Report FOR UJNR PANEL Detection in USA 1980-1982

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In previous years, the primary thrust of the detection activities was the development of sound, technically based performance/approval standards and installation and application guidelines. This goal was achieved with the development and adoption of Underwriters Laboratories standard no. 217 "Single and Multiple Station Smoke Detectors" [1] for product approvals and the National Fire Protection Assocation standard no. 74 "Household Fire Warning Equipment" [2] for installation and use. In 1980, Underwriters Laboratories issued their standard no. 268 "Smoke Detectors for Fire Protective Signaling Systems " [3] for commercial, system-connected smoke detectors based on the 217 standard. This has led to a degree of concern since the 268 standard for commercial detectors includes the smoldering smoke test requirement from the residential detector standard. The concern is that the smoldering smoke response requirements are difficult for ionization type detectors to meet thus requiring a highly sensitive detector, with an attendant increase in false alarms in large building systems many of which are directly connected to the fire department. However, smoldering fires are predominantly a residential problem, generally associated with cigarette ignition of upholstered furnishings and bedding. In the types of occupancies where system-connected detectors are used, i.e. office, commercial, etc., these fire scenarios are much less likely and a slowly developing smoldering fire is more likely to be discovered by occupants. CFR has taken the position that the smoldering test should either be deleted from the 268 standard or be made optional for system type detectors.

Sales of residential smoke detectors appear to have stabilized at about the 5 million unit per year level. This is considerably below the 12 to 13 million per year peak level of 1978. At the same time, use of commercial smoke detectors in non-residential occupancies have increased with system detector sales exceeding 1/2 million units per year. Some possible reasons for this include increased code requirements for smoke detectors in non-residential occupancies and also the fact that, since more than 1/2 of US homes have residential smoke detectors, public pressure on building owners and designers to install smoke detectors in non-residential buildings has had a major impact.

Data on the operational reliability of residential smoke detectors is now becoming available. At the last panel meeting, Canadian data [4] indicating a rate of random electronic failure of about 2% per year was discussed. Recently, a study conducted by the International Association of Fire Chiefs Foundation for the U.S. Fire Administration [5] reported the results of the testing of the alarm threshold of 3,357 installed detectors. These tests were conducted using the smoke detector field tester developed at CFR [6]. The detectors had been in place from 1 to 10 years with almost 80 percent between 4 and 5 years old. They found that over 92 percent were within the maximum 4 percent per foot limit set in the UL 217 standard. This indicates that sensitivity drift does not appear to be a problem, at least on the short term.

US fire statistics are beginning to show the decline in residential fire deaths which had been hoped for with the increased use of smoke detectors [7]. While it has not been proven conclusively that the smoke detectors are the sole cause, it is felt that they are a major contributing factor to this decline. Fire incident data (NFIRS) [8] indicates that there is still a disproportionately large percentage of fires which occur in residences without detectors.

This is because innercity and rural housing tends to have the highest fire rkdes and lowest detector usage rates and the more affluent, suburban populations have fewer fires and higher detector usage. The data shows that, given a fire, the risk of fatality is 2.3 times as great in a home without smoke detectors.

While in the last two years there has been little technological improvement in either residential or commercial detectors, there have been developments in the systems to which the commercial detectors are connected. More and more systems are being designed using multiplexing techniques to reduce the amount of wiring necessary in large building installations. Also, many designs feature computer control and include security and energy conservation features. Several systems have been developed which allow determination of individual detector sensitivities from the panel, and digital coding techniques allow identification of individual detector heads in alarm rather than on a zone basis. Spurred by advances in digital electronics, the next step in system design will be the use of analog sensors which will continuously report signal levels to a micro-processor in the panel. Such a system would have distinct advantages in that different alarm thresholds could be programmed into the system by location and time of day, the system alarms could be determined not only on the basis of signal level from a single detector but also could consider the level at several detectors or the rate of change of level.

In summary, this period has been one of limited technological growth and little new research. All indications are that the residential detectors currently being produced and installed are functioning admirably and will

have an increasing impact on the reduction of fire losses as their use becomes more universal. Commercial detection equipment also appears to be functioning well but significant gaps in knowledge still exist with regard to siting guidelines, particularly for complex ceiling geometries and high air flow areas such as below raised floors and above suspended ceilings where the space is used as a return air plenum.

References

[1] Standard for Safety, Single and Multiple Station Smoke Detectors, UL 217, Underwriters Laboratories, Inc., Northbrook, IL.

[2] Household Fire Warning Equipment, Pamphlet No. 74, National Fire Protection Association, Quincy, MA.

[3] Standard for Safety, Smoke Detectors for Fire Protective Signaling Systems, UL 268, Underwriters Laboratories, Inc., Northbrook, IL.

[4] Darge, J.H., and Sproule, H.E., Ontario Housing Corp. Fire Statistics for 1979 and the Role of Smoke Detectors, Ontario Housing Corp., Maintenance Branch, Toronto, Ontario, Canada, March 1980.

[5] An Evaluation of Residential Smoke Detectors Under Actual Field Conditions, Report No. FA-60, U.S. Fire Administration, Washington, D.C., March 1982.

[6] Lee, T.G.K., An Instrument to Evaluate Installed Smoke Detectors, NBSIR 78-1430, National Bureau of Standards, Wash., D.C., February 1978.

[7] Residential Fires in the United States 1979 Preview, U.S. Fire Administration, Washington, D.C.

[8] National Fire Incident Reporting System, U.S. Fire Administration, Washington, D.C.