

NBSIR 73-246

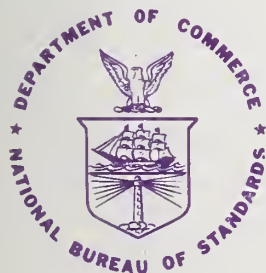
Fire Research Publications, 1969-1972

Nora H. Jason, Richard G. Katz, and Pamela A. Powell, Eds.

Fire Technology Division
Institute for Applied Technology
National Bureau of Standards
Washington, D. C. 20234

July 1973

Final Report



**U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS**

NBSIR 73-246

FIRE RESEARCH PUBLICATIONS, 1969-1972

Nora H. Jason, Richard G. Katz, and Pamela A. Powell, Eds.

Fire Technology Division
Institute for Applied Technology
National Bureau of Standards
Washington, D. C. 20234

July 1973

Final Report



U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary

NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

The "Fire Research Publications" is a list of papers and articles prepared by members of the Fire Technology Division, or the Building Fires and Safety Section of the Center for Building Technology, and by outside sources under contract or grant from the Fire Technology Division during the period 1969-1972. Papers written by NBS personnel before employment at the Bureau are not included. Items listed in "Publications on Fire Research", LP 19 (Sept. 1969, Revised) National Bureau of Standards, U.S. Department of Commerce, also are not included.

For documents that are available for purchase from either the Government Printing Office (GPO) or the National Technical Information Service (NTIS), the specific order number and paper copy price have been included in the citation.

GPO documents are obtained by writing directly to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Indicate the SD Catalog No. for each document requested. Orders must be prepaid. Remittance should be made either by coupons (obtainable from the Superintendent of Documents in sets of 20 for \$1.00 and good until used) or by check or money order payable to the "Superintendent of Documents, U.S. Government Printing Office".

NTIS Documents are obtained by writing directly to the National Technical Information Service, U.S. Department of Commerce, Springfield, Va. 22151. Indicate the NTIS Order No. for each document requested. Microfiche copies of documents are also available at a cost of \$1.45 for domestic orders and \$2.95 for foreign orders. Orders must be prepaid by check or money order payable to "National Technical Information Service" or by utilizing an NTIS Form with your deposit account number.

All other items should be requested directly from authors. The items are not available from the Fire Technology Division.

Table of Contents

	<u>Page</u>
I. Journal Articles	1
II. NBS Technical Notes	4
NBS Building Science Series	5
NBS Technical News Bulletins	5
III. Reports by Contractors and Grantees	6
IV. Author Index	9

I. Journal Articles

- Clark, J.E. The Federal Role in Fabric Flammability Research and Standards. Textile Information Sources and Resources, Vol. 4, No. 4, 7-9, April 1971.
- Clark, J.E. Research Requirements in Fabric Flammability. Textile Information Sources and Resources, Vol. 4, No. 9, 10-11, 1971.
- Comeford, J.J. and Birky, M. A Method for the Measurement of Smoke and HCl Evolution from Poly(vinyl chloride). Fire Technology, Vol. 8, No. 2, 85-90, May 1972.
- Comeford, J.J. The Spectral Distribution of Radiant Energy of a Gas-Fired Radiant Panel and Some Diffusion Flames. Combustion and Flame, Vol. 18, 125-132, 1972.
- Creitz, E.C. Gas Chromatographic Determination of Composition Profiles of Stable Species Around a Propane Diffusion Flame. Journal of Chromatographic Science, Vol. 10, 168-173, March 1972.
- Creitz, E.C. A Literature Survey of the Chemistry of Flame Inhibition. Journal of Research of the National Bureau of Standards, Vol. 7A, No. 4, 521-530, July - August 1970.
- Gross, D. and Natrella, M.G. Interlaboratory Comparison of the Potential Heat Test Method. ASTM Special Publication 464, 127-152, 1970.
- Issen, L.A., Gustafarro, A.H. and Carlson, C.C. Fire Tests of Concrete Members: An Improved Method for Estimating Thermal Restraint Forces. ASTM Special Publication 464, 153-185, 1970.
- Lee, T.G. A System for Continuously Monitoring Hydrogen Chloride Concentrations in Gaseous Mixtures Using a Chloride Ion-Selective Electrode. Analytical Chemistry, Vol. 41, 391, February 1969.
- McCarter, R.J. Apparatus for Rate Studies of Vapor Producing Reactions. NBS Special Publication 338, 137-150, October 1970.
- McCarter, R.J. The Cause of Anomalous Behavior in the Vertical Flammability Test. Textile Chemist and Colorist, Vol. 4, No. 4, 21-23, April 1972.

- McCarter, R.J. The Pyrolysis of Cellulose at Rates Approaching Those in Burning. Textile Research Journal, Vol. 42, No. 12, 709-719, December 1972.
- Parker, W.J. and Long, M.E. Development of a Heat Release Rate Calorimeter at NBS. ASTM STP 502, 135-151, 1972.
- Plitt, K.F. and Utech, H. Flammability of Turnout Coats Tested. Fire Engineering, November 1971.
- Robertson, A.F. and Gross, D. Fire Load, Fire Severity, and Fire Endurance. ASTM Special Publication 464, 3-29, 1970.
- Rockett, J.A. The Fire Research and Safety Center and the Fire Marshall. Fire Journal, Vol. 64, No. 6, 50-53, November 1970.
- Rockett, J.A. Objectives and Pitfalls in the Simulation of Building Fires with a Computer. Fire Technology, Vol. 5, No. 4, 311-322, November 1969.
- Rockett, J.A. On the Fire Frontier. Fire Journal, Vol. 66, No. 1, 44-45, 56, January 1972.
- Rockett, J.A. Planned Operation of National Bureau of Standards Fire Research and Safety Office. Fire Journal, Vol. 63, No. 6, 41-43, November 1969.
- Ryan, J.V. Nonwovens and Flammability Standards. Textile Information Sources and Resources, Vol. 4, No. 8, 29, 1971.
- Torrance, K.E., Orloff, L. and Rockett, J.A. Experiments on Natural Convection in Enclosures with Localized Heating from Below. Journal of Fluid Mechanics, Vol. 36, Part 1, 21-31, 1969.
- Torrance, K.E., Orloff, L. and Rockett, J.A. Numerical Study of Natural Convection in an Enclosure with Localized Heating from Below--Creeping Flow to the Onset of Laminar Instability. Journal of Fluid Mechanics, Vol. 36, Part 1, 33-54, 1969.
- Tovey, H. Fibers in Flammable Fabrics Case Histories. Textile Information Sources and Resources, Vol. 4, No. 7, 11-13, 1971. 162nd National Meeting, ACS, Washington, D.C., September 12-17, 1971.

Tovey, H. What's Next in Textile Flammability Standards.
Textile Information Sources and Resources, Vol. 5,
No. 1, 15-16, 1971.

Utech, H.P. Injuries Show What Protection Improved Clothing
Should Offer. Fire Engineering, April 1972.

II. NBS Technical Notes

- TN 498 Greenfeld, S.H., Warner, E.R. and Reinhart, H.W. Bibliographies on Fabric Flammability, Part 1, Wearing Apparel; Part 2, Fabrics Used on Beds; Part 3, Carpets and Rugs. February 1970. GPO; \$0.40.
- TN 498-1 Greenfeld, S.H., Warner, E.R. and Reinhart, H.W. Bibliographies on Fabric Flammability, Part 4, Interior Furnishings. June 1970. GPO; SD Catalog No. C13.46:498-1; \$0.30.
- TN 498-2 Greenfeld, S.H., Warner, E.R. and Reinhart, H.W. Bibliographies on Fabric Flammability, Part 5, Testing and Test Methods. September 1970. GPO; SD Catalog No. C13.46:498-2; \$0.45.
- TN 525 National Bureau of Standards. The Flammable Fabrics Program 1968-1969. April 1970. GPO; SD Catalog No. C13.46:525; \$0.75.
- TN 596 National Bureau of Standards. The Flammable Fabrics Program 1970. September 1971. GPO; SD Catalog No. C13.46:596; \$0.65.
- TN 708 Lee, T.G. Interlaboratory Evaluation of Smoke Density Chamber. December 1971. GPO; SD Catalog No. C13.46:708; \$0.75.
- TN 742 Katz, R.G. United States and Canadian Fabric Flammability Standards. October 1972. GPO; SD Catalog No. C13.46:742; \$0.60.
- TN 749 National Bureau of Standards. The Flammable Fabrics Program 1971. Interim 1971. December 1972. GPO; SD Catalog No. C13.46:749; \$1.50.
- TN 750 Slater, J.A., Buchbinder, B. and Tovey, H. Matches and Lighters in Flammable Fabric Incidents: The Magnitude of the Problem. December 1972. GPO; SD Catalog No. C13.46:750; \$0.55.

NBS Building Science Series

BSS 18 Gross, D., Loftus, J.J., Lee, T.G. and Gray, V.E.
Smoke and Gases Produced by Burning Aircraft
Interior Materials. February 1969. NTIS Order
No. PB-193736; \$3.00.

NBS Technical News Bulletins

Fabric Flammability Test Anomaly Resolved. Technical
News Bulletin, pp. 140,152. June 1971. GPO; SD
Catalog No. C13.13:55/6; \$0.30.

Firefighters' Turnout Coats. Technical News Bulletin,
November 1971. GPO; SD Catalog No. C13.13:55/11;
\$0.30.

Scheduled Fire Engine Replacement. Technical News Bulletin,
pp. 262-263, November 1972. GPO; SD Catalog No. C13.13:
56/11; \$0.30.

Study Indicated Need for Safer Matches and Lighters.
Technical News Bulletin, p. 215, September 1972.
GPO; SD Catalog No. C13.13:56/9; \$0.30.

III. Reports by Contractors and Grantees

Capital Systems Group, Inc.

A Review of the Plans and Requirements for a Fire Loss Data System. Capital Systems Group, Inc. March 31, 1972.

Cornell Aeronautical Laboratory

Brown, W.R. and Vassallo, F.A. Fabric Flammability Test Development. Cornell Aeronautical Lab. May 1970.

Deming, W. Edwards

Deming, W. Edwards. National Fire Survey. Aims of the Study. W. Edward Deming. September 18, 1972.

Denver Research Institute

Von Bickert, E.C. A Design for Studying the Incidence and Effects of Fires Involving Flammable Fabrics (Review Draft). Denver Research Institute. April 1970.

Factory Mutual Research Corporation

Heskestad, G., Kalelkar, A.S. and Kung, H.C. A Study of Pre-Ignition Heat Transfer Through a Fabric-Skin System Subjected to a Heat Source. Factory Mutual Research Corporation. Annual Report. December 1971. Government Industry Research Committee on Fabric Flammability (hereafter referred to as GIRCFF). NTIS Order No. COM-73-10959; \$4.50.

Markstein, G.H. and de Ris, J. Dynamics of Textile Fires: A Study of the Mechanisms Theory and Experiment. Factory Mutual Research Corporation. Final Report. June 1972. Contract No. 1-38841.

Firepro, Inc.

Wilson, R. Analysis of Four Extreme Variants in Annual "Fire Record of Cities" Report. Final Report. Firepro, Inc. May 1, 1972. NBS Order S-198434-71.

Georgia Institute of Technology

Alkidas, A., Hess, R.W., Wulff, W. and Zuber, N. Study of Hazards from Burning Apparel and the Relation of Hazards to Test Methods. Georgia Institute of Technology. Final Report. December 1971. GIRCFF, NSF Grant No. GK-27189. NTIS Order No. COM-73-10954; \$6.75.

Gillette Research Institute

Fourt, L. and Hollies, N.R.S. Improvement of Firemen's Turnout Coats for Greater Comfort and Effectiveness in Work. Gillette Company Research Institute. Final Report. December 1971.

Krasny, J.F. and Fisher, A.L. Study of Hazards from Burning Apparel and the Relation of Hazard to Test Methods: Flammability of Clothing Assemblies. Gillette Company Research Institute. First Annual Review Report. January 19, 1972. GIRCFF. NTIS Order No. COM-73-10953; \$3.75.

Fourt, L. Study of Ignition and Exposure. Gillette Company Research Institute. 4th Quarter Final Report. December 31, 1972. GIRCFF. NTIS Order No. COM-73-10958; \$4.75.

Harvard School of Public Health

Burgess, W.A. Protection Afforded by Self Contained Breathing Apparatus--Experiences With Two Municipal Fire Departments. Harvard School of Public Health. June 1972.

International Business Machines, Inc.

Firefighters' Breathing System Study. April 1972. IBM. NBS Contract No. 1-35907. NTIS Order No. COM-73-10952; \$6.00.

Israel Fiber Institute

Lewin, M. and Basch, A. The Influence of Fine Structure on the Pyrolysis and Combustion of Cellulosics. Israel Fiber Institute. 1972. NBS Contract No. 1-35955. NTIS Order No. COM-73-10323; \$4.50.

Market Facts, Inc.

Household Safety Study. November 15, 1970 to May 15, 1971. Summary Report. Market Facts, Inc. March 1972.

Massachusetts Institute of Technology

Mehta, A.K. and Wong, F. Measurement of Flammability and Burn Potential of Fabrics. MIT. Summary Report, December 1, 1970-November 30, 1971. February 15, 1972. GIRCCF, NSF Grant No. GK-27188. NTIS Order No. COM-73-10950; \$3.00.

Pugh-Roberts Associated, Inc.

Frohman, A., Schulman, M. and Roberts, E. Factors Affecting Innovation in the Fire Services. Pugh-Roberts Associated, Inc. Final Report. March 1972. NBS Contract No. 1-35905.

Southwest Research Institute

Hafer, C.A. and Yuill, C.H. Characterization of Bedding and Upholstery Fires. Southwest Research Institute. March 31, 1970.

Trident Engineering Associates, Inc.

Design Concepts for Safer Matches and Lighters. Trident Engineering Associates, Inc. September 29, 1972. NBS Contract No. 0197-4615.

Study of Clothing Ignition Hazards from Gas and Electric Ranges. Trident Engineering Associates, Inc. 1972.

IV. Author Index

- A
ALKIDAS, A.,6
- B
BASCH, A.,7
BIRKY, M.,1
BROWN, W.R.,6
BUCHBINDER, B.,4
BURGESS, W.A.,7
- C
CARLSON, C.C.,1
CLARK, J.E.,1
COMEFORD, J.J.,1
CREITZ, E.C.,1
- D
DEMING, W.E.,6
DE RIS, J.,6
- F
FISHER, A.L.,7
FOURT, L.,7
FROHMAN, A.,8
- G
GRAY, V.E.,5
GREENFELD, S.H.,4
GROSS, D.,1,2,5
GUSTAFERRO, A.H.,1
- H
HAFER, C.A.,8
HESKESTAD, G.,6
- H
HESS, R.W.,6
HOLLIES, N.R.S.,7
- I
ISSEN, L.A.,1
- K
KALELKAR, A.S.,6
KATZ, R.G.,4
KRASNY, J.F.,7
KUNG, H.C.,6
- L
LEE, T.G.,1,4,5
LEWIN, M.,7
LOFTUS, J.J.,5
LONG, M.E.,2
- M
MARKSTEIN, G.H.,6
MCCARTER, R.J.,1,2
MEHTA, A.K.,8
- N
NATRELLA, M.G.,1
- O
ORLOFF, L.,2
- P
PARKER, W.J.,2
PLITT, K.F.,2

R

REINHART, H.W.,4
ROBERTS, E.,8
ROBERTSON, A.F.,2
ROCKETT, J.A.,2
RYAN, J.V.,2

S

SCHULMAN, M.,8
SLATER, J.A.,4

T

TORRANCE, K.E.,2
TOVEY, H.,2,3,4

U

UTECH, H.,2,3

V

VASSALLO, F.A.,6
VON BICKERT, E.C.,6

W

WARNER, E.R.,4
WONG, F.,8
WULFF, W.,6

Y

YUILL, C.H.,8

Z

ZUBER, N.,6

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBSIR 73-246	2. Gov't Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE FIRE RESEARCH PUBLICATIONS, 1969-1972		5. Publication Date July 1973	
		6. Performing Organization Code	
7. AUTHOR(S) Nora H. Jason, Richard G. Katz and Pamela A. Powell, Eds.		8. Performing Organization NBSIR 73-246	
9. PERFORMING ORGANIZATION NAME AND ADDRESS NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234		10. Project/Task/Work Unit No. 4903293	
		11. Contract/Grant No.	
12. Sponsoring Organization Name and Address Same as No. 9		13. Type of Report & Period Covered Final	
		14. Sponsoring Agency Code	
15. SUPPLEMENTARY NOTES			
<p>16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)</p> <p>A list of publications is provided representing the papers and journal articles prepared by Fire Technology Division and by Building Fires and Safety Section of the Center for Building Technology personnel and by external laboratories under contract to the Fire Technology Division from 1969 through 1972.</p>			
17. KEY WORDS (Alphabetical order, separated by semicolons) Bibliographies; construction materials; fire departments; Fire Research & Safety Act; fire tests; flammability tests; flammable fabrics; Flammable Fabrics Act; protective clothing.			
18. AVAILABILITY STATEMENT <input checked="" type="checkbox"/> UNLIMITED. <input type="checkbox"/> FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NTIS.		19. SECURITY CLASS (THIS REPORT) UNCLASSIFIED	21. NO. OF PAGES 12
		20. SECURITY CLASS (THIS PAGE) UNCLASSIFIED	22. Price

