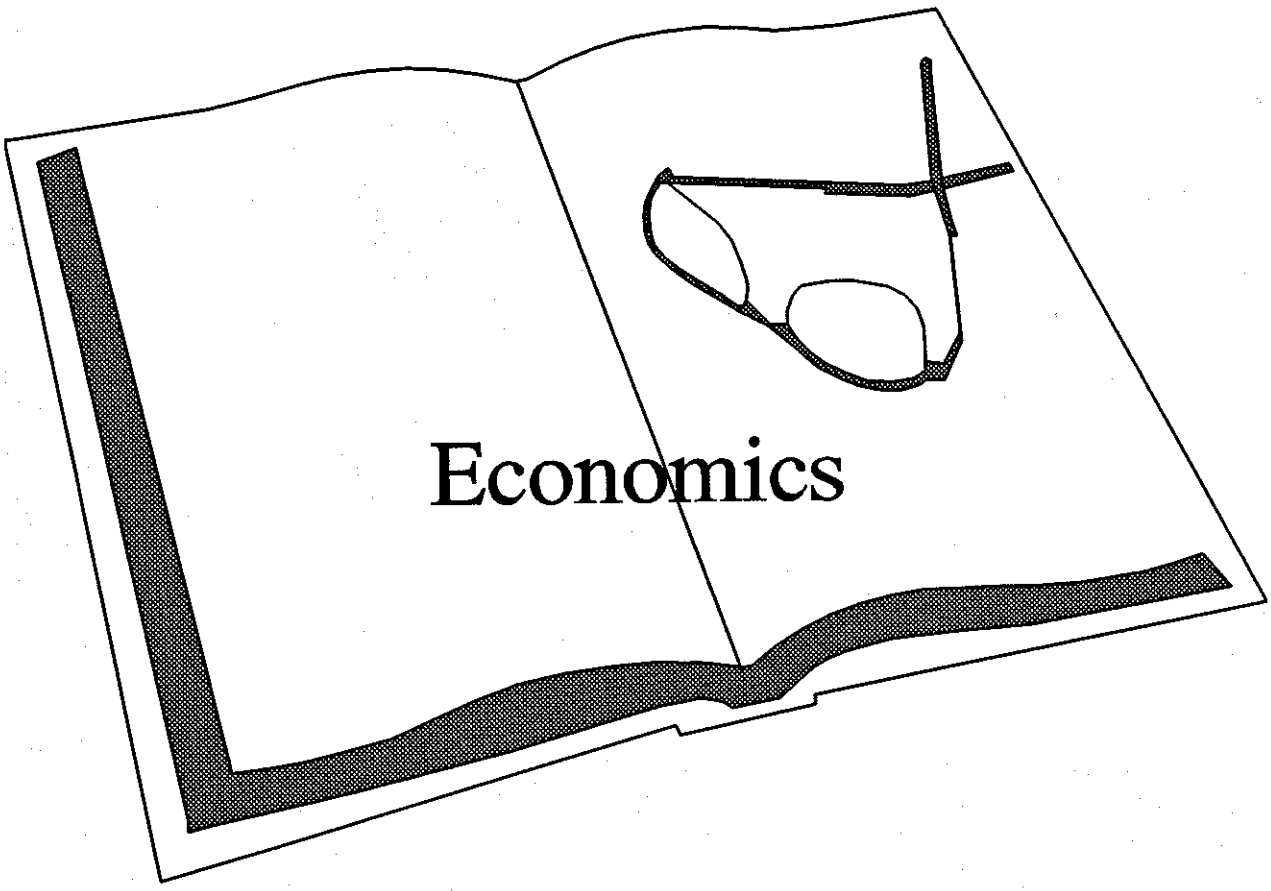


Economics

This section contains a collection of papers presenting cost-benefit analyses on detectors applied to a range of occupancies from residential [Colville 1990] to industrial [Ramachandran 1981] to historic [Marchant 1989] and general [Unoki 1990]. All such studies on detectors conclude that there is a large, positive ratio of benefit to cost for detectors. Similar studies on residential sprinklers often show the opposite.

Colville, J.

Colville, J.; Behnami, B.
Study of Fire Losses in Multi-Family Residences. Final Report.
Maryland Univ., College Park
297 p. April 1982.
Available from National Technical Information Services PB82-214701
fire losses; multifamily housing; residential buildings; fire safety; fire detection systems; fire resistant materials; sprinkler systems; construction materials; casualties; building fires; smoke detectors
This study, using the computer files of the U. S. Fire Administration National Fire Data Center in Washington, DC, investigated the relationships between construction type and fire losses in multi-family residential buildings. Three measures of fire loss (i.e., extent of flame damage, property losses, and casualties) were considered; also, a review was made of the recorded performance of detectors and sprinklers in these structures. Eight construction types for 14 states, and four construction types for California were considered; data from California was dealt with separately in several areas of the study.

Durkin, P.

Durkin, P.
Sweetening the Pot--Congress Takes a A Closer Look at Tax Credits for Automatic Fire Protection Systems.
International Fire Cheif, Vol. 50, No. 7, 19-21, July 1984.
fire detection; fire alarm systems; fire protection; legislation

Ehrenkrantz Group

Ehrenkrantz Group
Cost Impact of Duplicate Life and Safety Requirements in Codes. Final Report.
Ehrenkrantz Group, Washington, DC
HUD-0002970; 126 p. July 1983.
Available from National Technical Information Services PB84-188242
building codes; life safety; smoke detectors; multifamily housing; cost benefit analysis; fire safety
Conformance to model housing codes in the 1952 to 1977 period increased the cost of multifamily housing by less than 2 percent, but reduced the cost of single-family homes and low-rise apartments. This study sought to determine if compliance with code revisions in the 25 year period would have resulted in costs that exceeded benefits. The three model codes analyzed were the Uniform Building Code, the Basic Building Code, and the Standard Building Code. The study found that during this period, housing costs, increased due to interest rates, permits and fees, labor rates, processing time, and consumer preference, none of which can be attributed to model codes. The model codes, though significantly expanded, became more flexible and performance oriented, often allowing traditionally specified materials to be replaced by lower cost alternatives. The study also found that the rapid growth in the use of smoke detectors, now required by all model codes, has been a major factor in reducing the loss of life due to residential fires. While cooperation between the model code organizations has led to several joint efforts at uniformity, local level enforcement practices vary greatly. Recommendations for improving the code revision process, code changes, a guide to the variables used in the regression analysis, an explanation of the prototypic housing used in the analysis, and 21 references are supplied.

Gardham, J. H. T.

Gardham, J. H. T.
Financial Effects on County and Voluntary Residential Premises.
Consultant, England
Fire Service Technical College. Automatic Fire Detection in Non-Domestic Residential Premises. Technical Study. Paper 9. April 3-5, 1978, Gloucestershire, England, 68-74 pp, 1978.
residential buildings; fire detection; elderly persons

Gomberg, A.

Gomberg, A.; Buchbinder, B.; Offensend, R. L.
Evaluating Alternative Strategies for Reducing Residential Fire Loss--The Fire Loss Model.
National Bureau of Standards, Gaithersburg, MD
NBSIR 82-2551; 66 p. August 1982.
Available from National Technical Information Services PB82-263369
cost benefit analysis; fire losses; fire safety; residential buildings; smoke detectors; sprinkler systems

This report provides a preliminary documentation of a decision analysis framework for evaluating alternative residential fire loss reduction strategies. The framework, when it is completed, will provide a systematic means for assessing the costs and losses occurring under different intervention strategies. The current report focuses entirely on the problem of assessing fire losses, as this is where most of the uncertainty on system performance occurs. Subsequent reports will address the cost of the alternatives, after which the alternatives can be compared on a comprehensive cost/benefit basis. Three alternatives are considered in this preliminary report: smoke detctors, residential sprinkler systems with standard commercial-type sprinkler heads, and a combination of both measures. Based on the preliminary input data developed, the preliminary analysis indicates that both sprinklers and detectors are effective in reducing life loss. Detectors appear to be somewhat more effective in reducing personal losses, however, because of their earlier warning capability. Sprinklers appear to be significantly more effective that detectors in reducing property loss because of their earlier start in initiating suppression. Work is underway refining the loss model and developing a cost model so that meaningful cost/benefit comparisons of the alternatives can be conducted.

Helzer, S. G.

Helzer, S. G.; Offensend, F. L.; Buchbinder, B.
Decision Analysis of Strategies for Reducing Upholstered Furniture Fire Losses. Final Report.
National Bureau of Standards, Gaithersburg, MD
NBS TN 1101; 155 p. June 1979.
Available from Government Printing Office
building fires; cost benefit analysis; costs; decision analysis; fire losses; furniture; hazard analysis; probability; residential buildings; sensitivity analysis; smoke detectors; standards; upholstered furniture
Decision analysis is used to evaluate alternative strategies for reducing residential upholstered furniture fire losses. Three alternatives are evaluated: no-action, mandatory smoke detector installation, and the proposed upholstered furniture standard under consideration by the Consumer Product Safety Commission. Quantitative models are developed to assess fire losses and costs under each alternative. The alternatives are evaluated on the basis of minimizing the total cost plus loss to society over time. Subject to the assumptions set forth in the report, the analysis shows that the detector alternative and the proposed standard are essentially equivalent and preferred to the no-action alternative. The proposed standard is more effective in saving lives, whereas the detector alternative is less costly to implement. The sensitivity of the results to key assumptions and input parameters is tested. The results are shown to be particularly sensitive to the cost of the proposed standard, the loss of life value assignment, and the upholstered furniture replacement pattern.

Marchant, E. W.

Marchant, E. W.
Preventing Fire in Historic Buildings: The Acceptable Risk.
Edinburgh Univ., Scotland
Fire Technology, Vol. 25, No. 2, 165-176, May 1989.
historic buildings; fire safety; fire risks; management; fire detection systems; smoke control; fire suppression; costs

Platt, S.

Platt, S.
Levels of Detection and Their Cost Effectiveness.
Bury Fire Dept., England
Fire Service Technical College. Automatic Fire Detection in Non-Domestic Residential Premises. Technical Study. Paper 8. April 3-5, 1978, Gloucestershire, England, 62-67 pp, 1978.
fire detection; cost effectiveness; life safety

Ramachandran, G.

Ramachandran, G.
Assessing the Economic Value of Automatic Fire Detectors.
Fire Research Station, Borehamwood, England
Fire, Vol. 73, No. 910, 556-557, April 1981.
fire detectors; economic factors; industries

Ramachandran, G.
Economic Value of Automatic Detectors.
Fire Research Station, Borehamwood, England
Fire Engineers Journal, Vol. 41, No. 122, 36-37, June/September 1981.
fire detectors; fire damage; detection time; fire growth

Ramachandran, G.
Economic Value of Automatic Fire Detectors.
Fire Research Station, Borehamwood, England
IP 27/80; 4 p. November 1980.
fire detectors; economic factors

Ramachandran, G.; Chandler, S. E.
Economic Value of Early Detection of Fires in Industry and Commercial Premises.
Building Research Establishment, Watford, England
IP 13/84; 4 p. July 1984.
economic factors; commercial buildings; industries

Ramachandran, G.; Chandler, S. E.
Economic Value of Fire Detectors.
Fire Research Station, Borehamwood, England
Fire Surveyor, Vol. 13, No. 2, 8-14, April 1984.
fire detectors

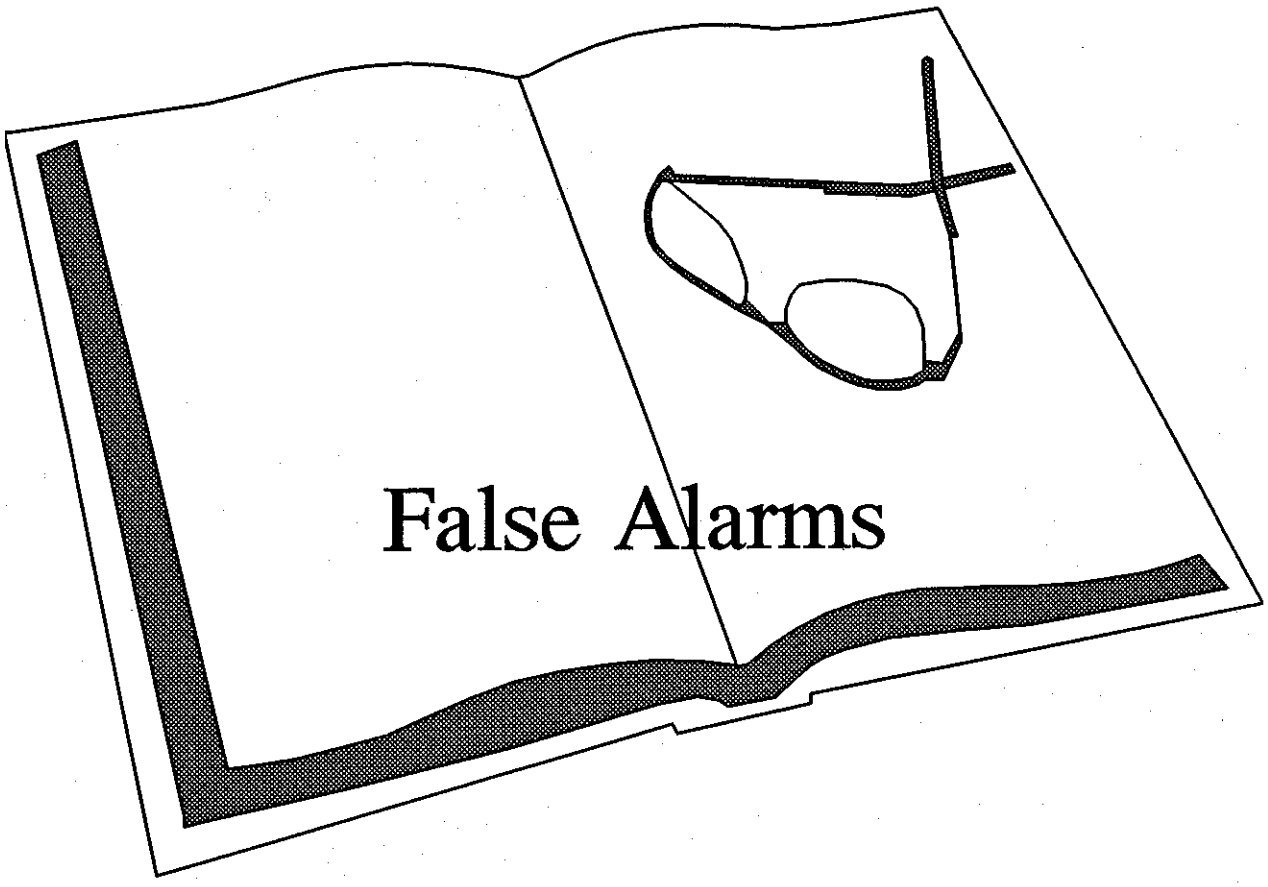
Rutstein, R.

Rutstein, R.
Cost Effectiveness of Building Protection.
Home Office Scientific Branch, England
Fire Engineers Journal, Vol. 38, No. 112, 31-33, December 1978.
sprinklers; fire detectors; cost effectiveness; fire protection

Unoki, J.

Unoki, J.
Some Examples of Calculations Related to Investment Effects of Fire Protection Systems.
11 p. 1990.
In: Japanese (Abstract in English)
fire protection
Examples of calculations to determine the cost of a fire protection system incorporating protected and unprotected areas, average loss anticipated from those areas, estimated cost of direct/indirect loss of those areas, human loss, system cost and accumulated interest are presented. The sum then is viewed in terms of the cost of foregoing a protection system.

International Fire Detection
Bibliography 1975-1990



False Alarms

This collection of papers demonstrates the international nature of the detector false alarm problem. This section contains numerous papers from the US, Japan, Canada, Germany, Switzerland, and the United Kingdom. The papers read alike - too many false alarms reducing system effectiveness and costing fire departments dearly in lost time. Most blame high detector sensitivity and attempt to resolve the problem by a combination of reducing sensitivity and time delays. Some correlate elevated false alarm rates with ineffective maintenance programs. None claim to have the definitive solution, but one, Fire Journal 1988, describes an effective program undertaken in Boston.

Abe, T.

Abe, T.
Results of Investigation Into False Alarms Produced by Automatic Fire Alarm Systems. (Translation)
Kasai, Vol. 32, No. 6, 16-27, 1986.
false alarms; fire alarms systems
The equipment which is used for the automatic detection of the fire emergency to function as the automatic fire alarm is installed into the vital areas to perform the important duty of informing people inside the building about the incident of the fire emergency. But the main purpose of such an automatic fire alarm system is to discover the fire emergency at the earliest stage and, therefore, the part of the equipment known as the detector is very important so far as the detection of the fire emergency is concerned. This automatic equipment must have sensors like the eye and nose of the human to process or detect the smoke or even the heat, etc. to identify the fire emergency. However, the high-precision results of the equipment will certainly depend on its ability to distinguish and decide the fire emergency accurately to differentiate it clearly from the false situations. In any way, it is demanded from the equipment that it should distinguish clearly whether the smoke or heat is coming from the ordinary cooking place or from the alarming place with the emergency fire. In many automatic fire alarm systems, discrimination is not achieved accurately and the operation of such signals in the detection environment causes the false functioning of the fire alarm systems.

Anderson, N. H. M.

Anderson, N. H. M.
National Approvals Authority.
Council of British Fire Protection Equipment Manufacturers, England
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 42-47 pp, 1982.
false alarms; manufacturing

Association of European Manufacturers of Fire and Intruder Alarm Systems (EURALARM)

Association of European Manufacturers of Fire and Intruder Alarm Systems (EURALARM)
Study of Unwanted Alarms of Fire Detection and Alarm Systems. EURALARM
Final Document; 9 p. September 1988.
fire detection systems; fire alarm systems; fire statistics
The results of three surveys carried out in the UK, Switzerland and Sweden are listed on pages 5-7 of this document. The studies are based on different sets of classifications of unwanted fire signals and therefore no direct comparison can be made.

Bearman, D. J.

Bearman, D. J.
Current State of the Technology.
British Fire Protection Systems Association PLC
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, Wiley (John) and Sons, Inc., NY, 12-18 pp, 1982.
false alarms; smoke detectors

Bertschinger, S.

Bertschinger, S.
Smoke Detectors and Unwanted Alarms.
Ontario's Ministry of Government Services, Canada
Fire Journal, Vol. 81, No. 6, 43-45, November/December 1987.
smoke detectors; fire alarm systems

Brannigan, F. L.

Brannigan, F. L.
Delayed Alarms--A Focus for Public Fire Educators.
National Fire Academy, Emmitsburg, MD

Fire Engineering, Vol. 137, No. 10, 53-54, October 1984.
fire alarm systems; safety engineering; false alarms; fire fighters

Breen, D. E.

Breen, D. E.
False Fire Alarms in College Dormitories: The Problem Revisited.
Harvard Univ., Cambridge, MA
SFPE TR 85-03; 20 p. 1985.
false alarms; dormitories; smoke detectors; stairwells; corridors; false alarms

DeWitte, D.

DeWitte, D.
Dossier Securite: Les Fausses Alarmes.
[Security Files: False Alarms.]
Revue Belge du Feu, No. 93, 17-20, Dec. 1988.
In: French

Dubivsky, P. M.

Dubivsky, P. M.; Bukowski, R. W.
False Alarm Study of Smoke Detectors in Department of Veterans Affairs Medical Centers (VAMCS).
National Institute of Standards and Technology, Gaithersburg, MD
NISTIR 89-4077; 234 p. May 1989.
Available from National Technical Information Services PB89-193288
sensitivity; false alarms; smoke detectors; smoking; tests; cleaning; dusts
A study of 133 VA Medical Centers (VAMC), out of a total of 172 throughout the U. S., coupled with visits to 20 facilities, was conducted to gather data on false alarms of smoke detectors. Data collected included name of the detector manufacturer and model number, control unit manufacturer and model number, number and type of detectors installed, where installed, number of false and real alarms for preceding year, date of installation, and policies on smoking, testing, cleaning, and maintenance. VAMC personnel involved with the installations were requested to indicate the maximum level of false alarms that could be tolerated and to provide any recommendations to reduce their occurrence.

Edwards, P. C.

Edwards, P. C.
Home Office View.
Home Office Fire Dept., London, England
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 26-34 pp, 1982.
false alarms; fire detection systems; legislation

Emmons, H. W.

Emmons, H. W.
Fire Detectors for Public Fire Safety.
Harvard Univ., Cambridge, MA
Home Fire Proj. Tech. Rpt. 71; 11 p. Oct. 1985.
smoke detectors; false alarms

Everton, A.

Everton, A.
Why Judge Ruled That Charges for False Fire Alarms Were Illegal.
Barrister-at-Law, England
Fire, Vol. 83, No. 1029, 7, March 1991.
fire alarms; false alarms; fire alarm systems
With the technological advance of the last two decades has come increasing use of automatic fire detection and alarm systems. According to a paper published by the FPA, the advantages lie in the enhanced safety of occupants of a building (by the giving of an early warning of fire), and the reduced loss of property (by the summoning, at an early stage, of the fire brigade). That paper underscores the point that: The most effective systems are connected to the fire brigade or to a central fire alarm depot.

Fire Journal

Fire Journal
How One City is Dealing With the Nuisance Alarm Problem.
Fire Journal, Vol. 82, No. 1, 57-61,82, January/February 1988.
smoke detectors; fire alarm systems; fire prevention; fire departments

Fire Journal
Malicious Alarms or Nuisance Alarms: Which Is the Larger Problem?
Fire Journal, Vol. 83, No. 1, 54, January/February 1989.
false alarms; fire statistics

Fischer, B.

Fischer, B.
Ursachen unerwunschter Alarme und ihre Vermeidung. [Reasons for Unwanted Alarms and Their Avoidance.]
Hekatron GmbH, Federal Republic of Germany
University of Duisburg. International Conference on Automatic Fire Detection "AUBE '89", 9th. September 26-28, 1989, Duisburg, West Germany, Luck, H., Editor, 25-36 pp, 1989.
In: German
false alarms

Frost, P.

Frost, P.
Developments in Equipment Testing and Standards.
Fire Offices' Committee
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 39-41 pp, 1982.
false alarms

Furey, B.

Furey, B.
Detection Defection? Growing Clamor Over Faulty Automatic Alarm Systems.
Valley Cottage Fire Dept., NY
Firehouse, 69-70,73-74, March 1984.
fire alarm systems; false alarms

Green, C.

Green, C.
Developments in Communications.
Home Office Fire Service Inspectorate, England
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 59-61 pp, 1982.
false alarms; fire departments

Guettinger, H.

Guettinger, H.; Scheidweiler, A.
New Ways Towards a Solution of the False Alarm Problem.
Cerberus Ltd., Mannedorf, Switzerland
International Association for Fire Safety Science. Fire Safety Science. Proceedings. 2nd International Symposium. June 13-17, 1988, Tokyo, Japan, Hemisphere Publishing Corp., New York, Wakamatsu, T., Hasemi, Y., Sekizawa, A., Seeger, P. G., Pagni, P. J. and Grant, C. E., Editors, 583-590 p., 1989.
fire research; fire safety; fire science; false alarms; fire detection systems; sensitivity; human behavior

Gupta, Y.

Gupta, Y.; Dharmadhikari, A.
Analysis of False Alarms Given by Automatic Fire Detection Systems.
Manitoba Univ., Canada
Reliability Engineering, Vol. 13, No. 3, 163-174, 1985.
fire alarm systems; accident prevention; probability; false alarms; human beings

Harwood, J.

Harwood, J.
False Alarms From Automatic Fire Detection Systems.
Fire Prevention, No. 152, 19-23, September 1982.
fire alarm systems; false alarms; fire detection systems; statistics

Hozack, J. M.

Hozack, J. M.
Reducing False Alarms in Automatic Fire Detection Systems.
Schindler Fire and Security, England
Fire Protection, Vol. 13, No. 1, 18-2, March 1986.
fire detection systems
The job of an automatic detection system for fire or intrusion is to provide the earliest possible warning in the event of an alarm, in order that intervention at a stage when the developing danger can still be averted relatively easily, can be carried out before serious damage has been done to equipment or property.

Jones, P. G.

Jones, P. G.
Synopsis of the False Alarm Problem.
British Fire Protection Systems Association PLC, England
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 19-25 pp, 1982.
false alarms; fire departments; fire detection

Kasahara, K.

Kasahara, K.
Insect Penetration into the Compartment of a Battery Driven Smoke Detector.
Fire Research Institute, Japan
Japanese Association of Fire Science and Engineering. Annual Conference. May 29-30, 1985, Tokyo, Japan, 19-20 pp, 1985.
In: Japanese (Abstract in English)
smoke detectors; false alarms
Ionization and photoelectric detectors were studied in several city and country locations in Japan. Insect penetration clearly triggered only one false alarm but may have caused three more, for a total of 3%. Insect netting placed in the internal compartment or over the smoke detection opening may effectively prevent insect penetration.

Kitchenham, C.

Kitchenham, C.
Controlling Nuisance Alarms.
Electro Signal Lab., Inc.
Consulting/Specifying Engineer, Supplement, 10-11,14, April 1990.
fire detection systems; contamination; cleaning; installation; maintenance

Kunz, F.

Kunz, F.
Automatische Brandmeldean lagen--ihre Wirksamkeit; Falschalarme und Massnahmen zu ihrer Reduzierung [Automatic Fire Detector Placement - its effectiveness; False Alarms and Measures for its Reduction]
EURALARM, Mannedorf, Switzerland
University of Duisburg. International Conference on Automatic Fire Detection "AUBE '89", 9th. September 26-28, 1989, Duisburg, West Germany, Luck, H., Editor, 11-35 pp, 1989.
In: German
fire detection; false alarms

Larsen, T. E.

Larsen, T. E.
Flame Detectors: Reducing False Alarms.
Detector Electronics Corp.
Fire Surveyor, Vol. 13, No. 1, 21-27, Feb. 1984.
flame detectors; fire detection; false alarms

McLaurin, M. F.

McLaurin, M. F.
Controlling Private Security System False Alarms.
International City Management Assoc., Washington, DC
MIS Report, Vol. 16, No. 7, 1-12, July 1984.
false alarms; operations research; costs; statistics

Mettler, H.

Mettler, H.
Zur problematik echter und unechter Alarme von Brandmeldeanlagen. [On the Dilemma of Valid and False Alarms From Fire Detection Systems.]
Vereinigung Schweizerischer Hersteller von Alarmanlagen, West Germany
SFZ/JSPS, 541-545, October 1986.
In: German
false alarms; fire detection systems

Miyama, J.

Miyama, J.; Jin, T.; Saito, F.
Progress Report on Fire Detection.
Sophia Univ., Bulgaria
Fire Research Inst., Tokyo, Japan
Building Research Inst., Tokyo, Japan
U.S./Japan Government Cooperative Program on Natural Resources. Fire Research and Safety. 6th Joint Panel Meeting of the UJNR Proceedings. May 10-14, 1982., Tokyo, Tsukuba, Japan, Building Research Inst., Tokyo, Japan, 2-9 pp, 1983.
fire detection; fire alarm systems; smoke detectors
This report consists of statistical investigation of the frequency of fire alarms including false ones concerning twelve large-scale buildings, experimental research on the performance of smoke detectors under several kinds of smoldering smoke, a light-absorption type smoke detector recently developed, and the relation between visibility in smoke and the performance of smoke detctors from the viewpoint of taking evacuation.

Miyama, J.; Watanabe, A.
False Alarm of Smoke Detectors.
Illuminating Engineering Inst., Japan
National Bureau of Standards. Fire Research and Safety.
3rd Joint Panel Proceedings Conference of the U.S. Japan Cooperative Program in Natural Resouces. March 13-17, 1978, Gaithersburg,

MD, National Bureau of Standards, NBS SP 540, Sherald, M. A., Editor, 46-53 pp, 1979.
Available from Government Printing Office SN-003-003-02141-5
false alarms; smoke detectors
The causes of false alarm of smoke detectors are described together with the standards for device and installation of smoke detectors, and the means to avoid false alarm are presented.

Moore, W. D.

Moore, W. D.
Fire Alarm Systems "Crying Wolf".
Mass Fire Alarms of New England, Lowell, MA Society of Fire Protection Engineers. Fire Detection and Suppression...Today's Technology. March 9-11, 1987, Linthicum Heights, MD, 1-9 pp, 1987.
fire alarm systems; false alarms; smoke detectors; sensitivity
False alarms, primarily from smoke detectors, play a major role in decreasing the credibility of a fire alarm system and their psychological impact may well be the most vulnerable link in our early warning systems as installed today.

Morgenstern, R. D.

Morgenstern, R. D.
False Alarms.
Congressional Budget Office, Washington, DC Urban Analysis, Vol. 4, No. 2, 221-234, 1977.
false alarms; fire departments; evaluation; fire alarm systems The subject of this case is false alarms, an increasing problem for fire departments in many areas of the country. In the body of the case we outline the nature of the problem and discuss the objectives and the criteria to be used in the evaluation. We then analyze one particular alternative: namely, discretionary response.

Mottler, H.

Mottler, H.
Au sujet de la problematique des fausses alarmes et des alarmes reelles produites par les installations de detection d'incendie. [On the Subject of the Problem of False Alarms and Real Alarms Produced by Fire Detectors.]
SFZ/JSPS, 541-545, October 1986.
In: French
detector response

Peacock, S. T.

Peacock, S. T.; Kamath, A. R. R.; Keller, A. Z.
Reliability Appraisal of Fire Detection Systems.
Bradford University Research Ltd., UK
Report, 1-20 pp [no date]
fire detection systems; reliability; chemical plants; false alarms; maintenance
The performance of Automatic Fire Detection Systems specifically with respect to reliability is discussed. It is shown that these systems are particularly susceptible to spurious alarms. Causes of these spurious alarms are identified and are shown to be dependent on a large number of factors ranging from the enviornment to operational procedures. The consequential reduction in the credibility of such systems raises questions regarding expediency of use, especially in high risk areas.

Peacock, S. T.; Wagstaff, T.
Statistical Analysis of False Fire Alarms From Hospitals.
Bradford Univ., UK
Department of Health and Social Security, London, England
Advances in Reliability Technology Symposium, 7th. 1982, 2C/4-11 pp, 1982.
hospitals; false alarms; statistical analysis; smoke detectors; heat detectors; tests
This paper is concerned with a statistical analysis of false alarms from fire alarm systems in eleven hospitals within one Area Health Authority (A.H.A.) of the Department of Health and Social Security. Data from the Local Authority Fire Brigade covering a two year period is analysed using various statistical techniques. These include the classificaion of causes of false alarms; calculation of alarm rates; analysis of variance to investigate the influence of the time and day of occurrence of alarms; Weibuil analysis of the times between false alarms; investigaton of the growth/reduction of false alarms with time using a non-homogeneous Poisson process model. The analyses are combined to obtain a global model of false alarms.

Pigott, B. B.

Pigott, B. B.; Burry, P. E.
Future Technology.
Fire Research Station, Borehamwood, England
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 48-58 pp, 1982.
false alarms

Platt, S.

Platt, S.
Identifying the Solutions.
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 62-66 pp, 1982.
false alarms

Rajan, K. S.

Rajan, K. S.; Snelson, A.; Schechter, H. R.; Mniszewski, K. R.; Waterman, T. E.; Yamate, G.; Harpe, S. W.
New Concepts of Fire Detection.
IIT Research Inst., Chicago, IL
Underwriters Laboratories, Northbrook, IL
97 p. December 1978.
fire detection systems; false alarms
This study was directed toward defining the differences in response of various detection concepts to both real and false fire signatures. Section 2 discusses the "multimode" detection concept of systems employing more than one detection mode and/or requiring more than one detector to operate prior to general alarm. Measurements of the response of the principal detector types to common household contaminants is presented as a guide to the design of future multimode systems.

Rankin, S.

Rankin, S.
Operational Perspective. Part 1.
Chief Fire Officer, Merseyside, England
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 3-5 pp, 1982.
fire departments; fire alarm systems

Scheidweiler, A.

Scheidweiler, A.; Guttinger, H.
Reducing False Alarms From Smoke Detectors.
Cerberus AG, Mannedorf, Switzerland
Fire International, Vol. 14, No. 125, 77-78, October/November 1990.
false alarms; smoke detectors; sensitivity; fire alarm systems

Sekizawa, A.

Sekizawa, A.; Takemoto, A.; Kasahara, K.
Research on False Alarms From Battery Driven Fire Detectors Monitored in Residential Houses.
Fire Research Institute, Japan
Japanese Association of Fire Science and Engineering. Annual Conference. May 29-30, 1985, Tokyo, Japan, 27-28 pp, 1985. In: Japanese (Abstract in English)
false alarms; fire detectors; residential buildings
Based on 1981 and 1982 surveys with nearly identical results. Contains figures on frequency, cause, and expectation of false alarms (for example, 80% of the households had experienced false alarms while asleep, 40% while cooking).

Takemoto, A.

Takemoto, A.
Abnormal Output as One of False Alarms From an Ionization Smoke Detector.
Fire Research Institute, Japan
Japanese Association of Fire Science and Engineering.
Annual Conference. May 20-22, 1986, Tokyo, Japan, 55-58 pp, 1986.
In: Japanese (Abstract in English)
false alarms; ionization detector; smoke detectors
Using automated data gathering measures, abnormal output and possible countermeasures were studied. As a result, it was found that abnormal output is random and one cannot specify the correlation between abnormal output and temperature, humidity, time of day, or season.

Takemoto, A.
False Alarm From a Battery Driven Ionization Smoke Detector.
Fire Research Institute, Japan
Japanese Association of Fire Science and Engineering.
Annual Conference. May 29-30, 1985, Tokyo, Japan, 17-18 pp, 1985.
In: Japanese (Abstract in English)
false alarms; ionization detectors; smoke detectors
Two groups of ionization detectors aging from 1-3.5 years old were submitted to different temperature, relative humidity and time conditions. Dust and lint were found in the ionization compartments or on the internal poles of all detectors triggered by humidity. Dust and lint formed a bridge between the central compartment and the internal poles, absorbed moisture and set off the alarms.

Takemoto, A.
False Alarms as a Function of Atmosphere Change in a Compartment.
Fire Research Institute, Japan
Japanese Association of Fire Science and Engineering. Annual Conference. May 20-22, 1986, Tokyo, Japan, 59-62 pp, 1986.
In: Japanese
false alarms; compartments

Takemoto, A.; Kasahara, K.; Sekizawa, A.
False Alarms Given by Fire Detectors Driven by a Battery.
Fire Research Institute, Tokyo, Japan
Japanese Association of Fire Science and Engineering. Annual Conference. May 22-23, 1984, Tokyo, Japan, 65-66 pp, 1984.
In: Japanese (Abstract in English)
false alarms; fire detectors
By sorting operation density, two models each of ionization and photoelectric type detectors were evaluated.

Fisher's official linear law was used to calculate the trigger rate. Differences in both the detector type and model were noted when tested in kitchens and cafeterias. Use and position of a ventilation fan also influenced whether the detector was triggered.

Takemoto, A.; Kouzeki, D.; Watanabe, M.; Yamauchi, Y.; Mammoto, A.
On the Cause for False Alarms and Its Duration--In Case of Hotel Guest Rooms.
Japanese Association of Fire Science and Engineering. Fire Research Annual Conference. May 17-18, 1990, 63-64 pp, 1990.
In: Japanese (Abstract in English)
fire research; false alarms; hotels
In evaluations of data from hotels on false alarms caused by steam and tobacco smoke, it was determined that a storage time of 10 seconds, 1/3 the norm, was sufficient.

Takemoto, T.

Takemoto, T.
View of Causes for False Alarms of Ionized Fire Alarm Systems.
Fire Prevention Laboratory of Ministry of Home Affairs, Japan
Paper 5; 8 p. 1985.
Japanese Association of Fire Science and Engineering. Annual Conference on Fire Research. May 29-30, 1985, Paper 5, 1985.
smoke detectors; false alarms

Unoki, J.

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False Alarms of Fire Detectors and Further Action Against Them in Japan.
Nohmi Bosai Kogyo Co., Inc., Japan
7 p. February 1984.
fire detectors; false alarms; fire alarm systems; buildings; human factors engineering; detector location; fire departments; fire statistics Tokyo Fire Department have surveyed false alarms of fire detectors during one year from August 1980 to July 1981 about 1,500 buildings where automatic fire alarm systems are installed.

Usuba, T.

Usuba, T.; Nakano, M.; Iwama, N.
False Alarms of Ionization Smoke Detectors Caused by Changes in Room Environment: When Dust and Threads Are Stuck to Poles.
Sophia Univ., Japan
Japanese Assoc. of Fire Science and Engineering. Annual Conference. May 20-22, 1986, Tokyo, Japan, 67-68 pp, 1986.
In: Japanese (Abstract in English)
temperature; compartments
Lint and dust may adhere to the poles in the ionization compartment. These may absorb moisture from the air. This absorption time may vary according to air current speed. Different experiments were conducted with acrylic thread, air conditioning, moisture emitted from a tea kettle, etc.

Whitaker, E. H.

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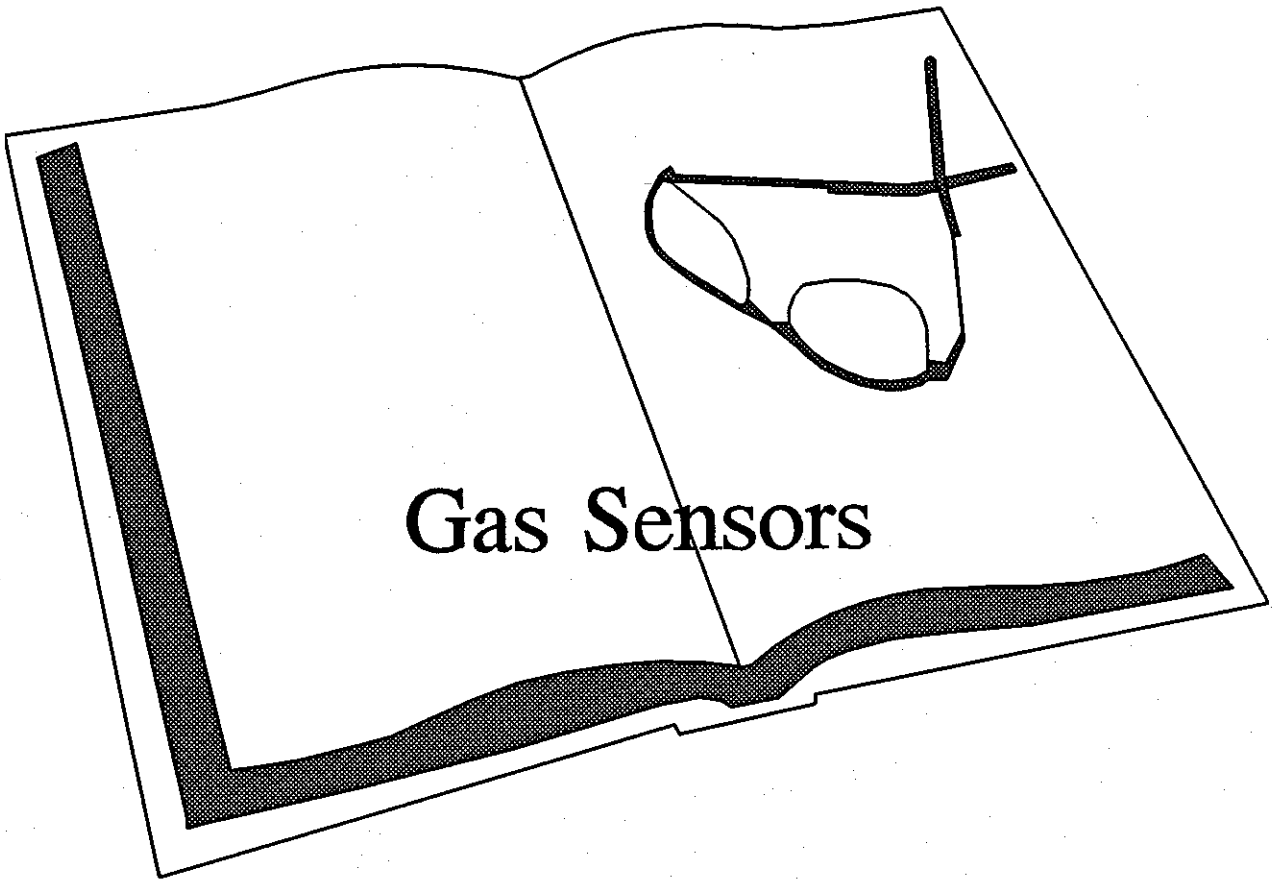
Operational Perspective. Part 2.
Chief Fire Officer, East Sussex, England
Home Office Fire Department. Seminar on False Alarms From Automatic Fire Detection Systems. May 5-6, 1982, Gloucestershire, England, 6-11 pp, 1982.
fire risk; fire statistics; false alarms

Wollin, G.

Wollin, G.
Measures for Reducing the Level of Unwanted Alarms Arising From Fire Detection and Alarm systems. Tele-Larm, Sweden
Final Document; 29 p. July 1987.
fire detection systems; fire alarm systems; fire statistics
The EURALARM document "measures for predicting the level of unwanted alarms arising from fire detection and alarm systems" has been prepared by the Working Group 1. This document is a follow-up to an earlier Euralarm document, entitled "Study of Alarms". Its purpose is to recommend defensive and preventive measures that can be taken to reduce the level of unwanted alarms identified in the earlier study. Ideally they should be applied at the planning stage, but many of them may be of value in reducing unwanted alarms from existing installations. The advice provided is directed towards systems that may or not have connections to a fire brigade or a central monitoring station having the responsibility for summoning the fire service. As both products and systems will vary from company to company, these recommendations are general in nature and are not related to any specific technology or system concept. Also, no attempt has been made to cover forecasts and trends as again these would differ widely both from company to company and country to country. The recommendations being put forward in this document, can be expected to make a significant contribution to reducing the level of unwanted alarms from fire detection and alarm systems.

International Fire Detection
Bibliography 1975-1990



Gas Sensors

This topic includes papers on modern applications of gas sensing fire detectors - a category of detectors recognized by US standards but generally not employed in this country. Of particular interest are several papers from the UK [Jones 1990, Ross *et al* 1990, Harrison *et al* 1990, Sonley 1990, and Southall 1983] which discuss such applications. Additionally, there are presentations of gas sensing techniques which have not previously been seen in the US [Ross 1990, Sonley 1990, Susott 1979, and Handa 1983].

Affens, W. A.

Affens, W. A.
Effect of Halon 1301 Fire Extinguishing Agent on the Response of Combustible GasIndicators. Final Report.
Naval Research Lab., Washington, DC
NRL-MR-4150; 20 p. January 18, 1980.
Available from National Technical Information Services AD/A-080529
fire hazards; warning systems; degradation; fire extinguishing agents; gas detectors; filiaments; sensitivity; shipboard fires
A combustible gas indicator (CGI) was tested in combustible vapor-air mixtures with and without the presence of Halon 1301 vapors. GCI response to hydrocarbon vapors was reduced on the average of about 30 percent in the presence of Halon 1301 vapors at fire extinguishment concentrations for hydrocarbon-type fire (3.7 percent) and about 45 percent at inerting concentrations (7.4 percent). Some filament deterioration was noted in filaments which were exposed to Halon vapors. Sensitivity loss for these filaments averaged about 9 percent.

Berkovitch, I.

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Gas Sensors.
Manufacturing Chemist, Vol. 57, No. 2, 60, 1986.
sensors; gas detectors

Bright, R. G.

Bright, R. G.
Do Gas Sensors Meet Smoke Detector Requirements?
National Bureau of Standards, Gaithersburg, MD
Fireline, Vol. 3, No. 3, 5-7,15, May/June 1978.
smoke detectors; fire tests; taguci gas sensor (trademark); sensitivity
Recently, there has appeared on the U. S. market a new type of fire detector, which utilizes as its basic sensing mechanism, a semiconductor, solid-state device commonly referred to as a Taguchi gas sensor (TGS).

Bright, R. G.
Report of Fire Tests on Eight TGS Semiconductor Gas Sensor Residential Fire/Smoke Detectors. Final Report.
National Bureau of Standards, Gaithersburg, MD
NBSIR 76-990; 16 p. April 1976.
Available from National Technical Information Services PB-251769
fire detectors; taguchi gas sensor (trademark); gas detectors; smoke detectors
At the request of the Bureau of Engineering Sciences Consumer Product Safety Commission, twenty-four Taguchi gas sensor (TGS) detectors, representing eight manufacturers were tested to the requirements of Section 22 (base sensitivity tests) and Section 24 (full-scale fire tests) of Underwriters' Laboratories Standard No. 217, "Standard for Single and Multiple Station Smoke Detectors". Two conventional single-station smoke detectors, one an ionization chamber type and the other a photoelectric type, were included in the test series for comparison. Only one of the TGS detectors was able to meet the requirements of Section 22, base sensitivity tests. None of the TGS detectors were able to meet the requirements of Section 24, full-scale fire tests. The two conventional smoke detectors met the requirements of Section 22 and 24.

Chemistry and Industry

Chemistry and Industry
Fire Sensors and Microchips Don't Add Up.
Chemistry and Industry, Vol. 23, No. 5, 874, December 1983.
sensors

Combley, R. C.

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Flammable Gases: Hazards and Detection.
Fire Surveyor, Vol. 16, No. 1, 22-27, Feb. 1987.
flammable gases; explosions; fuels; flash point; density effects; ignition; flameproofing; certification; vapors

Davies, D.

Davies, D.
Why Storage Risks Need Gas Detection.
Risk Control Services
Fire, Vol. 80, No. 994, 31, April 1988.
hospitals; storage; warehouses; gas detectors

Fire

Fire
Variety of Risks on Oil Rigs: Case for Portable Gas Detection.
Fire, Vol. 76, No. 937, 54, July 1983.
offshore platforms; paints; toxic gases; vapors

Fire Research Station

Fire Research Station
Guide to the Use of Portable Flammable Gas Detectors.
Fire Research Station, Borehamwood, England
CP 33/77; 7 p. July 1977.
gas detectors; flammable gases; vapors

Handa, T.

Handa, T.; Fukaya, H.; Kojima, K.; Endo, K.; Okayama, Y.
Current-Voltage Characteristics of Pt-Sn02 Point-Contact.
Science University, Tokyo, Japan
Nohmi Bosai Co., Ltd., Japan
Society of Materials Science, Japan. Japan Congress on Materals Research, 23rd. 1980, 220-224 pp, 1980.
electric potential; gas detectors; carbon monoxide
Seiyama et al, developed ZnO type ceramic gas detector in 1962. Since then, many study have been made so far on the ceramic gas detectors. However, it is no exaggeration to say that technology in this field is not yet established, because of the difficulty in the response of the sinterred bulky device during the long time exposure in the actual environment as well as the uniform response of the products. Almost all of gas sensors commercially available for the detecting appliance are equipped with various kinds of heater panel in ordinary service for excluding the effect from the moisture and other environmental gases and also for endowing a quick response time to the sensor. However, the single most difficulty in the use of the present sensors for fire detector is in that they can not preferentially detect CO gas or other products specific to smoldering fire sources. The present authors explored the possibility for developing a device which can exclude the effect of moisture and others gases in the environmental atmospheres without any heating panel and which can also detect preferentially CO and other polar gases specific to smoldering fire. This paper treats with the details of the point-contact cell device employing Pt-electrode and sinterred Sn02 wafer, and their Current(I)-Voltage(V) characteristics.

Handa, T.; Fukaya, H.; Sugawa, O.; Terasawa, Y.; Endoh, K.; Okayama, Y.
Calcination Temperature Effects to CO-Gas Sensor of Pt-Dispersed Hydrous SnO2 Gel.
Science Univ. of Tokyo, Japan
Nohmi Bosai Kogyo Co., Ltd., Tokyo, Japan
Fire Science and Technology, Vol. 3, No. 1, 1-12, 1983.
carbon monoxide; ceramics; temperature; moisture

Harrison, P. G.

Harrison, P. G.; Willett, M. J.
Mechanism of Operation of Tin (IV) Oxide Carbon Monoxide Sensors.
Nottingham Univ., England
Nature, Vol. 332, No. 6162, 337-339, March 24, 1988.
carbon monoxide; sensors; gas detectors; adsorption; tin; spectroscopy; infrared spectroscopy; electrical resistivity

Jones, T. A.

Jones, T. A.
Semiconductor Gas Sensors.
Health and Safety Executive, Sheffield, England
IEE Colloquium Digest, Vol. 1985, No. 54, 1-4, 1985.
IEE Colloquium on Solid State and Smart Sensors. May 14, 1985, London, England, 1985.
gas detectors; sensors; semiconductor devices; metal oxides
In this paper the advantages and disadvantages of this type of gas sensor are discussed and illustrated with reference to two sensors which use a metal oxide and an organic semiconductor respectively. The first is based on a single crystal of ZnO which can be used either for measurement of low levels of CO or for providing an early indication of onset of a fire by detecting the gaseous products evolved. The second, based on a film of lead phthalocyanine (PbPc), provides a means of selectively detecting strongly electrophilic gases such as NO2 and C12.

Okayama, Y.

Okayama, Y.; Handa, T.; Fukaya, H.; Maruyama, T.; Endo, K.
Carbon Monoxide Sensor Element Made of SnO2-Sb203-Pt Semiconductor.
2 p. 1990.
In: Japanese (Abstract in English)
carbon monoxide; sensors; semiconductors
Report of electric resistance characteristics in CO dense gas sensor element. This uses gas adsorption on a semi-conductor surface at a normal temperature, unlike other CO sensor elements which must be heated to maintain their particle surface temperature (200-300 deg C).

Okayama, Y.; Hotta, H.
Composite Type Silane Sensor.
4 p. 1990.
In: Japanese (Abstract in English)
sensors
A silane gas sensor was developed to detect both combustible and non-combustible components. An ionization sensor, best able to detect combustible components, and a semi-conductor type sensor, able to detect gaseous SiH4 were combined. This model was effective in tests on all three SiH4 states.

Ross, J. F.

Ross, J. F.; Terry, C. I.; Webb, B. C.
New Method for Protection Against Electrical Overheating Using a Sacrificial Coating and a CHEMFET Gas Sensor.
THORN EMI Central Research Lab., Hayes, England
Journal of Physics E: Scientific Instruments, Vol. 19, No. 7, 536-540, July 1986.
sensors; overheating; coatings; ureas; ammonium phosphates

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Use of Combustible Detectors in Protecting Facilities From Flammable Hazards.
Control Instruments Corp.
ISA Transactions, Vol. 20, No. 2, 25-30, 1981.
gas detectors; flammable gases; sensors; detector location; hazardous vapors

Sonley, J. M.

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Detection of Flammable Gases in an Offshore Environment.
International Gas Detectors Ltd., UK
BHRA, The Fluid Engineering Center; Society of Fire Protection Engineers; Safety and Reliability Directorate of UKAEA and Institution of Chemical Engineers. Fire Engineering in Petrochemical and Offshore Applications. International Conference Proceedings. June 23-24, 1987, Stratford-upon-Avon, England, Paper C2, 45-48 pp, 1987.
offshore platforms; flammable gases; gas detectors; infrared detectors

Southall, G.

Southall, G.
Gas Detection 'Coming Along Nicely' as Semiconductors are Developed.
Electronic Devices Ltd., Worcester, England
Fire, Vol. 75, No. 931, 416, January 1983.
gas detectors; offshore platforms; semiconductors

Susott, R. A.

Susott, R. A.; Shafizadeh, F.; Aanerud, T. W.
Quantitative Thermal Analysis Technique for Combustible Gas Detection.
Forest Service, Ogden, UT
Montana Univ., Missoula
Journal of Fire and Flammability, Vol. 10, No. 2, 94-104, April 1979.
gas detectors; thermal analysis; combustibles; solids

Umezu, M.

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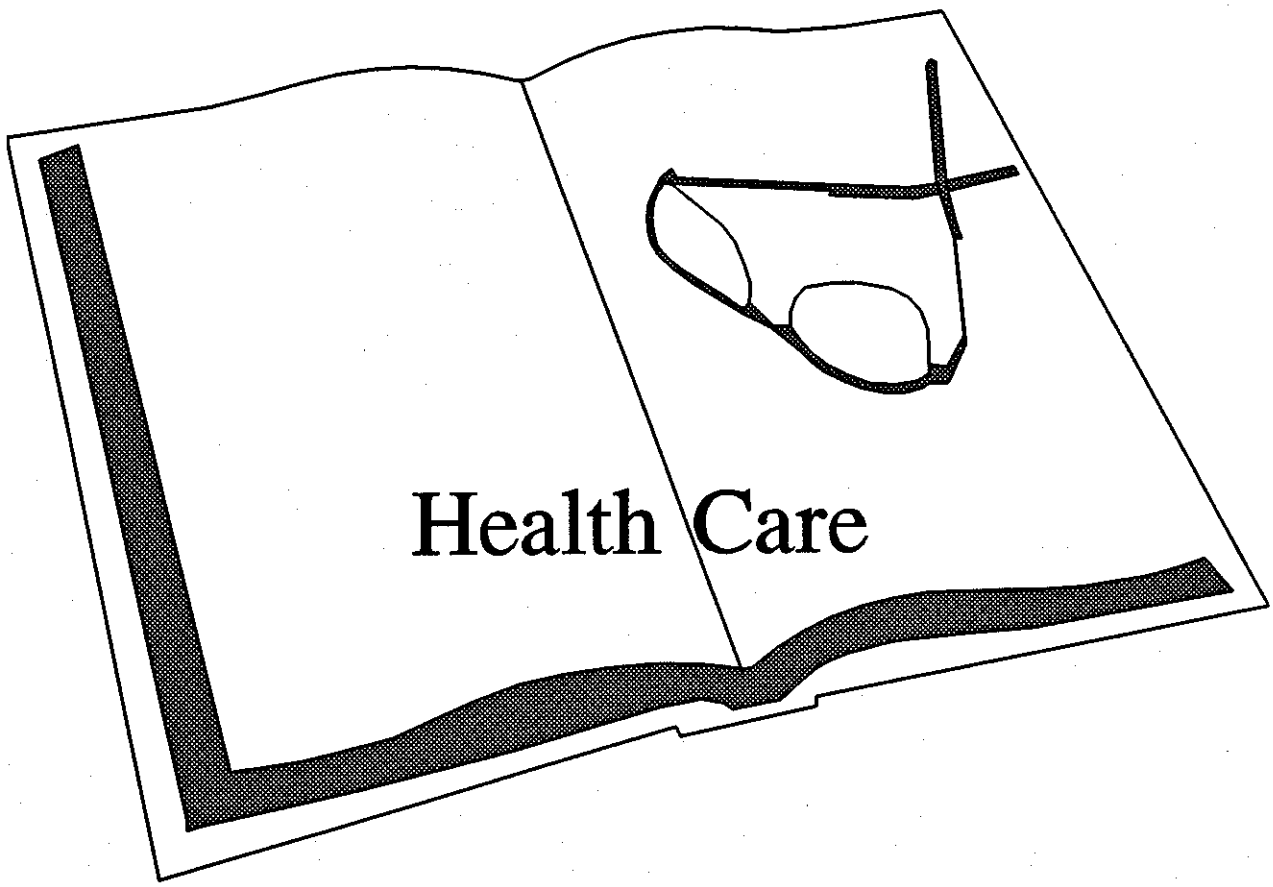
Semiconductor Sensor for Gas Detector.
National Research Institute for Pollution and Resources 10 p. 1977.
semiconductors; gas detectors; metal oxides; LP gas; carbon monoxide



Health Care

This topic area is dominated by a large series of papers by Bryan presenting occupant behavior analyses in fire incidents in health care facilities in which detectors and sometimes sprinklers are present. Thus, these works document the performance of detection systems in actual use. Several of the papers dealing with the present debate on the need for detectors in the presence of "quick response" sprinklers also are included.

As with gas sensors, the British have been quite active in this area. There are a series of papers by British authors which detail the utilization of detectors and sprinklers in health care facilities in the UK. Two of these papers [Todd 1989 and Palmer 1988] examine the detector/sprinkler question based on full-scale test results. They conclude that, while the quick response sprinkler acts to suppress a bed fire, the cooling of the gas layer causes decreased visibility and increased patient exposure to toxic gases. Thus, they feel that rapid detection/notification of staff for patient evacuation of the fire zone provides the optimum arrangement at present.

Bryan, J. L.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the American Nursing Home and Convalescent Center on May 11, 1978.
Maryland Univ., College Park
NBS-GCR-80-216; 32 p. August 31, 1978.
Available from National Technical Information Services PB80-192677
evacuation; fire departments; fire extinguishers; fire investigations; mattresses; nursing homes; nursing staff
The fire incident at the American Nursing Home and Convalescent Center on May 11, 1978 was detected by the nursing staff at approximately 1540 hours. The fire at detection involved a polyurethane mattress on an unoccupied bed in patient room 308, the third floor west wing. The three-story and basement building of fire resistive construction was erected in 1973. At the time of the fire incident, the building had a registered occupancy of 265 patients. The fire was confined to the mattress of the bed in room 308 and essentially extinguished by nursing personnel with a 6 pound, 2A, 40BC rated extinguisher. The fire department was notified and responded, with their services being limited to salvage, overhaul and smoke removal. Nine nursing staff, including the Director of Nursing, evacuated the approximately twenty-five patients in the fire zone to other areas on the third floor in a two phase evacuation prior to fire department arrival. There was no patient or staff injuries in this fire incident, including the extinguishing operations.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Crownsville Hospital Center on January 26, 1979.
Maryland Univ., College Park
NBS-GCR-80-233; 26 p. June 30, 1979.
Available from National Technical Information Services PB80-208986
evacuation; fire departments; fire extinguishers; fire investigations; patients; smoke; sprinkler systems
The fire incident at the Crownsville Hospital Center on January 26, 1979 was detected by a patient at approximately 0420. The fire at detection consisted of a flaming linen bag in the linen room of ward 91 in the Medical-Surgical Building with flames to a reported height of four to five feet. The fire was reported by phone to the facility operator, and the local alarm system was activated, and the fire department notified. Approximately twenty-five patients were on ward 91 at the time of the fire incident. Fifteen patients were evacuated to ward 93. Nine patients were moved in beds, five were ambulatory and walked, and one was carried. Smoke spread through ward 91 due to the linen room door being left open, and the open plan design of the ward. The one story, fire resistive medical-surgical building was approximately twenty-two years old. The Anne Arundel County Fire Department responded and verified the fire extinguishment by a staff member with a five pound dry chemical losted extinguisher with a 5A, 10BC rating. The wet pipe automatic sprinkler system also activated from a single ordinary rated head. The fire department also performed salvage and overhaul operations.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Kensington Gardens Nursing Home on January 1, 1978. Final Report.
Maryland Univ., College Park
NBS-GCR-79-159; 67 p. June 30, 1978.
Available from National Technical Information Services PB-290892
chairs; doors; evacuation; fire departments; fire fighters; nursing homes; patients; room fires; smoke; upholstered furniture

The fire incident at the Kensington Gardens Nursing Home on January 1, 1978 was detected by the nursing staff at approximately 9:56 a.m., at which time the fire consisted of preflashover state in patient room 250. The fire apparently originated in an upholstered chair from discarded smoking materials or matches by the room's occupant. The fire consumed the chair, spread to sheets on an adjacent bed, and the privacy curtains hanging between the beds. The fire was confined to the room of origin and did not achieve flashover. The two story building consisted of an original section of ordinary construction, erected in 1937, and a new addition of protected noncombustible construction which was six years old. The fire department was notified at 9:59 a.m. by telephone. Housekeeping and nursing personnel assigned to the second floor, west wing, detected the fire in patient room 250 and immediately closed the door to this fire room. Other patient room doors in the fire zone were then closed, and three patients were evacuated from the fire zone before the corridor became untenable from smoke migration. The housekeeping staff directed arriving fire department personnel up the exterior stairway to the fire zone. The fire department personnel removed four male patients from patient rooms within the fire zone. The seven patients in the fire zone were evacuated by the staff and the fire department in approximately ten minutes from the time of fire detection. The closing of the door to the fire involved room, and the closing of the patient room doors appeared to be critical adaptive actions in this fire incident.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Magnolia Gardens Nursing Home on April 2, 1978.
Maryland Univ., College Park
NBS-GCR-80-211; 43 p. July 31, 1978.
Available from National Technical Information Services PB80-187578
fire departments; fire incident; nursing homes; nursing staff; patients; smoke
The fire incident at the Magnolia Gardens Nursing Home on April 2, 1978 was detected by the nursing staff at approximately 1510 hours. A member of the nursing staff noticed smoke issuing from a ceiling ventilation diffuser in the second floor lounge area. The facility has a capacity of 104 patients and 102 patients were registered at the time of the fire incident. The facility is a two story protected noncombustible construction fully sprinklered building. Upon the detection of the smoke in the second floor lounge area, the ten patients in the area were evacuated through smoke barrier doors to an adjacent area of the second floor. The patients involved were ambulatory or in wheelchairs. The nursing staff then notified the fire department by phone and activated the facility local alarm system. The facility emergency procedures were initiated, the fire department responded and determined the cause of smoke as an electrical motor failure. No smoke detectors or automatic sprinkler heads activated.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Manor Care, Hyattsville Nursing Home on January 10, 1978.
Maryland Univ., College Park
NBS-GCR-80-206; 53 p. June 30 1978.
Available from National Technical Information Services PB80-183221
evacuation; fire department; fire investigations; nursing homes; nursing staff; patients; room fires; sprinkler systems
The fire incident at the Manor Care, Hyattsville Nursing Home on January 10, 1978 was detected by the nursing staff at approximately 2130 hours. The fire at detection involved multiple ignitions, some of which had self-extinguished. A preflashover fire was detected in the bathroom of the patient room of fire origin, room 65. The two-story building of fire resistive construction was approximately 12 years old. At the time of the fire incident the building had a registered occupancy of 126 patients. The fire was confined to the bathroom by staff action and extinguished by the operation of a single automatic sprinkler head. The facility alarm was activated and the fire department notified by telephone calls. The ten nursing staff on duty evacuated a total of ten patients from the fire zone on the terrace level and eight patients from the area above the fire zone in approximately 6.5 minutes, and was completed before the arrival of the fire department. The fire department confirmed extinguishment and performed overhaul and smoke removal operations.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Manor Care, Largo Nursing Home on August 14, 1978.
Maryland Univ., College Park
NBS-GCR-80-223; 36 p. September 30, 1978.
Available from National Technical Information Services PB80-195605
evacuation; fire departments; fire extinguishers; fire investigations; nursing homes; nursing staff; smoke
The fire incident at the Manor Care, Largo Nursing Home on August 14, 1978 was detected by the maintenance engineer at approximately 1100 hours. The fire at detection consisted of flaming in the flue of the incinerator with smoke propagation to the incinerator room and the first floor corridor of the east wing. The two story building of fire resistive construction was approximately two years old. At the time of the fire incident the building had a registered occupancy of approximately 100 patients. Forty patients were evacuated by the nursing staff from the second floor skilled care areas, above the area of fire origin, to the second floor solarium. The fire was contained within the incinerator and extinguished by the

maintenance engineer with a 5 pound all-purpose dry chemical extinguisher immediately prior to fire department arrival. The smoke spread was confined to the first floor east wing area by the smoke barrier doors, with smoke migration to the second floor east wing through minor openings between the first and second floors.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the North Arundel Hospital on September 4, 1978.
Maryland Univ., College Park
NBS-GCR-80-224; 29 p. October 31, 1978.
Available from National Technical Information Services PB80-197254
fire investigations; hospitals; nursing staff; bedding; patients
The fire incident at the North Arundel Hospital on September 4, 1978 was detected by a nurse at approximately 1315 hours. The fire at detection consisted of a smoldering propagation with a char area approximately two inches in diameter on the bedspread and blankets covering a sleeping sedated patient. The building in which the fire zone was located was of fire resistive construction, approximately four years old. At the time of the fire incident the building had a registered occupancy of approximately 285 patients. No patients were evacuated or moved in this fire incident. The bedding materials involved were removed from the bed and patient, carried to a utility room and extinguished by dousing with water in a sink. The staff and fire department were not notified, no visible smoke spread occurred, and there were no staff or patient injuries.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Sacred Heart Home, March 19, 1978.
Maryland Univ., College Park
NBS-GCR-80-205; 43 p. July 31, 1978.
Available from National Technical Information Services PB80-183212
evacuation; fire departments; fire investigations; nursing staff; nursing homes; patients; smoke
The fire incident at the Sacred Heart Home on March 19, 1978 was detected by the nursing staff at approximately 1330 hours. The nursing staff was investigating an odor of smoke on the third floor when the fire was detected in patient room 335, with flames issuing from a waste basket to a height of approximately eighteen inches. The facility has a capacity of 102 patients and at the time of the fire incident, had a registered capacity of 101 patients. The facility had the main building of protected noncombustible construction, is approximately forty-two years old and had the north wing of fire resistive construction added approximately 14 years ago. Upon detection of the fire, the nursing staff activated the local alarm system, which automatically transmits a signal to the fire department by a central station system arrangement, and also phoned the fire department. The nursing staff extinguished the waste container fire with water from the sink in room 335, evacuated the one ambulatory patient from room 335 and closed the patient room door. The fire emergency procedures of the facility were initiated by all the staff, the fire department responded and verified the extinguishment. There was reported to be no visible smoke accumulation in patient room 335 or the third floor corridor.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Sligo Gardens Nursing Home on June 10, 1978.
Maryland Univ., College Park
NBS-GCR-80-219; 41 p. August 31, 1978.
Available from National Technical Information Services PB80-191018
doors; evacuation; fire alarm systems; fire extinguishers; fire investigations; nursing homes; nursing staff; television; patients; room fires
The fire incident at the Sligo Gardens Nursing Home on June 10, 1978 was detected by the Second Floor, Nursing Wing charge nurse at approximately 1330 hours. The fire at detection consisted of a flaming power cord to a television set in patient room 228. The two story building of fire resistive construction was approximately ten years old. At the time of the fire incident the building had a registered occupancy to the full capacity of 100 patients. One patient was evacuated by the nursing staff from the room of fire origin without injury. The fire and smoke propagation was limited to room 228 by the closing of the 3/4 hour fire resistive rated doors. The facility local alarm system was activated, the fire department notified and they responded. The fire had been extinguished prior to fire department arrival by nursing staff with a 5 pound all puroose dry chemical extinguisher.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Southern Maryland Hospital Center on January 2, 1979.
Maryland Univ., College Park
NBS-GCR-80-232; 33 p. February 28, 1979.
Available from National Technical Information Services PB80-207343
fire departments; fire extinguishers; fire investigations; hospitals; nursing staff; smoke; smoke detectors
The fire incident at the Southern Maryland Hospital Center on January 2, 1979 was detected by a patient at approximately 0001 hours. The male patient in the psychiatric care unit on the fourth floor, west wing, reported to a nurse at the nurses station that there was an odor of smoke in the south corridor outside the closed

door of vacant patient room 414. The nurse immediately initiated the facility fire emergency procedures with a phone call to the facility telephone operator. The telephone operator alerted the facility with a verbal "Code Red" an anouncement over the public address system and phoned the Prince George's County Fire Communications Center on the "911" emergency number. The fire in a fiber glass waste container was extinguished by a male psychiatric patient using a 10 pound, listed all purpose dry chemical extinguisher, rated 5A, 60B, C. The smoke propagation was heavy in room 414, and moderate in the south corridor of the fourth floor, west wing. The smoke was confined to the east wing area by the smoke barrier doors. The smoke detector system in the psychiatric care unit, including room 414, activated immediately following extinguishment. The seventeen patients in the psychiatric care unit were all ambulatory and were evacuated to the fourth floor, east wing, following extinguishment for the duration of the night. The five- and two-story building of fire resistive construction was approximately thirteen months old. At the time of the fire incident, there were 17 patients in the 25 bed capacity psychiatric unit.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the St. Annes Infant Home on June 20, 1978.
Maryland Univ., College Park
NBS-GCR-80-221; 26 p. September 30, 1978.
Available from National Technical Information Services PB80-197262
evacuation; fire departments; fire extinguishers; fire investigations; nursing homes; nursing staff; smoke
The fire incident at the St. Annes Infant Home on June 20, 1978, was detected by the administrator at approximately 2015 hours. The fire at detection involved the overheating of electrical switch gear, which produced a white-colored smoke, completely filling the boiler room in the basement. The four-story and basement building of fire resistive construction was erected approximately 15 years ago. At the time of the fire incident, the facility had an occupancy of 79 children and 15 mothers. The fire was confined to the overheated electrical switch gear, with no visible flames, and smoke limited to the boiler room, the area of fire origin. The fire department was notified and responded. No residents were moved within the facility or evacuated from the facility. The staff action of turning off the electrical power stopped the overheating, and closing of the boiler room door confined the smoke.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the University Nursing Home on April 13, 1979. Final Report.
Maryland Univ., College Park
NBS-GCR-80-191; 36 p. January 1980.
Available from National Technical Information Services PB80-158157
death; doors; egress; evacuation; fire alarm systems; fire department; fire fighters; flashover; nursing homes; nursing staff; patients;room fires; smoke detectors
At approximately 0833 hours on April 13, 1979, the smoke detector located on the ceiling of the lounge area at the south end of the corridor of the South Section of B wing on the second floor activated in the University Nursing Home, 901 Arcola Avenue, Silver Spring, Maryland. This detector was activated by a flow of convected heat and dark smoke from the door of patient room 27 fifteen feet to the North. The activation of this smoke detector automatically initiated the activation of the local alarm system. The receptionist upon hearing the alarm notified the Montgomery County Emergency Operations Center. The nursing staff were able to close the doors to all the patient rooms in both the South and West Sections of B wing with the exception of the door to the room of fire origin, room 27. The room experienced flashover and the rapidly spreading heat and smoke forced the staff out of the area. The smoke barrier doors closed with the activation of the local alarm system and prevented the spread of smoke extensively to the West Section and in particular to A wing. Approximately 21 patients were removed from rooms in the South Section by the fire department, 7 of these down ladders. An additional 26 patients were evacuated from the West Section of B wing. Seventeen patients were transported to hospitals for medical treatment with eight staff members. Two of these patients subsequently died. The total fire department response involved three alarms. The fire was extinguished within 5 minutes of the arrival of the first engine and within 9 minutes of smoke detector activation.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Washington Adventist Hospital on December 22, 1978.
Maryland Univ., College Park
NBS-GCR-80-231; 31 p. January 31, 1979.
Available from National Technical Information Services PB80-207905
doors; evacuation; fire extinguishers; fire investigations; hospitals; nursing staff; patients; smoke
The fire incident at the Washington Adventist Hospital on December 22, 1978 was detected by a staff employee at approximately 1028 hours. The fire at detection consisted of a plastic food tray, with plastic containers and paper combustibles on an energized hot plate in the clean utility room of nursing unit 2200 on the second floor. At detection, flames had achieved a height of approximately 24 inches and a dense black layer of smoke had accumulated 18 inches in depth at the ceiling of the room of origin. The six story building of fire resistive construction was approximately twenty-eight years old. At the time of the fire incident this hospital had a registered occupancy of 360 patients. Two patients were evacuated

from the corridor adjacent to the room of origin, and one patient from a room across the corridor by the nursing staff. The fire and smoke propagation was limited to the clean utility room by the closing of the 20 minute fire resistive rated door. The hospital local alarm system was activated, the hospital fire brigade and the fire department were notified. The fire was extinguished by a physcian and nursing staff personnel with a pitcher of ice water and a 2-1/2 gallon pressurizd water extinguisher prior to fire department arrival. The fire department verified extinguishment and conducted overhaul and ventilation operations.

Bryan, J. L.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Kitchen Fire Incident at the Manor Care, Adelphi Nursing Home on March 1, 1978.
Maryland Univ., College Park
NBS-GCR-80-207; 42 p. July 31, 1978.
Available from National Technical Information Services PB80-185739
fire extingushers; fire investigations; kitchen fires; nursing homes
The fire incident in the kitchen at the Manor Care, Adelphi Nursing Home on March 1, 1978 was detected by the cook at approximately 0615. The fire at the time of detection consisted of grease burning on the side of the stove with light smoke and flames approximately eighteen inches high. The two story building of five resistive construction was approximately ten years old. At the time of the fire incident, the building, with a capacity for 210 patients, had a registered occupancy of 185 patients. The cook extinguished the fire with a ten pound all purpose listed dry chemical extinguisher. The local alarm system of the facility was not activated, the fire department was not notified, and since patients were not in the fire zone, no evacuation was initated.

Bryan, J. L.; DiNenno, P. J.
Human Behavior in a Nursing Home Fire.
Maryland Univ., College Park
Fire Journal, Vol. 74, No. 3, 44-47,141-143, May 1980.
human behavior; nursing homes; nursing staff; fire departments; smoke; flashover; fire alarm systems
University Nursing Home was a two-story building of protected, noncombustible construction, located in Silver Spring, Maryland. At approximately 8:33 am on April 13, 1979, a smoke detector on the ceiling of a lounge area at the south end of the corridor in the south section of B wing on the second floor of the nursing home activated. This detector was activated by a flow of convected heat and dark smoke from the door of patient room 27, approximately 15 feet to the north.

Bryan, J. L.; DiNenno, P. J.; Milke, J. A.
Determination of Behavior Response Patterns in Fire Situations, Project People II. Final Report--Incident Reports August 1977-June 1980.
Maryland Univ., College Park
NBS-GCR-80-297; 234 p. August 31, 1980.
Available from National Technical Information Services PB81-224545
doors; evacuation; fire alarm systems; fire departments; fire extinguishers; fire investigations; hospitals; nursing homes; nursing staff;smoke; smoke detectors; sprinkler systems
This report is a summary and initial analysis of the sixty-five fire incidents included in the study population of Project People II. The fire incidents have been analyzed to present in tabular form the descriptive characteristics of the facilities with the construction, interior finish, and fire zone features shown. Staff and fire department behavioral actions were summarized and are presented in another table, with the number of persons evacuated, the means of evacuation table, with the number of persons evacuated, the means of evacuation, the extinguishment behavior, the closing of doors and the ventilation of smoke through the facility windows. The fire protection features of the facilities are presented in a third table. The sixty-five fire incidents included in this summary occurred between August 10, 1977 and June 25, 1980. The facilities involved in the incidents have primarily been health care facilities in accordance with the objective of the research study, with twenty-five nursing home or convalescent center and thirty-three hospital incidents. In addition, two schools, two high rise apartments, two university dormitories and one correctional institution fire incidents were included due to the extensive evacuation behavior. The abstract of each fire incident report is presented with the diagrams of the maximum fire and smoke development in the realms and the movements of personnel in the survey of the facility and interviews with critical fire department, staff and patient personnel.

Bryan, J. L.; Milke, J. A.
Determination of Behavior Response Patterns in Fire Situations, Project People II. Final Report. Health Care.
Maryland Univ., College Park
NBS-GCR-81-343; 304 p. October 1981.
Available from National Technical Information Services PB82-136771
doors; evacuation; fire alarm systems; fire departments; fire extinguishers; fire investigations; hospitals; nursing homes; nursing staff; smoke; smoke detectors; sprinkler systems
This study involved the detailed investigation of 59 fire incidents in Health Care Facilities located in the State of Maryland, with one facility in Philadelphia. A total of 150 staff participants, 9 patients and 53 fire department personnel were interviewed relative to the fire and smoke

development during the fire incident, and the human behavior responses of the participants during the fire incident. The analysis and study of the fire incident and interview data enabled the examination of the parameters of the fire incident including: area of fire origin, ignition and fuel characteristics, and the fire protection design features of the building. The human behavior variables of the fire incidents relative to the means of becoming aware of the fire incident, and the first three actions of the participants were compared to the variables of the fire and smoke development, previous training and fire experience of the participants, and with their belief in the safety of the building. Statistical analyses were performed indicating the relationships among the variables. The evacuation behavior was studied with the sequences of the actions adopted by the personnel.

Bryan, J. L.; Milke, J. A.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Hidden Brook Treatment Center on February 15, 1979.
Maryland Univ., College Park
NBS-GCR-80-238; 32 p. August 31, 1979.
Available from National Technical Information Services PB80-209059
evacuation; fire departments; fire investigations; nursing staff; patients; smoke; smoke detectors
This fire incident was detected at approximately 2330 by the activation of a smoke detector in the first floor corridor and the concurrent activation of the local alarm system. The nursing staff of three persons and one visitor directed and assisted the thirty-five ambulatory patients from the building in approximately seven minutes. The fire was initiated in the first floor lounge of the four-story protected ordinary constructed building. The spread of fire within the lounge was initiated by fire retardant treated wall paneling. The vertical spread of flames and heat up the west stairway was limited by the one hour fire resistant rated door at the first floor. The spread of smoke was limited to a light accumulation in the patient occupied areas, even though dense smoke was observed in the first floor lounge, due to the effective operation of the corridor smoke barrier doors. The Harford County Communications Center was immediately notified by the staff. The Bel Air Volunteer Fire Department responded and extinguished the fire with one 1-1/2 inch hose line within 15 minutes of the activation of the detector, confining the fire to the area of origin, the first floor lounge. The fire department also performed ventilation, overhaul and salvage operations.

Bryan, J. L.; Milke, J. A.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Pikesville Nursing and Convalescent Center on February 8, 1979.
Maryland Univ., College Park
NBS-GCR-80-236; 29 p. August 31, 1979.
Available from National Technical Information Services PB80-204985
fire departments; fire investigations; nursing homes
This fire incident at the Pikesville Nursing and Convalescent Center on February 8, 1979 was initially detected by a laundress entering the laundry room. The laundress turned off the washing machine and also manually tripped the circuit breaker immediately after detection, which resulted in the extinguishment of the fire. The laundress then called the desk receptionist to initiate the facility emergency procedures and to notify the Baltimore County Fire Department. Patient room doors were closed by staff personnel and no patients were evacuated during this fire incident. Damage was limited to clothing inside the washing machine located in the basement of this two-story, 8-year-old facility of protected non-combustible construction. The Baltimore County Fire Department responded and verified extinguishment.

Bryan, J. L.; Milke, J. A.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Union Hospital of Cecil County on July 29, 1979.
Maryland Univ., College Park
NBS-GCR-80-261; 25 p. November 30, 1979.
Available from National Technical Information Services PB80-218084
fire departments; fire investigations; hospitals; smoke; smoke detectors
This fire incident at the Union Hospital of Cecil County on July 29, 1979 was initially detected by a pharmacy technician who perceived a smoke odor in the pharmacy on the first floor at approximately 1212 hours. The pharmacy technician immediately phoned the facility operator who initiated the facility fire emergency procedures with the public address system announcement and notified the fire department. The pharmacy technician and the laundry supervisor located the source of the smoke emitting from an exhaust duct in the linen finishing room on the first floor. Damage was limited to the duct in the finishing room and light smoke damage first floor area in the six-story, fire-resistive, nine-year-old building. Patients were protected in their rooms behind closed doors. The fire self-extinguished following the smoke detector activation of dampers in the duct. Ventilation of the first floor area with fans and over-haul procedures was performed by the Elkton and North East, Maryland Fire Departments with the Christinia and Newark, Delaware Volunteer Fire Departments.

Bryan, J. L.; Milke, J. A.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Wilson Health Care Center on June 25, 1980.

Maryland Univ., College Park
NBS-GCR-80-277; 50 p. July 31, 1980.
Available from National Technical Information Services PB80-224934
fire departments; fire extinguishers; fire investigations; mattresses; nursing homes; nursing staff; room fires; sprinkler systems
A series of three fires occurred in the Wilson Health Care Center, 301 Russell Avenue, Gaithersburg, Maryland in the early morning hours of June 25, 1980. The fires were all of undetermined, suspicious origin and all occurred in patient room 239, located on the second floor of the southwest wing. The Wilson Health Care Center is a portion of the Asbury Methodist Home Complex. The building of fire resistive construction was initially constructed in 1973 and the southwest wing involved in these fire incidents was constructed in 1980. The southwest wing is protected with combination smoke detectors and door closers on the patient room doors, wet pipe sprinkler system (7) class III standpipe system (11) smoke barrier doors in the corridors and extinguishers distributed according to standard partice.

Bryan, J. L.; Milke, J. A.; DiNenno, P. J.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at the Sheppard and Enoch Pratt Hospital on April 5, 1979.
Maryland Univ., College Park
NBS-GCR-80-241; 32 p. July 31, 1979.
Available from National Technical Information Services PB80-207236
beds (furniture); evacuation; fire departments; fire extinguishers; fire investigations; hospitals; patients
The fire incident at the Shepard and Enoch Pratt Hospital on April 5, 1979 was detected by a patient at approximately 0721 hours. The fire at detection consisted of the blankets, linen and top surface over three-fourths of the area of a single bed in room 110 of wing 1-E of the Chapman Building. The fire was reported by phone to the facility operator who initiated the "fire call" announcement on the public address system and notified the Baltimore County Fire Department. The approximately twenty ambulatory patients on the wing at the time of the fire were evacuated initially through the smoke barrier door to the stairway and eventually to the second floor of the building. The fire was extinguished by staff and the facility fire brigade, expending fifteen 5-pound dry chemical listed extinguishers with a 5A, 10BC rating. The fire department responded, verified extinguishment and performed salvage and overhaul operations.

Fire

Fire
Corner Questions Decision Not to Have Smoke Detectors in Fatal Fire Hospital.
Fire, Vol. 74, No. 921, 521, March 1982.
smoke detectors; hospitals

Fire Chief

Fire Chief
Nursing Home Saved.
Fire Chief, Vol. 21, No. 12, 32, December 1977.
nursing homes; fire detection; training; evacuation; patients

Koffel, W. E.

Koffel, W. E.
Detectors and/or Sprinklers in Residential and Institutional Occupancies? Sprinklers Are Sufficient.
Koffel Associates, Inc., Ellicott City, MD
Building Official and Code Administrator, Vol. 23, No. 3, 34-35,37-38, May/June 1989.
fire detectors; sprinkler systems; fire codes; effectiveness; health care facilities; bedrooms

Koffel, W. E.
Estimating the Effectiveness of State-of-the-Art Detectors and Automatic Sprinklers on Life Safety in Health-Care Occupancies.
Koffel Associates, Inc., Ellicott City, MD
Pacific Rim Conference of Building Officials Proceedings. April 9-13, 1989, Honolulu, HI, Intl. Conf. of Building Officials, Whittier, CA, 175-188 pp, 1989.
health care facilities; effectiveness; building codes; fire detectors; sprinklers; life safety; smoke detection; qualitative analysis; fire tests

Koffel, W. E.
Estimating the Effectiveness of State-of-the-Art Smoke Detectors and Automatic Sprinklers on Life Safety in Hospitals. Technical Document Series.
Koffel Associates, Inc., Marriottsville, MD
Technical Document 055894; 38 p. July 1987.
fire safety; smoke detectors; sprinklers; life safety; hospitals

Koffel, W. E.
Health Care Facilities--Do Sprinklers and Detectors Save Lives?
Koffel Associates, Inc., Ellicott City, MD
Fire Protection, Vol. 17, No. 1, 6-8,10-12, March 1990.
health care facilities; sprinklers; fire detection systems; life safety; hospitals; fire statistics; response time; large scale fire tests; smoke detectors

Koffel, W. E.
Smoke Detectors in Patient Rooms: Two Views of the Same Proposal...And Against the Proposal.
Koffel Associates Inc., Marriotsville, MD
Fire Journal, Vol. 81, No. 5, 21,114, September/October 1987.
smoke detectors; health care facilities; hospitals

Meland, O.

Meland, O.; Skaret, E.
Smoke Control in Hospitals.
SINTEF, River and Harbour Lab.
Norwegian Inst. of Technology
Fire Technology, Vol. 22, No. 1, 33-44, Feb. 1986.
smoke control; ventilation; smoke detectors; smoldering; large scale fire tests

Mortimer, A.

Mortimer, A.
Dorset Hospital's "Intelligent" Detection System.
Autronica Industrial Ltd., England
Fire, Vol. 77, No. 952, 26-27, October 1984.
hospitals; fire detection systems; escape means; false alarms

Neibauer, L. L.

Neibauer, L. L.
Detectors and/or Sprinklers in Residential and Institutional Occupancies? Both Are Necessary.
Automatic Fire Alarm Association
Building Official and Code Administrator, Vol. 23, No. 3, 34-36, May/June 1989.
fire detectors; sprinkler systems; fire codes; smoke detectors; hotels; life safety

O'Neill, J. G.

O'Neill, J. G.
Brief Status Report on NBS/CFR Sprinkler Projects.
National Bureau of Standards, Gaithersburg, MD
National Fire Prevention and Control Administration. Conference on Low Cost Residential Sprinkler Systems. November 29-20, 1977, 16 pp, 1977.
sprinklers; health care facilities; stairways
The National Bureau of Standards/Center for Fire Research, Program for Fire Detection and Control Systems, is presently engaged in two major sprinkler research projects. The first is a study of automatic sprinklers in health care facilities, and the second is a study of sprinkler and spray methods for the protection of open or partially open stairways. This is a brief report on the status as of November 1977. Full technical information will be presented in final reports when projects are completed.

Palmer, K.

Palmer, K.
Fire Protection in Health Care Premises.
Fire Research Station, Borehamwood, England
Fire Prevention, No. 209, 27-31, May 1988.
hospitals; mattresses; bedding; fire detection systems; sprinkler systems; upholstered furniture

Pearce, N.

Pearce, N.
Fire Alarm Systems in Health Care Premises.
Fire Surveyor, Vol. 15, No. 2, 12-17, April 1986.
health care facilities
The automatic fire detection system in a health care building has three prime functions. Briefly, its purpose is to detect a fire and to sound the alarm while at the same time summoning the fire brigade. Unfortunately the performance of many installed systems leaves a lot to be desired. In this article the author describes some of the main requirements of a hospital fire alarm system, and draws attention to some of the deficiencies and limitations of the systems we live with at the moment. A few areas where so called 'new generation' systems might improve matters are highlighted. The opinions expressed in this article are those of the author and necessarily those of the DHSS.

Todd, C.

Todd, C.
Fire Safety in Health Care Premises.
Society of Fire Protection Engineers, UK
Fire Surveyor, Vol. 18, No. 1, 33-40, Feb. 1989.
health care facilities; fire safety; fire tests; sprinklers; fire detection; training

Wagstaff, T.

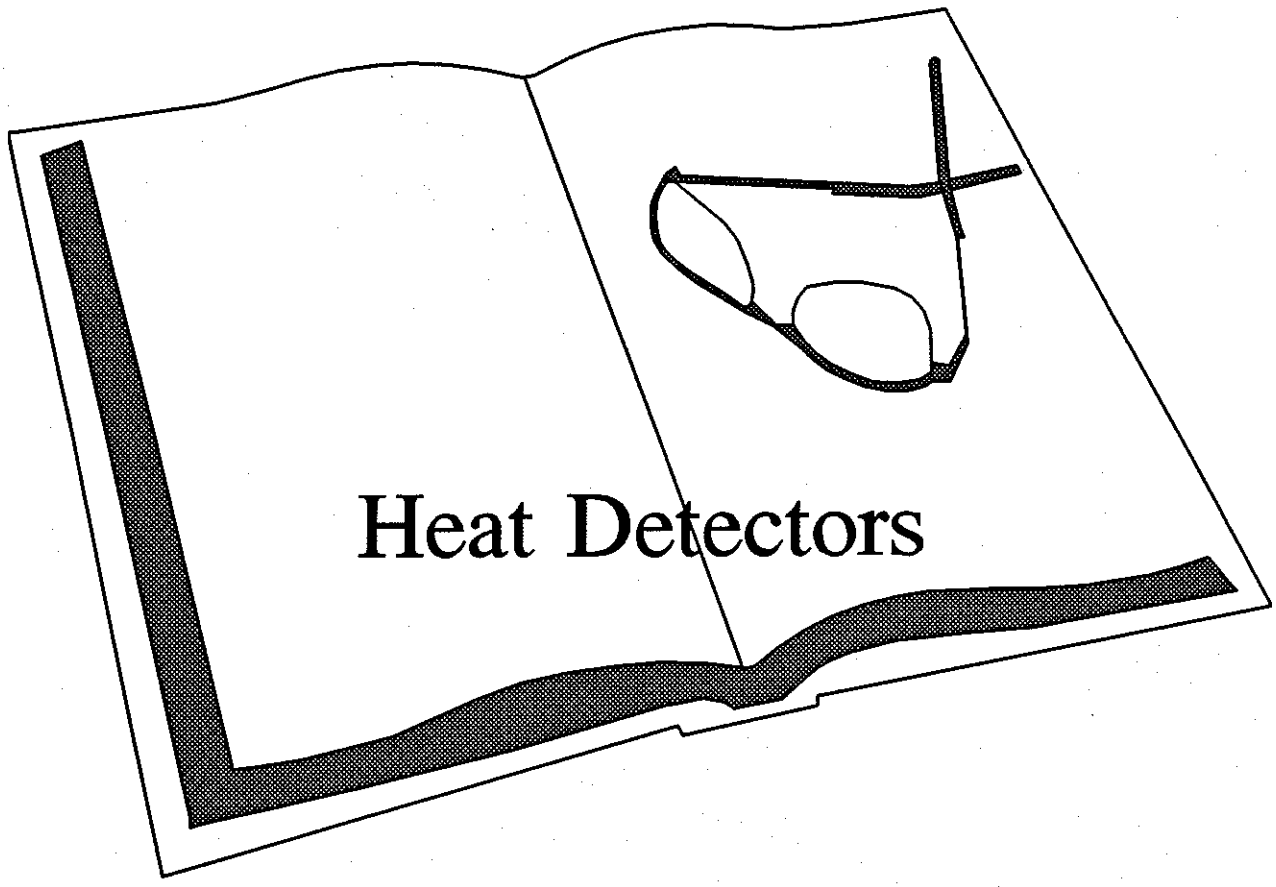
Wagstaff, T.
Detection Systems for Hospitals and Residential Care Premises.
Fire Surveyor, Vol. 13, No. 2, 4-7, August 1984.
fire detectors; hospitals; fire safety; residential buildings; fire alarm systems
Too often automatic fire alarm and detection systems are provided simply to fulfill a Code requirement. Hence, there is little incentive to attempt to match the system to the functional requirements of the building. Health care premises, by the very nature of their occupants, cannot be equated to other public buildings and their evacuation and fire policies reflect these differences. The fire alarm and

detection systems, if they are to be effective, should be designed to augment these policies. This article puts forward the special fire detection and alarm needs of hospitals and residential care premises.

Wagstaff, T.
Fire Alarms in Health Care Premises.
Department of Health and Social Security, London, England
Coventry Area Health Authority. Fire Safety in Health Care Buildings. November 6, 1980, Coventry, England, 65-77 pp, 1980.

health care facilities; fire alarm systems; fire detection

International Fire Detection
Bibliography 1975-1990



Heat Detectors

This section contains a small number of papers, none of which present any new material. Most are review articles containing similar descriptions of the operating principles of current devices. The only paper of note describes the performance characteristics of a German pneumatic tube system [Luck *et al* 1986].

Brooks, J. L.

Brooks, J. L.
Heat-Activated Alarm System for Railroad Boxcars Carrying Explosives. Final Report. October 1974-September 1977.
Civil Eng. Lab (Navy), Port Hueneme, CA
CEL-TN-1512; 27 p. December 1977.
Available from National Technical Information Services AD/A-051868
railroads; temperature warning system; explosives; transportation; safety; friction; heat; fire safety; heat detectors
An alarm system concept designed to alert train operators of excessive heating of any of the wheels of a boxcar laden with high-explosives has been developed. The excessive heat was determined to be caused by friction between a wheel and brake shoe that does not properly release while the train is in motion. The alarm system consists of heat sensors that are located on the boxcar above each wheel. These are wired to an alarm transmitter mounted near the top of the boxcar. This concept requires that each boxcar laden with high explosives be outfitted with the sensors and a transmitter. A receiving system is then located in the train caboose to decode the alarm signals, identify the boxcar, and sound the alarm. The system hardware, tests, and evaluation are described.

Burry, P.

Burry, P.
Principles of Fire Detection. Part 2. Heat Detectors.
Fire Research Station, Borehamwood, England
Fire Surveyor, Vol. 9, No. 6, 21-27, Dec. 1980.
heat detectors; fire detection

Drysdale, D. D.

Drysdale, D. D.
Mechanisms of Fire Detection.
Edinburgh Univ., Scotland
University of Edinburgh. Recent Developments in Fire Detection and Suppression Systems. (With Additional Papers
From a Course of the Same Title--July 8-9, 1987). November 10-12, 1986, Edinburgh, Scotland, 11 pp, 1987.
fire detection; flame detectors; heat detectors; smoke detectors

Lathrop, J. K.

Lathrop, J. K.
Dwelling Fire Kills Three Despite Heat Detectors.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 72, No. 5, 120-122, Sep. 1978.
heat detectors; residential buildings; death; single family dwelling

Luck, H. O.

Luck, H. O.; Deffte, N.
Dynamic Performance of Pneumatic Tube Type Heat Sensitive Fire Detectors.
Duisburg Univ., West Germany
International Association for Fire Safety Science. Fire Safety Science. Proceedings. 1st International Symposium.
October 7-11, 1985, Gaithersburg, MD, Hemisphere Publishing Corp., NY, Grant, C. E. and Pagni, P. J., Editors, 729-737 pp, 1986.
fire detectors; heat detectors

Newman, J. S.

Newman, J. S.
Principles for Fire Detection.
Factory Mutual Research Corp., Norwood, MA
Fire Technology, Vol. 24, No. 2, 116-127, May 1988.
fire detection; response time; enclosures; heat detectors; compartment fires; heat release rate

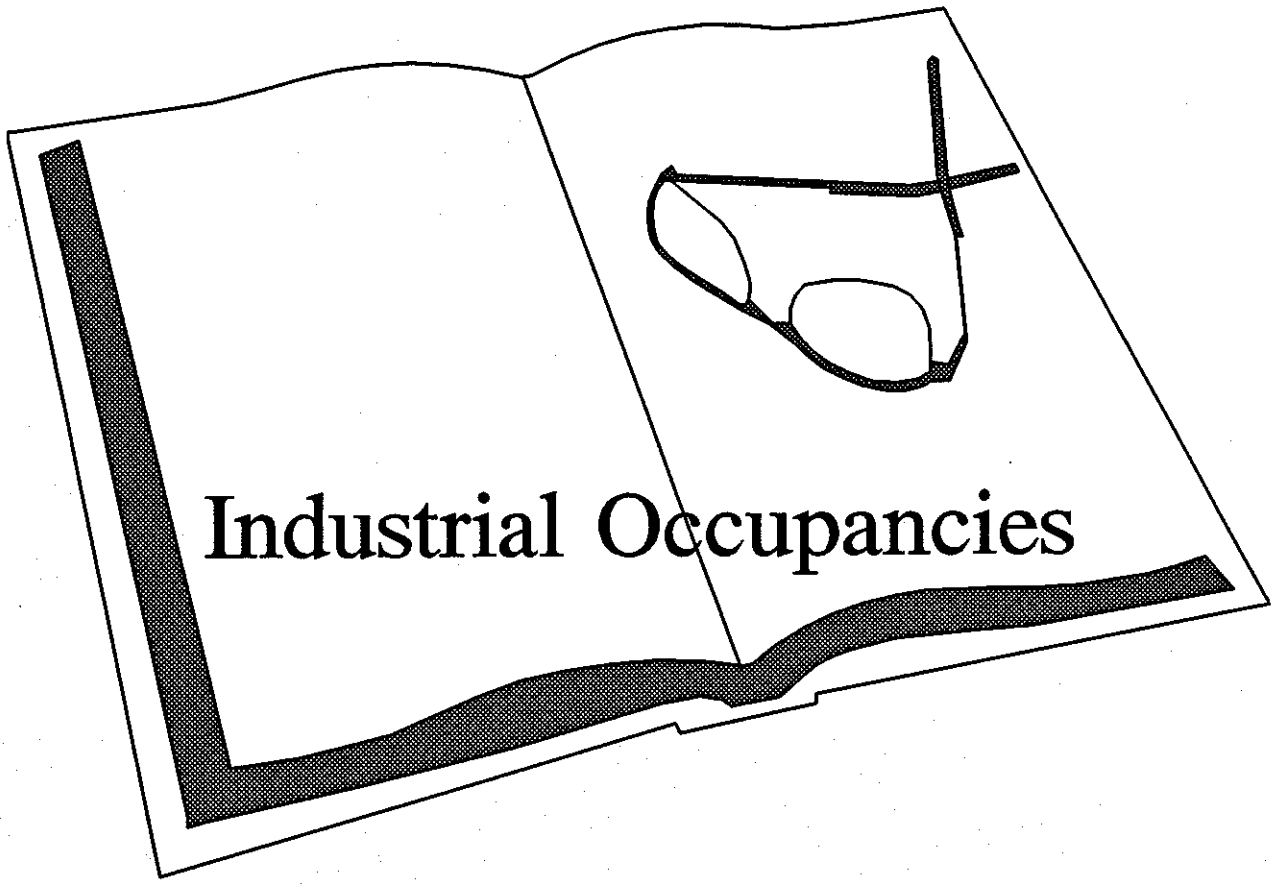
Takemoto, A.

Takemoto, A.
Response Characteristics of Heat Detectors.
Fire Research Institute, Tokyo, Japan
UJNR Panel on Fire Research and Safety. 8th Joint Panel Meeting. May 13-21, 1985, Tsukuba, Japan, 763-779 pp, 1985.
heat detectors

Thorpe, R. F.

Thorpe, R. F.
New Concept in Heat Detector Design.
Falcon Safety Products, Inc.
Fire Journal, Vol. 71, No. 2, 69-71, 96, Mar 1977.
heat detectors; design applications; fire protection

International Fire Detection
Bibliography 1975-1990



Industrial Occupancies

The papers in this topic are all related to the application of current technology detectors to various industrial hazards. The information provided represents an excellent overview of current concepts of industrial protection practice for a broad range of applications. While dominated by power plants (both nuclear and non-nuclear) and petrochemical operations, discussion of protection techniques for libraries and historic buildings, anechoic chambers, storage, ammunition plants, telephone facilities, offices, textile mills, highway tunnels, underground structures, and peat boiler plants can be found. Thus, these papers should provide an overview of the state-of-the-art in industrial protection.

American Petroleum Institute

American Petroleum Institute
Fire Prevention and Control on Open Type Offshore Production Platforms. Recommended Practice. 1st Edition.
American Petroleum Institute, Dallas, TX
API RP 14G; 26 p. September 1978.
offshore platforms; ignition source; fire prevention; fire detection systems; fire suppression; fire extinguishment; maintenance; safety
This RP presents recommendations for minimizing the likelihood of having an accidental fire, for designing, inspecting and maintaining fire control systems and emphasizes the need to train personnel in fire fighting, routine drills and methods for safe evacuation.

Anderson, C.

Anderson, C.; Celt, J. M.; Phillips, J.
Spectrum of Optical Fire Detection.
Detector Electronics Corp., Minneapolis, MN
Detector Electronics, UK
BHRA, The Fluid Engineering Center; Society of Fire Protection Engineers; Safety and Reliability Directorate of UKAEA and Institution of Chemical Engineers. Fire Engineering in Petrochemical and Offshore Applications. International Conference Proceedings. June 23-24, 1987, Paper C1, Stratford-upon-Avon, England, 39-41 pp, 1987.
fire detection; offshore platforms; industrial plants; ultraviolet detectors; infrared detectors

Benzenberg, G. E.

Benzenberg, G. E.
Overview of Line-Type Fire Detectors.
Alison Control Inc., Fairfield, NJ
Plant Engineering, Vol. 40, No. 14, 52-53, July 10, 1986.
fire detectors; industrial plants; fire protection; temperature measurement; sensors; engineering management; false alarms; maintenance

Boccio, J. L.

Boccio, J. L.; Hall, R. E.; Asp, I.
Acceptance and Verification for Early Warning Fire Detection Systems. Interim Guide.
Brookhaven National Lab., Upton, NY
Gage-Babcock and Assoc., Inc., Mount Kisco, NY
NUREG/CR-1798; BNL-NUREG-51296; NRC FIN No. A-3335; 105 p.
May 1980.
fire detection systems; warning systems; nuclear power plants

British Fire Protection Systems Association

British Fire Protection Systems Association
Fire Detection Systems for the 1990s.
Fire Surveyor, Vol. 19, No. 2, 20-23, April 1990.
fire detection systems; fire alarm systems; office buildings

Cartwright, N. K.

Cartwright, N. K.
Fire Protection at the New British Library.
Steenson Varming Mulcahy Partnership
Fire Prevention, No. 203, 20-24, October 1987.
libraries; fire protection; fire detection systems; building design; exhaust systems

Cerberus

Cerberus
Libraries, Collections and Works of Art: Always at Risk From Fire or Theft.
Fire and Security Engineering, Vol. 5, 1-4, August 1989.
libraries; historic buildings
You don't need a blazing torch nowadays to set a library on fire: in 1986 a small fire in one department destroyed a large part of America's third-largest library: 200,000 volumes were destroyed by the flames, 150,000 were damaged by fire or smoke and a further 600,000 suffered water damage. Furthermore, the most important collection of patents in the western USA was destroyed. Only three months later there was another arson attack on the same library, detroying artistic and musical collections.

Chohan, R. K.

Chohan, R. K.; Upadhyaya, B. R.
Safety and Fault Detection in Process Control Systems and Sensors.
Tennessee Univ., Knoxville
Fire and Materials, Vol. 14, 167-177, Jan. 1989.
safety; accidents; fire protection; explosions; accident prevention; fire alarm systems

Davidson, R. S.

Davidson, R. S.
Smoke, Fire and Gas Detection at British Gas Installations.
Presentation and Discussion.
British Gas plc, England
Communication 1298;
Institution of Gas Engineers. 52nd Autumn Meeting. November 1986, Communication 1298, London, England, 155-159 pp, 1986.
smoke detectors; gas detectors; fire protection; installation; offshore platforms

DiNenno, P. J.

DiNenno, P. J.; Dungan, K. W.
Effectiveness of Fire-Detection Systems in Light-Water-Reactor Facilities.
Professional Loss Control, Inc., Oak Ridge, TN 37830
DE81-029465; ALO-141; 100 p. August 1981.
Available from National Technical Information Services 49-1716
fire detection systems; effectiveness; nuclear reactors

Egilsrud, P. E.

Egilsrud, P. E.
Prevention and Control of Highway Tunnel Fires.
Sverdrup and Parcel, Inc., St. Louis, MO
FHWA/RD-83/032; 136 p. May 1984.
highways; tunnels; hazardous materials; risk analysis; fire prevention
This study investigates steps that can be taken to reduce the risk, damage, and fatalities from fires in existing and future highway tunnels and the effect of unrestricted transit of hazardous materials through them. The history of highway tunnel fires is examined to discover the design and operating features bearing on ignition, spread, detection, alarm transmission, response, control, resulting damage, and survivability aspects. Major domestic highway tunnel operators are interviewed concerning tunnel fires and their responses tabulated and compared. The procedures and results of several tunnel fire tests are examined and their recommendations evaluated in light of historical evidence and operating experience concerning tunnel fires. A risk analysis for unrestricted transit of hazardous materials through a reference tunnel is performed and applied to 35 tunnels included in the study. Qualitative assessments of the effect of traffic, tunnel design, and operations on this risk are made. Comprehensive design and operating recommendations for prevention, detection, alarm notification, control, extinguishment, suppression, and survival are developed. A ventilation system with a fire/emergency operating mode designed to provide motorists trapped in a tunnel fire with optimal escape potential is described and its inclusion in future vehicular tunnels recommended.

Fire

Fire
Fire Protection Measures in Underground Structures.
Fire, Vol. 69, No. 863, 605-607, May 1977.
structures; fire protection; smoke detectors

Fire Prevention

Fire Prevention
Fire Safety on Oil Rigs.
Fire Prevention, No. 203, 9-10, October 1987.
fire safety; offshore platforms; escape means; fire detection; extinguishing; contamination

Fisher, W. R.

Fisher, W. R.
Protecting Our Treasures From Threat of Fire.
Professional Safety, Vol. 25, No. 2, 21-24, February 1980.
warning systems; fire detectors; fire protection; historic buildings

Green, B. J.

Green, B. J.
Protection in a Nuclear Research Establishment.
Fire International, No. 105, 24-26,29, June/July 1987.
fire detection; fire alarm systems; fire suppression; nuclear reactors

Haffmans, I.

Haffmans, I.
Fire Detectors in Telephone Exchanges.
Technical Center for Fire Prevention TNO, Delft, The Netherlands
University of Duisburg. 8th International Conference on Automatic Fire Detection "AUBE

'82". Probleme der automatischen brandentdeckung. October 5-7, 1982, Duisburg, West Germany, Luck, H., Ed., 440-447 pp, 1982.
fire detection; telephones; fire detectors; fire risks; electronics

Hems, J. P.

Hems, J. P.
Today's Concepts and Design Foam-Water Spray Systems.
Optima Fire Consultants, UK
BHRA, The Fluid Engineering Center; Society of Fire Protection Engineers; Safety and Reliability Directorate of UKAEA and Institution of Chemical Engineers. Fire Engineering in Petrochemical and Offshore Applications. International Conference Proceedings. June 23-24, 1987, Stratford-upon-Avon, England, Paper E3, 87-92 pp, 1987.
water sprays; foam extinguishing systems; design applications; flammable liquids; flammable gases; fire detection; fire extinguishing agents; containment

Ishimoto, W. Y.

Ishimoto, W. Y.
Survey of Commercial Non-Nuclear Security Programs.
SAS of Texas, Ltd., Austin
NUREG/CR-3619; 50 p. March 1984.
Available from National Technical Information Services NUREG/CR-3619
detection; prevention

Joblove, L.

Joblove, L.; Avelar, M.; Dobbs, N.; Frank, L.
Engineering Guide for Fire Protection and Detection Systems at Army Ammunition Plants. Volume 2. Testing and Inspection. Final Report.
Ammann and Whitney, New York, NY
ARRADCOM, Dover, NJ
ARLCD-CR-80049; 190 p. December 1982.
Available from National Technical Information Services AD/B-070350
fire protection; fire detectors; sprinklers; fire extinguishers; fire safety; water supply; fire extinguishing agents; industrial plants;standards; safety; deluge systems; water curtains
This report presents guidelines for testing and inspection of fire protection systems used in Army Ammunition Plants. Existing published standards for fire protection systems are cited and methods applicable to specialized systems are described.

Klapmeier, K. M.

Klapmeier, K. M.
Recent Advances in High Speed Detection Systems for Ammunition Plants.
Detector Electronics Corp., Minneapolis, MN
Minutes of the Explosives Safety Seminar, 21st. August 28-30, 1984, Houston, TX, 627-644 pp, 1984.
Available from National Technical Information Services AD/P-004850
ammunition; explosives; fire detectors; ultraviolet detectors; infrared detectors; military facilities; manufacturing; industrial plants
The author discusses the application of UV detection systems in radioactive environments and the application considerations of infrared, combination infrared, and combinations of ultraviolet and infrared. Recent developments in high speed single frequency infrared detection systems and their applications to munitions processes are also reviewed.

Krasner, L. M.

Krasner, L. M.; Ganti, C. S.; Vincent, B. G.; Samanta, P. K.; Boccio, J. L.
Evaluation of Available Data for Probabilistic Risk Assessments (PRA) of Fire Events at Nuclear Power Plants.
Brookhaven National Laboratory, Upton, NY
NUREG/CR-4231; 68 p. May 1985.
fire hazards; fire data; nuclear power plants; fire detection systems; fire protection
Several crucial parameters are needed in the assesment of fire risk in nuclear power plants. Among those that need to be developed from a data base are: (1) fire frequency, (2) fire detection time, and (3) fire suppression time. Currently, the data base for nuclear power plants is not large enough to develop these parameters, considering fuel location, fuel geometry, combustion properties, enclosure geometry, etc. This study attempts to augment the nuclear data base by investigating the usefulness of other nonnuclear data bases which contain fire incident loss experience of occupancy classes having somewhat similar physical features and fire protection engineering systems normally found in nuclear power plants. This study has found that indeed some useful information can be gleaned from nonnuclear sources; in particular, detection and suppression times. However, other fire-risk data needs such as fire frequency and fire size would require other forms of data searches and data analyses that at this stage can only be conceptualized.

Larsen, T. E.

Larsen, T. E.; Petersen, A. H.
Concept of Offshore Platform Fire Detection.
Detector Electronics Corp., Minneapolis, MN

Automation in Offshore Oil Field Operation. Computer Applications in Shipping and Shipbuilding. Volume 3.
IFAC/IFIP Symposium. June 14-17, 1976, Bergen, Norway,
North-Holland Publishing Co., New York,
Galtung, F. L., Rosandhaug, K., Williams, T. J., Editors, 73-75 pp, 1976.
offshore platforms; fire detection; ultraviolet detectors

Levinson, S. H.

Levinson, S. H.; Yeater, M. L.
Methodology to Evaluate the Effectiveness of Fire Protection Systems in Nuclear Power Plants.
Rensselaer Polytechnic Inst., Troy, NY
Nuclear Engineering and Design, Vol. 76, 161-182, 1983.
nuclear power plants; fire protection; ignition; fire detection; fire suppression; fire spread

Linna, V.

Linna, V.
Safe Production and Use of Domestic Fuels. Part 2. Fire Detectors.
Valtion Teknillinen Tutkimuskeskus, Espoo, Finland
VTT-TIED-505; 61 p. October 1985.
Available from National Technical Information Services DE86-752302
fuel oils; power plants; smoke detectors; boilers; combustion; fire prevention; safety; solid fuels; storage
Fire detectors and their suitability to peat boiler plants is considered. The main interest is concentrated on the methods applicable to detection of smouldering fires. The description of fire detection of smouldering fires. The description of fire detection methods is based on the literature and brochure information of the devices. In addition, fire detection and extinguishing systems of three peat boiler plants are described briefly. The conventional smoke detectors are not applicable to detection of smouldering fires in dusty environments. IR spark and flame detectors have been developed intensively during the last years and these are also available to detection of smouldering fires. The improvement of detectors has decreased their sensitivity to false alarms. The present IR detectors are most applicable to spark and fire warning in pneumatic dust coveyor tubes and in dust separators, but these detectors have been used also in association with belt conveyors at peat heating plants.

Loyd, R. A.

Loyd, R. A.
Fire Protection Systems Utilized in United States Army Ammunition Plants (Ultra High Speed Deluge Systems). Final Report.
Army Armament Munitions and Chemical Command Safety Office, Rock Island, IL
Final Report; 49 p. November 30, 1987.
Available from National Technical Information Services AD/A-192447
deluge systems; ammunition; fire protection; hazard analysis; maintenance

Merrick, D.

Merrick, D.
Arctic Halon Systems.
Society of Fire Protection Engineers. Fire Detection and Suppression...Today's Technology. March 9-11, 1987, Linthicum Heights, MD, 1-11 pp, 1987.
Halon 1301; fire suppression; petroleum; fire protection; fire prevention; hazard analysis; systems engineering; instruments; design applications
Design and installation information on Halon 1301 fire suppression systems for Arctic oil production facilities.

Merrick, D.
Fire Protection for Robotics--A Systems Approach. Part 1. Industrial Fire World, Vol. 2, No. 4, 18-21, August 1987.
robotics; fire protection; fire detection

Merrick, D.
Industrial High Technology Fire Protection.
Fire International, Vol. 102, 33-35, December 1986-January 1987.
industrial safety; fire protection; fire detection; fire extinguishment; fire detectors; smoke detectors
With the introduction of high technology equipment comes the need for high technology fire protection. This article examines the problems and suggests a way of tackling them.

Mesley, W. R.

Mesley, W. R.
Fire and Overheat Detection for Conveyor Belt Systems.
Alarmline Ltd.
Fire, Vol. 76, No. 939, 180, September 1983.
fire detection systems; belts conveyors

Potter, C.

Potter, C.
Thinging About Fire. Part 8. Construction and Handover: Checklist for Fire Doors; Furniture Fittings, Furnishings and Fires; Commissioning Fire Protection Services; AJ Fire Index.
Architects' Journal, Vol. 176, No. 42, 89-99, October 1982.
construction; fire doors; fire safety; furniture; fire detection systems; extinguishing; fire protection

Raine, A. J.

Raine, A. J.; Lawrence, A. J.
Detection and Control for a Foam System.
Angus Fire Armour Ltd., UK
GP-Elliott Electornic Systems Ltd., UK
BHRA, The Fluid Engineering Center; Society of Fire Protection Engineers; Safety and Reliability Directorate of UKAEA and Institution of Chemical Engineers. Fire Engineering in Petrochemical and Offshore Applications. International Conference Proceedings. June 23-24, 1987, Stratford-upon-Avon, England, Paper E1, 75-80 pp, 1987.
foam extinguishing systems; flammable liquids; fire detection; fire suppression; safety; fire protection; maintenance

Rittenhouse, R. C.

Rittenhouse, R. C.
Fire: Detection and Prevention at Power Plants.
Power Engineering, Vol. 85, No. 2, 42-50, February 1981.
power plants; fire protection

Ruger, C.

Ruger, C.; Boccio, J. L.; Azarm, M. A.
Evaluation of Current Methodology Employed in Probabilistic Risk Assessment (PRA) of Fire Events at Nuclear Power Plants.
Brookhaven National Lab., Upton, NY
NUREG/CR-4229; 44 p. May 1985.
fire hazards; fire models; nuclear power plants; risk assessment
This report presents a general evaluation of the current methodology used by industry for the probabilistic assessment of fire events in nuclear power plants. The basis for this evaluation, in which the strengths and weaknesses of the methods are identified, stem from reviews of several, industry-sponsored, full-scope Probabilistic Risk Assessments (PRAs) and various deterministic/probabilistic approaches used by industry to judge their compliance with or used to seek exemptions from the fire-protection requirements enumerated in Appendix R to 10 CFR 50. In performing this evaluation of the current methodologies, state-of-the-art literature on the modeling of fire propagation/detection/suppression, input parameters, and modeling uncertainties are utilied. Areas are identified where recently-developed, more accurate and complete techniques can be implemented to reduce the state-of-knowledge uncertainties that presently exist. Recommendations also are made which could be the basis for a more suitable and complete fire-risk methodology.

Siu, N.

Siu, N.; Apostolakis, G.
Modeling the Detection Rates of Fires in Nuclear Plants: Development and Application of a Methodology for Treating Imprecise Evidence.
Pickard, Lowe and Garrick, Inc., Newport Beach, CA
California Univ., Los Angeles
Risk Analysis, Vol. 6, No. 1, 43-59, 1986.
nuclear plants
A model is developed for the detection time of fires in nuclear power plants, which differentiates between competing modes of detection and between different initial fire severities. Our state-of-knowledge uncertainties in the values of the model parameters are assessed from industry experience using Bayesian methods. Because the available data are sparse, we propose means to interpret imprecise forms of evidence to the develop quantitative information, which can be used in a statistical analysis; the intent is to maximize our use of all available information. Sensitivity analyses are performed to indicate the importance of structural and distributional assumptions made in the study. The methods used to treat imprecise evidence can be applied to a wide variety of problems. The specific equations developed in this analysis are useful in general situations, where the random quantity of interest is the minimum of a set of random variables (e.g., in "competing risks" models). The computational results indicate that the competing modes formulation can lead to distributions different from those obtained via analytically simpler models, which treat each mode independently of the others.

Slye, O. M.

Slye, O. M.
Fire Protection on the Beryl A Platform.
Mobile Research and Development Corp.
Fire Journal, Vol. 74, No. 3, 75-77, May 1980.
offshore platforms; fire risks; fire protection; fire detection; fire extinguishing agents

Slye, O. M.
Overview of Applied Research on Hydrocarbon Fire Control.
Loss Control Associates, Inc., Levittown, PA
SFPE Bulletin, No. 87-4, 1,4,7, September 1987.
fire suppression; hydrocarbons; petroleum; industries; fire prevention; fire detection

Taylor, K. T.

Taylor, K. T.
Office Building Fires...A Case for Automatic Fire Protection.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 84, No. 1, 52-54, January/February 1990.
office buildings; fire protection; fire suppression; fire statistics; fire detection systems

Taylor, K. T.
Temporarily Disconnected.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 83, No. 3, 24-27, May/June 1989.
telephones; fire detection systems; fire statistics; costs

Textile World

Textile World
Early Detection Stops Fire Before it Starts.
Textile World, Vol. 131, No. 10, 111, Oct. 1981.
industries; fire detection

Thompson, C.

Thompson, C.
Fire Detectors for Offshore Applications--Types and New Developments Described.
Bechtel Ltd., UK
Fire, Vol. 79, No. 978, 39-40, December 1986.
fire detectors; offshore platforms; heat detectors; smoke detectors; flame detectors

Thompson, C. P. A.

Thompson, C. P. A.
Fire Safety Systems for Unmanned Platforms.
Bechtel Ltd., UK
BHRA, The Fluid Engineering Center; Society of Fire Protection Engineers; Safety and Reliability Directorate of UKAEA and Institution of Chemical Engineers. Fire Engineering in Petrochemical and Offshore Applications. International Conference Proceedings. June 23-24, 1987,
Stratford-upon-Avon, England, Paper B2, 25-34 pp, 1987.
offshore platforms; fire safety; regulations; reliability; performance evaluation; design applications; fire detection systems; risk analysis; water; hazard analysis; fire protection; systems analysis; halons

Thorne, P. F.

Thorne, P. F.
Principles of Fire and Explosion Protection.
Fire Research Station, Borehamwood, England
LA-9911-C-Vol. 1; LA-9911-C-Vol. 2; CSNI No. 83; October 1983.
CSNI Specialist Meeting on Interaction of Fire and Explosion With Ventilation Systems in Nuclear Facilities. Volume 1 and Volume 2. April 25-28, 1983, LA-9911-C-Vol. 1, Los Alamos, NM, 419-434 pp, 1983.
Available from National Technical Information Services DE84-003976-Vol 1 DE84-003977-Vol 2
explosions; combustion; ignition; fire detection systems; flammable gases; vapors; liquids

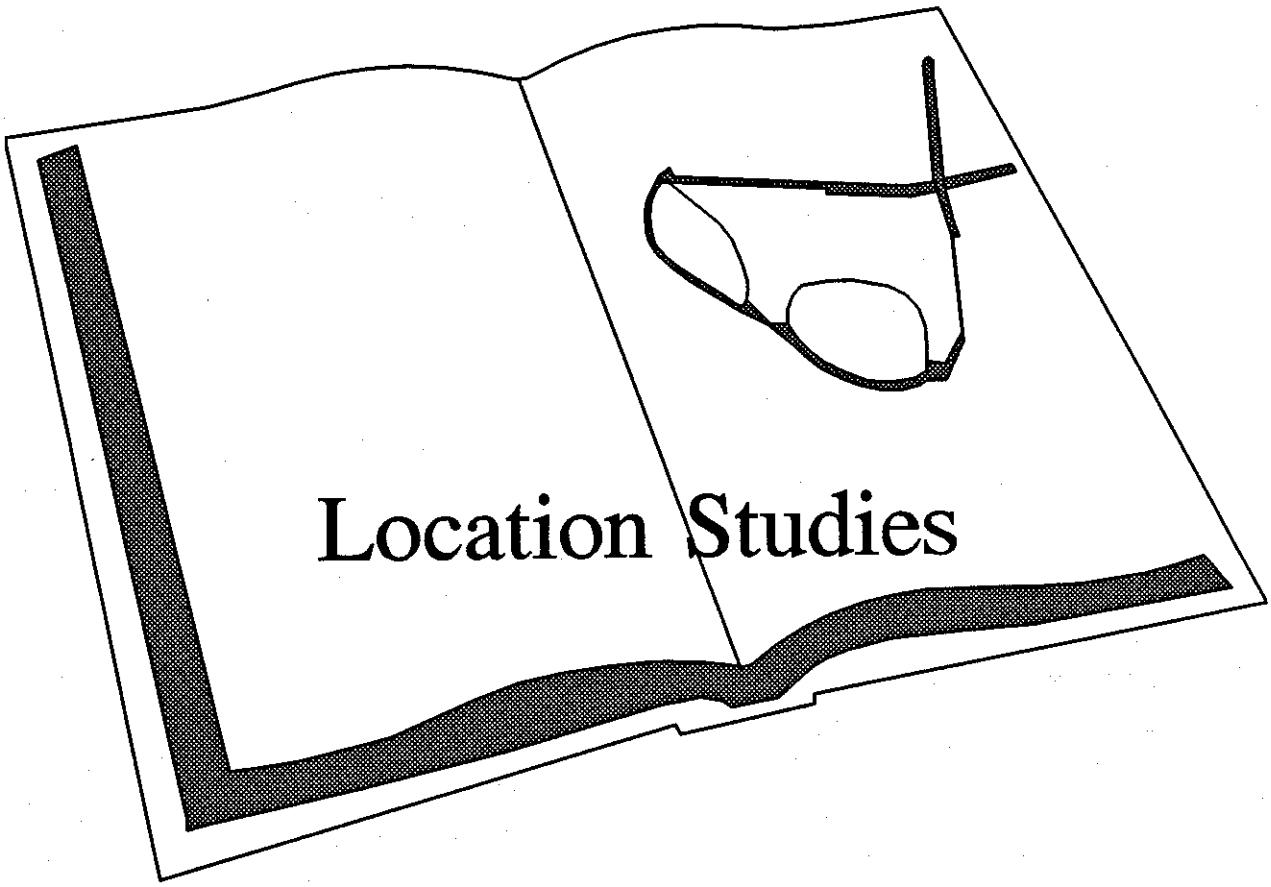
University of Tennessee Space Institute

University of Tennessee Space Institute
Industrial Safety and Fire Protection Appraisal Report.
University of Tennessee Space Institute, Tullahoma
DOE/ET/10815-T6; 12 p. July 18-21, 1988.
Available from National Technical Information Services DE89-003043
industrial safety; fire protection; fire detection systems; fire safety; fire codes

Waterman, T. E.

Waterman, T. E.; Campbell, J. A.; Paarmann, L. D.; Mindel, I. N.; Smoots, C. W.
Evaluation of RF Anechoic Chamber Fire Protection Systems.
Final Report.
Tactical Weapon Guidance and Control Information and Analysis Center, Chicago, IL
GACIAC-SR-80-02; NWC-TP-6211; 170 p. July 1980.
Available from National Technical Information Services AD/A-092478
anechoic chambers; fire resistant materials; fire protection; human performance; fire detectors; fire suppression; flame detectors

The increasing use of microwave anechoic chambers plus several recent chamber fires was the impetus for this special study. The report identifies and collects in one document the various issues and problems associated with the fire protection of anechoic chambers. It also addresses the interfaces between personnel groups including the chamber designers, operators, maintenance and the fire department. It is not a design report: i. e., it does not contain enough detail to design either a chamber or the fire protection system. Instead, it presents the pros and cons of the various fire protection options available to the designers (smoke and heat detectors, alarm systems, sprinkler heads, preferred physical locations, fire suppressant agents, etc.) and relates these to the chamber operation. The report also identifies several areas where additional investigation is required such as detection of deep-seated combustion, testing of new more fire-resistant absorber materials, and analysis of the combustion products of halogen-type suppressants. An extensive list of references is included.



Location Studies

The small number of papers in this category adds little new information to this area. Most of the papers deal with detector placement in residences - the occupancy with the least critical placement criteria. Two of the papers deal as much with placement for audibility than with response [Halliwell *et al* 1989 and 1988]. However, several other papers are worthy of special note. One [Kraemer 1989, in German] deals with a computer program which guides the user through placement rules (derived from the standards rather than from a performance model). Another [Matthews *et al* 1985] describes test results examining the interaction of ceiling fans and detector response - a question which comes up regularly since ceiling fans increased in popularity several years ago. An interesting paper [Mniszewski 1980] describes a series of tests conducted for the US General Services Administration on the ability of duct detectors to respond to fires in an adjoining room. There is a discussion of criteria for detector placement in cable spreading rooms [Boccio 1982], and one (unfortunately in Swedish) predicting smoke detector response in rooms with a field model [Vannerberg 1988].

Benjamin, I. A.

Benjamin, I. A.; Heskestad, G.; Bright, R. G.; Hayes, T.
Analysis of the Report on Environments of Fire Detectors.
Fire Detection Institute
35 p. 1979.
fire detectors; smoke detectors

Beyler, C. L.

Beyler, C. L.
Design Method for Flaming Fire Detection.
Worcester Polytechnic Inst., MA
Fire Technology, Vol. 20, No. 4, 5-16, November 1984.
fire detection

Boccio, J. L.

Boccio, J. L.
Requirements for Establishing Detector Siting Criteria in Fires Involving Electrical Materials.
Brookhaven National Lab., Upton, NY
NUREG/CR-2409; SAND81-7168; 51 p. July 1982.
fire detection systems; fire protection; nuclear reactors; electrical cables

Bukowski, R. W.

Bukowski, R. W.
Investigation of the Effects of Heating and Air Conditioning on the Performance of Smoke Detectors in Mobile Home. Final Report.
National Bureau of Standards, Gaithersburg, MD
NBSIR 79-1915; 179 p. October 1979.
Available from National Technical Information Services PB80-100001
detection time; detector location; fire tests; gas detectors; kitchen fires; mobile homes; smoke detectors; tenability limits; upholstered furniture Since its original promulgation in June 1976, the U.S. Department of Housing and Urban Development's Federal Mobile Home Construction and Safety Standard has required the installation of at least one smoke detector to protect the mobile home occupants. The location of the smoke detector was based on earlier tests in a mobile home conducted by NBS in 1976. Because of the limited scope of the earlier NBS tests and subsequent improvements in the design of smoke detectors and the construction of mobile homes, a new series of tests was conducted to evaluate the influences of the operation of central forced-air heating and air conditioning systems on the performance of smoke detectors representative of those which are currently being installed. The tests were conducted with upholstered chairs in smoldering and flaming fire modes, representing key residential fire death scenarios. Tests were conducted in both summer and winter weather conditions. The effects of detector location (wall or ceiling and position within the bedroom corridor) and the effects of open and closed bedroom doors were also investigated. The report concludes that, for the scenarios examined, a properly functioning ionization or photelectric smoke detector mounted near the ceiling on the inside or outside wall at the living room end of the corridor should provide an alarm in sufficient time for occupant escape.

Bukowski, R. W.
Tests on the Performance of Automatic Fire Detectors in Health Care Occupancies--A Preliminary Report.
National Bureau of Standards, Gaithersburg, MD
NBSIR 79-1739; 28 p. April 1979.
Available from National Technical Information Services PB-297150
corridors; escape; fire detectors; large scale fire tests; heat detectors; hospitals; ionization detectors; mattresses; nursing homes; photoelectric detectors
The paper reports the results of the first series of eight full-scale fire tests to evaluate the response of automatic fire detectors in health care occupancies to flaming ignition mattress fires. Comparisons were made between three types of detectors (ionization, photoelectric, and heat)

installed in the patient room versus in the corridors. For the fire scenario selected (flaming igniton of bedding and mattress), the results indicated that the ionization-type detectors in the patient room provided the maximum time for escape. The maximum time period available for either rescue of an non-ambulatory patient in the room of origin or for use of the corridor past the room of origin as a means of escape averaged only about five minutes. The time available for escape or rescue were based on the time provided between detector alarm and the time that one of several criteria selected for occupant tenability was exceeded.

Evans, D. D.

Evans, D. D.; Morehart, J.
Investigation of the Effects of a Stratified Two Layer Environment on Fire Plume Temperatures.
National Bureau of Standards, Gaithersburg, MD
California Institute of Technology, Pasadena, CA
American Society of Mechanical Engineers and Japan Society of Mechanical Engineers.
Proceedings of the 1987 ASME-JSME Thermal Engineering Joint Conference. Volume 1.
March 22-27, 1987, Honolulu, HI, American Society of Mechanical Engineers, New York, Marto, P. and Tanasawa, I., Eds., 381-386 pp, 1987.
fire plumes; high temperature gases
A layer of gas at elevated temperature accumulates below the ceiling of a room during a fire. This layer affects fire plume and ceiling jet flows, heat transfer to the ceiling material, and ultimately detector (suppression system) response time. This paper experimentally examines the effects of a stratified warm gas layer on plume flow temperatures originating from a source located in an ambient lower layer. Measurements of spatial distributions of temperature at steady state are presented for a confined 1.2 m diameter cylindrical ceiling configuration. Encouraging agreement is found between experimental temperature measurements and predictions by two existing models for describing temperatures in this two layer environment.

Gawin, W. M.

Gawin, W. M.
Mobile Home Smoke Detector Siting Study. Final Report.
National Bureau of Standards, Gaithersburg, MD
NBSIR 76-1016; 54 p. May 1976.
Available from National Technical Information Services PB-254177
fire detectors; photoelectric detectors; detector sensitivity; mobile homes; smoke detectors
An investigation was conducted to evaluate the significance of smoke detector locations to response time for a specific set of fire conditions in a mobile home. Parameters having the potential of affecting response time include: the physical location within a mobile home such as inside wall vs outside wall or wall vs ceiling installations; the impact of air circulation resulting from the operation of the heating, ventilating, and air-conditioning system; and the basic detector parameter of smoke detector alarm threshold. For the study only photoelectric-type smoke detectors were used. These detectors utilize the Tyndall Effect in their sensing mechanism. This limitation was imposed to limit the number of variables. Detector response was evaluated for the fires in both smoldering and flaming modes. The results of the study provide a case for wall installations as opposed to ceiling installations. Further, inside wall installations may be marginally superior to outside wall installations. The most significant finding of the study suggests that, when in operation, the forced-air circulating system has a major delaying effect on detector response time to a given fire size.

Ghosh, B. K.

Ghosh, B. K.
Protecting the Means of Escape. Detectors in Corridors Not Sufficient.
Fire Research Station, Borehamwood, England
Fire Surveyor, Vol. 16, No. 6, 5-8, December 1987.
escape; residential buildings; fire detectors

Halliwell, R. E.

Halliwell, R. E.; Sultan, M. A.
Guide to the Most Effective Locations for Smoke Detectors in Residential Buildings.
National Research Council of Canada, Ottawa, Ontario
Building Practice Note 62; 11 p. June 1986.
smoke detectors; residential buildings

Halliwell, R. E.; Sultan, M. A.
Method to Determine the Optimum Location for Fire Alarms in Residential Buildings.
National Research Council of Canada, Ottawa, Ontario
Canadian Acoustics, Vol. 17, No. 2, 9-18, 1989.
IRC Paper 1592; NRCC 30417
fire alarm systems; residential buildings; smoke detectors; attenuation

Heskestad, G.

Heskestad, G.; Delichatsios, M. A.
Environments of Fire Detectors. Phase 1. Effect of Fire Size, Ceiling Height and Material.
Volume 1. Measurements.
Technical Report.
Factory Mutual Research Corp., Norwood, MA
NBS-GCR-77-86; FMRC Serial 22427; RC76-T-37; 206 p. May 1977.

Available from National Technical Information Services PB-272882

ceiling height; ceilings; cotton; detector location; detectors; fire detectors; polyurethanes; polyvinyl chloride; room fires; rooms; smoldering; wood

An experimental program has been initiated to map ceiling environments to which fire detectors are exposed for various combinations of room geometry, ceiling configuration, fire type, and detector spacing. This report covers Phase I of the program, which considered 1) flat, extensive ceiling areas, 2) a quiescent test space, 3) flaming and smoldering fires of wood, cotton, foamed polyurethane, and polyvinyl chloride, 4) ceiling heights of 8, 15 and 29 ft, and 5) instrument stations at 10, 20, and 40 ft from the geometric fire axis. Measured environmental parameters included temperature, velocity, and optical density. In addition, response times of a set of five fire detectors (heat detectors of fixed temperature, rate-of-rise, and rate anticipation types; one ionization smoke detector; and one photoelectric smoke detector of the reflection type) were recorded at each instrument station. A total of 49 fire tests were conducted. The reduced data are presented in two tables, one listing detector reponse times and the other listing the environmental data. Analysis of the data is presented in a second volume (Volume II) and includes determination of spacing requirements for fire detectors in flaming fires.

Heskestad, G.; Delichatsios, M. A.
Environments of Fire Detectors. Phase 1. Effect of Fire Size, Ceiling Height and Materials. Volume 2. Analysis.
Factory Mutual Research Corp., Norwood, MA
NBS-GCR-77-95; FMRC Serial 22427; 129 p. July 1977.
Available from National Technical Information Services PB-272883

ceiling height; ceilings; cotton; detector location; fire detectors; fire growth; heat detectors; polyurethanes; polyvinyl chloride; smoke detectors; smoldering fires; temperature rise; wood

This volume is an analysis of experimental data presented in Volume 1 on the ceiling environment and response to this environment by various types of fire detectors. Data and the analysis pertain to flat, extensive ceilings and quiescent surroundings. The results for smoldering fires are found to be of limited utility because of dominant influence of uncontrolled variables such as pre-existing temperature stratifications; however, an anomalous smoke pattern has been explained, which should aid future investigations. The results of environmental variables versus time for the unsteady, flaming fires are found to correlate very well in coordinates which intrinsically account for variations in fire-growth rate and ceiling height. Hence, ceiling temperatures and velocities can be predicted as function of time for any combination of fire-growth rate and ceiling height. Optical densities for a given combustible material are found to be in approximately constant ratio to the local temperature rise. In flaming fires smoke detectors are found to respond at approximately constant temperature rise of the fire gases; this temperature rise depends on the combustible material and mode of fire spread. The response of heat detectors is shown to be predictable theoretically from the temperature and velocity fields and key detector characteristics. The final section of the report deals with spacing requirements of fire detectors in flaming fires as influenced by ceiling height, fire-growth rate, and detector characteristics. The results are presented in graphical and tabular forms.

Heskestad, G.; Delichatsios, M. A.
Environments of Fire Detectors. Phase 2. Effect of Ceiling Configuration. Volume 2. Analysis. Final Report.
Factory Mutual Research Corp., Norwood, MA
NBS-GCR-78-129; 112 p. June 1978.
Available from National Technical Information Services PB-284042

beams; ceiling height; detectors; fire detectors; fire growth; heat detectors; room fires; smoke detectors; spacing; velocity

This volume contains an analysis of experimental data presented in Volume I on (1) the ceiling environment generated by flaming fires under extensive beamed ceilings and (2) the response to this environment by various types of fire detectors. Data on gas temperatures, gas velocities and optical densities have been presented in readily usable form for each of six beam configurations. These data have been converted to "reduced" forms which allow predictions to be made of the environmental variables for any combination of ceiling height and fire growth rate. The experimental response of fire detectors was generally found to conform with available response theories. With the aid of these theories and the data on the "reduced" variables, optimum spacing configurations of fire detectors have been determined as a function of ceiling height for each beam configuration. It is cautioned that the resulting spacing configurations pertain to large, unobstructed beamed ceilings and may be overly conservative in many practical situations.

Heskestad, G.; Delichatsios, M. A.
Evironments of Fire Detectors. Phase 2. Effect of Ceiling Configuration. Volume 1. Measurements.
Factory Mutual Research Corp., Norwood, MA
NBS-GCR-78-128; 172 p. June 1978.
Available from National Technical Information Services PB-290951

beams; ceiling height; detectors; fire detectors; fire growth; heat detectors; room fires; smoke detectors; spacing; velocity

This report describes Phase II of a sustained research program to map ceiling environments to which fire detectors are exposed. Phase I, reported previously, concerned flat, horizontal ceiling of large extent. Phase II extends ceiling measurements of temperature, velocity and optical density to six different beam configurations in extensive, horizontal ceilings. As in Phase I, the response times of variously located sets of fire detectors were

measured (three types of heat detectors, an ionization detector and a photoelectric smoke detector). A total of 21 fire tests were conducted. The reduced data are presented in two tables, one listing detector response times and the other listing environmental data. Analysis of the data is presented in a second volume (Volume II).

Hotta, H.

Hotta, H.
Fire Detection in the Air-Conditioned Room With a Plenum Return Chamber.
Japanese Association of Fire Science and Engineering. Fire Research Annual Conference. May 17-18, 1990, 69-72 pp, 1990.
In: Japanese (Abstract in English)
fire research; fire detection; air conditioning
In tests conducted, it was found that with air conditioning off, fire detection was possible with even a small quantity of smoke. However, when the air conditioning fan is operating, smoke is exhausted through the plenum return chamber. Therefore it is necessary to lessen the space between detectors in order to detect fire by an equal quantity of smoke.

Kennedy, R. H.

Kennedy, R. H.; Riley, K. W. P.; Rogers, S. P.
Study of the Operation and Effectiveness of Fire Detectors Installed in the Bedrooms and Corridors of Residential Institutions.
Fire Research Station, Borehamwood, England
CIB W14/79/03 (UK); CP26/78; 15 p. April 1978.
fire detectors; residential buildings; operations research; effectivenes; bedrooms; corridors; fire tests

Kraemer, U.

Kraemer, U.
Computerized Procedure for Planning Placement of Fire Detectors. [Ein computergestutztes Verfahren zur Planung fur den Einbau von Flammenmeldern.]
NT Universitat Duisburg, Germany
University of Duisburg. International Conference on Automatic Fire Detection "AUBE '89", 9th. September 26-28, 1989, Duisburg, West Germany, Luck, H., Ed., 775-785 pp, 1989.
In: German
fire detection; fire detectors; planning

Manfredonia, S.

Manfredonia, S.
Fire Detectors: What Kind, Where?
W. A. DiGiacomo Associates, New York
Consulting Engineer, Vol. 49, No. 10, 90-91, October 1977.
fire detectors; heat detectors; flame detectors; photoelectric detectors; ionization detectors

Matthews, J. D.

Matthews, J. D.; Walker, F. K.
Assessment of the Effects of Ceiling-Mounted Destratification Fans on the Performance of "Products of Combustion" Type Fire Detectors. Final Report. April-September 1983.
Naval Civil Eng. Lab., Port Hueneme, CA
ESL-TR-8366; 36 p. January 1984.
Available from National Technical Information Services AD/A-140182
fire detectors; fire detection; combustion products; warning systems; ventilation; ceilings; response time; fire prevention; safety; combustion products
The introduction of ceiling mounted destratification fans into rooms protected by "products of combustion" type fire detectors will reduce the effectiveness of these detectors. This report documents the tests, test results and recommendations concerning the effects of ceiling mounted destratification fans on "products of combustion" type fire detectors arising from the experiments and data analysis performed at the Naval Civil Engineering Laboratory under sponsorship of the U.S. Air Force Engineering and Services Center.

Mniszewski, K.

Mniszewski, K.; Waterman, T. E.
Effectiveness of Duct-Installed Smoke Detectors in Two Different Ventilation System Configurations. Final Report.
IIT Research Inst., Chicago, IL
GSA/PBAC-78-127; IIT Project J6464; 113 p. February 26, 1979.
smoke detectors; ventilation; smoke control; ducts

National Electrical Manufacturers Association

National Electrical Manufacturers Association
Guide for Proper Use of Smoke Detectors in Duct Applications. 1987-1988 Edition.
National Electrical Manufacturers Assoc., Washington, DC, 28 p. 1988.
smoke detectors; ducts
The Guide is updated every 5 years.

National Electrical Manufacturers Association
Guide for Proper Use of System Smoke Detectors
National Electrical Manufacturers Assoc., Washington, DC, 35 p.
smoke detectors

Newman, J. S.

Newman, J. S.
Fire Tests in Ventilated Rooms--Detection of Cable Tray and Exposure Fires. Interim Report.
Factory Mutual Research Corp., Norwood, MA

EPRI NP-2751; 93 p. February 1983.
Available from National Technical Information Services DE83-901860
fire tests; ventilation; cable trays; exposure; electrical insulation; smoke detectors; electrical cables

Okubo, I.

Okubo, I.
Follow-Up Survey on Actually-Installed Fire Detectors.
Japan Fire Equipment Inspection Corp.
U. S./Japan Government Cooperative Program on Natural Resources. Panel on Fire Research and Safety. Volume 6.
Fire Detection. October 19-22, 1976, Tokyo, Japan, 1-8 pp, 1976.
fire detection; fire research; fire safety; fire detectors; humidity; mechanical properties; corrosion; test methods

Oliverson, R. L.

Oliverson, R. L.
M/E Update: Smoke Detectors.
Senior Editor, Specifying Engineer
Specifying Engineer, Vol. 39, No. 2, 119-123, February 1978.
smoke detectors; fire losses; ionization detectors; spacing

Pasek, F.

Pasek, F.
Location of Smoke Detector Important for Operation.
Rixson-Firemark, Inc.
Fire Engineering, Vol. 130, No. 6, 22, June 1977.
smoke detectors; installation

Stroup, D. W.

Stroup, D. W.; Evans, D. D.
Use of Computer Fire Models for Analyzing Thermal Detector Spacing.
National Bureau of Standards, Gaithersburg, MD
Fire Safety Journal, Vol. 14, 33-45, 1988.
fire detection; computers; fire models; heat detection; fire detection systems
This paper presents a methodology for evaluating heat detection systems installed in buildings. Previous work for use primarily in designing new thermal fire detection systems was used as a starting point. The previous work was enhanced and supplemented to make it more useful for evaluating existing systems. The resulting equations were programmed into a user-interactive computer program.

Stroup, D. W.; Evans, D. D.; Martin, P. M.
Evaluating Thermal Fire Detection Systems (English Units). Final Report.
National Bureau of Standards, Gaithersburg, MD
NBS SP 712; 557 p. April 1986.
Available from National Technical Information Services PB86-206570
fire alarm systems; fire detection; fire detection systems; fire hazard assessment; fire protection; fire suppression; heat detectors; sprinkler systems
This report presents a methodology for evaluating heat detection systems installed in buildings. Previous work for use primarily in designing new thermal fire detection systems was used as a starting point. The previous work was enhanced and supplemented to make it more useful for evaluating existing systems. The resulting equations were programmed into a user interactive computer program. This program is availble in both BASIC and FORTRAN and will run on mainframes as well as personal computers. In addition, a modified version of the FORTRAN program was used to develop an extensive set of tables listing detector activation times for given building geometries, detector characteristics, and fire growth rates. These tables are useful for quick evaluation of alternative heat detector installations. Finally, practical examples are included to illustrate the use of the tables and computer programs.

Stroup, D. W.; Evans, D. D.; Martin, P. M.
Evaluating Thermal Fire Detection Systems (SI Units). Final Report.
National Bureau of Standards, Gaithersburg, MD
NBS SP 713; 557 p. April 1986.
Available from Government Printing Office, Washington, DC 003-003-02741-3
fire alarm systems; fire detection; fire detection systems; fire hazard assessment; fire protection; fire suppression; heat detectors; sprinkler systems
This report presents a methodology for evaluating heat detection systems installed in buildings. Previous work for use primarily in designing new thermal fire detection systems was used as a starting point. The previous work was enhanced and supplemented to make it more useful for evaluating existing systems. The resulting equations were programmed into a user interactive computer program. This program is available in both BASIC and FORTRAN and will run on mainframes as well as personal computers. In addition, a modified version of the FORTRAN program was used to develop an extensive set of tables listing detector activation times for given building geometries, detector characteristics, and fire growth rates. These tables are useful for quick evaluation of alternative heat detector installations. Finally, practical examples are included to illustrate the use of the tables and computer programs.

Thorne, P. F.

Thorne, P. F.; Melinek, S. J.; Theobald, C. R.
Thermal Performance of Sprinkler Heads.
Fire Research Station, Borehamwood, England

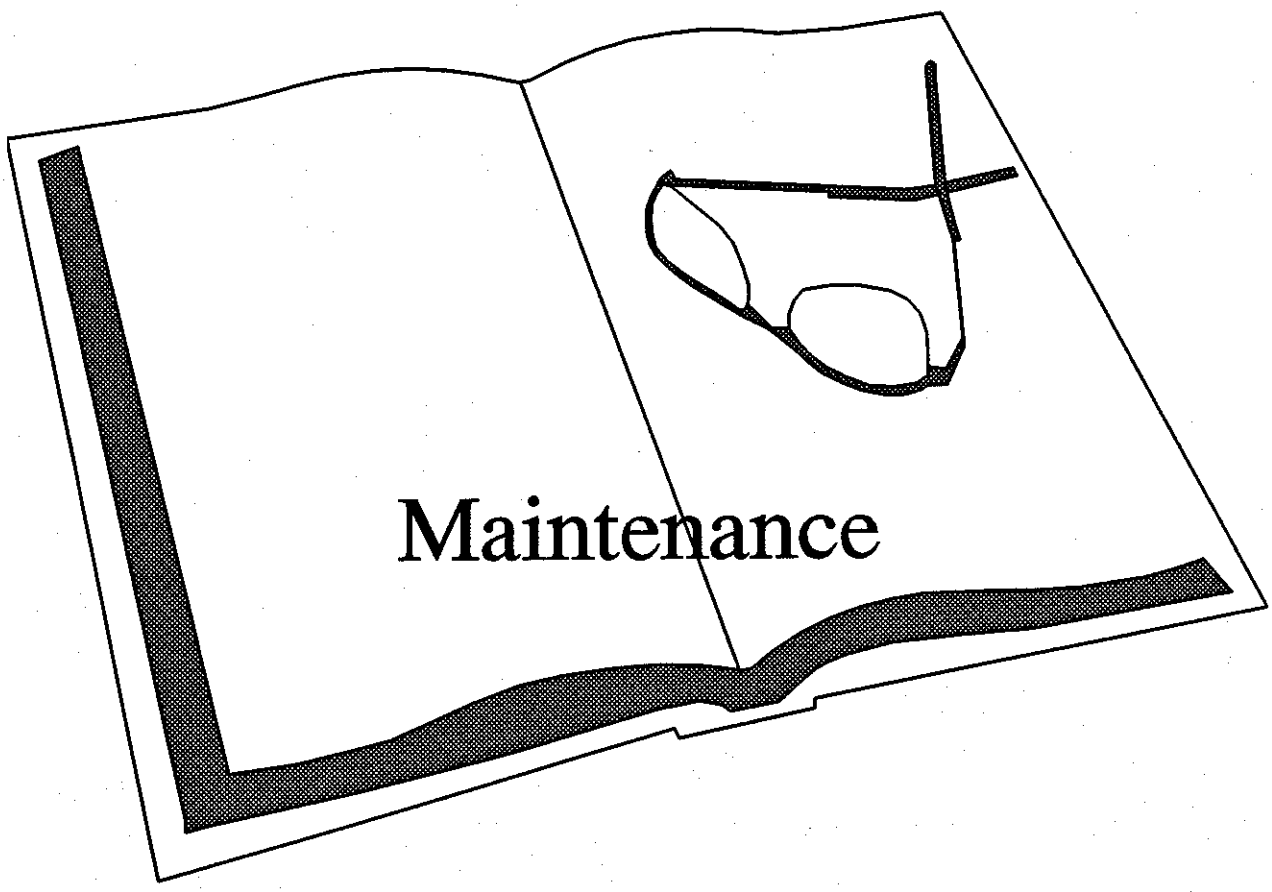
Fire Safety Journal, Vol. 14, No. 1&2, 89-99, July 1, 1988.
Society of Fire Protection Engineers. Fire Detection and Suppression...Today's Technology. March 9-11, 1987, Linthicum Heights, MD, 1-26 pp, 1988.
sprinklers; heat transmission; gas temperature; time constant; heat transfer
A methodology for describing, measuring and prescribing the performance of sprinkler heads when subject to heating regimes is necessary for three purposes: 1. Quality control during manufacture, 2. 'Approval' by interested bodies for particular applications, 3. Development of a 'model' for activation time of sprinklers that can be incorporated into computer codes for fire scenarios, involving both life and property safety.

Vannerberg, C.

Vannerberg, C.
Numerical Simulation of Smoke Detectors Using Field Models.
(Numerisk Simulering av Detektion-Miljo Med Faltmodeller.)
Lund Univ., Sweden
LTUVDG/(TVBB 3052); 47 p. 1988.
In: Swedish (Abstract in English)
smoke detectors; response time; temperature; smoke density

Waterman, T. E.

Waterman, T. E.; Harpe, S. W.; Christian, W. J.
Engineering Approach to the Positioning of Fire Detectors in Residences.
IIT Research Institute, Chicago, IL
Underwriters Labs., Inc., Northbrook, IL
SFPE TR 77-06; 35 p. 1977.
Society of Fire Protection Engineers (SFPE).
SFPE Seminar:
Engineering an End to Residential Life Loss.
May 17, 1977,
SFPE TR 77-06, Washington, DC, 1977.
residential buildings; fire detectors; fire tests; smoke detectors; installation; sensitivity



Maintenance

While this section has few papers, most are of interest and contain useful information on the relationship between maintenance and operational reliability [e.g., Kamath *et al* 1990, Moore 1987, and Nielsen 1986].

Bean, M. J.

Bean, M. J.
Installation Use and Maintenance of Automatic Fire Detection Equipment.
Honeywell Ltd., England
Fire Service Technical College. Automatic Fire Detection in Non-Domestic Residential Premises. Technical Study. Paper 3. April 3-5, 1978, Gloucestershire, England, 13-21 pp, 1978.
fire detection; installation; maintenance

Hall, J. R., Jr.

Hall, J. R., Jr.
Most Recent Statistics on Smoke Detector Installation and Maintenance in U. S. Homes.
National Fire Protection Assoc., Quincy, MA
Fire Prevention, No. 215, 30-32, December 1988.
smoke detectors; installation; maintenance; fire statistics; home fires

Hygge, S.

Hygge, S.
Smoke Detectors in Apartments and One-Family Houses: A Comparison Between the Maintenance, Care and Performance of Free and Purchased Smoke Detectors.
National Swedish Institute for Building Research, Gavle, Sweden
Fire Safety Journal, Vol. 15, No. 3, 195-210, 1989.
smoke detectors; apartments; housing; maintenance; performance evaluation; insurance

Jernigan, W.

Jernigan, W.
Keeping the Smoke Detectors Operational: The Dallas Experience.
Dallas Fire Dept., TX
Fire Journal, Vol. 81, No. 4, 57,59-60+, July/August 1987.
smoke detectors

Kamath, A. R. R.

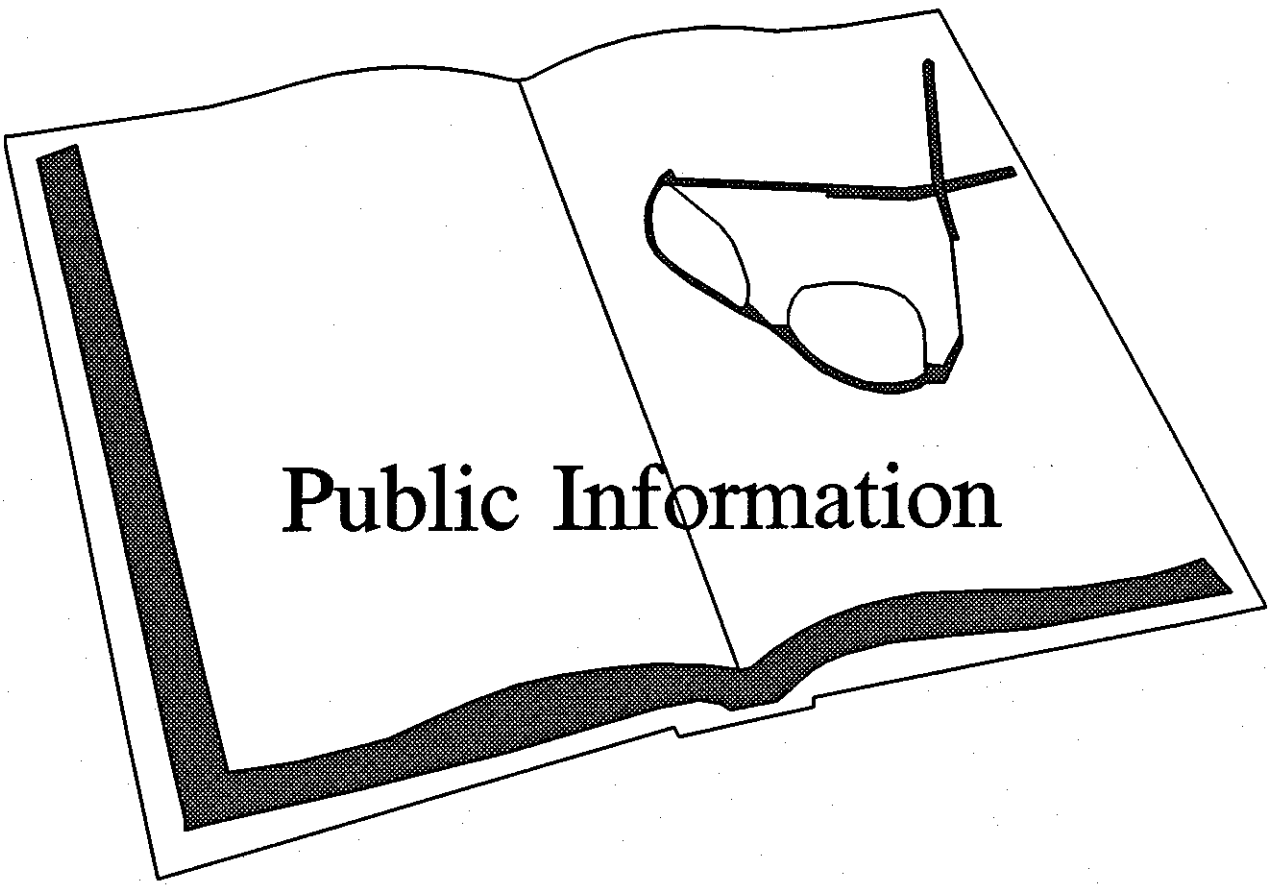
Kamath, A. R. R.; Keller, A. Z.; Selman, A. C.
Fire Alarm Maintenance in Health Service Industries.
Bradford Univ., UK
Department of Health and Social Security, London, England
Advances in Reliability Technology Symposium, 7th. 1982, 2C/2-14 pp, 1982.
hospitals; statistical analysis; fire alarm systems; maintenance; tests
Data collected from 55 hospitals in the north of England is analysed using nonparametric statistics. Factors such as false alarms, time spent on testing/maintenance are identified and investigated. Various statisitcal models are employed to examine the fire alarm incident rates and annual false alarm rate predictions made.

Moore, W. D.

Moore, W. D.
Testing and Maintenance--Increasing Fire Detection Systems Reliability.
Mass Fire Alarms of New England, Lowell, MA
Society of Fire Protection Engineers. Fire Detection and Suppression...Today's Technology. March 9-11, 1987, Linthicum Heights, MD, 1-5 pp, 1987.
fire detection systems; tests; maintenance
In recent major fires, fire detection systems either failed to operate, failed to operate correctly, or the public failed to respond properly.

Nielsen, E.

Nielsen, E.
Inspection and Maintenance of Active and Passive Fire Protection.
Danish Fire Protection Assoc., Copenhagen, Denmark
Saudi Arabian Standards Organization.
Protection of Buildings From Fires. Symposium. February 8-10, 1982, Riyadh, Saudi Arabia, 129-135 pp, 1982.
fire safety
Fire safety in building depend on the fire protection measures built in at the design of the building. Fire safety depends on the maintenance of the fire protection, both passive (fire doors, etc.) and active measures (fire detection systems, sprinklers, etc.)



Public Information

The papers in this section are written for general audiences and contain little technical information. Papers deal with the promotion of detector installation in residences and other occupancies, and with special topics such as the hearing impaired [DeVoss 1990, Nober 1990, and Tucker 1985] and radiation safety from ion chambers [Wernli 1990]. The current British view is covered in two papers by the same author [Ashmore 1988].

Ashmore, F. S.

Ashmore, F. S.
Assessment of the Risk.
Fire Safety Consultants
University of Edinburgh. Recent Developments in Fire Detection and Suppression Systems. (With Additional Papers From a Course of the Same Title--July 8-9, 1987). November 10-12, 1986, Edinburgh, Scotland, 8 pp, 1987.
fire risks; fire protection; risk assessment

Ashmore, F. S.
Selection of the System.
Fire Safety Consultants
University of Edinburgh. Recent Developments in Fire Detection and Suppression Systems. (With Additional Papers From a Course of the Same Title--July 8-9, 1987). November 10-12, 1986, Edinburgh, Scotland, 13 pp, 1987.
fire detection; fire suppression; risk assessment

Bemis, B.

Bemis, B.
What's "Bugging" Your Smoke Detectors?
American Fire Journal, Vol. 39, No. 1, 17,29, January 1987.
smoke detectors

Benjamin/Clarke Associates, Inc.

Benjamin/Clarke Associates, Inc.
Fire Deaths - Causes and Strategies for Control.
Benjamin/Clarke Assoc., Inc., Kensington, MD 78 p. 1984.
fire safety; smoke detectors; fire protection; public awareness; death; sprinklers

Cassidy, V. M.

Cassidy, V. M.
M/E Update Security Systems.
Specifying Engineer, Vol. 45, No. 5, 103-107, May 1981.
fire detection systems; life safety

Cerberus

Cerberus
Age of the Data Rush.
Alarm--Modern Fire Protection and Security Systems Review, No. 104, 1-5, August 1988.
computers; fire alarm systems; fire tests; fire detection; warning systems
There is hardly anything so coveted today than are data: everyone is clinging to them as if they were pure gold. By analogy we could rightly speak of an age of data rush. As the gold rush was in old times, so the way to, and the handling of data today is accompained by risks and dangers, and anyone inpossession of them is well advised to take good care of them! Here too, there are thieves and forgers, people who offer "light" coin, and others who lull themselves into a sense of false security. Data are in demand, and are, therefore, in danger.

Cohn, J.

Cohn, J.
NBS Center Studies Ways to Improve Fire Safety.
Journal of the West Virginia State Firemen's Assoc., Vol. 3, No. 1, 4-7, Dec-Jan 1984.
fire safety; fire research; fire suppression; smoke detectors; health care facilities; fire models

Consumer Product Safety Commission

Consumer Product Safety Commission
What You Should Know About Smoke Detectors.
Consumer Product Safety Comm., Wash., DC 5 p. January 1985.
smoke detectors

Consumer Reports

Consumer Reports
Are Smoke Detectors Hazardous?
Consumer Reports, Vol. 42, No. 1, 52-54, January 1977.
smoke detectors; health hazards; fire fighters
Consumer Reports
Smoke Detectors.
Consumer Reports, Vol. 49, No. 10, 564-567, October 1984.
smoke detectors

Consumer Reports
Update: Smoke Detectors.
Consumer Reports, Vol. 42, No. 5, 283, May 1977.
smoke detectors

Consumers Digest

Consumers Digest
How to Survive a Fire.
Consumers Digest, 30-34, July/August 1981.
survival; smoke detectors

Crevling, F.

Crevling, F.
Public Relations Idea.
Park Forest Fire Dept., IL
Fire Chief, Vol. 20, No. 4, 52, April 1976.
smoke detectors; public awareness

DeVoss, F.

DeVoss, F.
Bringing Alarms to Light--Signaling for the Hearing Impaired.
Underwriters Labs., Inc., Northbrook, IL
UL Lab Data, Vol. 20, No. 1, 4-7, 1990.
lighting equipment; fire alarm systems; signals

Federal Emergency Management Agency

Federal Emergency Management Agency
Ounce of Prevention.
Federal Emergency Management Agency, Washington, DC
FA-76; 17 p. May 1988.
fire prevention; sprinklers; smoke detectors

Fire

Fire
How a Swedish Home Smoke Detector Campaign is Meeting With Success.
Fire, Vol. 77, No. 952, 37-38, October 1984.
fire safety; smoke detectors
Not a day seems to go by without the radio or TV news reader telling us of a fire--usually overnight--which has cost the lives of one or more member of a family. And newspapers have a succession of stories with headlines like "Family perish; Mother trapped with four children". What can we do to reduce the toll of these residential fires? Must we accept the deaths as an inevitable price to be paid for the privilege of living with gas, electric, coal and paraffin fires, of smoking cigarettes or playing with matches, or being careless with cleaning fluids? What we must accept is the "an Englishman's home is still his castle", but at the same time we must besiege him with fire safety missives. The Fire Protection Association, through the Central Fire Liaison Panel Network and with the support of the government, is about to do this by making "Fire costs lives" the theme of this year's Fire Safty Week, from October 22-27. Fire joins the campaign with this special feature hich includes reports of efforts made to solve the problem of home fire safety in Scandinavia and throughout Europe.

Fire Fighting in Canada

Fire Fighting in Canada
Fire Detection Through Thermal, Smoke and Product of Combustion Detectors.
Fire Fighting in Canada, Vol. 20, No. 6, 8,20, December/January 1977.
fire detection; heat detectors; flame detectors

Fleming, R. P.

Fleming, R. P.
Applications/Limitations of QRS Technology.
Sprinkler Quarterly, 15-27, Spring 1987 and Fire Safety Journal, Vol. 14, Nos. 1&2, 75-88, July 1, 1988,
sprinklers; quick response sprinklers

Garbacz, C.

Garbacz, C.
Smoke Detector Effectiveness and the Value of Saving a Life.
Missouri Univ., Rolla
Economics Letters, Vol. 31, No. 3, 281-286, 1989.
smoke detectors; effectiveness; life safety

Gatfield, A. J.

Gatfield, A. J.
Visit to the United States of America and Canada and a Brief Study of the Fire Safety Scene.
34 p. April 1982.
fire safety; fire codes; enforcement; escape means; fire fighters; handicapped; smoke detectors; sprinklers; arson

Gilbert, K.

Gilbert, K.
FIREBUSTER: Baltimore City Fire Department Mounts Detector Offensive.
Baltimore Evening Sun Newspaper
Firehouse, Vol. 7, No. 5, 30-32, May 1982.
fire detectors; smoke detectors

Glass, R. A.

Glass, R. A.; Rubin, A. I.
Fire Safety for High-Rise Buildings: The Role of Communications.
National Bureau of Standards, Gaithersburg, MD
NBS BSS 115; 47 p. April 1979.

Available from National Technical Information Services AD/B-053232
decision analysis; fire detection systems; smoke detection; smoke movement; smoke control; extinguishment; fire safety; high rise buildings; people movement; systems engineering

Grant, C. C.

Grant, C. C.; Mulhaupt, R.
Current Research Activity of the National Fire Protection Research Foundation. Short Communication.
National Fire Protection Assoc., Quincy, MA
Fire Safety Journal, Vol. 15, No. 6, 477-483, 1989.
research facilities; halons; sprinklers; fire detection; self contained breathing apparatus; risk assessment; flammable liquids; refrigerants

Green, L.

Green, L.
Smoke and Heat Detectors.
Specifying Engineer Editor, Des Plaines, IL
Specifying Engineer, Vol. 52, No. 1, 117-120, July 1984.
smoke detectors; heat detectors

Hirst, R.

Hirst, R.
Underdown's Practical Fire Precautions. 3rd Edition, Gower Publishing Co. Ltd., England, 1989.
fire protection

Holland, K.

Holland, K.
Fire Detection--Towards Greater Public Safety.
Fire Prevention, No. 211, 29-32, July/Aug. 1988.
fire detection; fire safety; standards; public awareness

Jaffer, R. P.

Jaffer, R. P.
Meeting Today's Fire Problems...Fire Detection/Alarm Systems.
Consulting Engineer, Tampa, FL
Specifying Engineer, Vol. 45, No. 5, 82-87, May 1981.
fire alarm systems; fire detection; life safety

Jameson, F.

Jameson, F.
Notification and Alarm Systems--The Las Vegas Story.
Las Vegas Fire Dept., Las Vegas, NV

AIA Research Foundation. Life Safety and the Handicapped, 1980 Conference. Final Report. October 26-30, 1980,
Washington, DC, NBS-GCR-82-283, Kennett, E. W., Editor, 36-38 pp, 1982.
Available from National Technical Information Services PB82-194515
fire alarm systems
Can the deaf hear smoke detectors? Do ambulatory patients find it easy to get away from fire, especially in highrise buildings? Can the blind keep their sense of direction in a fire? Can mentally retarded people be taught fire safety? Under the direction of Chief Sam Cooper, the Las Vegas Fire Department has found "yes" to some of those questions, and has implemented the resulting knowledge and technology.

Jurgen, R. K.

Jurgen, R. K.
Where There's Smoke...There'd Better be a Smoke Detector.
Inexpensive, Life-Saving Systems Vie for Consumer Interest.
IEEE Spectrum, V. 13, No. 8, 24-26, Aug. 1976.
smoke detectors; life safety; detector location

Maclean, J.

Maclean, J.
Early Warning Saves Lives.
Fire Fighting in Canada, Vol. 20, No. 2, 39-40,58, April/May 1976.
warning systems; smoke detectors; ionization detectors; insurance

Markman, H. M.

Markman, H. M.; Crombie, P. E., Jr.
Smoke Detectors and Legislation: An Update on State and Local Laws.
Federal Emergency Management Agency, Washington, DC
31 p. June 1979.
Available from Government Printing Office
smoke detectors; legislation

McGehan, F. P.

McGehan, F. P.
Clearing the Air on Smoke Detectors.
National Bureau of Standards, Gaithersburg, MD
National Bureau of Standards Dimensions, Vol. 61, No. 3, 7-9, March 1977.
smoke detectors

McGehan, F. P.
Life-Saving Investments: Smoke Detectors for the Home.
National Bureau of Standards, Gaithersburg, MD
National Bureau of Standards Dimensions, Vol. 60, No. 4, 6-8, April 1976 and Fire, Vol. 69, No. 855, 184-185,September 1976.,
smoke detectors
These two stories illustrate dramatically what countless Americans have been discovering--that the purchase of a relatively inexpensive detector may save their homes--and lives--in the event of a fire. Smoke detector sales reached 50,000 when they came on the market in 1971.

Mniszewski, K. R.

Mniszewski, K. R.; Waterman, T. E.; Harpe, S.
Detector Directory.
IIT Research Inst., Chicago, IL
Underwriters Labs., Northbrook, IL
176 p. December 1978.
fire detectors; manufacturing; bibliographies

National Fire Protection Association

National Fire Protection Association
Smoke Detectors--A Sound You Can Live With!
National Fire Protection Assoc., Quincy, MA
BR-28; 6 p. 1988.
smoke detectors; fire safety

National Fire Protection Association
Smoke Detectors--Fire Safety While You Sleep.
National Fire Protection Assoc., Quincy, MA
BR-4; 6 p. 1988.
smoke detectors; fire safety; sleep; escape means

National Fire Protection Association
What is America's Fire Problem?
National Fire Protection Assoc., Quincy, MA
5 p. 1990.
costs; statistics; fire risks; fire prevention; fire detection; fire safety

Nober, H.

Nober, H.
Alarms for the Hearing-Impaired.
Fire Prevention, No. 233, 28-31, October 1990.
fire alarm systems; handicapped; warning systems; smoke detectors; evacuation; color; noise (sound); signals; light scattering detectors

Peissard, W. G.

Peissard, W. G.
Automatic Fire Alarms--Are They a Benefit or Nuisance?
Cerberus AG, Mannedorf, Switzerland
Fire, Vol. 75, No. 925, 62, July 1982.
fire alarm systems; fire detection systems

Pendergrast, R. F.

Pendergrast, R. F.
Selling the Public on Smoke Detectors.
Northfield Rescue Squad., IL
Fire Chief Magazine, Vol. 25, No. 12, 37-38, December 1981.
smoke detectors; public awareness

Perkins, C.

Perkins, C.; Berenblut, B. J.
Does Electronic Equipment Need Automatic Fire Detection?
Insurance Technical Bureau, England
Fire, Vol. 73, No. 900, 24, June 1980.
electrical equipment; fire detection; fire protection

Public Technology, Inc.

Public Technology, Inc.
Impact of the Use of Smoke Detectors. Urban Consortium for Technology Initiatives.
Information Bulletin.
Public Technology, Inc., Washington, DC
PTI-78/504; 27 p. 1978.
smoke detectors; technology utilization

Specifying Engineer

Specifying Engineer
Systems Challenge: Balanced Life-Safety Design With Sprinklers and Detection/Alarm Devices.
Specifying Engineer, Vol. 54, No. 5, 82-86, 88-89, October 1985.
fire protection; sprinkler systems

Sylvia, D.

Sylvia, D.
U. S. Programs Eye Grass Roots, Tipton and McCormack Tell FDIC.
Associate Editor
Fire Engineering, Vol. 129, No. 5, 36-38,40,42, May 1976.
research facilities; smoke detectors; training; fire fighters; education; consumer protection

Taylor, K. T.

Taylor, K. T.
Burning Down the School...The Lessons We Don't Learn Can Hurt Us.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 84, No. 3, 60-64,66,68-69, May/June 1990.

schools; fire statistics; fire detection systems; fire suppression

Tucker, T.

Tucker, T.
Sound Idea Helps Hearing Imparied.
Fort Wayne Fire Dept., IN
Fire Chief, 39-40, June 1985.
handicapped; smoke detectors

U. S. Conference of Mayors

U. S. Conference of Mayors
U. S. Conference of Mayors. Final Report. Fire Prevention Poject 1980 to the U. S. Fire Administration. March 1981.
Conference of Mayors, Washington, DC
75 p. March 1981.
Available from National Technical Information Services PB81-205130
fire prevention; fire safety; education; fire protection; fire alarm systems; smoke detectors; fire detection systems; regulations; building codes; arson
This is the final report of a one year fire prevention project with mayors of 73 cities and the U. S. Fire Administration. The primary purpose of the project was to assess the needs and priorities of mayors in the area of fire protection. This report includes an overview of the year's activities with final products appended to the approprate sections. It includes: Fire Prevention and Arson Resolutions, Mayors Leadership Institute report and evaluation, Mayors Manual on Fire Prevention (includes the manual), and an Assessment of Fire Prevention Needs and Strategies with report on the assessment. This final report also includes nine recommendations from the Mayors Conference to the U. S. Fire Administration. The recommendations include, the need for a basic cost/benefit analysis for retrofitting older buildings for sprinkler and smoke detector systems, and studies that address the reassignment of fire personnel for activities such as master planning and public education and incorporating more comprehensive fire data systems in cities.

U. S. Consumer Product Safety Commission

U. S. Consumer Product Safety Commission
What You Should Know About Smoke Detectors.
Consumer Product Safety Commission, Washington, DC, 11 p. 1978.
smoke detectors; public awareness

U. S. Department of Commerce

U. S. Department of Commerce
Reducing the Nation's Fire Losses--The Research Plan.
Department of Commerce, Washington, DC
64 p. January 1976.
fire losses; research facilities; fire research; ignition; fire spread; fire growth; fire detection; fire suppression; escape means; refuge; fire protection

U. S. Department of Commerce
Smoke Detectors--What They Are and How They Work.
Department of Commerce, Washington, DC
LC 1074; 8 p. December 1976.
smoke detectors

U. S. Department of Commerce
Wake Up! Smoke Detectors...Can Save Your Life.
Department of Commerce, Washington, DC
8 p. December 1976.
smoke detectors

U. S. Department of Commerce; National Fire Prevention and Control Administration
Annual Report of the Secretary of Commerce on Implementation of the Federal Fire Prevention Control Act of 1974.
Department of Commerce, Washington, DC
National Fire Prevention and Control Admin., Washington, DC
Annual Report; 48 p. July 1978.
research facilities; fire research

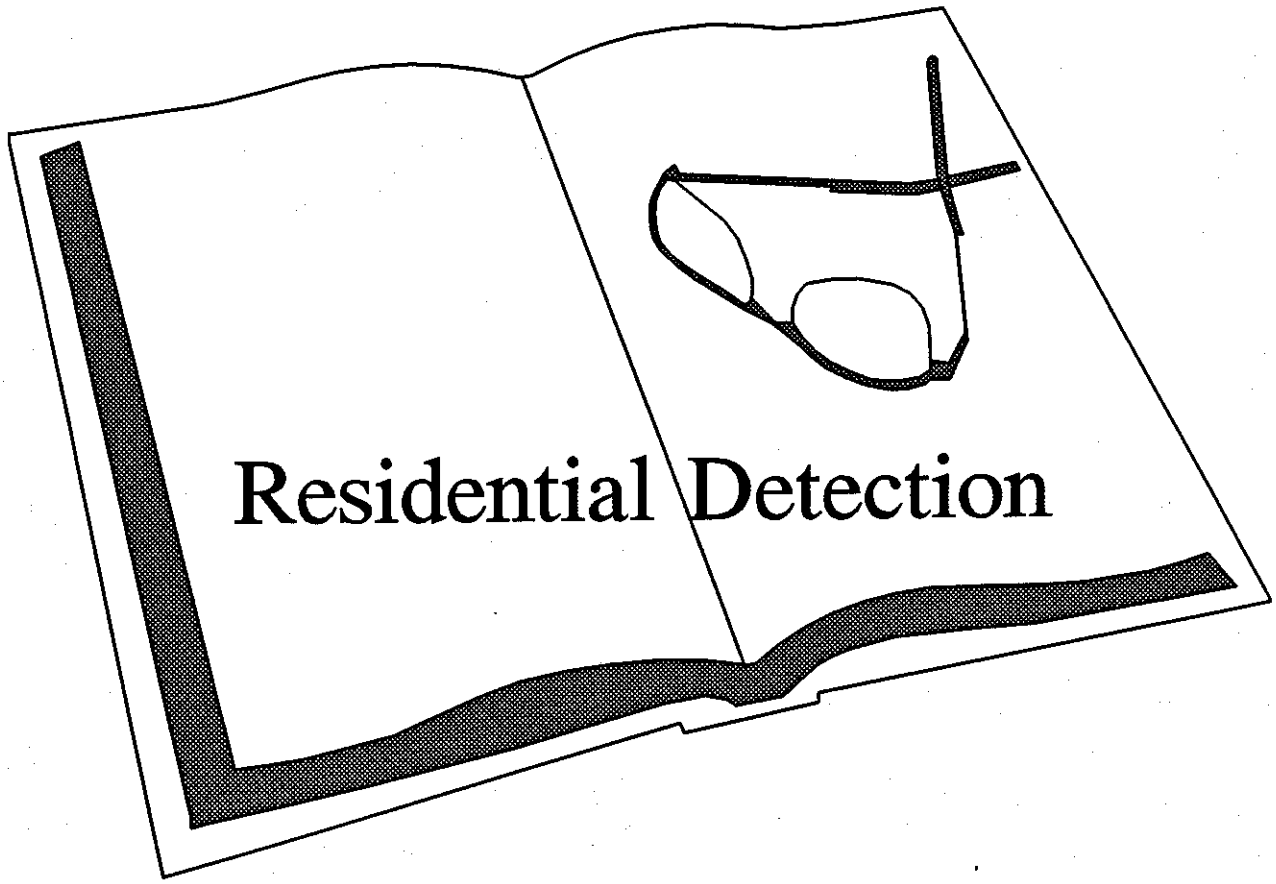
Walsh, H.

Walsh, H.
National Mandate for Smoke Detectors.
Federal Emergency Management Agency, Washington, DC
International Fire Chief, Vol. 52, No. 8, 8-9, August 1986.
smoke detectors

Wernli, C.

Wernli, C.
Radiological Risk From Am-241 in Ionization Smoke Chambers.
Eidgenoessisches Institute fuer Reaktorforschung, Wuerenlingen, Switzerland
EIR-369; 42 p. June 1979.
Available from National Technical Information Services DE82-700830
smoke detectors; aerosols; ionization chambers; radiation hazards; radiation protection; risk assessment; inhalation
The author discusses the risk to man from the use of ionization smoke chamber detectors with an Am-241 radiation source. The estimated dose is compared with that due to natural radioactivity.

International Fire Detection
Bibliography 1975-1990



Residential Detection

This is the second largest section behind Detector Performance. Of note among the more than 100 papers in this section are the final reports of several studies begun in the 70's; the Toledo Study [Moyer *et al* 1990] which looked at detector performance and owner attitudes, and a study of Automatic Residential Remote Alarm Systems (AARAS) [Baileys 1990] which began in a planned community in Texas. Also, there is a compilation of HUD data from mobile homes [NFDC 1990] and an examination by the IAFC Foundation of detectors installed in homes [Gratz *et al* 1990]. Also interesting are papers on the performance of smoke detectors in college dorms [Breen 1990] and in hotels in the US [Bill 1990] (describing full-scale tests) and in Japan [Takemoto 1990] (addressing false alarm statistics).

A number of papers on audibility/acoustics [Myles 1979, 1990, Nober 1978, 1981, 1983, Haliwell 1986, and Fidell 1990] should be of benefit in general audibility research. There are also a number of retrospective articles on the long term effectiveness of mandatory detector laws [Mass 1990, Jansky 1976, LeCoque *et al* 1990, Brannigan 1977, Smith 1977, Ozment 1977, Halpin *et al* 1978, etc.].

Baileys, T. P.

Baileys, T. P.
Automatic Residential Remote Alarm System Survey. Final Report.
Fire Administration, Washington, DC
Final Report; 16 p. September 1979.
Available from National Technical Information Services PB80-124811
fire alarm systems; residential buildings; false alarms; fire safety; fire departments; warning systems; surveys; questionnaires; smoke detectors
This is a compilation of the results of a survey conducted by the United States Fire Administration and the International Association of Fire Chiefs Foundations to study the impact of smoke detector use and to obtain the views of fire chiefs with respect to an Automatic Residential Remote Fire Alarm System (ARRAS). Results indicated interest in the remote alarm concept. About 75 percent of the respondents linked increased smoke detector use to a reduction in fire losses in their respective jurisdictions. More than 90 percent felt that notification 15 minutes earlier would be important in reducing fire losses, and agreed with large-scale ARRAS implementation assuming false alarms were maintained at an acceptable level. For 65 percent of the chiefs, five to ten false alarms per thousand homes per year would be acceptable. Nearly half favored use of a telephone call-back or a manual abort-switch to prevent false alarms. A majority thought they could modify their present first alarm response assignment to single family residences when given early notification.

Best, R.

Best, R.
Coates House Hotel Fire: 20 Die, 36 Rescued Down Ladders in 92-Year-Old Kansas City Hotel.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 72, No. 4, 23-29, July 1982.
hotels; death; high rise buildings; fire protection; damage; fire detection systems

Best, R.
Dwelling Fire Kills Two, Melrose, Massachusetts.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 71, No. 1, 12-14, Jan. 1977.
residential buildings; death; heat detectors

Best, R.
Three Die in Dwelling Fire; Gift Smoke Detector Not Installed.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 73, No. 1, 74-76, Jan. 1979.
residential buildings; death; smoke detectors

Best, R.
Three Die in Single-Family Dwelling Fire.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 71, No. 5, 81-84,109, September 1977.
residential buildings; death; heat detectors; smoke detectors

Bill, R. G., Jr.

Bill, R. G., Jr.
Life Safety Team: Smoke Detectors and Sprinklers in Hotels.
Factory Mutual Research Corp., Norwood, MA
Fire Journal, Vol. 84, No. 3, 28-31,34-35,37, May/June 1990.
hotels; smoke detectors; sprinklers; large scale fire tests; test facilities; beds (furniture); smoldering

Bill, R. G., Jr.
Response of Smoke Detectors to Smoldering-Started Fires in a Hotel Occupancy. Technical Report.
Factory Mutual Research Corp., Norwood, MA
FMRC J.I. 0Q0R4.RA; 72 p. November 1988.
smoke detectors; hotels; smoldering; fire tests; beds (furniture); corridors; ventilation

Bill, R. G., Jr.; Kung, H. C.; Brown, W. R.; Hill, E. E., Jr.
Evaluation of Extended Coverage, Sidewall Sprinklers and Smoke Detectors in a Hotel Occupancy. Technical Report.
Factory Mutual Research, Norwood, MA
Journal of Fire Protection Engineering, Vol. 1, No. 3, 77-98, 1989.
FMRC J.I.0M3N5.RA(4); 87 p. May 1988.
sprinklers; smoke detectors; hotels; fire tests

Bowallius, L.

Bowallius, L.
Residential Fire. (Bostadsbrand.)
National Defence Research Inst., Stockholm, Sweden
FOA Report E10003-1.2; 68 p. June 1988.
In: Swedish (Abstract in English)
residential buildings; fire losses; rescue operations; fire spread; fire statistics; effectiveness
The report is a presentation of a study of about 1000 residential fires and operations of rescue units. The purpose has been to illustrate the correlation between the environment, fire loss and rescue opeations and finally to find a method to make this illustration. A large number of data (observations and estimates) which describe the environment, fire spread, smoke spread, operations and course of events have been analysed. The study inter alia points out that the number of fatalities could have been reduced 40-50 percent if smoke detectors had existed and that the operation units in almost all fires were larger than necessary. One of the most interesting results is the description of the risk for fire spread as a function of time in different kind of dwellings.

Brannigan, V.

Brannigan, V.
Legal Implications of Mandatory Home Fire Detection.
Consumer Product Safety Commission, Washington, DC
Fire Journal, Vol. 71, No. 2, 59-65, March 1977.
fire detectors; residential buildings; smoke detectors; fire protection; legislation

Breen, D. E.

Breen, D. E.
Do Smoke Detection Systems Work in College Dormitories?
Harvard Univ., Cambridge, MA
SFPE TR 84-08; 34 p. May 1984.
dormitories; smoke detectors; false alarms; fire alarm systems; fire behavior; fire protection; fire safety; life safety; human response

Breen, D. E.
Improved Life Safety Through More Reliable Smoke Detection Systems.
Harvard Univ., Cambridge, MA
New Technology to Reduce Fire Losses and Costs. October 2-3, 1986, Luxembourg, Elsevier Applied Science Publishers, NY, Grayson, S. J. and Smith, D. A., Editors, 227-234 pp, 1986.
smoke detectors; life safety; false alarms

Breen, D. E.
Toward More Reliable Residential Smoke Detection Systems.
Harvard Univ., Cambridge, MA
Journal of Fire Protection Engineering, Vol. 2, No. 1, 1-10, 1990.
smoke detectors; false alarms; fire statistics

Bright, R. G.

Bright, R. G.
Advances in Residential Smoke Detection.
National Bureau of Standards, Gaithersburg, MD
Fire Journal, Vol. 68, No. 6, 69-77, Nov. 1974.
National Fire Protection Association. Fire Protection Structure and Systems Design. Open Learning Fire Service Program. 315-324 pp, 1982.
smoke detectors; smoke detection; residential buildings; fire statistics

Bright, R. G.
Domestic Fire Detectors--Technical Developments.
National Bureau of Standards, Gaithersburg, MD
Fire Surveyor, Vol. 7, No. 4, 33-38, Aug. 1978.
fire detectors; smoke detectors; ionization detectors
Four years ago, the annual production rate for smoke detectors in the U.S. was around a half-million units per year. By the end of 1977, as far as we have been able to determine, the annual rate of production has reached some 10 million units per year. It is estimated that by the

end of 1977 somewhere around 30 million of these detectors had been installed in single-family homes, apartments and mobile homes in the U. S.

Bright, R. G.
Status Report on Residential Smoke Detectors.
National Bureau of Standards, Gaithersburg, MD
Fire Marshals of North America Meeting. In Conjunction with the 81st Annual Meeting of the National Fire Protection Association. May 16-19, 1977, Washington, DC, 1-17 pp, 1977.
smoke detectors; fire alarm systems
The purpose of this presentation is to give you a status report on residential smoke detectors. This report will be presented in a "good news, bad news" format.

Bright, R. G.
Technical Developments of Domestic Fire Detectors.
National Bureau of Standards, Gaithersburg, MD
International Fire, Security and Safety Exhibition and Conference. April 24-28, 1978, London, England, 9-16 pp, 1978.
fire detectors; smoke detectors; ionization detectors
In 1974, I appeared before this Conference and my subject was the same as it is today, domestic fire detectors. In the four years since that presentation, there have been many changes in domestic fire detectors, particularly in the U.S. In the time available to me today, I'll describe some of the more significant technical developments which have occurred, some of the problems encountered, and some of our visions of the future.

Bryan, J. L.

Bryan, J. L.; Milke, J. A.
Examination and Analysis of the Dynamics of the Human Behavior in the Fire Incident at Chesapeake Hall on February 3, 1980.
Maryland Univ., College Park
NBS-GCR-80-275; 43 p. June 30, 1980.
Available from National Technical Information Services PB80-218373
smoke; fire alarm systems; fire departments; fire investigations
This fire incident occurred on the second floor, north wing of Chesapeake Hall, University of Maryland at Baltimore County in Catonsville, Maryland. The fire incident was simultaneously detected by the resident assistant on the second floor by smoke in her room, the activation of a smoke detector in resident room 257, and the activation of a trouble alarm in the resident director's apartment on the first floor at approximately 0359. The resident assistant opened her room door and observed heavy smoke and flames in the corridor on the north wing adjacent to room door 257. She returned to her room, 266 and dialed the public safety dispatcher on 3133 to have him notify the Baltimore County Fire Department in accordance with the facility emergency procedures. The resident director on the first floor, investigating the trouble alarm heard screams from the second floor and investigated and upon seeing smoke activated the local alarm system at the station on the first floor. The Baltimore County Fire Department received the alarm at 0403.

Budnick, E. K.

Budnick, E. K.
Estimating Effectiveness of State-Of-The-Art Detectors and Automatic Sprinklers on Life Safety in Residential Occupancies.
National Bureau of Standards, Gaithersburg, MD
Fire Techology, Vol. 20, No. 3, 5-22, Aug. 1984.
NBSIR 84-2819; 81 p. January 30, 1984.
Available from National Technical Information Services PB84-153980
fire losses; life safety; residential buildings; sprinklers systems; smoke detectors
The report provides a qualitative assessment of the life safety impact of early warning fire detection and automatic sprinkler technology in residential occupancies. This assessment is based on the results of full scale studies and statistics on residential fire fatalities from the NFIRS data base. Estimates of the impact of three alternatives, smoke detectors, standard automatic sprinklers, and residential sprinklers, are provided for major fire hazard scenarios in residential occupancies. The results of this study indicate that significant life safety benefits can be derived from broad application of detectors and sprinklers in all residential buildings. Further work is necessary to reduce the gaps which exist in our understanding of the performance limits, cost-effectiveness, and reliability of these devices. In addition, there are residential scenarios, for example, occupants intimately exposed to a fire, where the impact of these devices appears marginal. A quantitative approach is outlined that can lead to a more accurate assessment of the impact of detectors and sprinklers. An initial framework is presented which identifies the key parameters for residential like safety. A mathematical expression is proposed as a success criterion. Work is underway to extend the framework to sufficient detail to permit formulation of appropriate analytical expressions necessary for quantitative evaluation of specific parameters and their interrelationships.

Bukowski, R. W.

Bukowski, R. W.
Field Investigation of Residential Smoke Detectors. Final Report.
National Bureau of Standards, Gaithersburg, MD
Fire Journal, Vol. 71, No. 2, 18,21-30,41, March 1977.
NBSIR 76-1126; 45 p. November 1976.

Available from National Technical Information Services PB-260878
detector sensitivity; escape; fire tests; heat detectors; building fires; residential buildings; smoke detectors
A test program was undertaken to evaluate the effect of sensitivity and placement of residential smoke detectors on their response to fires in homes. The tests were conducted in two homes scheduled for demolition and used actual furnishings in typical configurations. In addition to the detector response times, the homes were highly instrumented with data on smoke, temperature, and gas concentration measured for all tests. The tests showed that smoke detectors can be highly effective in providing adequate warning of a fire before conditions in the home become dangerous.

Bukowski, R. W.
Fire Detection and Alarm Systems.
National Bureau of Standards, Gaithersburg, MD
NBSIR 86-3360; 14 p. April 1986.
Available from National Technical Information Services
fire detection; fire detection systems; fire alarm systems; smoke; heat detection
Fire detectors sense the presence of fire by responding to changes in their local environment which are indicative of a fire within their associated area of coverage. The goal is to select conditions for sensing which appear as early as possible and which are present at levels sufficiently above those which might be produced by non-fire conditions to minimize false alarms. Such conditions are referred to as fire signatures. Not all unwanted fire conditions produce all fire signatures, so optimum detector system design requires that the detector types selected must be matched to the hazard present.

Bukowski, R. W.
Report for UJNR Panel Detection in USA 1980-1982.
National Bureau of Standards, Gaithersburg, MD
U.S./Japan Government Cooperative Program on Natural Resources. Fire Research and Safety. 6th Joint Panel Meeting of the UJNR Proceedings. May 10-14, 1982., Tokyo/Tsukuba, Japan, Building Research Inst., Tokyo, Japan, 10-14 pp, 1983.
detection; smoke detectors.
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.

Callan, J. J.

Callan, J. J.
Motel Disaster Averted.
Fairfax City Fire and Rescue Service, VA
Fire Chief Magazine, Vol. 28, No. 1, 46-47, January 1984.
hotels; smoke detectors; fire departments

Carpenter, D. J., Jr.

Carpenter, D. J., Jr.; Jennings, C.
Power Off to Hard-Wired Detector in Nine-Fatality House Fire, Peoria, Illinois (April 11, 1989). With Supplement on Role of Smoke Detectors in Fatal Townhouse Fire, Annapolis, Maryland. USFA Fire Investigation Technial Report Series.
TriData Corp., Arlington, VA
Report 031; 31 p. 1989.
fire investigations; home fires; death; wooden structures; smoke detectors; arson; apartments

Cerberus

Cerberus
Recent Tests on Fire Safety in Hotels.
Alarm--Modern Fire Protection and Security Systems Review, No. 105, 4-6, November 1988.
hotels; fire safety; fire tests; fire endurance tests
Hotels and guesthouses vary widely, both in structure and in outfitting and interior decoration. The safety of guests and personnel depends in any event on suitable provisions being made, which a) as far as possible, prevent fires from even occurring, b) offer no chance of spreading to a fire which has nevertheless occurred, c) ensure rapid detection of the fire and raising the alarm, d) facilities effective intervention by automatic equipment or hotel personnel until the fire department arrives.

Cote, A. E.

Cote, A. E.
Field Test and Evaluation of Residential Sprinkler Systems. Part 3.
National Fire Protection Assoc., Quincy, MA
Fire Technology, Vol. 20, No. 2, 41-46, May 1984.
sprinklers; mobile homes; smoke detectors; fire tests

Custer, R. L. P.

Custer, R. L. P.
Fire Power: Making the Movie.
Worcester Polytechnic Inst., MA
Fire Journal, Vol. 80, No. 6, 23-26,31-33,64, November 1986.

home fires; fire spread; fire growth; upholstered furniture; flame spread; smoke detector; ignition; temperature; smoke; sprinklers; carbon monoxide; flashover

Demers, D. P.

Demers, D. P.
Improperly Placed Smoke Detector Fails to Save Two Children.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 72, No. 3, 43-44, May 1978.
smoke detectors; children; death; multifamily housing; wood; apartments

Doerschuk, D. C.

Doerschuk, D. C.; Kleszczelski, S. E.
Investigation of Improved Sensor/Actuator Concepts for Residential Sprinkler Systems. Final Report. June 1979-December 1979.
Battelle Columbus Labs., Columbus, OH
FA-9; G-8293; 71 p. May 1980.
fire detectors; fire protection; sprinklers; residential buildings; sensitivity

Eguchi, Y.

Eguchi, Y.
Automatic Fire Detection in Japanese Dwellings.
Association of Fire Alarms of Japan
U. S./Japan Government Cooperative Program on Natural Resources. Panel on Fire Research and Safety. Volume 6.
Fire Detection. October 19-22, 1976, Tokyo, Japan, 1-15 pp, 1976.
fire detection; fire research; fire safety; residential buildings; fire detectors; false alarms; heat detectors; smoke detectors; installation;tests

Federal Emergency Management Agency

Federal Emergency Management Agency
Evaluation of Residential Smoke Detectors Under Actual Field Conditions. Final Report.
Federal Emergency Management Agency, Washington, DC
FA-60; 71 p. Marcy 1982.
smoke detectors; residential buildings

Federal Emergency Management Agency
Smoke Detectors: Don't Stay Home Without One.
Federal Emergency Management Agency, Washington, DC
L-163; 6 p. October 1988.
smoke detectors; safety

Fidell, S.

Fidell, S.
Evaluation of Effectiveness of Residential Fire Detection System Audible Warning Signals.
Bolt Beranek and Newman, Inc., Canoga Park, CA
National Fire Protection Association. Annual Meeting, 83rd.
May 1979, St. Louis, MO, 1-9 pp, 1979.
warning systems; fire detection systems; evaluation; effectiveness; residential buildings; noise (sound); smoke detectors; sleep

Fire

Fire
Lead Given on Automatic Fire Detection for Householders.
Fire, Vol. 78, No. 946, 581-582,614, April 1984.
fire detection

Fire Engineering

Fire Engineering
Edmonton Loses Detector Battle But Continues War to Save Lives.
Fire Engineering, Vol. 129, No. 11, 122-123, November 1976.
smoke detectors; fire protection; building codes; legislation

Fire Engineering
Sprinklers, Detectors Protect High-Rise.
Fire Engineering, Vol. 129, No. 9, 44-45, September 1976.
high rise buildings; sprinklers; fire detectors

Fire Journal

Fire Journal
Fire Damage Drastically Reduced Due to Florida "Detection" Program.
Fire Journal, Vol. 72, No. 6, 85,91, November 1978.
smoke detectors; fire detectors; public awareness; fire safety

Fire Prevention

Fire Prevention
Self-Contained Smoke Detectors.
Fire Prevention, Vol. 174, 21-23, Nov. 1984.
smoke detectors

This code of practice has been compiled by EURALARM (Association of European Manufacturers of Fire and Intruder Alarm Systems) in conjunction with BFPSA (The British Fire Protection Systems Association Ltd) to provide guidance for prospective users of self-contained smoke detectors on the application and limitations of these devices for the detection of fire in domestic dwellings.

Fire Surveyor

Fire Surveyor
Self-Contained Detectors. BFPSA's View.
Fire Surveyor, Vol. 11, No. 1, 30, February 1982.
smoke detectors; installing

Fire Surveyor Journal

Fire Surveyor Journal
Specification for Automatic Fire Alarm Systems for Domestic Dwellings. Part 2. Self-Contained, Multi-Sensitive Fire Detectors Providing Staged Audible and Other Alarm Signals.
Fire Surveyor Journal, Vol. 9, No. 2, 38-39, April 1980.
fire alarm systems; residential buildings; fire detectors

First Alert

First Alert; McDonald's
Plan to Get Out Alive. VHS Tape. 45 Minutes. 1988.
home fires; time; escape means; smoke; smoke detectors

Fuller, S. K.

Fuller, S. K.
Risk Exposure and Risk Attitude of Homeowners in Fire Protection Investment Decisions.
National Institute of Standards and Technology, Gaithersburg, MD
NISTIR 89-4212; 82 p. December 1989.
Available from National Technical Information Services PB90-141383
fire protection; risk analysis; sprinkler systems; decision making; risks
The report demonstrates that the Analytic Hierarchy Process (AHP) is a promising decision tool for evaluating fire protection systems for homeowners. It lays the ground for development of specialized computer software for applying the AHP to decisions of individual homeowners. Unlike conventional methods of economic analysis, the AHP integrates quantifiable and qualitative variables. The study explores how to include in the decision-making process information on an individual's risk exposure and risk attitude, information which is generally difficult or impossible to quantify. By differentiating between risk exposure and risk attitude, this application goes beyond the AHP's conventional treatment of risk. The AHP is applied to the choice of purchasing smoke detectors, a sprinkler system, or a combination of the two.

Gallagher, E. L.

Gallagher, E. L.
Is NBS Wrong?
A-T-O Inc.
Fire Journal, Vol. 71, No. 6, 86-89, Nov. 1977.
research facilities; smoke detectors; standards; life safety; sleep; bedrooms

Gancarski, J. L.

Gancarski, J. L.; Timoney, T.
Home Smoke Detector Effectiveness.
National Fire Protection Assoc., Quincy, MA
Fire Technology, Vol. 20, No. 4, 57-62, November 1984.
smoke detectors
In August 1983, the National Fire Protection Association was awarded a cooperative agreement with the Federal Emergency Management Agency/United States Fire Administration to study issues relative to home smoke detector installation, maintenance, and reliability, and to review smoke detector application programs in selected communities.

Gratz, D. B.

Gratz, D. B.; Hawkins, R. E.
Evaluation of Residential Smoke Detector Performance Under Actual Field Conditions. Final Report. Phase 1.
International Association of Fire Chiefs Foundation, Washington, DC
FEMA/FA-15; 50 p. June 1980.
Available from National Technical Information Services PB80-209604
smoke detectors; residential buildings; fire alarm systems; fire protection; evaluation
This report presents the first major effort to evaluate the effectiveness of residential smoke detectors under actual field conditions. Objectives of the study were to examine how smoke detectors perform when an unwanted fire occurs and to develop a data base to provide direction for future research in the performance of smoke detectors. The report supports previous research studies which indicate that smoke detectors in residential properties are preventing injuries, saving lives and reducing fire losses. The data was furnished by twelve jurisdictions, reporting on 1168 fire incidents that were responded to by fire departments. There were 1589 smoke detectors in the incidents reported. It was found that detectors provided

the early warning to life threatening situations in more than 40% of the unwanted fires. A smoke detector alarm reduced the potential for serious injury or death in 27% of the unwanted fires; fire loss was reduced in 35% of the unwanted fires.

Gratz, D. B.; Hawkins, R. E.
Evaluation of Smoke Detectors in Homes. Interim Report. Phase 1.
International Association of Fire Chiefs Foundation, Washington, DC
FA-26; 38 p. September 1980.
smoke detectors; residential buildings; legislation

Halliwell, R. E.

Halliwell, R. E.; Sultan, M.A.
Attenuation of Smoke Detector Alarm Signals in Residential Buildings.
National Research Council of Canada, Ottawa, Ontario
NRCC 25897; IRC Paper 1372 AND
International Association for Fire Safety Science. Fire Safety Science. Proceedings. 1st International Symposium.
October 7-11, 1985, Gaithersburg, MD, Hemisphere Publishing Corp., NY, Grant, C. E. and Pagni, P. J., Editors, 689-697 pp, 1986.
smoke detectors; residential buildings

Halpin, B. M.

Halpin, B. M.; Dinan, J. J.; Deters, O. J.
Assessment of the Potential Impact of Fire Protection Systems on Actual Fire Incidents. Fire Problems Program.
Johns Hopkins Univ., Laurel, MD
FPP TR 35; 78 p. October 1977.
fire protection; case histories; casualties; residential building; smoke detectors; fire alarm systems; fire suppression

Harpe, S. W.

Harpe, S. W.; Waterman, T. E.; Christian, W. J.
Detector Sensitivity and Siting Requirements for Dwelling--Phase 2. Final Report.
IIT Research Inst., Chicago, IL 60616
NBS-GCR-77-82; 379 p. February 1977.
Available from National Technical Information Services PB-263882
detector sensitivity; escape; fire tests; gas detectors; heat detectors; residential fires; smoke detectors
The contract for a field investigation of the effectiveness of residential smoke detectors was extended to cover 36 additional tests investigating details not completely covered in the first report. The objective of the second phase summer/fall conditions without air conditioning and to expand available information on high volume, two story structures. The effects of open windows, new technical developments in photoelectric detector design, and the response of semiconductor type residential gas detectors and mechanically powered heat detectors were also included. The tests reinforced the conclusions of the first phase of testing. They showed that open windows have little appreciable affect of life safety and detection times, and that semiconductor gas sensing fire detectors exhibit fuel specific response characteristics which seriously degraded the effectiveness in certain types of fires.

Harwood, B.

Harwood, B.
Residential Smoke Detectors--A Consumer Product Safety Commission Evaluation.
Consumer Product Safety Commission, Washington, DC
International Fire Chief, Vol. 46, No. 11, 20-23, November 1980.
smoke detectors; evaluation

Home Office

Home Office
Automatic Fire Detection in Non-Domestic Residential Premises.
Home Office, London, England
FIR/78-82/72/1; 7 p. October 13, 1978.
fire detection; fire detectors; residential buildings

Hygge, S.

Hygge, S.
Installation and Reliability of a Free Smoke Detector.
National Swedish Institute for Building Research, Gavle, Sweden
International Association for Fire Safety Science. Fire Safety Science. Proceedings. 1st International Symposium.
October 7-11, 1985, Gaithersburg, MD, Hemisphere Publishing Corp., NY, Grant, C. E. and Pagni, P. J., Editors, 739-748 pp, 1986.
smoke detectors

Hygge, S.
Smoke Detectors in Apartments and One-Family Houses: Fire Risk, Property Loss and the Presence of Smoke Detectors.
National Swedish Institute for Building Research, Gavle, Sweden

Fire Safety Journal, Vol. 15, No. 6, 421-435, 1989.
smoke detectors; apartments; housing; fire risk; insurance

Hyun, M. K.

Hyun, M. K.
United States of America Before Federal Trade Commission In the Matter of Figgie International, Inc., a Corporation.
Initial Decision.
Administrative Law Judge
Docket 9166; 77 p. October 23, 1984.
heat detectors; fire alarm systems

International Fire Chief

International Fire Chief
Residential Smoke Alarm Report.
International Fire Chief, Vol. 46, No. 9, 62-67, September 1980.
fire alarm systems; residential buildings; fire detectors

Isner, M. S.

Isner, M. S.
Successful Residential Sprinkler Activation. Cobb County, Georgia, May 2, 1985. 1 Child, 3 Adults Saved. Summary Investigation Report.
Federal Emergency Management Agency, Washington, DC
National Bureau of Standards, Gaithersburg, MD
Fire Command, Vol. 53, No. 1, 22-27, Jan. 1986.
NFPA-GA-CO-1; 24 p. 1985.
fire extinguishment; plastics; smoke detectors; sprinkler systems; residential buildings
Since their first installation in 1982, Cobb County sprinkler systems have successfully controlled a number of fires in residential properties. In each case the fires did not cause injuries and fire officials reported property damage was minimal. The most dramatic of these incidents occurred on May 2, 1985 when a fire started in a toddler's bedroom. During the incident, a circuit breaker tripped cutting power to the apartment's only smoke detector, and the sleeping occupants did not receive early warning. Still, a residential sprinkler extinguished the fire, alerted occupants, and allowed safe evacuation of the building. The result of this incident differs sharply from the results of many other similar residential fires in which tragic losses of life have occurred. One such incident happened in Hollywood, Florida on the night of December 20, 1982. The lack of early occupant warning and extinguishment of the fire in its incipient phase resulted in the death of a child. A comparative analysis of the Cobb County and Hollywood incidents demonstrates the life safety benefits of residential sprinklers. It also suggests that residential sprinklers will be able to maintain a tenable environment for occupants in residential fire scenarios that, in the past, has resulted in tragic losses of life.

Isner, M. S.; Smith, R.
Fire in Boarding Home: A Success Story.
NFPA Investigation Report.
National Fire Protection Assoc., Quincy, MA
Fire Marshals Assoc. of North America
Fire Journal, Vol. 80, No. 2, 75-77, 79-81, March 1986.
board and care homes
Unlike other boarding home fires investigated by the NFPA, smoke detectors and an automatic sprinkler system operated in this one, preventing serious injuries and deaths. The fire is significant because it demonstrates the importance that an automatic sprinkler system can have in improving the level of protection in boarding homes--occupancies with an identified fire problem.

Jansky, D.

Jansky, D.
Detector Law Can Affect Old Homes.
Farmers Branch Fire Dept., TX
Fire Engineering, Vol. 129, No. 5, 31, May 1976.
smoke detectors; installations

Jansky, D.
Ultimate Answer--Strong Codes.
Farmers Branch Fire Dept., TX
Fire Chief, Vol. 20, No. 4, 54-55, April 1976.
smoke detectors; residential buildings; building codes

Johnson, P. F.

Johnson, P. F.; Brown, S. K.
Smoke Detection of Smoldering Fires in a Typical Melbourne Dwelling.
Scientific Services Branch, Port Melbourne, Australia
Commonwealth Scientific and Industrial Research Organization, Highett, Australia
Fire Technology, Vol. 22, No. 4, 295-340, November 1986.
smoke detectors; residential buildings; smoldering; visibility; escape

Johnson, P.

Johnson, P.; Moulen, A. W.
Fire Detection in a Typical Cottage. Report of Tests Conducted at Springwood, NSW.
Central Investigation and Research Lab., Chatswood, New South Wales

Experimental Building Station, Chatswood, New South Wales
Technical Record 453; 32 p. November 1979.
fire detection; residential buildings; fire tests

King, E.

King, E.
Smoke Detectors--Why Every Home Should Have Them.
Greendale Fire Dept., WI
Fire Chief, Vol. 20, No. 4, 49-51, April 1976.
smoke detectors; residential buildings; life safety

Klem, T. J.

Klem, T. J.
New York Dwelling Fire Kills Family of Seven. Investigation Report.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 78, No. 6, 42-45, 51, November 1984.
home fires; kerosene
Careless use of a portable kerosine heater, lack of early detection, stored combustible liquids and other combustible materials combined to snuff out the lives of an entire family--in a fire that might have been prevented. The NFPA investigated this fire in order to document and analyze significant factors that resulted in the loss of life.

Kyte, G.

Kyte, G.
Rooming House Fire Claims Five Lives. Fire Investigation Report.
National Fire Protection Assoc., Quincy, MA
Fire Command, Vol. 53, No. 12, 18-21, December 1986.
home fires; fire deaths; arson; ignition source; fire detection systems; combustion; interior finishes

Lathrop, J. K.

Lathrop, J. K.
Dormitory Fire Leaves One Dead Twenty-Three Hospitalized, Saratoga Springs, New York.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 70, No. 6, 5-7,13, November 1976.
dormitories; death; trash; students; heat detectors

LeCoque, P. G.

LeCoque, P. G.; Harris, K.
State by State...An Update of Residential Smoke Detector Legislation.
BRK Electronics, Aurora, IL
Pittway Corp., Northbrook, IL
Fire Journal, Vol. 84, No. 1, 40-45,47, January/February 1990.
smoke detectors; legislation; residential buildings; fire statistics

Maguire, H. M.

Maguire, H. M.
Seattle Stresses Home Smoke Detectors in Neighborhood Meetings After a Fire.
Seattle Fire Dept., WA
Fire Engineering, Vol. 129, No. 12, 27-28, December 1976.
smoke detectors; residential buildings; fire prevention; fire fighters

Massachusetts Public Interest Research Group

Massachusetts Public Interest Research Group
To Save a Life: Smoke Detectors and the Law in Massachusetts.
Massachusetts Public Interest Research Group, Boston
NSF/OSS-82007; 47 p. December 1982.
Available from National Technical Information Services PB83-173781
smoke detectors; safety devices; fire protection; warning systems; legislation; regulations; fire safety; fire detection systems; fire departments
The effectiveness of Massachusetts' laws regarding the installation of smoke detectors is examined. The report is based on the results of a survey of 500 renter households as well as the results of interviews with officials from fire departments throughout the state. It was found that many tenants are without adequate legal protection and that there is uneven enforcement of the laws that have been enacted. Uniform support for comprehensive statewide regulations and/or legislation was found. It is recommended that regulations mandate the installation of smoke alarms. In addition, because almost half of the landlords of rental units in Massachusetts have failed to install smoke alarms, it is suggested that voluntary compliance by landlords is not sufficient to protect the lives of the tenants.

Massey, J. D.

Massey, J. D.; Jones, V.
Detector in Every Other Home: Results of a Survey of Smoke and Fire Detector Owners. Full Report.
Elrick and Lavidge Inc., Atlanta, GA
FA-54; 150 p. November 1980.
Available from National Technical Information Services PB81-218091
smoke detectors; fire detectors; housing

Masten, H. L.

Masten, H. L.
Detectors Give Princeton High Degree of Protection.
Princeton Univ., NJ
Fire Engineering, Vol. 133, No. 5, 18, May 1980.
smoke detectors; dormitories; fire alarm systems

Masten, H. L.
Fire Protection at Princeton: Ten Years of Successful Operation.
Princeton Univ., NJ
Fire Journal, Vol. 74, No. 3, 128-130, May 1980.
fire protection; dormitories; smoke detectors

McGehan, F. P.

McGehan, F. P.
Inexpensive Detector Suggested to Save Lives, Property in Home.
National Bureau of Standards, Gaithersburg, MD
Fire Engineering, Vol. 129, No. 8, 60,62, Aug. 1976.
fire alarm systems; fire detectors; fire protection; heat detectors; smoke detectors

McGuire, J. H.

McGuire, J. H.
Fire Detectors for the Home.
National Research Council of Canada, Ottawa, Ontario
Building Practice Note 9; 7 p. September 1978.
fire detectors; installation

McLoughlin, E.

McLoughlin, E.
Smoke Detector Legislation: Its Effect on Owner-Occupied Homes.
Johns Hopkins Univ., Baltimore, MD
American Journal of Public Health, Vol. 75, No. 8, 858-862, August 1985.
Thesis; 217 p. April 1984.
smoke detectors; legislation

Miles, T.

Miles, T.
Fire Detection System in Georgian Mansion Two Weeks Too Late.
Fire, Vol. 77, No. 956, 15,20, February 1985.
fire detection systems; fire investigations

Moore, D. A.

Moore, D. A.
Remote Detection and Alarm for Residences: The Woodlands System.
Fire Admin., Washington, DC
Fire Journal, Vol. 74, No. 1, 57-61, Jan. 1980.
fire detection; fire alarm systems; residential buildings; smoke detectors; fire statistics

Morbidity and Mortality Weekly Report

Morbidity and Mortality Weekly Report
Prevalence of Smoke Detectors in Private Residences--Dekalb County, Georgia, 1985.
Morbidity and Mortality Weekly Report, Vol. 35, No. 28, 445-448, July 18, 1986.
smoke detectors; surveys

Moyer, N.

Moyer, N.; Miller, S. E.
Pilot Study Design to Test Effectiveness of Smoke Detection Devices in Private Dwellings. Final Report.
Toledo, OH
HUD/RES-1214; 198 p. August 14, 1977.
Available from National Technical Information Services PB-275944
smoke detectors; residential buildings; fire safety; fire alarm systems; fire protection; warning systems; performance evaluation; fire prevention
This is the final report of a pilot research project conducted in Toledo, Ohio, sponsored by the National Fire Prevention and Control Administration under Grant No. 7X002 which was designed to investigate factors related to fire hazard awareness and fire prevention measures of families in private dwellings. More specifically, the major focus of the study dealt with the effectiveness of smoke detectors plus the attitude, beliefs, and behavior patterns associated with their use.

Myles, M. M.

Myles, M. M.
Analysis of Acoustic Signals Produced by Residential Fire Alarms.
Bolt Beranek and Newman, Inc., Cambridge, MA
National Fire Protection Association. Annual Meeting, 83rd.
May 1979, St. Louis, MO, 1-17 pp, 1979.
fire alarm systems; acoustic sensors; warning systems; residential buildings; fire detectors; UL 217; standards

Myles, M. M.; Fidell, S. A.
Evaluation of the Detectability of Residential Fire Alarms.
Bolt Beranek and Newman, Inc., Cambridge, MA
Report 3833; 38 p. November 1978.
fire alarm systems; residential buildings; fire detectors; acoustic sensors; signals; attenuation

National Fire Data Center

National Fire Data Center
Fire Performance Evaluation of the Federal Mobile Home Construction and Safety Standard.
National Fire Data Center, Washington, DC
249 p. 1980.
Available from National Technical Information Services PB81-193104
mobile homes; construction; safety standards; residential buildings; trailers; fire safety; performance evaluation; fire protection; fireresistant materials; construction materials; fire damage; smoke detectors; fire investigations
This report was developed for the Division of Mobile Home Standards, HUD, by the National Fire Data Center. The results of the study show that it is estimated that between 12,000 and 20,000 mobile home fires occur each year, causing 400-450 deaths, 1000-1600 injuries and $70-120 million in direct property loss. This study analyzed over 400 in-depth fire investigations to assess the role of smoke detectors, exit facilities, fire stopping, and flame resistance provided by wall, ceiling, and other interior construction materials in fire origin and development, and fire losses. Results of the Data Center show that the HUD standard has been effective in reducing deaths, injuries, and property loss in mobile home fires. Further reductions are expected to continue until all homes built before the date of the Standard have been replaced in about the year 2000. One important finding underscores the value of smoke detectors. Mobile homes with smoke detectors as required by the Standard, had much lower rates of deaths, injuries, and property loss than mobile homes without detectors.

National Technical Assistance

National Technical Assistance
Implementing a Community-Wide Automatic Residential Remote Alarm System: The Westland Plan.
National Technical Assistance, Wayne, MI
FA-52; 56 p. February 1981.
smoke detectors

Nober, E. H.

Nober, E. H.; Peirce, H.; Well, A.
Waking Effectiveness of Household Smoke and Fire Detection Devices. Final Report.
Massachusetts Univ., Amherst
NBS-GCR-83-439; 92 p. July 1983.
Available from National Technical Information Services PB83-256511
adults; alarm responses; auditory perception; decibal levels; developmentally disabled; children; elderly persons; fire departments; noise (sound); sleep; smoke detectors; wakefulness
The present work consists of three experiments. Experiment measured the frequency response and directionality of five typical home smoke alarms. In experiment B, normal-hearing young adults were subjected to alarm signals of 85, 70, and 55 dBA while asleep in their own bedrooms under both low and moderate background noise levels. Times required to awaken, turn off the alarm and phone the fire department ranged from 49-115 seconds at 55 dBA to 24-109 sec at 85 dBA with low background noise. With moderate background noise, times increased to 45-137 sec for the 55 dBA signal and 36-119 sec for the 70 dBA signal. In experiment C, subjects included families with and without children, varying types of housing, elderly, and developmentally disabled populations. Times required to awaken and evacuate all subjects in the household were measured. Mean evacuation times for these groups were 48.5 sec for the families, 65.8 seconds for the elderly, and 57.9 sec. for the developmentally disabled. The report concludes that college-aged subjects can be awakened and alerted with alarm levels as low as 55 dBA (even with moderate background noise) and that evacuation times for families, geriatric and developmentally disabled populations seem to be in a range of one to two minutes.

Nober, E. H.; Peirce, H.; Well, A. D.
Acoustic Spectral Characteristics of Household Smoke Detector Alarms.
Massachusetts Univ., Amherst
Fire Journal, Vol. 75, No. 3, 94-98,144, May 1981.
fire alarm systems; smoke detectors; fire safety

Nober, E. H.; Peirce, H.; Well, A. D.
Waking Effectiveness of Household Smoke and Fire Detection Devices. Final Report.
Massachusetts Univ., Amherst
9 p. January 10, 1983.
fire detection devices; wakefulness; smoke

Nober, E. H.; Peirce, H.; Well, A. D.; Johnson, C. C.; Clifton, C.
Waking Effectiveness of Household Smoke and Fire Detection Devices.
Massachusetts Univ., Amherst
Fire Journal, Vol. 75, No. 4, 86-91,130, July 1981.

NBS-GCR-80-284; 85 p. October 1980.
Available from National Technical Information Services PB80-127565
adults; fire alarm systems; auditory perception; decibel levels; fire departments; noise (sound); sleep; smoke detectors; wakefulness; residential buildings; human behavior
Normal-hearing, young adults were subjected to home smoke detector alarm signals of 85, 70, and 55 dBA while asleep in their own bedrooms under quiet background conditions. In addition, other adults received 70 and 55 dBA alarm signals masked by window air conditioner background noise. Each person, upon awakening from the alarm signal, was instructed to shut off the alarm and telephone the local fire department. The 85, 70, and 55 dBA alarm levels were all sufficient to awaken the subjects at varying hours of the night and days of the week, under quiet background conditions. While there were statistically significant differences in waking times between 55 dBA and the other two alarm levels, the total times never exceeded 115 seconds for the combined alarm shutoff and the fire department telephone call at any alarm level. With background noise, waking times for the 70 and 55 dBA alarm levels increased (85 dBA not tested). At 70 dBA, the total time for the alarm shutoff and the fire department telephone call ranged from 36 to 119 seconds. At 55 dBA, two persons failed to awaken and one person awakened after the four-minute test termination criteria. For the remaining seven persons, the total time for the combined alarm shutoff and the fire department telephone call ranged from 45 to 137 seconds.

Nober, E. H.; Well, A. D.; Moss, S.
Does Light Work As Well As Sound? Smoke Alarms for the Hearing-Impaired.
Massachusetts Univ., Amherst
Fire Journal, Vol. 84, No. 1, 26-28,30, January/February 1990.
lighting equipment; smoke detectors; handicapped; sound (noise)

Ozment, D.

Ozment, D.
Home Fire Detectors: 90% Are Effective.
Minneapolis Fire Inspector
Minnesota Fire Chief, Vol. 12, No. 4, 14,71, March/April 1967.
fire detectors; fire detection systems

Ozment, D.
Minneapolis Enacts Detector Ordinance.
Minneapolis Fire Inspector, MN
Minnesota Fire Chief, Vol. 13, No. 5, 20,29, May/June 1977.
smoke detectors; residential buildings; standards

Pendergrast, R. F.

Pendergrast, R. F.
Deadly Fire Underscores Need for Smoke Detectors.
Northfield Rescue Squad, IL
Fire Chief, Vol. 24, No. 12, 24-26, Dec. 1980.
smoke detectors; home fires

Pucill, P. M.

Pucill, P. M.
Domestic Fire Detectors. Part 1.
AFA-Minerva (EMI) Ltd., England
Fire Surveyor, Vol. 7, No. 3, 33-37, June 1978.
fire detectors; life hazards; reliability

Record

Record
Home Safe Home. Firesafety On the Job Begins With Fire Safety at Home.
Record, Vol. 55, No. 3, 3-8, May/June 1978.
home fires; fire safety; construction; heating; electrical equipment; human beings; fire detection; fire fighting

Salamone, R.

Salamone, R.
Retrofitting High-Rise Dorms With Alarm and Detection Systems.
Cerberus-Pyrotronics, Cedar Knolls, NJ
Fire Journal, Vol. 84, No. 1, 37-39, January/February 1990.
dormitories; fire alarm systems; fire detection systems; fire safety

Schifiliti, R. P.

Schifiliti, R. P.
Designing Fire Alarm Audibility.
Fire Data Systems, Inc., Lowell, MA
Fire Technology, Vol. 24, No. 2, 181-187, May 1988.
Society of Fire Protection Engineers. Fire Detection and Suppression...Today's Technology.
March 9-11, 1987,
Linthicum Heights, MD, 1-20 pp, 1988.
fire alarm systems; fire protection engineering; noise (sound); signals
This paper demonstrates a method for fire protection engineers to estimate the relative effectiveness and cost of various fire alarm alerting systems during the design process.

Shapiro, J. M.

Shapiro, J. M.; Carpenter, D. J., Jr.; Schaenman, P. S.; Stambaugh, H.
Four House Fires That Killed 28 Children.
USFA Fire Investigation Technical Report Series.
TriData Corp., Arlington, VA
Report 020; 85 p. 1989.
home fires; children; death; adults; smoke detectors; wooden structures; escape means
The Summary of Key Issues chart on the following page shows a more detailed comparison of the key aspects of these four fires. Three of the fires exemplify the largest and least easily solved fire safety problem in the United States -- overcrowded homes in poor neighborhoods where the people have had little or no fire safety education and do not maintain smoke detectors. The fourth fire shows it can happen elsewhere, too. Together they represent high hazards that working detectors and escape plans can reduce.

Smith, R. B.

Smith, R. B.
History of Montgomery County's Law.
Fire Marshals Association of North America
Fire Journal, Vol. 71, No. 2, 61,65,79, March 1977.
smoke detectors; residential buildings; legislation

Smith, R. B.
Smoke Detectors in All Dwellings Required by Retroactive Law.
Fire Marshal, Montgomery County, MD
Fire Engineering, Vol. 130, No. 3, 53-54, March 1977.
smoke detectors; residential buildings; legislation

Sultan, M. A.

Sultan, M. A.; Feldman, W. M.
Smoke Alarms in the Home: What Every Physician Should Know.
National Research Council of Canada, Ottawa, Ontario
Canadian Medical Association Journal, Vol. 133, 1207-1210, December 15, 1985.
DBR Paper 1348; NRCC 25332;
smoke detectors
Primary care physicians interested in health education and accident prevention should be knowledgeable about smoke alarms (smoke detectors with built-in alarms). Either ionization or photoelectric smoke alarms can help save lives if they are properly installed and maintained. The number, site and maintenance of smoke alarms in the home and the steps a person should take in the event of a fire are discussed. Considering the rates of death, disability and disfigurement associated with residential fires, early warning devices such as smoke alarms make sense.

U. S. Fire Administration

U. S. Fire Administration
Fire Alarm and Detection Systems for the Hearing Impaired.
Report to Congress.
Fire Administration, Emmitsburg, MD
Public Law 100-476; 25 p. March 21, 1989.
fire alarm systems; fire detection systems; deafness; handicapped; warning systems; life safety; smoke detectors; sleep; standards

Underwriters Laboratories of Canada

Underwriters Laboratories of Canada
Fire Detection in the Home.
Underwriters Labs. of Canada, Ontario
10M-76; 13 p. 1976.
home fires; fire detection

VanGompel, H.

VanGompel, H.
Belgian Hotel Fire Claims 18 Lives.
Brussels Fire Dept., Belgium
Fire International, No. 58, 65-71, Dec. 1977.
hotels; death; fire fighting; fire fighters; fire detection

Wagner, J. P.

Wagner, J. P.
Smoke Detector Characteristics.
Gillette Reserch Inst., Rockville, MD
University of San Francisco. International Conference on Fire Safety, 2nd. Volume 2.
January 24-28, 1977, San Francisco, CA, 432-458 pp, 1977.
fire safety; smoke detectors; ionization detectors; photoelectric detectors; taguchi gas sensor (trademark); residential buildings; tests

Waterman, T. E.

Waterman, T. E.
Detector Response VS Available Escape Time in Residences.
IIT Research Inst., Chicago, IL
Society for Fire Protection Engineers and the National Bureau of Standards. Engineering Applications of Fire Technology Workshop Proceedings. April 16-18, 1980.,

National Bureau of Standards, Gaithersburg, MD, Society for Fire Protection Engineers, Boston, MA, Nelson, H. E., Ed., 25-50 pp, 1983.
fire detectors; escape; residential buildings; smoke detectors

Western, F.

Western, F.
Pre-Planned Fire Safety for the People in Nat West's Tower.
Fire, Vol. 73, No. 910, 551-552, April 1981.
high rise buildings; construction; fire safety; fire detection systems; warning systems

Willey, A. E.

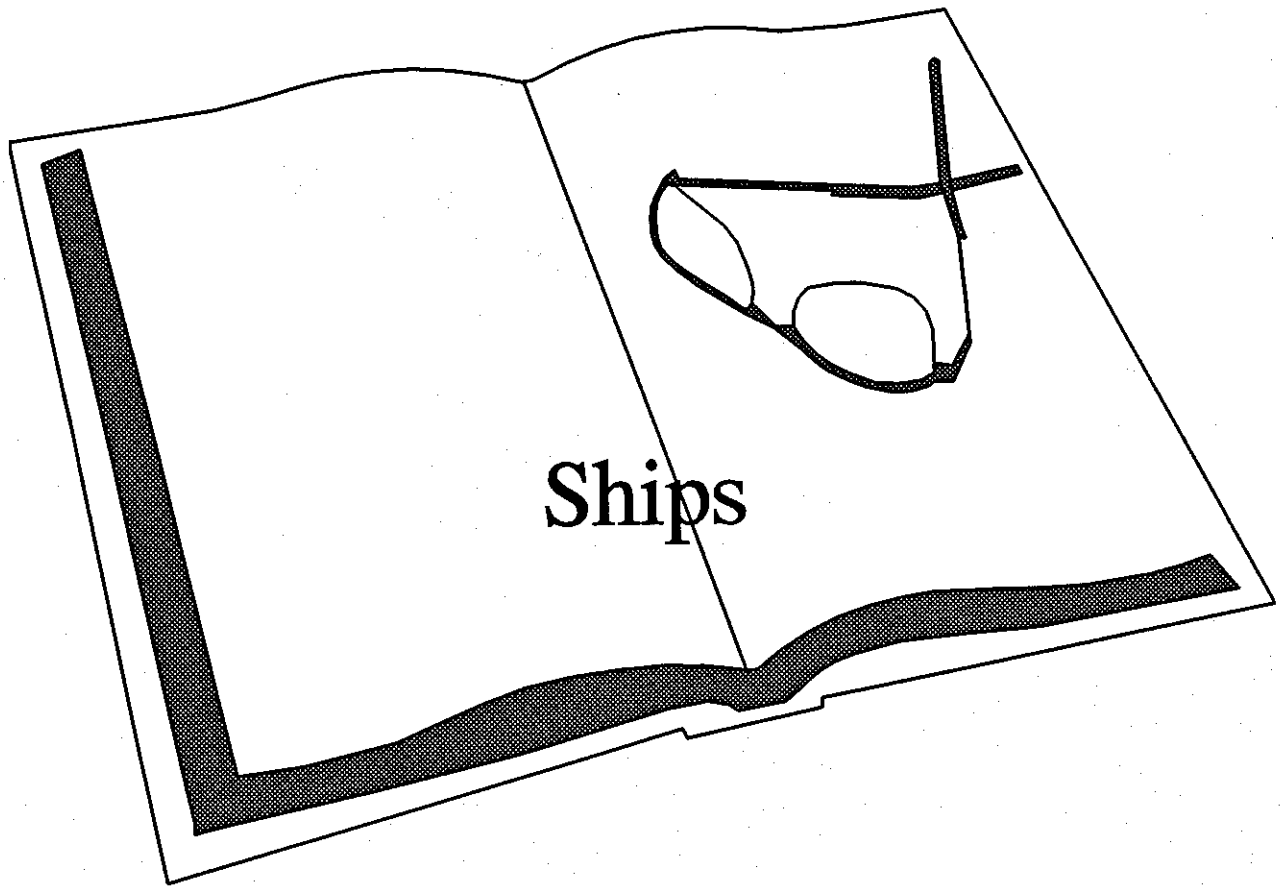
Willey, A. E.
Factors in Unsuccessful Smoke Detector Performance in Residential Occupancies. Preliminary Analysis.
National Fire Protection Assoc., Quincy, MA
Fire Journal, Vol. 73, No. 3, 42-45, April 1979.
smoke detectors; residential buildings; fire statistics; human behavior

Wilson, R.

Wilson, R.; Gomberg, A.
Occupant Risk Method Illustrated By a Study of Occupants in Mobile Home Fires.
Firepro Inc., Wellesley Hills, MA
Firepro Report 101; 69 p. 1978.
mobile homes; fire risks; structures; fire safety; smoke detectors

Winkworth, G.

Winkworth, G.
Cause for Alarm.
Hereford and Worcester Fire Dept., UK
Fire Engineers Journal, Vol. 48, No. 149, 17-18, June 1988.
fire alarm systems; fire protection; safety engineering



Ships

It is intriguing to find that, while there is little new detection technology discussed in the general fire literature, a great deal of effort has been expended in this category. This might be indicative of the fact that the US Navy has been funding work in the past few years when other sources have not. Thus, while there are only a few papers here, most are of interest to developers.

Notable are papers on fiber optic systems [Little *et al* 1990] sensors [Rogers *et al* 1990, Yencha *et al* 1988, 1989, Iverson 1983, Finney 1986, and Pati 1990]. Several papers by Callahan [1989, 1984, 1983] relate to a NAVSEA system using conventional technology which has been plagued with problems; and two by Street [1989 and 1982] discuss a "smart" detector developed at NRL.

Callahan, J. T.

Callahan, J. T.
Fire Signature Measurements in Shipboard Machinery Space Environments. Interim Report.
Naval Ship Engineering Center, Philadelphia, PA
NAVSECPHILAD-A-1623-1; 40 p. April 1979.
LIMITED DISTRIBUTION
Available from National Technical Information Services AD/B-037929
ships; fire detectors; fire protection; fire detection systems; instruments; large scale fire tests

Callahan, J. T.
Shipboard Fire Detection System Selection and Installation Guidance. Interim Report.
Naval Ship Systems Engineering Station, Philadelphia, PA
A-1623-2; 48 p. July 8, 1981.
Available from National Technical Information Services AD/B-058715
fire alarm systems; installing; fire protection; shipboard fires; costs; smoke
Detector types are identified for thirteen general categories of shipboard spaces and for certain specific spaces. Detector selection rationale are given. Fire scenarios are identified for the general shipboard categories. Detector selection and installation guidance, methods for determining detector and switchboard quantities and estimated acquisition and installation costs also are given.

Callahan, J. T; Ostroff, A. N.
Military Specification for a Shipboard Fire Detection System. Interim Report.
Naval Ship Systems Engineering Station, Philadelphia, PA
A-1623-3; 198 p. July 1981.
Available from National Technical Information Services AD/B-060135
fire detection systems; fire detectors; fire protection; shipboard fires; specifications; large scale fire tests; small scale fire tests; sensitivity analyses; databases

Davies, D.

Davies, D.
Naval Fire Protection for the 1990's.
Graviner, Ltd., United Kingdom
Fire International, No. 105, 39,42-43, June/July 1987.
compartments; carbon dioxide; toxic gases; fire protection; fire suppression; fire fighting; halon 1301; bromotrifluoromethane; shipboard fires
As a result of the South Atlantic campaign, Operation Corporate, the need to review fire fighting procedures was apparent. To be effective against anti-ship missiles, the old concept of fire fighting must be replaced by fully automatic fire "suppression". It would consist of an integrated detection and extinguishing system.

Finney, A.

Finney, A.
Current Trends in Detection Systems On Board Ships.
Lloyds Register of Shipping, London, England
Fire International, Vol. 10, No. 97, 43-45, February/March 1986.
fire detection
Statutory and Classification regulations for fire detection systems on ships are becoming more detailed and stringent. This article discusses advances in fire detection technology.

Heskestad, G.

Heskestad, G.
Modeling Detection of Fire.
Factory Mutual Research Corp., Norwood, MA
Naval Research Laboratory and Naval Sea Systems Command.
Workshop on Fire Modeling and Scaling. December 2-3, 1981, Washington, DC, Naval Research Lab., Washington, DC, Carhart, H., Williams, F., Childs, E. and Quintiere, J. G.,, Editors, 11/1-4 pp, 1981.
fire data; fire detectors

Iverson, M. L.

Iverson, M. L.
Ultrasonic Data Link Measurements. Final Report. October 1977-September 1978.
Naval Weapons Center, China Lake, CA
NWC-TP-6094; 32 p. March 1979.
Available from National Technical Information Services AD/A-066510
ships; steel structures; warning systems; ultrasonics; communications networks

Little, W. R.

Little, W. R.; Otto, D. C.; Denier, C. A.
New Approach to Sensors for Shipboard Use.
Eldec Corp., Bothell, WA
SPIE--The International Society for Optical Engineering.
Fiber Optic Systems for Mobile Platforms. August 20-21, 1987, San Diego, CA, SPIE/Intl. Soc. for Optical Engineering, WA, Vol. 940, Lewis, N. and Moore. E. L., Eds., 72-79 pp, 1987.
ships; sensors; fiber optics; transducers; transformers; flooding
The shipboard environment, with its potential for extreme EMI levels, electrical problems, flooding, fire and other damaging conditions, is particularly well suited to benefit from fiber optic based sensing technology. Eldec Corporation has been involved in the development of such sensors and this paper outlines some of the issues related to that development, including an examination of the particular requirements of shipboard systems and how those requirements affect development of general purpose fiber optic based sensors. The tradeoffs between passive fiber optic transducers and equivalent self-powered electric 'active' devices using fiber optic signal lines are examined. Additionally, a basis for the development of these 'active' sensors will be presented, along with descriptions of a non-contacting limit switch and linear position sensor equivalent in function to the LVDT linear variable differential transformer.

Lugar, J. R.

Lugar, J. R.; Rollhauser, C. M.
Fire-Protection Study of High-Performance Ships.
David W. Taylor Naval Ship R&D Center, Annapolis, MD
MAT-75-46; 36 p. February 1976.
Available from National Technical Information Services AD/A-021939
ships; construction materials; fire detection; fire protection; gas turbine engines

Malkoff, D. B.

Malkoff, D. B.; Moy, M. C.; Williams, H. L.
Computer-Assisted Fault Detection and Recovery: Ship Firemain Systems. Final Report.
Navy Personnel Research and Development Center, San Diego, CA
NPRDC TR 85-31; 41 p. July 1985.
Available from National Technical Information Services AD/B-094306
ships; computers
This report addresses the application of human factors technology in association with state-of-the-art computer and display technologies to shipboard firemain system malfunction detection and recovery. The advantages and disadvantages of differing degrees of automation and central control are explored. The results should be of interest to those concerned with propulsion unit fault-handling, computer control systems, personnel training, ship damage control, and firemain design.

New Scientist

New Scientist
Chemical Detector Prevents Fire Down Below.
New Scientist, Vol. 91, No. 1268, 526, 1981.
ships; electrical faults; ammonia; paints; sensors

Pati, V. B.

Pati, V. B.; Joshi, S. P.; Sowmianarayana, R.; Vedavathi,
M.; Rana, R. K.
Simulation of Intelligent Fire Detection and Alarm System for a Warship.
Institute of Armament Technology, Pune, India
Defence Science Journal, Vol. 9, No. 1, 79-94, 1989.
fire detection systems; fire alarm systems; ships; fire extinguishers; sensors; fiber optics; fire detectors
Fire is one of the major hazards in warships. A warship being a very complex structure, with sophisticated weapons, machinery, fuel and ammunition is always at risk of fire. Restrictions on movement of ship's personnel and equipment requires automation in fire detection and control systems. This paper describes the limitations of conventional fire detection systems, followed by the features of modern fire detection and alarm (the so-called intelligent) systems and the types of fire detectors used in fire detection systems. The experimental set-up used for simulating a simple system having 24 sensors connected to the microcomputer via digital input card is explained in detail with the limitations of the experimental set-up and improvements that can be made by incorporating serial communication in a loop, using fiber optics data links, and intelligent loop/interface units.

Rogers, A. C.

Rogers, A. C.; Johnson, J. E.
Assessment of Shipboard Sensors and Instrumentation. Final Report. September 25, 1979-February 28, 1982.
Southwest Research Institute, San Antonio, TX
MA-RD-920-82047; 455 p. February 1982.
Available from National Technical Information Services PB82-201484
sensors; ships; merchant vessels; temperature measuring instruments; fire detection systems; technology assessment
Shipboard sensors and associated signal conditioning instrumentation used for the measurement and control of pressure, vacuum, temperature, flow, and level limit are generically classified and representative instruments of these classes are assessed through laboratory and design review evaluations. The evaluation procedure is based upon an all-encompassing sensor standard that was written to promote the development of safe and reliable shipboard sensors and instrumentation. Domestic and foreign owners/operators, shipbuilders, classification societies, regulatory agencies, and manufacturers were consulted throughout this study program and a compendium of their attitudes, opinions, experiences, and recommendations is included and summarized. Major foreign and domestic instrumentation related requlations are presented in a form to identify similarities and dissimilarities between regulatory requirements. The report concludes with recommendations for the implementation and adoption of realistic marine standards for use in specifying sensors and related instrumentation.

Rolf Jensen and Associates, Inc.

Rolf Jensen and Associates, Inc.
Fuel Loading Design Criteria for Habitability Spaces. Draft.
Rolf Jensen and Associates, Inc., Annandale, VA
W1375.1; 51 p. October 17, 1978.
fuel load; fire protection; fire hoses; fire detection; shipboard fires

Street, T. T.

Street, T. T.; Alexander, J. I.; Williams, F. W.
Processor Aided Fire Detector.
Naval Research Lab., Washington, DC
NRL-MR-3680; Project F43451; 30 p. December 1977.
Available from National Technical Information Services AD/A-053845
fire detectors; ionization detectors; reliability; test methods; smoke detectors; shipboard fires; stability; fire tests

Street, T. T.; Lawrence, K. D.; Williams, F. W.; Alexander, J. I.
NRL Processor-Aided Fire Detection System.
Naval Research Lab., Washington, DC
NRL Report 8341; 116 p. September 14, 1979.
Available from National Technical Information Services AD/A-077665
fire detection systems; fire detectors; smoke; prototypes; test methods; fire alarm systems; sampling; reliability; shipboard fires; fuels; stability; fire tests; smoke detectors
A series of fire tests has been conducted simulating shipboard environments. During these tests an NRL prototype fire detection system was compared to two commercial fire detectors. The detectors were exposed to various fuel-type fires inolving both solids and liquids, and to different humidity and temperature conditions. Comparative results for 100 experiments are presented. The reliability of the detectors also is examined.

Street, T. T.; Williams, F. W.; Alexander, J. I.
Logic Aided Fire Detection System.
Naval Research Lab., Washington, DC
Journal of Fire and Flammability, Vol. 11, No. 3, 212-220, July 1980.
fire detection systems; fire detectors

Williams, F. A.

Williams, F. A.; Corlett, R. C.; Alger, R. S.
Status Review of Experimental Modeling of Shipboard Fires.
California Univ., San Diego
Fireline, 7-11, January 1977.
shipboard fires; scaling; fire detection; smoke; toxic gases; fire suppression; fire damage; fuel beds

Yencha, T. J.

Yencha, T. J.; Rumuly, D. L.
Shipboard (CV, FFG, DD, DDG, and AO) Testing of the Automatic Chemical Agent Alarm Set (Ionization and Enzymatic Detectors).
Naval Surface Weapons Center, Dahlgren, VA
NSWC TR 82-403; Project S0410SL; 18 p. November 1982.
Available from National Technical Information Services AD/B-095217
ionization detectors; chemical agents; false alarms; shipboard fires; tests

Yencha, T. J.; Rumuly, D. L.; Buhmann, K. A.
Shipboard (DD and CVA) Testing of the Automatic Chemical Agent Alarm Set (Ionization Detector and M43E2). Final Report.
Naval Surface Weapons Center, Dahlgren, VA
NSWC/TR-80-44409; 31 p. May 1982.
Available from National Technical Information Services AD/B-065794
ships; helicopters; ionization detectors; chemical agents; chemical warfare; test methods; false alarms; tests