit Interrupters (Combination Type)









Human Symbiotic Robots

Our challenge is to develop practical guidelines to improve safety for our families, neighbors and our property.

These guidelines need to be supported as much as possible by data and analysis that can provide a strong foundation and credibility to stimulate the required actions.

We will need excellent, clear information, training, communications, the right products, standards, codes and legislation to help in this process.

Our first step is to understand all of the issues involved

Ultimately, we need to develop a strategy as to how we can best ensure that inspections and upgrades are made on a proactive basis.

NFPA, the Code Panels, CPSC, UL and the companies that have sponsored this effort should be recognized for their preparatory work and funding in this area.

It is great to see your interest and participation in this effort.

Thank you for your time and attention.

Let us transition now to our first session on "Defining the Problem".