U.S. Consumer Product Safety Commission
LOG OF MEETING

SUBJECT: National Fire Protection Association (NFPA) World Safety Conference - Education Session Presentation: "Aging Electrical Wiring Systems in Buildings"

DATE OF MEETING: May 18-21, 2003

LOG ENTRY SOURCE: William H. King, Jr., ES

DATE OF LOG ENTRY: June 3, 2003

LOCATION: Dallas Convention Center, Dallas, TX

CPSC ATTENDEE(S): William H. King, Jr., ES

NON-CPSC ATTENDEE(S): Registrants at the NFPA World Safety Conference

SUMMARY OF MEETING: A copy of the outline of remarks made by Mr. King at Session SU34 is attached. Mr. King also attended other meetings while at the conference; in particular the meetings sponsored by the Electrical Section of NFPA.

Aging Electrical Wiring Systems in Buildings

William King, Chief Engineer for Electrical Fire Safety
U.S. Consumer Product Safety Commission

Outline

- Fire Incident Data
- Inspection/Correction
- Outreach
- New Technologies
- Conclusions

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Data

Dwelling Fires Related to Electrical Wiring Systems: 40,000 fires, 350 deaths, 1,400 injuries (annual average)

Older homes at greater risk; new homes not immune.

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Plan to Obtain Better Data

- Fire Protection Research Foundation proposal on wiring
  - Evaluation of wiring systems in existing homes
  - Improving fire reports
  - Lab testing of old components

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Wire Safety Issues

- Aging, environmental stress
- Improper wiring practices
- Appliance/equipment load exceeds system design capacity

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Potential Wire Safety Issues

- Environmental Stress - Chafing, embrittlement, and corrosion
- Improper installation
- Mishandling of wiring during maintenance
- Accumulated damage as wire ages

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Current Practices

- Conformance with existing regulations, codes, and standards and revisions to them.
- Training of inspectors and electricians.
- Inspection, assessment, and maintenance of wire.
- Engineering improvements.
- Safety investigations.
- Analysis of wire system data.
- Exchange of technical information.

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Current Technology Initiatives

- **Diagnostics:** non-destructive evaluation (NDE) techniques, inspection and detection technologies, and monitoring sensors for identifying wire system defects.
- **Failure Mechanisms:** causes and models of wire system failure and analysis of maintenance data.
- **Interconnection Technologies:** improved connectors, such as at terminations and splices in wire systems, training, management tools, and advanced distribution technologies, such as modular wiring, fiber optics, and wireless technologies.
- **New Materials:** new materials for wire system components, such as conductors and insulation, and novel approaches for wire systems such as the application of microelectronic technology.

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Common Issues

- Faulty wiring poses a risk to public health and safety; it may lead to failure of essential functions and even to smoke and fire.
- Managing aging wire systems is expensive and time-consuming.
- Inspection, testing, and maintenance of wire systems is a technical challenge.
- Most diagnostic procedures can detect only "hard failures" that result in serious deterioration of electrical integrity.
- Our knowledge about how wire systems age and how they fail is limited.

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Common Issues

- There are limitations to our electrical codes and standards.
- Wire systems are becoming more complex with increasing computerization of operations and of information about those operations.
- Wire system maintenance is very expensive and it is difficult to get funding to address wiring issues before a system break down.
- Current practices flow from – and are limited by -- the current state-of-the-art of wire systems technology in terms of design, installation, diagnosis and maintenance.

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CPSC Actions

- CPSC-sponsored electrical distribution system fire investigations in the 1980s conclude older homes at greatest risk
- CPSC priority project in early 1990s develops strategies:
  - inspection code for existing residences
  - application of new technology to older residences
  - demonstrate practical safety improvements
- CPSC joins National Science and Technology Council "Wire System Safety Interagency Working Group" in 2000, a joint agency effort to look at aging and deterioration of wiring systems

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Wire System Safety Interagency Working Group

Consumer Product Safety Commission
Department of Commerce
Department of Defense
Office of the Secretary of Defense
- United States Air Force
- United States Navy
- United States Army

Department of Energy
Department of Transportation
- Federal Aviation Administration
- Federal Railroad Administration
- Federal Transit Administration
- US Coast Guard

Food and Drug Administration
National Aeronautics and Space Administration
National Science Foundation
Nuclear Regulatory Commission

In addition, the following organizations are represented on the WSSIWG:

Defense Nuclear Facilities Safety Board
Office of Management and Budget
Office of Science and Technology Policy
National Partnership for Reinventing Government
National Transportation Safety Board (observer)

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Inspection Code for Existing Homes

- NFPA 73
- Complements the *National Electrical Code* (NFPA 70)
- Principal members include CPSC, UL, IEEE, NAHB, IAEI, NECA, NEMA, EEI
- New proposals are now being accepted.

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New Technology

- CPSC-sponsored research contract in 1995
- Arc-Fault Circuit-Interrupter (AFCI) technology identified
- First generation AFCI devices on the market for several years
- AFCI requirement introduced in the 1999 edition of the *NEC*
- Many proposals for the 2005 *NEC*
  - Report on Proposals to be issued soon
  - Comment period ends October 31, 2003

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CPSC Demonstrations

- Four old homes inspected and improved (Washington, DC area, Atlanta, St. Louis and Redlands, CA)
- TV-quality videos produced
- CPSC Guide Booklet "Home Wiring Hazards"
- Nationwide distribution of over 1000 sets of materials to state and local fire and electrical officials

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Current CPSC Activities

- Research Project on Residential Electrical System Aging - a cooperative effort with The Fire Protection Research Foundation of NFPA
- Government-owned housing: addressing older wiring with AFCIs
- Outreach efforts via media (publications, video tapes, presentations)
- Continuing efforts via codes and standards
  - NFPA 70 proposals for additional AFCI protection
  - NFPA 73, evaluation criteria for installed systems

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Conclusion

The aging of wire systems is a national safety issue.

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Recommendations

- Three basic strategies are necessary to improve wire system safety:
  - Altering the perception of wire systems.
  - Increasing collaboration between industry, academia, and the government.
  - Improve wire system technology.

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