NBS TECHNICAL NOTE 596

The Flammable Fabrics Program 1970

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[2] Part of the Center for Radiation Research.
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UNITED STATES DEPARTMENT OF COMMERCE
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NATIONAL BUREAU OF STANDARDS • Lewis M. Branscomb, Director

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The Flammable Fabrics Program 1970

U.S. Department of Commerce Report of Activities Under the Flammable Fabrics Act 1970

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ABSTRACT

This Annual Report to the Congress, required by the Flammable Fabrics Act, covers calendar year 1970. Specific flammability standards outputs were standards for carpets and rugs and for small carpets and rugs, a proposed standard for children's sleepwear, and notices of possible need and institution of proceedings for standards for certain items of children's apparel, all blankets, and all mattresses. Research included studies, in-house and by contract, on subjects such as full scale carpet burn experiments and heat transfer from burning fabrics. Studies of the feasibility of reducing flammability included pyrolysis of textile materials and chemical aspects of fire retardancy. Test development was completely related to the standards outputs, and training ranged from the preparation of bibliographies through Congressional and public presentations to full time Research Associateship participation in the program. Cooperation was carried out with HEW, the public, industry, and voluntary standards groups.

Key words: Annual report to Congress; blankets; carpets and rugs; children's sleepwear; cooperation; flammability; flammability reduction; mattresses; research; small carpets and rugs; standards; test development.

PREFACE

The 90th Congress amended the Flammable Fabrics Act of 1953 to authorize the Secretary of Commerce to conduct research on the flammability of fabrics, related materials, and products; to conduct studies on the feasibility of reducing their flammability; to develop test methods and devices; and to offer training in the use of these devices. The technical responsibility for these activities was delegated by the Secretary to the National Bureau of Standards.

The amended Act (PL 90-189) requires annual reports to the Congress on the above activities. The first such report covered the period 1968-69; the second, contained herein, covers 1970. In the interim occurring between the two reports, much was accomplished. Two standards were issued, one on large carpets and rugs and another on small carpets and rugs. A third standard, children's sleepwear, was proposed and proceedings were instituted for the development of a mattress standard and a blanket standard. In an effort to make this information readily available to the public, the Second Annual Report to the Congress is published here as a Technical Note.

THE FLAMMABLE FABRICS PROGRAM 1970

SUMMARY

1. Introduction. This Annual Report describes the work carried out by the Department of Commerce in calendar year 1970 to fulfill the responsibilities delegated to that Department under the Flammable Fabrics Act as amended. The Secretary retained authorities for certain activities and delegated other responsibilities to the Assistant Secretary for Science and Technology and to the National Bureau of Standards. The NBS Office of Flammable Fabrics (OFF) attained a staff level of 25 by the end of 1970, and was supporting other NBS staff at a 5 man-year level.

2. Preparation of Standards. Two standards were established, a third standard was proposed, and proceedings were instituted for the development of two other standards.

2.1 Flammability Standards Established.

2.1.1 Carpets and Rugs. The standard proposed in 1969 was revised and established, as DOC FF 1-70, by publication in the Federal Register on April 16, 1970. It becomes effective one year from that date. The standard measures the surface flammability of carpets when exposed to a timed burning tablet. Carpets manufactured after April 15, 1971 must pass the test.

2.1.2 Small Carpets and Rugs. The hazard from small carpets and rugs is less than from large carpets and rugs; therefore DOC FF 1-70 is not reasonable for small carpets and rugs. A separate standard, DOC FF 2-70, was established by publication in the Federal Register on December 29, 1970, and becomes effective one year later. It requires the same test as for large carpets and rugs, and it requires the labeling of small carpets and rugs that fail the test.

2.2 Flammability Standard Proposed.

2.2.1 Children's Sleepwear. A proposed standard, DOC PFF 3-70, was published in the Federal Register on November 17, 1970. It proposed that children's sleepwear up through size 6X must pass a vertical flammability test by exhibiting char length less than a prescribed distance and by not exhibiting sustained burning of molten or other material that may fall from the specimens. It requires that such behavior be exhibited in the new

condition and after 50 cycles of home laundry type washing and drying. Tests are required of samples from finished garments, including trim, seams, etc. If bleaches or other agents or treatments will affect the flammability of an item it shall carry a precautionary label. The proposed standard was judged technologically practicable in that some garments now on the market would pass, and it was judged reasonable in that a Department study showed the cost increase for treating garments should not be excessive. At the end of the year, several issues were still under discussion. They had been raised in the public comments on the proposed standard.

2.3 Proceedings Instituted for Development of Standards.

2.3.1 Mattresses. A finding of possible need was published in the Federal Register on June 10, 1970. It was based on data from fire department records, from the National Fire Protection Association, and from a contract study carried out by Southwest Research Institute, which showed that mattresses are ignited by cigarettes and produce lethal concentrations of toxic and noxious fumes. A test based on cigarettes applied to mattresses was being subjected to interlaboratory evaluation at the end of the year.

2.3.2 Blankets. The same data sources that showed mattresses represented a hazard when a cigarette is the ignition source showed that blankets are a hazard when open flames are the source. A blanket test is under development, in which a small flame is applied to the blanket specimens.

2.4 National Advisory Committee for the Flammable Fabrics Act. The Committee participated actively in the review of the carpet standards, the proposed children's sleepwear standard, and of the entire program. The original appointments expired at the end of the year and members for the new committee were under consideration.

3. Research. Research immediately associated with the described standards developments was discussed in Section 2. Other research is summarized below.

3.1 In-House Research.

3.1.1 Products of Combustion. Victims of interior furnishings fires are likely to be overcome by fumes or trapped by smoke. Studies were made of smoke both as it obscures vision and as it carries or is accompanied by toxic fumes.

3.1.2 Full Scale Carpet Experiments. A corridor was completed for the study of full scale burn experiments to identify the specific hazards resulting from the ignition of carpets. The results are being correlated with several laboratory tests for carpet flammability.

3.1.3 Heats of Combustion and Heat Transfer. Data are presented for heat release and heat transfer from fabrics burning freely in air. Heat release was reduced as amount of flame-retardant treatment was increased.

3.1.4 Mannequin Burn Experiments. This study continued with instrumentation for measuring heat transfer, and with multiple layers of garments.

3.1.5 Field Studies. Staff examined two major fire sites in which flammable fabrics were thought to have been important.

3.1.6 Consultation. OFF retained two consultants and had significant contact with experts from several universities and other government agencies.

3.1.7 Research Materials. A collection of materials was established to provide uniform experimental materials for in-house and contract research.

3.2 Contract Research. Four contracts were completed during the year. Two are discussed under related subjects elsewhere in the Report.

3.2.1 Heat Transfer. This contract, started in 1969, showed that maximum heat transfer occurred when the fabric was about one half inch from the body, but that all the tested fabrics produced at least twice the heat required to produce burns.

3.2.2 Upholstery Fire Hazards. Full scale experiments showed that upholstered chairs are susceptible to ignition by cigarettes and flames, producing toxic and noxious fumes, smoke, and dangerously high temperatures.

4. Reduction of Flammability.

4.1 Pyrolysis. Study of the nature of pyrolysis and of the effect of flame-retardant treatments on the pyrolysis reactions showed that current treatments act by increasing charring of the fabric and reducing the release of combustible gases.

4.2 Chemistry of Fire Retardancy. The basic chemistry of the action of representative fire retardants for textiles is being investigated by mass spectrometric techniques, by electron spin resonance, and by chemical and functional characterization of thermal degradation products.

5. Test Development. All test development was related to, and discussed under sections on, the several standards in process.

6. Training. No formal classroom training, but less formal training was given.

6.1 Research Associates. Research associates joined OFF program from Underwriters' Laboratories and from the National Cotton Council.

6.2 Bibliographies. Five bibliographies were published in the NBS Technical Notes Series.

6.3 Congressional Briefings.

6.3.1 Hearings. Statements were presented to reauthorization and oversight hearings related to the Flammable Fabrics Act program and to the Marietta Ohio nursing home fire.

6.3.2 Congressional Inquiries. Responses were made to numerous inquiries from members of the Congress.

6.4 Other Briefings.

6.4.1 Government. Formal presentations were held for representatives of seven Federal Departments or agencies, including two Congressional Committees.

6.4.2 Public Communication. Material was provided for a television appearance by Mrs. Virginia Knauer; the OFF program was featured on television news; spot radio announcements were prepared; and a public display was prepared and shown.

6.5 Personnel Interchanges. Laboratory personnel had extensive interchanges with those of the Federal Trade Commission and of the U. S. Department of Agriculture laboratories.

7. Cooperation with Public and Private Agencies. In addition to the cooperation described under specific areas, more general cooperation was frequent.

7.1 Cooperation with HEW. The accident reporting format was standardized for use by FDA investigators. The rate of cases investigated was increased during the last part of the year, the number of reports received from FDA exceeding the total for all previous years. OFF has computerized the data base system and has queried the system in regard to children's sleepwear and other products.

7.2 Incidence of Fabric Fires. OFF contracted for a study to design an improved sampling for determining the incidence of fabric fires and provided FDA with the resulting report.

7.3 Industry and Other Private Groups. Four research contracts and grants were made with funds provided by three major textile industry associations and the National Science Foundation. The particular studies were selected by a committee representing these groups and the Department of Commerce. These and other industry groups have cooperated in the development and evaluation of test methods.

7.4 Voluntary Standards Groups. OFF has participated in and received the cooperation of committees of ASTM, AATCC, ANSI, and NFPA.

7.5 International Contacts. A paper was presented at an international conference and visitors were received from five foreign countries.

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1. INTRODUCTION

The Flammable Fabrics Act (15 U.S.C. 1193 as amended, Sec. 3, Public Law 90-189, 81 Stat. 568, hereinafter referred to as the Act) authorizes the Secretary of Commerce to set new and amended flammability standards or other regulations, including labeling, for a fabric, related material, or product, when needed to protect the public against unreasonable risk of the occurrence of fire leading to death, personal injury, or significant property damage.

The Act authorizes appropriate activities to provide the basis for standards, and states in part:

"Sec. 14(b) In cooperation with appropriate public and private agencies, the Secretary of Commerce is authorized to--

(1) conduct research into the flammability of products, fabrics, and materials;

(2) conduct feasibility studies on reduction of flammability of products, fabrics, and materials;

(3) develop flammability test methods and testing devices; and

(4) offer appropriate training in the use of flammability test methods and testing devices.

The Secretary shall annually report the results of these activities to the Congress."

The Secretary of Commerce retained the authorities to adopt final flammability standards, to select members of the National Advisory Committee, to receive their comments on proposed standards, and to transmit an annual report of the results of the Department's activities under the Act. The Secretary delegated to the Assistant Secretary for Science and Technology the responsibilities for issuance of procedural regulations, determinations of need, institution of proceedings for the determination of flammability standards, and for chairing the meetings of the National Advisory Committee.

The Secretary delegated responsibility for activities under Section 14(b) to the National Bureau of Standards by revision of Department Organization Order 30-2A dated October 1,

1968. All activities under the Act, including those under Section 14(b), are conducted to contribute to the identification of need for standards, or to providing a sound technical basis for the development of standards and test methods. Assessment of technological practicability (including studies of the feasibility of reducing flammability), of reasonableness, and of appropriateness are parts of standards development.

This is the second report in response to the requirement of Sec. 14(b) quoted above. The first report was submitted approximately a year ago, and covered calendar year 1969, and that part of 1968 for which appropriated funds were available. In order to make the first report available to the interested public, it was published as National Bureau of Standards Technical Note 525, [1]. The main body of this report discusses activities under the Act as they relate to specific standards developments. Additional Sections of the report describe general activities, which cut across all or most standards developments.

At the end of calendar year 1970, the Office of Flammable Fabrics (OFF), in the National Bureau of Standards' Institute for Applied Technology, had 25 scientific and supporting personnel directly employed in the implementation of the Department's responsibilities under the Act. In addition, the OFF was funding the efforts of other Bureau personnel equivalent to a rate of another five man-years. OFF funded two man-years in the Office of Textiles, Department of Commerce to maintain liaison with industries affected by the Act or by standards resulting from implementation of the Act, and to furnish economic impact studies in areas concerned with the proposed standard. One outside contract was let in 1970, and three that had been initiated in 1969 were completed. With the growth in staff and programs, the Office established subordinate Units on Flammability Research, Test Development, and Information and Data.

2. PREPARATION OF STANDARDS

During calendar year 1970, two standards were promulgated and steps were taken toward other standards. A graphic illustration of this progress is given in Figure 1. These steps were in conformance with the Flammable Fabrics Act Procedures [2] developed and published to implement the Act, and to provide opportunities for interested parties to participate in the development of standards.

2.1 Flammability Standards Established

2.1.1 DOC FF 1-70, Surface Flammability of Carpets and Rugs

The proposed standard for carpets and rugs [3], described in the 1968-69 Annual Report, was modified in the light of the comments received, and published in the Federal Register on April 16, 1970 [4], under the designation DOC FF 1-70. This standard is designed to protect the public from the occurrence of carpet and rug fire from small ignition sources, such as matches or fireplace embers. The standard applies to carpets and rugs larger than 24 square feet or having one dimension greater than six feet. It becomes effective on April 16, 1971. All large carpets and rugs manufactured or imported after that date must comply.

The test method involves the exposure of each of eight conditioned, replicate specimens of a given carpet or rug to a standard igniting source in a draft-protected environment, and measurement of the extent of char formation. The texts of the standard for carpets and rugs and of the notice are given in Appendix I. The test chamber is shown in Figure 2.

A specimen passes the test if the charred portion does not extend beyond a specified limit. At least seven of the eight specimens must meet the test criterion in order to conform with this Standard. If the carpet or any of its constituent materials has received a fire-retardant treatment, the carpet must be subjected to 10 cycles of a specified laundering and drying procedure, or to an alternative procedure approved by the Federal Trade Commission, prior to testing.

The Department has had frequent contact with the Federal Trade Commission to assist in developing the Commission's Rules and Regulations for administering the standard.

2.1.2 DOC FF 2-70, Surface Flammability of Small Carpets and Rugs

The standard for large carpets and rugs, DOC FF 1-70, was not considered appropriate and reasonable for small

carpets and rugs (less than 24 square feet in area and less than six feet in greatest dimension). Because of their smaller size, they are less likely to be ignited or, if ignited, to spread fire to other combustibles in the room. Therefore, a separate notice of proposed standard for small carpets and rugs was published in the April 16, 1970, issue of the Federal Register [5]. Pursuant to this notice, and to the comments received in response thereto, the standard described below was published in the Federal Register on December 29, 1970 [6], under the designation DOC FF 2-70. It requires that small carpets and rugs be subjected to the same flammability test described under DOC FF 1-70, Standard for the Surface Flammability of Carpets and Rugs. The standard permits the manufacture for sale of small carpets and rugs that do not pass the flammability test provided that such small carpets and rugs be labeled to warn the consumer against use near ignition sources. The texts of the standard for small carpets and rugs and of the covering notice are given in Appendix II.

2.2 Flammability Standard Proposed

2.2.1 DOC PFF 3-70, Flammability of Children's Sleepwear

A notice of finding of possible need for standards for children's apparel, specifically including sleepwear, dresses, and underwear, and instituting proceedings for such development was published in the Federal Register on January 24, 1970 [7]. Pursuant to this notice, and with consideration of the comments received in response thereto, and of additional information from research and investigation, a proposed flammability standard for children's sleepwear was developed and was published in the Federal Register on November 17, 1970 [8], under the designation DOC PFF 3-70. The finding that such a standard is needed for children's sleepwear is based on an analysis of data developed by investigations of deaths and injuries due to wearing apparel fires and on results of laboratory research involving garments and fabrics for children's sleepwear. Typically, children's sleepwear is ignited while the children play with matches or get too close to other ignition sources such as kitchen stoves. A system for computerized analyses of the data base has

been developed by the Information and Data Unit. An output of that system was analysis of data from the 580 accident case histories received from FDA through August 31, 1970. This analysis indicated that garments of small children and the elderly constitute a disproportionately large fraction of the garments involved in fires, as is shown in Figure 3. Further analysis of the data showed that, among the accident cases received from FDA, sleepwear garments of boys in the 0-5 age group were represented nearly 4 times as frequently as would be expected on the basis of the percentage of the total population that is in this age group; garments for girls in the same age group were represented over 1-1/2 times as frequently as would be expected on the same basis. Laboratory research indicates that children's sleepwear garments, and fabrics for such garments, present a significant burn hazard to children. In response to requests from interested parties, the period for submission of written comments was extended to January 29, 1971, by public notice in the Federal Register on December 19, 1970 [9]. Public hearings were requested for January 14-15, 1971. Notice of the hearings was published in the Federal Register on December 23, 1970 [10]. Sixteen representatives of manufacturers, distributors, and the consuming public were scheduled to present statements.

The proposed standard for children's sleepwear is based on a vertical test with char length of the specimens and time of continued burning of molten drips or other fragments from the specimens as the acceptance criteria. The test chamber is a modification of that used in Federal Test Method 5903 [11].

To provide protection to the wearer throughout a reasonable garment life, the standard requires that the test must be met by the item in new condition and after 50 cycles of laundering and drying in household machines.

The texts of the proposed standard for the flammability of children's sleepwear and of the covering notice are given in Appendix III.

A number of technical issues were considered prior to publication of the proposed standard. These include:

flame impingement time;

hazard of thermoplastics;

effects of seams and trim;

laundering conditions;

technological practicability.

The considerations pertinent to each of these issues follow.

Most vertical flammability tests use a 12 second flame impingement time on the assumption that maximum char length will be attained with that impingement time. Experiments on treated cotton indicated that this assumption is not always true. Some flame-retardant treated cottons passed with a 12 second impingement, but failed with a three second impingement. For this reason, two flame impingement times, three seconds followed by 12 seconds if failure did not occur in three seconds, have been proposed for the test method.

Experiments conducted in 1969 indicated that thermoplastic fibers tend to melt back from the flame and, consequently, do not burn in the vertical test. In the 1969 report, it was stated that the most effective means then known for testing thermoplastic materials was by stitching parallel rows of glass thread up the middle of each specimen. However, mannequin tests conducted during 1970 have shown that the use of glass thread bears little relationship to simulated life situations. Therefore, the glass thread stitching feature was not incorporated in the proposed standard.

Mannequin tests have indicated that trim and some types of seams tend to be more flammable than the base fabric of the garment. For this reason, the proposed test method specifies that tests must be performed on specimens cut from the most flammable portion of the garment, which quite frequently involves a seam or trim.

A flame-retardant treated garment should retain its flame-retardant properties throughout its useful life. Fifty wearings are generally considered by textile experts to represent a reasonable life of a children's sleepwear garment. On this basis, 50 washings have been stipulated in the proposed test method.

The method also called for washing the garment in water at 140 °F. This temperature was specified on the basis that sleepwear, particularly cellulosic sleepwear, will be washed at the "hot" machine setting. Best information available indicates that the typical temperature of wash water at the "hot" setting is 140 °F.

Tests performed in 1969 and 1970 showed that commercial flame-retardant treated celluloses are durable for 50 laundering cycles under many home washing conditions, including machine washing, machine drying, and line drying. However, studies using nylon and flame-retardant treated cotton fabrics showed that their flammability increased after washing with soap in hard water. The flame-retardant properties of treated cellulosics may be destroyed by washing with chlorine bleach. The proposed standard requires that all items of children's sleepwear shall be labeled with precautionary instructions to protect the items from agents or treatments which are known to cause deterioration of their flame resistance.

The Act requires that standards must be technologically practicable and reasonable. Consideration of these requirements includes both the existence, actual or anticipated, of products that will comply if a standard is promulgated, and the impact of the standard on the consuming public, and the industry. With regard to existence of products, OFF has purchased on the open market items of children's sleepwear that meet the performance requirements of the proposed standard. However, these items represent a limited range of fabric types and a small portion of children's sleepwear currently available.

With regard to reasonableness, one important impact of the standard on the consuming public will be in the cost of the garments. In order to preliminarily estimate the economic ramifications of the cost of added finishing to children's sleepwear, a contract was let to the accounting firm of Ernst and Ernst to approximate the increased cost to the consumer caused by increased costs of finishing [12].

Using publicly available information on existing chemical treatments for cotton in terms of the prices of the chemicals and the cost of applying them to woven fabrics, and normal mark up practices, the contractor estimated the cost increases at the essential manufacturing steps and arrived at a conclusion that the end cost would not be prohibitive. The contract study did not include the cost of added quality control procedures necessary to assure that garments are in compliance with the standard, the additional capital investment in new equipment to provide the necessary finishing and quality control, nor the probable effects on cost of increased volume and competition. Based upon this initial cost study, the tentative conclusion

was that cost alone would not be a barrier to issuance of a proposed standard which would require that children's sleepwear be made out of materials which would not support combustion.

2.2.1.1 Issues Under Discussion

Many comments were received after publication of the proposed standard. The major issues raised were:

(1) relative humidity and temperature under which the specimens are conditioned,

(2) the design, angle and position of the burner,

(3) the position and size of the specimen and specimen holder,

(4) the need for two impingement times,

(5) the measurement of afterflame time,

(6) the means for selecting the most flammable part of the garment,

(7) the need for laundering finished garments,

(8) possible dermatological and toxicological side effects,

(9) technological practicability, and

(10) scope of coverage

All these issues had been studied prior to the publication of the proposed standard. More detailed and extensive investigations of these issues are in progress because the comments indicated a need for more information on them.

2.3 Proceedings Instituted for Development of Standards

2.3.1 Mattresses

A notice of finding of possible need for a flammability standard for mattresses was published in the Federal

Register on June 10, 1970 [13]. This finding and the background information upon which it was based are given in Appendix IV. This information showed, through accident data provided by fire departments and the National Fire Prevention Association, that large numbers of fires start in beds and that the hazards presented by bedding fires were largely smoke, fumes, and atmospheres that would not support human life. Research performed for NBS under contract to the Southwest Research Institute [14, 15] demonstrated that bedding fires can start through ignition of mattresses by burning cigarettes and that the burning mattress can produce sufficiently large quantities of smoke and toxic and other combustion products to result in dangerous atmospheres in relatively short periods of time.

Based on information in the study by the Southwest Research Institute, a flammability test based on cigarette ignition was developed for use in a standard. During the evolution of the test procedure, it was found that different areas of a mattress have different susceptibilities to cigarette ignition. In many real-life situations, the cigarette would fall on a sheet or blanket, and not contact a bare mattress. Consequently, the effects of sheets and blankets on mattress ignition were investigated. Lighted cigarettes were placed on several mattresses, each mattress covered successively with: (a) one sheet, with cigarettes on the sheet; (b) two sheets, with cigarettes between the sheets; and (c) two sheets and one blanket, with cigarettes between the sheets. The probability of ignition increased significantly when the cigarettes were burned between two sheets on the mattress and increased a further small amount when the blanket was added. There was no significant effect of humidity on the cigarette ignition of mattresses in the range of 10 to 65% R.H. Mattresses representative of over 95 percent of those offered for sale in the United States were ignited by cigarettes under these test conditions.

A preliminary test procedure involving these concepts was developed. Cigarettes are placed at the three different types of locations: on smooth surfaces; in depressions caused by quilting, tufts, or buttons; and along taped edges. Cigarettes are placed on the bare mattress and on the mattress with two layers of sheet. In the latter case, the cigarettes are placed between the sheet layers. Ignition of the mattress is defined in the test procedure as

the development of a char more than one inch in any direction from the cigarette, or smoke evolution greater than from the cigarette alone.

Late in 1970, arrangements were made with the ASTM Task Group on Bedding Flammability and with the National Association of Bedding Manufacturers (NABM) for their participation in an interlaboratory evaluation of the test method. The mattress types for the interlaboratory evaluation were selected on the basis of a national market survey conducted by NABM at the request of NBS to determine the most commonly used mattress constructions. The 119 test mattresses were contributed by 7 manufacturers and testing was started in December by the 17 participating laboratories. Analysis of the data will be undertaken by NBS as soon as the results are available.

2.3.2 Blankets

A notice of finding of possible need for a flammability standard for blankets was published in the Federal Register on June 10, 1970 [16]. This finding and the background information on which it was based are given in Appendix V.

Blankets could not be ignited by lighted cigarettes in laboratory studies. Flaming ignition sources, such as matches or lighters, resulted in ignition of almost all blankets and caused many blankets to surface flash. Analysis of accident reports by the Office of Flammable Fabrics confirmed the results of laboratory work indicating that the usual ignition source for blankets is an open flame. On this basis, an open flame was selected as the ignition source for a blanket test.

In the latter part of the year, OFF participated in an ASTM interlaboratory evaluation of CS 191-53 [17], the 1953 standard for wearing apparel, as a blanket flammability test. The repeatability and reproducibility of the test method for blankets were poor.

For example, the coefficient of variation of results from all laboratories ranged from 15.4% for one blanket sample to 93.2% for another blanket sample. Because of these and other results of interlaboratory tests conducted during the past several years, and because of work done at OFF, the CS 191-53 version of the 45° test does not appear promising as a test method for blankets.

The 1969 Annual Report discussed the development of a modified 45° test. The modifications resulted in two tests: (1) Ignition and (2) Flame propagation rate. Both are being considered for use as blanket flammability tests.

2.4 Participation of the National Advisory Committee for Flammable Fabrics Act in Standards Development

Sec. 17 of the amended Act provides for a National Advisory Committee for the Flammable Fabrics Act, and provides that the Secretary must consult with the National Advisory Committee for the Flammable Fabrics Act before prescribing a final flammability standard. The Committee members discussed the standards on carpets and rugs and on small carpets and rugs, and gave their comments to the Secretary before the final standard was promulgated. The Committee has also been kept informed of all work toward proposed standards or findings of possible need, and has met periodically to discuss such work. The members have given the Department the benefit of their comments which have helped guide progress in standards development.

The last 1970 meeting of the Committee was held November 20, at which meeting the members reviewed the proposed standard on children's sleepwear (DOC PFF 3-70) [8]. This standard has been developed in part in response to the urging of members of the Committee that this was an area of great need. Following review, they were requested to provide individual written comments on the proposed standard, to complete the process of consultation required by the Act. Sixteen of the 17 members provided such written comments.

The membership of the National Advisory Committee during 1970 is listed in Appendix VI.

The terms of office of the members of the Committee expired on December 31, 1970. Prospective members for the new committee were being considered as the year ended.

3. ACTIVITIES UNDER SEC. 14(b)(1): RESEARCH

Research provides a portion of the basic technical information necessary for the setting of reasonable, appropriate, and effective flammability standards. The

research program has as its principal objectives:

(1) more precise and quantitative identification of the hazards associated with textile fires, as guidance to the development of more appropriate test methods;

(2) a better understanding of the chemical and physical mechanisms involved in the origin and development of textile fires;

(3) an understanding of the mode of action of textile flame retardants, in order to evaluate the feasibility of retardant processes and to appraise the prospects for further advances in reduction of flammability.

Work directed toward the attainment of all three objectives is in progress both internally and through cooperative programs with other agencies.

Research activities were centralized during the year through the formation of a Flammability Research Unit. The staff was supplemented by two industrially sponsored Research Associates working in the research areas. Increases were made in laboratory space and research equipment to accommodate this increased activity. Four major projects are underway in the Research Unit. A number of limited investigations of specific problems were carried out. Research contracts and cooperative programs with other laboratories supplemented the in-house program.

3.1 In-House Research

3.1.1 Products of Combustion

In fires involving interior furnishings, e.g., bedding, upholstered furniture and carpeting, the evolution of smoke and toxic gases and depletion of oxygen may represent more serious hazards than flame and high temperatures (section 2.3.1). Surprisingly, relatively little quantitative information is available on these subjects. A research project was started with the objective of increasing and quantifying understanding of the hazards associated with the products of combustion of interior furnishings.

The laboratory-scale study of material balances for the combustion of cotton batting from mattresses has been completed. Yields of carbon monoxide and carbon dioxide and rates of oxygen depletion were in reasonable agreement

with the results of full-scale burning tests conducted at the Southwest Research Institute (section 2.3.1). This agreement encourages the belief that laboratory test methods to evaluate smoke and toxic gas hazards which will correlate with real fire experience can be developed.

The hazards from smoke are twofold:

(1) obscuration of vision, which hinders escape or rescue, and

(2) inhalation toxicity.

Both of these hazards are related to the particle size of the smoke. The toxicity hazard is also related to the chemical properties of the smoke particles. References frequently are found to fatalities from "smoke inhalation" but it is not clear whether the smoke particles or the gases which accompany them are responsible.

Preliminary investigations have been carried out to determine if significant quantities of toxic gases are absorbed on smoke particles from burning wool. Wool was selected because it produces significant quantities of sulphur dioxide (SO_2) and hydrogen cyanide (HCN), both of which are toxic. Little absorbed gas was found on the smoke particles. Non-volatile components of the smoke are under study.

The laboratory studies of smoke and toxic gas formation have been extended to carpeting materials. The results will be compared with those obtained from full-scale carpet fires in the corridor test facility (section 3.1.2) to investigate further the feasibility of using laboratory scale tests to evaluate smoke and toxicity hazards.

3.1.2 Full Scale Carpet Burn Experiments

The carpet and rug flammability standard, DOC FF 1-70, [4] employs the so-called "pill test" as a measure of performance. This is a test of surface flammability from small ignition sources, and it is intended to protect the public from carpet fires started by a dropped match, a spark from a fireplace, or comparable sources. Even a carpet which would pass the DOC FF 1-70 acceptance criterion may burn, evolving smoke and toxic gases and contributing to fire intensity and fire spread, when exposed to a fire that is fully developed in other furnishings or in the structure.

The Marietta, Ohio, nursing home fire, January 9, 1970, was a tragic example of the contribution of carpeting to the hazards in a building fire. Ordinarily, autopsies are not performed on fire victims. Consequently, research must be conducted to identify the specific life hazards that develop in such fires. To evaluate hazards resulting from carpet behavior in such large scale building fires, a corridor test facility has been constructed jointly by the Office of Flammable Fabrics and the Fire Research Section (Building Research Division, IAT, NBS). The facility consists of a corridor 30 ft. long with an 8 ft. x 8 ft. room at the side near one end (Figure 4). The corridor width can be varied from 6 to 12 feet and the ceiling height can be varied from 6 feet 8 inches to 9 feet 3 inches. Air conditioning equipment permits control of the initial air temperature and relative humidity and of air flowing into the corridor during the test.

Instrumentation is provided for measurement of temperature, heat flux (by conduction, convection, or radiation) and air velocity at many points. Smoke density and the concentrations of carbon dioxide (CO_2), carbon monoxide (CO) and oxygen (O_2) are monitored continuously during tests. Samples of smoke and gases are collected at intervals for laboratory study (section 3.1.1). Pictures are taken to record the progress of burning.

A program was begun to observe the rate of fire development and fire spread for a variety of carpet, underlayment and floor constructions in combination with a range of wall and ceiling materials. Ignition sources of varying intensity are used in the room, and fire spread from the room into the corridor can be observed. Preliminary burning tests have been carried out in the facility. An extensive series of tests is planned.

Carpets and underlayment for the tests are being furnished by the Carpet and Rug Institute. Carpet assemblies used in the corridor test also are being subjected to a variety of laboratory tests in our own and cooperating laboratories to observe the extent of correlation between these tests and behavior in a full-scale fire. These tests will include:

Tunnel Test (ASTM E 84-68)

Chamber Test (U.L. 992)

Radiant Panel Test (ASTM E 162-67)

Radiant Panel Test (I.S.O. preliminary)

Pill Test (DOC FF 1-70)

Smoke Density Chamber

Oxygen Index Test (ASTM D 2863-70)

Radiant energy input appears to be a major factor in determining the behavior of a carpet in a building fire. The thermophysical properties of the carpet, underlayment and floor will affect the heat balance in the carpet and thus its burning behavior. Therefore, establishment of a total hazard rating for a carpet would be difficult without reference to the underlayment and floor to be used. Special attention is being given to the measurement of radiative and convective energy transfer to the carpet in the corridor test in order that these conditions can be simulated by a radiation source in the laboratory. Thermal conductivities and heat capacities of carpet and flooring materials are being measured to facilitate this simulation.

3.1.3 Heats of Combustion and Heat Transfer

The rate of burning of a fabric, as measured by the test method of the present mandatory standard (CS 191-53) [17], is commonly assumed to be a measure of hazard, the faster burning fabrics being the more dangerous. Because heat transfer to the skin is the principal damage mechanism in apparel fires, it may be argued that a direct measurement of heat release and heat transfer would provide a more direct indication of the degree of hazard associated with a particular fabric (section 3.2.1). A research project is underway to provide quantitative data on these parameters.

The calorimeter for free burning in air (isoperibol calorimeter) discussed briefly in the 1969 Annual Report has been redesigned and calibrated (Figure 5). It provides an accurate measure of the heat release from a fabric sample burning freely in air. Typical results are given in Table 1. It is apparent that the actual heat release from a fabric burning in air is only a portion of the value determined in a bomb calorimeter. It was found to be between 50 to 90% of the latter in the cases studied. With modification being made, it will be possible to obtain a complete heat balance for textile fabrics burning freely in air.

Table 1

Rate of Heat Release, Free Burning (Isoperibol Calorimeter)
Heat Release, and Heat of Combustion for various Fabrics

Material	Fabric Wt. oz/yd^2	Free Burning Residue %	Rate of heat* release, cal/sec	Free burning heat release** ΔH, cal/g	Calorimetric*** heat of combustion, cal/g	Heat release as % of heat of combustion
Cotton (print cloth)	3.2	∿1.5	400 ± 5	3324	3688	90.1
Cotton	3.5	∿1.5	398 ± 5	3315	3688	89.9
Cotton (knit)	9.56	∿1.5	230 ± 26	2886	3688	78.3
Rayon (knit)	9.30	∿1.5	282 ± 3	2838	3516	80.6
Acetate (tricot)	2.64	11.5 ± 1.2	216 ± 19	3289	4100	80.2
Arnel (tricot)	3.86	13.3 ± 0.9	197 ± 22	3084	4200	73.4
90/10 Arnel/ Nylon (knit)	6.24	11.3 ± 0.1	194 ± 6	3502	4473****	78.3
Acrilan (knit)	9.46	22.1 ± 1.0	217 ± 9	4118	7020	58.7
35/65 cotton/ polyester (gaberdine)	2.93	4.6 ± 1.1	358 ± 15	2776	4707****	59.0
50/50 cotton/ polyester (broadcloth)	3.82	5.2 ± 0.2	346 ± 26	2566	4472****	57.4
Kodel II	4.3	28.9 ± 2.9	289 ± 10	3363	6492	51.8

* for a sample 2 in. wide by 5 in. long, burning upward at a 45° angle, edge ignition.
** standard deviation = ± 3% (estimated from calibration)
*** oxygen bomb data, water in vapor phase
**** calculated from the net heats of combustion of pure components in the blend.

The heat produced when blended fabrics burn is not an additive function of the heats produced by the pure fibers. A series of cotton/polyester blends was studied, with the results shown in Figure 6. The heat release curve passed through a minimum at approximately 55% cotton. The cotton fibers burned more rapidly than the polyester fibers. In the middle range of blends the cotton burned, leaving a predominately polyester residue that failed to burn because the burning cotton depleted the oxygen in the atmosphere. At low levels of cotton content, the polyester burned slowly but more nearly completely.

Cotton fabrics treated with low levels (0.2 to 2.3% phosphorus) of three flame retardants (phosphoric acid, diammonium hydrogen phosphate, and ammonia cured tetrakis hydroxymethyl phosphonium hydroxide) were prepared and studied. In each case, the heat release decreased as the phosphorus content was increased (section 4). If larger amounts of flame retardant had been used the heat release would presumably have decreased further to the point where the fabrics would have been self extinguishing.

The calorimeter also was used to measure the rate of heat release (Table 1). For fabrics of similar composition and construction, the rate of heat release was found to be approximately independent of fabric weight (Table 2).

Table 2

Rate of Heat Release
And Heat Release for Fabrics of Different Weights, Under Free Burning (Isoperibol Calorimeter)

Material	Fabric Weight oz/yd^2	Heat Release Rate* cal/sec	Heat Release cal/gm
Cotton	3.2	400 ± 5	3324
	3.5	398 ± 5	3315
	4.8	381 ± 15	3236
	5.9	400 ± 5	3240
	8.5	374 ± 24	3245
Rayon	4.4	360 ± 5	3177
	6.1	374 ± 8	3142

* For a sample 2 in. wide by 5 in. long burning upward at an angle of 45°.

This was not unexpected because the burning rate had been found to be inversely proportional to fabric weight and thus the mass consumption rate was constant. These results demonstrate the danger of using the linear burning rate as the sole measure of hazard.

3.1.4 Mannequin Burning Experiments

In a continuing effort to gain a better insight into the behavior of apparel fires, the experiments involving the burning of complete garments on mannequins were made more sophisticated. The mannequins were instrumented for the recording of temperature and heat flux at various points, and motion pictures were taken to record the courses of the fires.

Fabric type and garment design affected the results significantly, as was expected. Close fitting garments, such as pajamas, were less easily ignited and spread the fire more slowly than loose fitting gowns. On the other hand, close fitting garments produced somewhat higher "skin" temperatures. An elastic waistband acted as a flame barrier and slowed the rate of flame spread. Thermoplastics, such as nylon, showed a slower and less regular flame spread than cellulosics, and thus might be less hazardous, although flaming or molten drips from the thermoplastics could cause local burns. However, a nylon nightgown melted onto the mannequin when a cotton robe over it burned, leading to high total heat transfer to the "skin". Such combinations, therefore, could be quite hazardous.

3.1.5 Field Studies of Building Fires Involving Carpets

More than 30 people died in or as a direct result of the Harmar House nursing home fire in Marietta, Ohio, on January 9, 1970. The deaths were attributed to smoke and toxic combustion products produced primarily by burning carpet. A representative of the Office of Flammable Fabrics inspected the scene of the fire and obtained samples of the carpets. These were of low level loop nylon pile with integral foam rubber backing. Samples of two different colors, although nominally of the same style and construction, showed significant differences in weight and burning behavior. Laboratory tests showed that the carpets were difficult to ignite and passed the "pill test" [4]. Cigarettes, matches, books of matches and methenamine tablets

burned out on the pile surface without causing sustained ignition. However, once ignited by a more intense ignition source, the carpets burned vigorously and generated large volumes of black, noxious smoke. The foam rubber backing was the primary source of smoke and contributed to the intensity of burning.

A fire in the Museum of Science and Technology of the Smithsonian Institution caused extensive property damage. Carpeting was suspected of having contributed to the rapidity of fire spread. The site was visited and samples of the carpet and foam rubber underlayment were obtained. Laboratory tests, including cooperative tests with The Underwriters' Laboratories, showed the carpet, a fire-retardant acrylic, to be very flame resistant. It was concluded that the carpet was not the primary site of ignition and was not responsible for the rapid spread of the fire. However, in the presence of a well-developed fire, the carpet would provide additional fuel and possibly increase the intensity of the fire and magnitude of smoke production.

3.1.6 Input From Related Expertise

An excellent method for keeping abreast of the latest developments in technical fields is through formal and informal consultation with others doing complementary research. Drs. Alice Stoll of the U. S. Naval Air Development Center and Robert Fristrom of the Johns Hopkins Applied Physics Laboratory have been retained as consultants. Individual discussions and informal seminars were conducted at the Office of Flammable Fabrics, by Prof. Hoyt Hottel, Massachusetts Institute of Technology; Prof. Irving Glassman, Princeton University; Prof. Richard Corlett, University of Washington; Prof. Irving Einhorn, University of Utah; Prof. Robert Barker, Clemson University; Mr. George Drake, U. S. Department of Agriculture (USDA); and Dr. Matthew Radnofsky, National Aeronautics and Space Administration. NASA scientists conducted an annual review of their fire research programs in conjunction with an OFF program review. Technical representatives from various industrial organizations also presented information on their latest processes and products. The discussions of related studies conducted by these experts, and their comments on the Office of Flammable Fabrics studies, were of significant value to all concerned.

3.1.7 Research Materials Collection

Correlation and comparisons of results obtained in different laboratories can be facilitated if the same materials are used. A collection of textiles and related materials is being assembled in the Office of Flammable Fabrics for this purpose as well as for in-house research and testing. Polymers, fibers, fabrics, and fire-retardant chemicals are included. Industrial companies have cooperated in furnishing samples of well characterized materials and in providing data on their physical and chemical properties.

Small lots of flame-retardant treated fabrics have been prepared on request by a nearby textile laboratory. Facilities are being planned to permit small scale application of flame retardants in-house for the preparation of research samples and the evaluation of flame-retardant processes.

3.2 Contract Research

In addition to the in-house projects at the National Bureau of Standards, research conducted under contracts with academic and commercial laboratories forms an integral part of the research program. Contract research permits greater flexibility in the allocation of resources, makes available specialized facilities and the services of experts in related disciplines, and infuses new ideas and new techniques into the program. Three contracts in progress in 1969 were completed during 1970. A fourth contract was started and completed during 1970. These contract studies were on the following subjects:

Characterization of bedding and upholstery fires [14].

Heat transfer from burning fabrics [18].

Design for studying incidence of flammable fabrics fires.

Additional cost of children's sleepwear under flammability standards [12].

The study on heat transfer from burning fabrics is discussed in the following subsection (section 3.2.1); that dealing with the characterization of upholstery fire hazards is discussed immediately thereafter (section 3.2.2). Characterization of hazards of bed fires was discussed in connec-

tion with the development of test methods for mattresses (section 2.3.1). The study of a sampling technique for determining the incidence of fabric fires is discussed in relation to the data base effort (section 7.2). The study on additional cost was discussed under the children's sleepwear proposed standard (section 2.2.1).

Contract research sponsored by other agencies, such as the National Science Foundation, other departments of the Federal Government, and the Government-Industry Research Committee on Flammable Fabrics (section 7.3.1), is coordinated with the internal research program. The National Bureau of Standards cooperates in these programs by evaluating proposals, providing research materials, monitoring progress, and disseminating the results of investigation.

3.2.1 Heat Transfer From Burning Fabrics

A project at the Cornell Aeronautical Laboratories for a study of the variables affecting the transfer of heat from burning fabrics to skin was started in 1969 and completed in 1970. A final report was published [18].

An instrumented test chamber was developed which permitted the measurement of the heat flux from a burning fabric to a parallel flat plate located at a known distance. Literature data on the heat input at various flux levels necessary to cause second degree burns were employed to formulate a method of data interpretation. A graphical overlay method applied to plots of integrated heat input was used to find the time at which a second degree burn would be expected at various points relative to the test surface. It was found that all fabrics which burned freely in the test chamber produced at least twice the heat flux necessary to cause second degree burns. A maximum in the heat flux curve was found at a fabric to surface spacing of approximately one half inch. Closer spacings tended to quench the flame. Thermoplastics presented special difficulties in obtaining meaningful measurements. Some of the findings and recommendations from this work are being pursued in an in-house project (section 3.1.3).

3.2.2 Characterization of Upholstery Fires

As mentioned under the development of a mattress test method (section 2.3.1), Southwest Research Institute studied the

life hazards developed by the burning of upholstered chairs (and beds) in a moderate size room. In the series of 8 chair experiments, the upholstered chairs showed appreciable variation in resistance to ignition, ranging from ignition by a single cigarette to ignition from three blazing matches. However, once the chairs were ignited, conditions hazardous to life were obtained within short time periods.

Although formal steps toward standards for upholstery had not been started at the end of the year, it is recognized that there is appreciable risk associated with flammable upholstery. Laboratory work has been initiated to further define the hazards from upholstery fires.

4. ACTIVITIES UNDER SECTION 14(b)(2): REDUCTION OF FLAMMABILITY

4.1 Pyrolysis of Textile Materials

The combustion of polymeric materials is known to take place through a generalized mechanism involving surface pyrolysis to give a fuel gas, interdiffusion of the fuel gas and air to give a combustible mixture which supports a gas phase flame, and energy feed-back from the flame to the polymer surface to support the pyrolysis reaction. Flame-retardant treatments affect both the rate of pyrolysis and the composition of the pyrolysis products. Study of the pyrolysis of textile materials affords an insight into the mechanism of the combustion reaction and the mode of action of flame retardants.

The apparatus for studying pyrolysis reactions reported last year was refined and used on a number of fibers and fabrics [19]. This apparatus can be used for accurate measurements at high heating rates approximating those encountered in actual combustion. Such rates are considerably higher than those practical with most conventional thermal analysis methods. Because the nature of decomposition reactions has been found to vary with the reaction rates, kinetic data obtained by conventional methods may not reflect what actually occurs in the burning of fabrics.

In a simplified sense, pyrolysis of cellulose takes place through two simultaneous mechanisms. One is an endothermic dehydration leading to the formation of water vapor, carbon dioxide and a carbonaceous char, and contributing very little gaseous fuel to the flame. The other is an exothermic depolymerization leading to the formation of levoglucosan and

more volatile fuel gases. Most textile fire retardants act by enhancing the first reaction path: lowering the initial reaction temperature, increasing char formation, and decreasing the amount of gaseous fuel supplied for burning. A number of celluloses of different origin, both with and without flame-retardant treatment, were partially pyrolyzed to study the initial phases of the reaction.

The effect on pyrolysis behavior of heavy metal atoms bonded to the cellulose structure is also being investigated, for some of these metals are associated with very efficient retardants.

It is now generally accepted that most retardants for cellulosic materials function by chemical action within the substrate of material. However, no specific theoretical mechanism has yet been found that explains all of the experimental observations. Analyses in progress include crystallinity, gas analysis, infrared spectroscopy, electron microscopy, elemental analysis, solubility, accessibility of reactive sites, and measurements of degree of polymerization. One mechanism of flame retardance suggested by the data collected to date is that retardant action results from hindrance or removal of the sixth carbon unit of the cellulose monomer.

4.2 Chemical Aspects of Fire Retardancy

The basic chemistry of the action of representative fire retardants for textiles is being investigated. The Office of Flammable Fabrics is funding this study in the Inorganic Chemistry Section (Inorganic Materials Division, Institute for Materials Research, NBS). Three tasks are included in the program:

1. Mass spectrometric investigation of pyrolysis and flame processes.

2. Electron spin resonance investigation of free radical reactions in pyrolysis.

3. Chemical and functional characterization of thermal degradation products from retardant materials.

As part of the first task, a high pressure sample inlet system for a mass spectrometer was designed and built. This permits sampling from selected regions in a flame. By intro-

ducing retardants into the flame, their effect on reaction profiles can be observed and the active inhibiting species can be identified.

Electron spin resonance (ESR), which provides an extremely sensitive method of detecting free radicals, is being used to study the role that such radicals play in polymer pyrolysis and flame retardancy. When a sample of cellulose is heated, the concentration of radicals increases slowly until a threshold temperature of 225 to 250 °C is reached, above which the concentration of radicals increases rapidly. This corresponds roughly to the temperature at which pyrolysis can first be detected by chemical methods. Further work will be devoted to the identification of the radical species and study of the kinetics of radical formation.

Pure samples of tetrakis-hydroxymethyl phosphonium chloride (THPC), a commercial flame retardant, have been prepared and pyrolyzed. Their pyrolysis products are being examined by mass spectrometry and gas chromatography.

5. ACTIVITIES UNDER SECTION 14(b)(3): TEST DEVELOPMENT

All of the test development carried on in 1970 was related to standards development, and has been described in previous sections on children's sleepwear, mattresses, and blankets.

6.0 ACTIVITIES UNDER SECTION 14(b)(4): TRAINING

The training activities authorized by the Flammable Fabrics Act were expanded during 1970 as the staff of the Office of Flammable Fabrics was enlarged. Although the nature of the training needed at this time did not require formal classwork, the training and educating of interested individuals and groups were accelerated in the several ways discussed below.

6.1 Research Associate Programs

The Research Associate Program provides a mechanism for joint support of research of mutual interest by OFF and industry. It also provides excellent training opportunities for the individual Research Associates and, through them, the sponsoring industry group.

Two of the many efforts to establish Research Associate Programs were crystallized in the second half of the year. The National Cotton Council program was started in August. Dr. Kwan-nan Yeh is studying ways of evaluating the potential hazards of burning fabrics in terms of heat evolved and transferred to victims.

Early in October, Mr. Miles Suchomel joined the staff as a Research Associate for The Underwriters' Laboratories, Inc. He is studying the fire hazards presented by carpets and upholstered furniture through the evaluation of full-scale test results.

Discussions are being conducted with other groups and associations for the establishment of additional Research Associateships in areas of mutual interest as these areas become important focal points for new standards.

6.2 Bibliographies

Five bibliographies were published in the NBS Technical Note Series; because the first three were of limited size, they were published under one cover. The Flammable Fabrics Bibliographies are:

NBS Technical Note 498 Part 1: Wearing Apparel [20]

Part 2: Fabrics Used on Beds

Part 3: Carpets and Rugs

NBS Technical Note 498-1 Part 4: Interior Furnishings [21]

NBS Technical Note 498-2 Part 5: Test Methods [22]

They are available from the Government Printing Office.

6.3 Congressional Briefings

Communication with individual members of the Congress and with appropriate subcommittees increased as the efforts of the program expanded and generated new or intensified interests.

6.3.1 Hearings Statements

Statements on reauthorization of the Flammable Fabrics Act appropriations were prepared and presented to the Consumer Subcommittee of the Senate Committee on Commerce and to the Commerce and Finance Subcommittee of the House Committee on Interstate and Foreign Commerce. Amendments to the Act were also suggested. A statement was prepared and presented to the Subcommittee on Long-Term Care of the Senate Special Committee on Aging regarding the carpet and rug standard and the tragic nursing home fire in Marietta, Ohio.

6.3.2 Congressional Inquiries

As the work of the Department expanded into new areas, more individuals, organizations and industrial firms have written to their Congressmen and Senators expressing interest or concern. In turn, these members of Congress have consulted with the staff working on flammable fabrics both to obtain answers to these inquiries and to keep abreast of the general progress being made.

6.4 Other Briefings and Presentations

Further opportunities for providing information on the Flammable Fabrics Program during the year were in the form of briefings and demonstrations on the work to representatives of Federal and State Government, the mass communication media, and the public. Hundreds of industrial and consumer interest individuals have visited OFF.

6.4.1 Government Presentations and Visits

Formal presentations were made to members of the staffs of the following Federal organizations:

1. Senate Committee on Commerce

2. House Committee on Interstate and Foreign Commerce

3. Special Assistant to the President for Consumer Affairs.

4. Department of Justice

5. Department of State

6. National Aeronautics and Space Administration

7. Department of Health, Education, and Welfare

6.4.2 Radio and Television Presentations

Cooperation and assistance were provided for flammable fabrics presentations on radio and television as follows:

1. Television appearance of Mrs. Virginia Knauer, Special Assistant to the President for Consumer Affairs.

2. Television news programs, Mr. Robert Gneisser, Commentator.

3. Spot radio notices, during and after Fire Prevention Week.

6.4.3 Public Display

A display was prepared to show the progress made in the field of flammable fabrics. It was first used at an NBS Symposium, "Mechanisms of Pyrolysis, Oxidation and Burning of Organic Materials", sponsored by the Institute for Materials Research, in October. The display will be sent "on the road" with other NBS displays. Hundreds of inquiries for flammable fabrics publications have been received as a direct result of this display. The display is shown in Figure 7.

6.5 Personnel Interchanges with Other Laboratories

Laboratory personnel of the Federal Trade Commission frequently visit the NBS laboratories for information and consultation.

An arrangement has been made with the Southern Regional Research Laboratory (SRRL) of the U. S. Department of Agriculture for a brief interchange of personnel for training. A member of the OFF staff spent a week at the New Orleans laboratory presenting results of OFF research

on cellulosic materials and studying the laboratory techniques developed at SRRL; other members of OFF visited for shorter periods. SRRL staff visited OFF briefly and lectured on flame-retardant cellulosics; one of their staff will visit OFF for a week in 1971.

7. ACTIVITIES UNDER SECTION 14(b): COOPERATION WITH PUBLIC AND PRIVATE AGENCIES

The Flammable Fabrics Act, as amended, specifies that the activities authorized under Section 14(b) are to be performed in cooperation with appropriate public and private agencies. The discussions already given in preceding sections of this report on the specific activities under subsections (1) through (4) of Section 14(b), have described the cooperation and mutual participation with such groups. In addition, the Office of Flammable Fabrics has participated in joint efforts of more general nature, often cutting across several of the four specific areas identified in the Act. This cooperation has been with the Department of Health, Education, and Welfare, the Federal Trade Commission, with manufacturers, retailers, other private groups, and with voluntary standards groups; the Office has maintained general liaison with groups and individuals interested in fabric flammability standards.

7.1 Cooperation with HEW

The Office of Flammable Fabrics has cooperated with the Department of Health, Education, and Welfare to facilitate the collection of meaningful data on accidents involving flammable fabrics.

7.1.1 Development of the Flammable Fabrics Investigation Report Form

During 1970, the Office of Flammable Fabrics, jointly with the Bureau of Product Safety, FDA, HEW, identified and defined the significant information needed to determine the chain of events that cause a fabric burn accident and to correlate the behavior of the fabric in such an accident with its behavior in laboratory tests. A report form was developed to provide the needed information in a consis-

tent format, approved, and put into use by investigators in FDA Districts contributing to the program. The development of this uniform accident investigation report and its adoption by all FDA investigators assures greater consistency, adequacy, and usefulness of the collected information.

7.1.2 Volume of Cases Received

At the start of 1970, 417 case investigations had been reported to NBS by FDA [1]. These investigations were performed primarily by FDA's injury study teams in Boston and Denver. In 1970, FDA initiated an accelerated flammable fabrics investigation program, under which its Atlanta, Baltimore, Buffalo, Chicago, Cincinnati, Dallas, Denver, Detroit, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, San Francisco and Seattle Districts devoted a total of 17 man-years to the investigation of flammable fabrics accidents. As a result of this accelerated program, which used the new investigation reporting form, the rate at which flammable fabric accidents were reported to NBS increased to around 200 investigations per month in the last months of 1970. Over 1,000 case reports were received from FDA during 1970.

7.1.3 Development of a Computerized Information System on Flammable Fabrics

Early in 1970 it became apparent that manual methods of tabulating and correlating data derived from accidents involving flammable fabrics were inadequate to process the growing volume of information received. Therefore, a computerized system was designed for processing, storing, and retrieving the information obtained from OFF analysis of the FDA Investigation Reports and of the data obtained from NBS laboratory investigation of the fabrics involved. By the end of 1970, 424 accident cases had been analyzed and coded by OFF for computer input; about 200 of these had been read into the computer master file. The protocol and the coding manual developed for processing case histories under this system details the sequence of processing steps, listing acceptance criteria and incorporating reproductions of the forms and coding sheets used. Figure 8 shows the case history processing cycle.

7.1.4 Testing of Fabrics Involved in Fire Accidents

As part of the total system analysis of accidents involving flammable fabrics, samples of the actual fabric products involved in a fire are collected by FDA investigators and forwarded to NBS together with their report on the accident. These fabrics are subjected to appropriate tests of a research nature to determine the relationship between the flammability behavior of garments and other fabric products in actual use and their behavior in the laboratory. Therefore, the results are not necessarily equivalent to the results that would be obtained if the fabric products were subjected to the standard tests. The results of these tests are correlated with the results of accident report analyses. Also, if the results indicate possible failure under the standard tests, this fact is brought to the attention of the FTC, in connection with their responsibility for administration of the standards.

7.1.5 The Output of the Data Analysis System

The OFF analysis of a fully detailed fabric burn accident case report can develop some 200 different bits of information on the case. These are entered into the computer tapes, and the data base created in this manner can be queried on any of the bits or on correlations among them.

Analyses of the accident data provided information that indicated needs for new standards in several areas. These analyses provided part of the basis for the notice that there is need for a children's sleepwear flammability standard [8] (section 2.2.1). During 1970, the Office of Flammable Fabrics also provided FDA with the results of optical and chemical analyses of fibers, fabric weights, and CS 191-53 [17] flammability tests performed on fabric samples submitted to NBS by FDA investigators.

7.2 Incidence of Fabric Fires

While the reports provided to NBS by FDA investigators give in-depth information on fires involving fabrics, they do not provide statistical information on the incidence of fabric fires on a nation-wide basis. Such information, obtained periodically, would be helpful in establishing

priorities for the development of flammability standards for fabric products and for determining the effectiveness of standards that are promulgated. With this objective in mind, OFF let a contract to the Denver Research Institute for the development of a design for studying the national incidence and effects of fires involving flammable fabrics. The result of this contract was a report recommending a national survey involving randomly selected households. This report was given to the Department of Health, Education, and Welfare to help develop their information gathering program.

7.3 Liaison With Industry and Other Private Groups

7.3.1 The Government-Industry Research Committee on Fabric Flammability

Early in the year discussions were held with representatives of industry and the National Science Foundation concerning a joint research study of hazards from burning apparel. These discussions led to the formation of the Government-Industry Research Committee on Fabric Flammability, which is chaired by a member from OFF and includes members from industry and the National Science Foundation. The research program of the Committee is funded jointly by industry, with the American Textile Manufacturers Institute, the National Cotton Council, and the Man-Made Fiber Producers Association each contributing $25,000, and by the Government, with the National Science Foundation contributing $92,900. Other support for the research program came from six textile companies (Burlington Mills, J. P. Stevens and Co., Cone Mills Corporation, E. I. Dupont de Nemours and Co., Beaunit Corporation, and The William Carter Co.) who provided significant quantities of fabrics to the Committee for use by the cooperating research organizations and by the Office of Flammable Fabrics in its own research program. These fabrics will make it possible to achieve greater compatibility of data and improved coordination among these related studies.

The objectives of the joint research study were described in detail in a work statement prepared by the Committee. This work statement was advertised and distributed to potential contractors and grantees, as a solicitation for research proposals directed towards the described objectives. The 42 proposals received were evaluated by the Committee, and

four were chosen for funding:

1. Factory Mutual Research Corporation; Study of Pre-Ignition Heat Transfer Through a Fabric-Skin System Subjected to a Heat Source;

2. Georgia Institute of Technology; Study of Hazards From Burning Apparel and the Relations of Hazards to Test Methods;

3. Gillette Research Institute; Work on the Probability of Ignition and the Effect of Garment Construction and Multi-Fabric Layers, Using Full Size Mannequins;

4. Massachusetts Institute of Technology; Research on Measurement of Burn-Injury Potential of Fabrics.

7.3.2 Cooperation in Test Method Development

Segments of industry, acting through trade associations for the most part, have cooperated in the development and evaluation of test methods. This cooperation has included laboratory work, as part of interlaboratory evaluations to determine the repeatability and reproducibility of test methods, and contribution of materials to be used in the evaluation tests. Of equal or greater value has been industry's contribution of technical knowledge. They have provided information on market distribution, which has guided selection of representative materials for use in test evaluations. Industry has contributed representative and special materials for use in the research program and the pre-evaluation stages of the test method development program carried out by the Office of Flammable Fabrics at NBS. The National Cotton Batting Institute and the National Association of Bedding Manufacturers have cooperated in the development and evaluation of the mattress test method. The Carpet and Rug Institute is contributing carpets for use in studying the fire hazards presented by carpets in building fires.

7.4 Other Liaison With Industry and the Public

The Office of Flammable Fabrics has had contacts with numerous other groups in industry, in government, and in the scientific/technical community. The Office has been invited to cooperate with the American Burn Association in their work on gathering

burn case information from those physicians and surgeons who give medical assistance to victims. Discussions of the Flammable Fabrics Program, and interactions with other programs, have been held with the Textile Research Institute, the American Chemical Society, the Rubber Manufacturers Association, the Interagency Committee on Fire Research, the Federal Council on Flammability and Smoke, and others. Staff of the Office of Flammable Fabrics participated in Symposia held by the University of Detroit, Clemson University, and the University of Utah, and the Annual Meeting of the Information Council on Fabric Flammability.

7.5 Liaison With Voluntary Standards Groups

The Department of Commerce and the national voluntary standards organizations continued to draw mutual benefits from liaison. Participation in the technical committees concerned with materials or products subject to the Flammable Fabrics Act provides a forum for technical discussions of particular test procedures and factors influencing the results to be expected therefrom, most likely ways to achieve improvements in test procedures, evaluation of tests, and, most importantly, the relationship between a test and the real-life hazard. The Office of Flammable Fabrics and various committees have jointly participated in interlaboratory evaluations of test methods, as discussed under section 2 of this report. Staff of the Office hold membership and participate actively in committees of the American National Standards Institute, American Society for Testing and Materials, American Association of Textile Chemists and Colorists, and National Fire Protection Association.

7.6 International Contacts

Because the standards developed by the Department of Commerce affect import and export items involving fabrics and related materials and because many foreign governments are looking to the United States for leadership in the development of appropriate standards, an active liaison program is maintained with several foreign countries. During the year, visitors came from Canada, France, Israel, Japan and Switzerland to observe our progress and inform us of theirs.

A presentation on the progress of standards on flammability was made in Switzerland and, as a consequence, some tests were conducted for the Swiss Government laboratory.

A test method proposed by the International Standards Organization is being evaluated for application to carpets and flooring materials, in cooperation with the Fire Research Section of the Building Research Division, IAT, NBS.

7.7 General Liaison

The Department and the Office of Flammable Fabrics have been hosts to numerous visitors, have responded to numerous telephone inquiries, and have handled voluminous correspondence. It is estimated that the Office of Flammable Fabrics responded to over 6,000 telephone and 1,500 written inquiries and received over 500 visitors in 1970.

8. CONCLUSION

Calendar year 1970 saw further progress in the growth and development of the Flammable Fabrics Program and in the Office of Flammable Fabrics. Two standards were prescribed under the Amended Act and proceedings toward three other standards were instituted.

9. REFERENCES

1. The Flammable Fabrics Program 1968-69; NBS Technical Note 525, Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, 75 cents, April 1970.

2. Flammable Fabrics Act Procedures; Federal Register, Vol. 33, No. 191, October 1, 1968, page 14642.

3. Carpets and Rugs, Notice of Proposed Flammability Standard; Federal Register, Vol. 34, No. 242, December 18, 1969, page 19812.

4. Carpets and Rugs (Pill Test), Standard for the Surface Flammability of Carpets and Rugs, DOC FF 1-70; Federal Register, Vol. 35, No. 74, April 16, 1970, page 6211.

5. Small Carpets and Rugs, Notice of Proposed Flammability Standard, Federal Register, Vol. 35, No. 74, April 16, 1970, page 6212.

6. Small Carpets and Rugs, DOC FF 2-70, Standard for the Surface Flammability of Small Carpets and Rugs (Pill Test), Federal Register, Vol. 35, No. 251, December 29, 1970, page 19703.

7. Children's Wearing Apparel, Notice of Finding that Flammability Standard or Other Regulation may be Needed and Institution of Proceedings, Federal Register, Vol. 35, No. 17, January 24, 1970, page 1019.

8. Children's Sleepwear, Proposed Standard for the Flammability of Children's Sleepwear (DOC PFF 3-70), Federal Register, Vol. 35, No. 223, November 17, 1970, page 17671.

9. Children's Sleepwear, Proposed Flammability Standard, Notice of Extension of Time for Filing Comments, Federal Register, Vol. 35, No. 246, December 19, 1970, page 19274.

10. Children's Sleepwear, Proposed Flammability Standard, Notice of Hearing, Federal Register, Vol. 35, No. 248, December 23, 1970, page 19520.

11. Flame Resistance of Clothing; Vertical, Method 5903, Federal Test Method Standard No. 191, Federal Supply Services, General Services Administration, December 31, 1969.

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16. Blankets, Notice of Finding that Flammability Standards or Other Regulations may be Needed and Institution of Proceedings, Federal Register, Vol. 35, No. 112, June 10, 1970, page 8943.

17. Flammability of Clothing Textiles, Commercial Standard CS 191-53, Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402.

18. Brown, W. R., and Vassallo, F. A., Fabric Flammability Test Development, CAL Report No. VH-2856-2-1, Contract No. CST-982-5, May 1970; available as PB 194-614 from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22151.

19. McCarter, R. J., Apparatus for Rate Studies of Vapor Producing Reactions, NBS Special Publication 338, Status of Thermal Analysis, Proceedings of a Symposium, Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 (Order by SD Catalog No. C13.10:338), $1.

20. 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, NBS Technical Note 498, February 1970; Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, 40 cents.

21. Greenfeld, S. H., Warner, E. R., and Reinhart, H. E., Bibliographies on Fabric Flammability, Part 4. Interior Furnishings, NBS Technical Note 498-1, June 1970; Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 (Order by SD Catalog No. C13.46:498-1), 30 cents.

22. Greenfeld, S. H., Warner, E. R., and Reinhart, H. E., Bibliographies on Fabric Flammability, Part 5. Testing and Test Methods, NBS Technical Note 498-2, September 1970; Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 (Order by SD Catalog No. C13.46:498-2), 45 cents.

Office of the Secretary

CARPETS AND RUGS

Notice of Standard

On December 18, 1969, there was published in the FEDERAL REGISTER (34 F.R. 19812) a notice of finding that a flammability standard was needed for carpets and rugs, to protect the public against unreasonable risk of the occurrence of fire leading to death, injury, or significant property damage, arising from the hazards of rapid flash burning or continuous slow burning or smoldering. A proposed standard, which was preliminarily found to protect the public against this unreasonable risk, was published in the same FEDERAL REGISTER. It was also preliminarily found that the proposed standard was reasonable, technologically practicable and appropriate and stated in objective terms, and that the proposed standard was limited to carpets and rugs which present unreasonable risk.

After review and consideration of the comments received pursuant to the above referenced publication of a proposed standard for the flammability of carpets and rugs; after review and consideration of the reports of the National Advisory Committee for the Flammable Fabrics Act on the proposed standard for the flammability of carpets and rugs; and upon having made appropriate changes in the proposed standard for the flammability of carpets and rugs based on those reviews and considerations, it is hereby found that the flammability standard as set out in full at the end hereof:

(a) Is needed for carpets and rugs to protect the public against unreasonable risk of the occurrence of fire arising from the hazards of rapid flash burning or continuous or slow burning or smoldering, and leading to death, personal injury, or significant property damage;

(b) Is reasonable, technologically practicable and appropriate and is stated in objective terms; and

(c) Is limited to carpets and rugs, which currently present the unreasonable risks specified in (a) above.

Intent of the Standard. There has heretofore existed no flammability standard for carpets and rugs affording protection to the general public from an unreasonable risk of the occurrence of fire. This Standard will provide a measure of that protection, in that it is particularly designed to protect the public from the occurrence of fire from small ignition sources, such as glowing fireplace embers or inadvertently discarded lighted cigarettes, cigars, or matches. These sources will usually affect only the surface of the carpet or rug, hence the Standard is one for the surface flammability of carpets or rugs. The Standard affords to the general public greater protection than is presently provided in federally owned or leased buildings, the rugs purchased for which must comply with Federal purchase specification DDD–C–95, Carpets and Rugs, Wool, Nylon, Acrylic, Modacrylic.

The effects of underlayments are not specifically considered in this Standard. Such effects, as well as the production of toxic fumes and the behavior of rugs in well-established fires in which drafts and heat transfer from walls and ceilings are important, will be the subject of further research and possibly other standards.

Small carpets and rugs. Several of the comments received in response to the notice of proposed flammability standard for carpets and rugs (34 F.R. 19812), including several from the National Advisory Committee for the Flammable Fabrics Act, pointed out that carpets and rugs of sizes less than 1.83 meters (6 feet) in major dimension and less than 2.23 square meters (24 square feet) in area may represent less risk to the public because of their smaller size and, thereby, less probability that they will be used in a manner whereby they could spread fire to other combustibles in the room, such as drapes, tablecloths, or furniture. For many uses, particularly as bath mats in bathrooms, they are not used under or near other combustible interior furnishings.

Therefore, carpets and rugs smaller than the above size limits are excluded from the definitions of "Carpet" and "Rug" given therein. Indiscriminate use of smaller carpets and rugs does represent unreasonable risk to the public, but the appended Standard is not appropriate for them. A notice of need and proposed complementary standard for small carpets and rugs is published in this issue of the FEDERAL REGISTER.

Effective date. The appended Standard, DOC FF 1–70, Standard for the Surface Flammability of Carpets and Rugs (Pill Test), shall become effective 12 months from the date of its publication in the FEDERAL REGISTER, and all carpets and rugs, as defined in the Standard, and all materials which may reasonably be expected to be used as carpets and rugs, manufactured for sale on or after that date shall comply with the Standard. Carpets and rugs, and materials which may reasonably be expected to be used as carpets and rugs, in inventory or with the trade as of the effective date shall be exempt from the Standard. All concerned parties may be required to provide records proving that carpets and rugs offered for sale after the effective date are eligible for the exemption.

Issued: April 10, 1970.

MAURICE H. STANS,
Secretary of Commerce.

CARPETS AND RUGS (PILL TEST)

STANDARD FOR THE SURFACE FLAMMABILITY OF CARPETS AND RUGS

DOC FF 1–70

.1 *Definitions.* In addition to the definitions given in section 2 of the Flammable Fabrics Act, as amended (sec. 1, 81 Stat. 568; 15 U.S.C. 1191), and § 7.2 of the Procedures (33 F.R. 14642, Oct. 1, 1968), the following definitions apply for the purposes of this Standard:

(a) "Acceptance Criterion" means that at least seven out of eight individual specimens of a given carpet or rug shall meet the test criterion as defined in this Standard.

(b) "Test Criterion" means the basis for judging whether or not a single specimen of carpet or rug has passed the test, i.e., the charred portion of a tested specimen shall not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point.

(c) "Carpet" means any type of finished product made in whole or in part of fabric or related material and intended for use or which may reasonably be expected to be used as a floor covering which is exposed to traffic in homes, offices, or other places of assembly or accommodation, and which may or may not be fastened to the floor by mechanical means such as nails, tacks, barbs, staples, adhesives, and which has one dimension greater than 1.83 m. (6 ft.) and a surface area greater than 2.23 $m.^2$ (24 sq. ft.). Products such as "carpet squares", with one dimension less than 1.83 m. (6 ft.) and a surface area less than 2.23 $m.^2$ (24 sq. ft.), but intended to be assembled upon installation into assemblies which may have one dimension greater than 1.83 m. (6 ft.) and a surface area greater than 2.23 $m.^2$ (24 sq. ft.), are included in this definition. Mats, hides with natural or synthetic fibers, and other similar products in the above defined dimensions are included in this definition, but resilient floor coverings such as linoleum, asphalt tile and vinyl tile are not.

(d) "Rug" means the same as carpet and shall be accepted as interchangeable with carpet.

(e) "Traffic Surface" means a surface of a carpet or rug which is intended to be walked upon.

(f) "Timed Burning Tablet" (pill) means the methenamine tablet, weighing approximately 0.149 gram (2.30 grains), sold as Product No. 1588 in Catalog No. 79, December 1, 1969, by the Eli Lilly Company of Indianapolis, Ind. 46206, or an equal tablet.

(g) "Fire-Retardant Treatment" means any process to which a carpet or rug has been exposed which significantly decreases the flammability of that carpet or rug and enables it to meet the acceptance criterion of this Standard.

.2 *Scope and application.* This Standard provides a test method to determine the surface flammability of carpets and rugs when exposed to a standard small source of ignition under carefully prescribed draft-protected conditions. It is applicable to all types of carpets and rugs used as floor covering materials regardless of their method of fabrication or whether they are made of natural or synthetic fibers or films, or combinations of or substitutes for these.

One of a kind, carpet or rug, such as an antique, an Oriental, or a hide, may be excluded from testing under this Standard pursuant to conditions established by the Federal Trade Commission.

.3 *General requirements*—(a) *Summary of test method.* This method involves the exposure of each of eight conditioned, replicate specimens of a given carpet or rug to a standard igniting source in a draft-protected environment, and measurement of the proximity of the charred portion to the edge of the hole in the prescribed flattening frame.

(b) *Test criterion.* A specimen passes the test if the charred portion does not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point.

(c) *Acceptance criterion.* At least seven of the eight specimens shall meet the test criterion in order to conform with this Standard.

.4 *Test procedure*—(a) *Apparatus*—(1) *Test chamber.* The test chamber shall consist of an open top hollow cube made of

noncombustible material[1] with inside dimensions 30.48 x 30.48 x 30.48 cm. (12 x 12 x 12 in.) and a minimum of 6.35 mm. (¼ in.) wall thickness. The flat bottom of the box shall be made of the same material as the sides and shall be easily removable. The sides shall be fastened together with screws or brackets and taped to prevent air leakage into the box during use.

NOTE: A minimum of two chambers and two extra bottoms is suggested for efficient operation.

(2) *Flattening frame.* A steel plate, 22.86 x 22.86 cm. (9 x 9 in.), 6.35 mm. (¼ in.) thick with a 20.32 cm. (8 in.) diameter hole in its center is required to hold the carpet or rug flat during the course of the test. It is recommended that one be provided for each test chamber.

(3) *Standard igniting source.* No. 1588 methenamine timed burning tablet or an equal tablet. These tablets shall be stored in a desiccator over a desiccant for 24 hours prior to use. (Small quantities of sorbed water may cause the tablets to fracture when first ignited. If a major fracture occurs, any results from that test shall be ignored, and it shall be repeated.)

(4) *Test specimens.* Each test specimen shall be a 22.86 x 22.86 cm. (9 x 9 in.) section of the carpet or rug to be tested. Eight specimens are required.

(5) *Circulating air oven.* A forced circulation drying oven capable of removing the moisture from the specimens when maintained at 105° C. (221° F.) for 2 hours.[2]

(6) *Desiccating cabinet.* An airtight and moisturetight cabinet capable of holding the floor covering specimens horizontally without contacting each other during the cooling period following drying, and containing silica gel desiccant.

(7) *Gloves.* Nonhygroscopic gloves (such as rubber polyethylene) for handling the sample after drying, and raising the pile on specimens prior to testing.

(8) *Hood.* A hood capable of being closed and having its draft turned off during each test and capable of rapidly removing the products of combustion following each test. The front or sides of the hood should be transparent to permit observation of the tests in progress.

(9) *Mirror.* A small mirror mounted above each test chamber at an angle to permit observation of the specimen from outside of the hood.

(10) *Vacuum cleaner.* A vacuum cleaner to remove all loose material from each specimen prior to conditioning. All surfaces of the vacuum cleaner contacting the specimen shall be flat and smooth.

(b) *Sampling*—(1) *Selection of samples.* Select a sample of the material representative of the lot and large enough to permit cutting eight test specimens 22.86 x 22.86 cm. (9 x 9 in.), free from creases, fold marks, delaminations, or other distortions. The test specimens should contain the most flammable parts of the traffic surface at their centers. The most flammable area may be determined on the basis of experience or through pretesting.

If the carpet or rug has had a fire-retardant treatment, or is made of fibers which have had a fire-retardant treatment, the selected sample or oversized specimens thereof shall be washed, prior to cutting of test specimens either 10 times under the washing and drying procedure prescribed in Method 124–1967 of the American Association of Textile Chemists and Colorists [washing procedure 6.2(III) with a water temperature of 60°±2.8° C. (140°±5° F.), drying procedure 6.3.2(B), maximum load 3.64 kg. (8 pounds)],[3] or such number of times under such other washing and drying procedure as shall previously have been found to be equivalent by the Federal Trade Commission. Alternatively, the selected sample or oversized specimens thereof may be washed, dry-cleaned, or shampooed 10 times, prior to cutting of test specimens, in such manner as the manufacturer or other interested party shall previously have established to the satisfaction of the Federal Trade Commission is normally used for that type of carpet or rug in service.

(2) *Cutting.* Cut eight 22.86±0.64 cm. (9±¼ in.) square specimens of each carpet or rug to be tested to comply with section .4(b)(1).

(c) *Conditioning.* Clean each specimen with the vacuum cleaner until it is free of all loose ends left during the manufacturing process and from any material that may have been worked into the pile during handling.[4] Care must be exercised to avoid "fuzzing" of the pile yarn.

Place the specimens in the drying oven in a manner that will permit free circulation of the air at 105° C. (221° F.) around them for 2 hours.[5] Remove the specimens from the oven with gloved hands and place them horizontally in the desiccator with traffic surface up and free from contact with each other until cooled to room temperature, but in no instance less than 1 hour.

(d) *Testing.* Place the test chamber in the draft-protected environment (hood with draft off) with its bottom in place. Wearing gloves, remove a test specimen from the desiccator and brush its surface with a gloved hand in such a manner as to raise its pile. Place the specimen on the center of the floor of the test chamber, traffic surface up, exercising care that the specimen is horizontal and flat. Place the flattening frame on the specimen and position a methenamine tablet on one of its flat sides in the center of the 20.32 cm. (8 in.) hole.

Ignite the tablet by touching a lighted match or an equivalent igniting source carefully to its top. If more than 2 minutes elapse between the removal of the specimen from the desiccator and the ignition of the tablet, the conditioning must be repeated.

Continue each test until one of the following conditions occurs:

(1) The last vestige of flame or glow disappears. (This is frequently accompanied by a final puff of smoke.)

(2) The flaming or smoldering has approached within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point.

When all combustion has ceased, ventilate the hood and measure the shortest distance between the edge of the hole in the flattening frame and the charred area. Record the distance measured for each specimen.

Remove the specimen from the chamber and remove any burn residue from the floor of the chamber. Before proceeding to the next test, the floor must be cooled to normal room temperature or replaced with one that is at normal room temperature.

(e) *Report.* The number of specimens of the eight tested in which the charred area does not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame shall be reported.

(f) *Interpretation of results.* If the charred area does not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point for at least seven of the eight specimens, the carpet or rug meets the acceptance criterion.

.5 *Labeling.* If the carpet or rug has had a fire-retardant treatment or is made of fibers which have had a fire-retardant treatment, it shall be labeled with the letter "T" pursuant to conditions established by the Federal Trade Commission.

[F.R. Doc. 70–4657; Filed, Apr. 15, 1970; 8:50 a.m.]

[1] 6.35 mm. (¼ in.) cement asbestos board is a suitable material.

[2] Option 1 of ASTM D 2654–67T, "Methods of Test for Amount of Moisture in Textile Materials," describes a satisfactory oven. ("1969 Book of ASTM Standards," Part 24, published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

[3] Technical Manual of the American Association of Textile Chemists and Colorists, Vol. 45, 1969, published by AATCC, Post Office Box 12215, Research Triangle Park, N.C. 27709.

[4] The vacuum cleaning described is not intended to simulate the effects of repeated vacuum cleaning in service.

[5] If the specimens are moist when received, permit them to air-dry at laboratory conditions prior to placement in the oven. A satisfactory preconditioning procedure may be found in ASTM D 1776–67, "Conditioning Textiles and Textile Products for Testing." ("1969 Book of ASTM Standards", Part 24, published by the American Society for Testing and Materials, 1916 Race Street, Phliadelphia, Pa. 19103.)

Office of the Secretary

SMALL CARPETS AND RUGS

Notice of Standard

On April 16, 1970, there was published in the FEDERAL REGISTER (35 F.R. 6212) a notice of finding that a flammability standard was needed for small carpets and rugs to protect the public against unreasonable risk of the occurrence of fire leading to death, injury, or significant property damage, arising from the hazards of rapid flash burning or continuous slow burning or smoldering. A proposed standard, which was preliminarily found to protect the public against the unreasonable risk, was published in the same FEDERAL REGISTER. It was also preliminarily found that the proposed standard was reasonable, technologically practicable and appropriate and stated in objective terms.

In deciding to issue the final standard on small carpets and rugs, there were reviewed and considered the comments received pursuant to the above-referenced publication of the proposed standard for small carpets and rugs, and the reports of the members of the National Advisory Committee for the Flammable Fabrics Act on that proposed standard. As a result of this review and consideration, the labeling requirements of the proposed standard were changed. Therefore, pursuant to my responsibilities and authority under the Flammable Fabrics Act, as amended, it is hereby found that the standard as set out in full at the end hereof:

(a) Is needed for small carpets and rugs to protect the public against unreasonable risk of the occurrence of fire arising from the hazards of rapid flash burning or continuous slow burning or smoldering and leading to death, personal injury, or significant property damage;

(b) Is reasonable, technologically practicable and appropriate and is stated in objective terms; and

(c) Is limited to small carpets and rugs which currently present the unreasonable risks specified in (a) above.

Intent of the Standard. There has heretofore existed no flammability standard for small carpets and rugs affording protection to the general public from an unreasonable risk of the occurrence of fire. This standard is particularly designed to protect the public from the occurrence of fire from small ignition sources, such as glowing fireplace embers or inadvertently discarded lighted matches. These sources will usually affect only the surface of the carpet or rug; hence, the standard is one for surface flammability of small carpets and rugs. The standard affords to the general public additional protection to that presently provided in the Standard for the Surface Flammability of Carpets and Rugs (DOC FF 1–70) recently published by the Secretary of Commerce in the FEDERAL REGISTER (35 F.R. 6211, Apr. 16, 1970), which does not include small carpets and rugs.

Standard. On the basis of comments received in response to the notice of proposed flammability standard for carpets and rugs (34 F.R. 19812, Dec. 18, 1969), it has been determined that the standard DOC FF 1–70 is not appropriate for small carpets and rugs (defined as having no dimension greater than 1.83 meters (6 feet) and an area not greater than 2.23 square meters (24 square feet)), but that nonetheless a labeling standard complementary to DOC FF 1–70 is needed to warn the consuming public against use of such small carpets and rugs in locations where their ignition could cause the spread of fire to other combustible interior furnishings.

Therefore, all small carpets and rugs no larger than the above size limits, and fabrics or related materials intended to be used, or which may reasonably be expected to be used, as small carpets and rugs, which fail to meet the acceptance criterion of the test method described in the appended standard, shall be provided with a permanent label warning the public against the risk associated with the indiscriminate use of such small carpets and rugs.

Effective date. The appended standard, DOC FF 2–70, a Standard for the Surface Flammability of Small Carpets and Rugs (Pill Test), shall become effective 12 months from the date of its publication in the FEDERAL REGISTER, and all small carpets and rugs, as defined in the standard, and all materials which may reasonably be expected to be used as small carpets and rugs manufactured on or after that date shall comply with the standard. Small carpets and rugs, and materials which may reasonably be expected to be used as carpets and rugs, in inventory or with the trade as of the effective date shall be exempt from the standard. All concerned parties may be required to provide records proving that small carpets and rugs offered for sale after the effective date are eligible for the exemption.

Issued: December 22, 1970.

MAURICE H. STANS,
Secretary of Commerce.

SMALL CARPETS AND RUGS DOC FF 2–70

STANDARD FOR THE SURFACE FLAMMABILITY OF SMALL CARPETS AND RUGS (PILL TEST)

.1 *Definitions.* In addition to the definitions given in section 2 of the Flammable Fabrics Act, as amended (sec. 1, 81 Stat. 568; 15 U.S.C. 1191), and section 7.2 of the Procedures (33 F.R. 14642, Oct. 1, 1968), the following definitions apply for the purposes of this Standard:

(a) "Acceptance Criterion" means that at least seven out of eight individual specimens of a small carpet or rug shall meet the test criterion as defined in this Standard.

(b) "Test Criterion" means the basis for judging whether or not a single specimen of a small carpet or rug has passed test, i.e., the charred portion of a tested specimen shall not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point.

(c) "Small Carpet" means any type of finished product made in whole or in part of fabric or related material and intended for use or which may reasonably be expected to be used as a floor covering which is exposed to traffic in homes, offices, or other places of assembly or accommodation, and which may or may not be fastened to the floor by mechanical means such as nails, tacks, barbs, staples, adhesives, and which has no dimension greater than 1.83 m. (6 ft.) and an area not greater than 2.23 m^2. (24 sq. ft.). Products such as "Carpet Squares" with dimensions smaller than these but intended to be assembled, upon installation, into assemblies which may have dimensions greater than these, are excluded from this definition. They are, however, included in Standard DOC FF 1–70. Mats, hides with natural or synthetic fibers, and other similar products are included in this definition if they are within the defined dimensions, but resilient floor coverings such as linoleum, asphalt tile, and vinyl tile are not.

(d) "Small Rug" means, for the purposes of this Standard, the same as small carpet and shall be accepted as interchangeable with small carpet.

(e) "Traffic Surface" means a surface of a small carpet or rug which is intended to be walked upon.

(f) "Timed Burning Tablet" (pill) means the methenamine tablet, weighing approximately 0.149 grams (2.30 grains), sold as Product No. 1588 in Catalog No. 79, December 1, 1969, by the Eli Lilly Co. of Indianapolis, Ind. 46206, or an equal tablet.

(g) "Fire-Retardant Treatment" means any process to which a small carpet or rug has been exposed which significantly decreases the flammability of that small carpet or rug and enables it to meet the acceptance criterion of this Standard.

.2 *Scope and Application.* This Standard provides a test method to determine the surface flammability of small carpets and rugs when exposed to a standard small source of ignition under carefully prescribed draft-protected conditions. It is applicable to all types of small carpets and rugs used as floor covering materials regardless of their method of fabrication or whether they are made of natural or synthetic fibers or films, or combinations of, or substitutes for these.

One of a kind small carpet or rug, such as an antique, an Oriental or a hide, may be excluded from testing under this Standard pursuant to conditions established by the Federal Trade Commission.

.3 *General requirements—*

(a) *Summary of test method.* This method involves the exposure of each of eight conditioned, replicate specimens of a small carpet or rug to a standard igniting source in a draft-protected environment and measurement of the proximity of the charred portion to the edge of the hole in the prescribed flattening frame.

(b) *Test criterion.* A specimen passes the test if the charred portion does not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point.

(c) *Acceptance criterion.* At least seven of the eight specimens shall meet the test criterion in order to conform with this Standard.

.4 *Test procedure*—(a) *Apparatus*—(1) *Test chamber.* The test chamber shall consist of an open top hollow cube made of noncombustible material[1] with inside dimensions 30.48 x 30.48 x 30.48 cm. (12 x 12 x 12 in.) and a minimum of 6.35 mm. (¼ in.)

[1] 6.35 mm. (¼ in.) cement asbestos board is a suitable material.

wall thickness. The flat bottom of the box shall be made of the same material as the sides and shall be easily removable. The sides shall be fastened together with screws or brackets and taped to prevent air leakage into the box during use.

NOTE: A minimum of two chambers and two extra bottoms is suggested for efficient operation.

(2) *Flattening frame.* A steel plate, 22.86 x 22.86 cm. (9 x 9 in.), 6.35 mm. (¼ in.) thick with a 20.32 cm. (8 in.) diameter hole in its center is required to hold the specimen flat during the course of the test. It is recommended that one be provided for each test chamber.

(3) *Standard igniting source.* No. 1588 methenamine timed burning tablet or an equal tablet. These tablets shall be stored in a desiccator over a desiccant for 24 hours prior to use. (Small quantities of sorbed water may cause the tablets to fracture when first ignited. If a major fracture occurs, any results from that test shall be ignored, and it shall be repeated.)

(4) *Test specimens.* Each test specimen shall be a 22.86 x 22.86 cm. (9 x 9 in.) section of the small carpet or rug to be tested. Eight specimens are required.

(5) *Circulating air oven.* A forced circulation drying oven capable of removing the moisture from the specimens when maintained at 105° C. (221° F.) for 2 hours.[2]

(6) *Desiccating cabinet.* An airtight and moisturetight cabinet capable of holding the floor covering specimens horizontally without contacting each other during the cooling period following drying, and containing silica gel desiccant.

(7) *Gloves.* Nonhygroscopic gloves (such as rubber or polyethylene) for handling the sample after drying and raising the pile on specimens prior to testing.

(8) *Hood.* A hood capable of being closed and having its draft turned off during each test and capable of rapidly removing the products of combustion following each test. The front or sides of the hood should be transparent to permit observation of the tests in progress.

(9) *Mirror.* A small mirror mounted above each test chamber at an angle to permit observation of the specimen from outside the hood.

(10) *Vacuum cleaner.* A vacuum cleaner to remove all loose material from each specimen prior to conditioning. All surfaces of the vacuum cleaner contacting the specimen shall be flat and smooth.

(b) *Sampling*—(1) *Selection of samples.* Select a sample of the material representative of the lot and large enough to permit cutting eight test specimens 22.86 x 22.86 cm. (9 x 9 in.) free from creases, fold marks, delaminations or other distortions. The representative sample of material may require the use of more than one small carpet or rug. The test specimens should contain the most flammable parts of the traffic surface at their centers. The most flammable area may be determined on the basis of experience or through pretesting.

If the small carpet or rug has had a fire-retardant treatment, or is made of fibers which have had a fire-retardant treatment, the selected sample or oversized specimens thereof shall be washed, prior to cutting of test specimens, either 10 times under the washing and drying procedure prescribed in Method 124–1967 of the American Association of Textile Chemists and Colorists [washing procedure 6.2 (III) with a water temperature of 60±2.8° C (140±5° F), drying procedure 6.3.2(B), maximum load 3.6.4 kg (8 pounds)],[3] or such number of times under such other washing and drying procedures as shall previously have been found to be equivalent by the Federal Trade Commission. Alternatively, the selected sample or oversized specimens thereof may be washed, dry-cleaned, or shampooed 10 times, prior to cutting of test specimens, in such manner as the manufacturer or other interested party shall previously have established to the satisfaction of the Federal Trade Commission is normally used for that type of small carpet or rug in service.

(2) *Cutting.* Cut eight 22.86±0.64 cm (99 ± ¼ in.) square specimens of each small carpet or rug to be tested to comply with section .4(b)(1).

(c) *Conditioning.* Clean each specimen with the vacuum cleaner until it is free of all loose ends left during the manufacturing process and from any material that may have been worked into the pile during handling.[4] Care must be exercised to avoid "fuzzing" of the pile yarn.

Place the specimens in the drying oven in a manner that will permit free circulation of the air at 105° C (221° F) around them for 2 hours.[5] Remove the specimens from the oven with gloved hands and place them horizontally in the desiccator with traffic surface up and free from contact with each other until cooled to room temperature, but in no instance less than 1 hour.

(d) *Testing.* Place the test chamber in the draft-protected environment (hood with draft off) with its bottom in place. Wearing gloves, remove a test specimen from the desiccator and brush its traffic surface with a gloved hand in such a manner as to raise its pile. Place the specimen on the center of the floor of the test chamber, traffic surface up, exercising care that the specimen is horizontal and flat. Place the flattening frame on the specimen and position a methenamine tablet on one of its flat sides in the center of the 20.32 cm. (8 in.) hole.

Ignite the tablet by touching a lighted match or an equivalent igniting source carefully to its top. If more than two minutes elapse between the removal of the specimen from the desiccator and the ignition of the tablet, the conditioning must be repeated.

Continue each test until one of the following conditions occur:

(1) The last vestige of flame or glow disappears. (This is frequently accompanied by a final puff of smoke.)

(2) The flaming or smoldering has approached within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point.

When all combustion has ceased, ventilate the hood and measure the shortest distance between the edge of the hole in the flattening frame and the charred area. Record the distance measured for each specimen.

Remove the specimen from the chamber and remove any burn residue from the floor of the chamber. Before proceeding to the next test, the floor must be cooled to normal room temperature or replaced with one that is normal room temperature.

(e) *Report.* The number of specimens of the eight tested in which the charred area does not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame shall be reported.

(f) *Interpretation of results.* If the charred area does not extend to within 2.54 cm. (1.0 in.) of the edge of the hole in the flattening frame at any point for at least seven of the eight specimens, the small carpet or rug meets the acceptance criterion.

.5 *Labeling requirement.* (a) If a small carpet or rug does not meet the acceptance criterion, it shall, prior to its introduction into commerce, be permanently labeled, pursuant to rules and regulations established by the Federal Trade Commission, with the following statement: FLAMMABLE (FAILS U.S. DEPARTMENT OF COMMERCE STANDARD FF 2–70); SHOULD NOT BE USED NEAR SOURCES OF IGNITION.

(b) If a small carpet or rug has had a fire-retardant treatment or is made of fibers which have had a fire-retardant treatment, it shall be labeled with the letter "T" pursuant to rules and regulations established by the Federal Trade Commission.

[F.R. Doc. 70–17474; Filed, Dec. 28, 1970; 8:50 a.m.]

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[2] Option 1 of ASTM D 2654–67T, "Methods of Test for Amount of Moisture in Textile Materials," describes a satisfactory oven. ("1969 Book of ASTM Standards," Part 24, published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

[3] Technical Manual of the American Association of Textile Chemists and Colorists, vol. 45, 1969, published by AATCC, Post Office Box 12215, Research Triangle Park, NC 27709.

[4] The vacuum cleaning described is not intended to simulate the effects of repeated vacuum cleaning in service.

[5] If the specimens are moist when received, permit them to air-dry at laboratory conditions prior to placement in the oven. A satisfactory pre-conditioning procedure may be found in ASTM D 1776–67, "Conditioning Textiles and Textile Products for Testing." ("1969 Book of ASTM Standards," Part 24, published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

DEPARTMENT OF COMMERCE

Office of the Secretary

[15 CFR Part 7]

CHILDREN'S SLEEPWEAR

Proposed Flammability Standard

On January 24, 1970, there was published in the FEDERAL REGISTER (35 F.R. 1019) a notice of finding that a flammability standard or other regulation, including labeling, may be needed for children's wearing apparel, specifically including sleepwear, and fabrics, or related materials intended to be used, or which may reasonably be expected to be used, for such apparel, to protect the public against unreasonable risk of the occurrence of fire leading to death, injury, or significant property damage, and of institution of proceedings for the development of appropriate flammability standards or other regulations for children's wearing apparel, including the specific category of sleepwear.

After review and analysis of the comments received, and after review of information including that previously cited in the January 24, 1970, FEDERAL REGISTER (35 F.R. 1019) and more recent additions thereto, it is hereby found that a flammability standard for sleepwear normally worn by young children (5 years and under) is needed to protect the public against unreasonable risk of the occurrence of fire leading to death, injury, or significant property damage.

Proposed standard. It is preliminarily found that the proposed flammability standard (DOC PFF 3–70) as set out in full at the end hereof:

a. Is needed for young children's sleepwear to protect the public against unreasonable risk of the occurrence of fire leading to death, personal injury, or significant property damage;

b. Is reasonable, technologically practicable, and appropriate, and is stated in objective terms; and

c. Is limited to young children's sleepwear, and fabrics or related materials which are intended to be used or which may reasonably be expected to be used in children's sleepwear, and which have been determined to present such unreasonable risk.

Basis for proposed flammability standard. Although there now exists a flammability standard for all wearing apparel [Flammable Fabrics Act, as amended in 1954 (15 U.S.C. 1191, 67 Stat. 111)], analysis by the Department of Commerce of data including those supplied by the Department of Health, Education, and Welfare (HEW) has led to the conclusion that the existing standard does not adequately protect children against flammable sleepwear fires. The National Advisory Committee for the Flammable Fabrics Act concurs with this conclusion.

The finding that a flammability standard or other regulation is needed for children's sleepwear is based on the analysis of data developed by investigations of deaths and injuries due to wearing apparel fires and on results of laboratory research involving garments and fabrics for children's sleepwear. The analysis of accident data indicates that children are injured at particularly high frequencies from ignition and burning of sleepwear. Laboratory research indicates that children's sleepwear garments, and fabrics for such garments, present a significant burn hazard to children.

In the course of the development of this finding, the Department of Commerce has analyzed data from 580 cases investigated by HEW. The reports of HEW indicated that, in the cases investigated by them, 1059 separate garments were ignited, causing deaths of 76 persons and injury to 504. The remains of 413 garments were recovered from 258 of the cases, including 36 cases in which death resulted. Tests conducted by the Department of Commerce on the remains of the garments recovered showed that none of the tested garments exceeded the rapid and intense burn limits established by the existing standard (CS 191–53, "Flammability of Clothing Textiles").

Of the 580 cases, 174 involved the spillage of flammable liquids on the garments. These 174 cases were not considered in further analyses of either accident reports or flammability test behavior of the recovered garments. Analysis of the remaining 406 cases, involving 713 garments, showed that children in the 0–5 age group are injured at particularly high frequencies by burning of sleepwear: girls 1.6 times and boys 3.9 times as often as would be expected on the basis of their percentage of total population of the nation. The Department of Commerce has also determined that, within the scope of the sample, these conclusions are statistically meaningful.

Children in the 0–5 age group were the victims in 86 cases (21.2 percent of the 406 cases not having flammable-liquid contamination of the garments), involving 138 garments of all categories and leading to 9 deaths and 77 injuries; 37 of these cases (43 percent of the 0–5 age group cases) were reported as involving 41 sleepwear garments and as leading to 3 deaths and 34 injuries; 17 sleepwear garments were recovered from 15 of the 37 cases and sent to the National Bureau of Standards for testing. In these 15 cases, there were two deaths and 13 injuries reported.

Of the 17 sleepwear garments recovered and forwarded to NBS by HEW, the parts of the garments remaining after the accident and after testing by the present standard (CS 191–53), permitted testing of 11 garments by the proposed standard. The results showed that none passed the proposed standard. Therefore, the proposed standard is appropriate in that, had it been in effect during the past several years, it would have protected the public by keeping off the market the garments involved in those particular children's burn cases.

Research indicated that purchased items of children's sleepwear were readily ignited by a small ignition source. Exposure to a 1½-inch natural gas flame for 3 seconds resulted in ignition and burning of many such items. Burning of such items in their usual, vertical configuration was rapid.

Simulation of real-life accident conditions was accomplished by dressing child-size mannequins in purchased items of children's sleepwear. Brief exposure of these assemblies to small flames resulted in extensive damage to the mannequins. These experiments indicate the children wearing such garments would have been seriously injured.

The proposed standard is reasonable and technologically practicable. In the course of the development of the proposed standard, NBS purchased garments on the open market that comply with the proposed standard. These garments are being marketed nationally by major distributors, both through their retail outlets and through catalog sales.

The proposed standard, which the Department of Commerce finds is needed to protect the public against unreasonable risk of the occurrence of fire leading to death, personal injury or significant property damage, is limited to young children's sleepwear.

Participation in proceedings. All interested persons are invited to submit written comments relative to the proposed flammability standard within 30 days after the date of publication of this notice in the FEDERAL REGISTER. Written comments should be submitted in at least four (4) copies to the Assistant Secretary for Science and Technology, Room 3862, U.S. Department of Commerce, Washington, D.C. 20230, and may include any data or other information pertinent to the subject.

Inspection of relevant documents. The written comments received pursuant to this notice will be available for public inspection at the Central Reference and Records Inspection facility of the Department of Commerce, Room 2122, Main Commerce Building, 14th Street between E Street and Constitution Avenue NW., Washington, D.C. 20230. A supporting document relating to data from burn cases is also available, for public examination or copying, in this facility.

Issued: November 12, 1970.

MYRON TRIBUS,
Assistant Secretary for Science and Technology.

CHILDREN'S SLEEPWEAR

PROPOSED STANDARD FOR THE FLAMMABILITY OF CHILDREN'S SLEEPWEAR

[DOC PFF 3–70]

.1 *Definitions.* In addition to the definitions given in section 2 of the Flammable Fabrics Act, as amended (sec. 1, 81 Stat. 586; 15 U.S.C. 1191), and § 7.2 of the Procedures (33 F.R. 14642, Oct. 1, 1968), the following definitions apply for the purposes of this Standard:

(a) "Children's Sleepwear" means any product of wearing apparel up to and including size 6X, such as nightgowns, pajamas, or similar or related items, such as robes, intended to be worn primarily for sleeping or activities related to sleeping. Diapers and underwear are not included in this definition.

(b) "Size 6X" means the size defined as 6X in Department of Commerce Voluntary Product Standard, previously identified as Commercial Standard, CS 151–50, "Body Measurements for the Sizing of Apparel for Infants, Babies, Toddlers, and Children."[1]

(c) "Char Length" means the distance from the original lower edge of the specimen exposed to the flame in accordance with the procedure specified herein in ".4 Test Procedure" to the end of the tear or void in the charred, burned, or damaged area, the tear being made in accordance with the procedure specified herein in .4(d)(2).

(d) "Item" means any product of children's sleepwear, or any fabric or related material intended for use in children's sleepwear, or which may reasonably be expected to be used in children's sleepwear.

(e) "Acceptance Criterion" means that set of char length and afterflame properties which an item must exhibit in order to comply with this standard.

(f) "Trim" means decorative materials, such as ribbons, laces, ornaments, or functional materials (findings) such as zippers used to construct the garment.

(g) "Afterflame Time" means the time in seconds that molten material or other fragments dropping from the specimen continue to flame after the burner flame has been removed.

(h) "Afterglow" means the continuation of glowing of parts of a specimen after flaming has ceased.

.2 *Scope and application.* (a) This Standard provides a test method to determine the flammability of items of children's sleepwear.

(b) All items of children's sleepwear must meet the acceptance criterion.

.3 *General requirements*—(a) *Summary of test method.* Five conditioned specimens, 7.0 x 25.4 cm. (2¾ x 10 in.), are suspended one at a time vertically in holders in a prescribed cabinet and subjected to a standard flame along their bottom edges for a specified time under controlled conditions. The afterflame time and char length are measured.

(b) *Acceptance criterion.* An item meets the acceptance criterion if: (1) The average char length of five specimens does not exceed the appropriate value given in Table 1, (2) no individual specimen has a char length of 25.4 cm. (10 in.), and (3) the average afterflame time of molten material or other fragments dropping from the specimen does not exceed 2 seconds when the testing is done in accordance with ".4 Test Procedure"

TABLE 1

Original fabric weight		Char length	
g./sq. m.	*(oz./sq. yd.)*	*cm.*	*(in.)*
Less than 207	(Less than 6.0)	18.0	(7.09)
207–345, inclusive	(6.0–10.0)	15.5	(6.10)
Greater than 345	(Greater than 10.0)	13.0	(5.12)

[1] Copies available from the National Technical Information Service, 5285 Port Royal Street, Springfield, Va. 22151.

.4 *Test procedure*—(a) *Apparatus*—(1) *Test chamber.* The test chamber shall be a stainless steel cabinet with inside dimensions of 30.5±2.5 cm. (12±1 in.) wide, 30.5±2.5 cm. (12±1 in.) deep and 78.7±2.5 cm. (31±1 in.) high. It shall have a frame which permits the suspension of the specimen holder over the center of the base of the cabinet at such a height that the bottom of the specimen holder is 1.71±0.08 cm. (¾±1/32 in.) above the top of the gas burner specified in .4(a)(3) and perpendicular to the front of the cabinet. The front of the cabinet shall be a hinged or sliding door with a glass insert to permit observation of the entire test. The specified cabinet is illustrated in Figure 1.[2]

(2) *Specimen holder.* The specimen holder is designed to permit suspension of the specimen in a fixed vertical position and to prevent curling of the specimen when the flame is applied. It shall consist of two U-shaped 0.32 cm. (⅛ in.) thick stainless steel plates, 40.64 cm. (16 in.) long and 7.62 cm. (3 in.) wide between which the specimen shall be fixed and which shall be held together with side clamps. The openings in the plates shall be 5.1 x 35.6 cm. (2 x 14 in.). The plates shall be hinged to assure alignment. The specified holder is illustrated in Figure 2.[2]

(3) *Burner.* The burner shall be a Tirrell Burner, 15.24 cm. (6 in.) in height. It shall have a tube of 1.8 cm. (7/16 in.) inside diameter. It shall have a variable orifice to adjust the height of the flame, and the air vents at its base shall be closed and taped shut. A centering device shall be built into the floor of the test chamber so that the burner may be moved quickly under the test specimen and away from it, as illustrated in Figure 1. The burner shall be connected to the gas source by rubber of other flexible tubing.

(4) *Gas supply system.* There shall be a control valve system with a delivery rate designed to furnish gas to the burner under a pressure of 129±13 mm. Hg. (2½ ±¼ lbs. per sq. in.) at the burner inlet. The manufacturer's recommended delivery rate for the valve system shall include the required pressure.

(5) *Gas.* The gas shall be C.P. methane (99% purity).

(6) *Hooks and weights.* Metal hooks and weights shall be used to produce a series of loads used to determine char length. The metal hooks shall consist of No. 19 gauge steel wire, or equivalent, and shall be made from 7.6 cm. (3 in.) lengths of the wire, bent 1.3 cm. (½ in.) from one end to a 45° angle hook. One end of the hook shall be fastened around the neck of the weight to be used and the other in the lower end of each burned specimen to one side of the burned area. The requisite loads are given in Table 2.

[2] Engineering drawings may be purchased from the Central Reference and Records Inspection Facility, Room 2122, Department of Commerce Building, Washington, D.C. 20230.

TABLE 2

Original fabric weight		Loads	
g./sq. m.	*(oz./sq. yd.)*	*g.*	*(lb.)*
Less than 207	(Less than 6.0)	113.5	(0.25)
207–345, inclusive	(6.0–10.0)	227.0	(0.50)
Greater than 345	(Greater than 10.0)	340.5	(0.75)

(7) *Stopwatch.* A stopwatch or similar timing device shall be used to measure time to 0.1 second.

(8) *Scale.* A linear scale graduated in 0.25 cm. (0.1 in.) divisions shall be used to measure char length.

(9) *Circulating air oven.* A forced circulation drying oven capable of maintaining the specimens at 105° C. (221° F). shall be used to dry the specimens while mounted in the specimen holders.[3]

(10) *Desiccator.* An air-tight and moisture-tight desiccating chamber shall be used for cooling mounted specimens after drying. Anhydrous silica gel shall be used as the desiccant in the desiccating chamber.

(11) *Hood.* The test shall be conducted under a hood capable of being closed and having its draft turned off during each test, and capable of rapidly removing the products of combustion following each test. The hood fan shall be turned off during the test and shall be turned on after testing to remove fumes.

(12) *Sewing machine.* A machine capable of carrying out the operations in .4(b)(3) shall be used whenever sewing is required.

(b) *Specimens and sampling*—(1) *Selection of fabric samples.* Select a sample of the item representative of the lot and large enough to permit cutting five specimens, as described in .4(b)(2) or (3) from the most flammable part of the item. More than one item of the lot may be used if necessary. The most flammable part or direction of the item may be determined on the basis of experience or through pretesting, and may be in the machine or cross-machine direction or on the bias, and may contain trim or seams.[4] If pretesting has shown that significantly different results are obtained for specimens cut with their long dimensions in different directions, the official test specimens shall be cut such that they are tested in the direction that gives the greatest flammability.

(2) *Cutting.* Cut five specimens, 7.0 x 25.4 cm (2–¾ x 10 in.) from the sample selected in .4(b)(1). If the sample is wrinkled, it may be ironed. If possible, specimens shall be cut so that each contains different machine direction yarns and different cross-machine direction yarns.

(3) *Cutting and preparation of specimens from finished sleepwear.* If the most flammable part of a garment contains seams or trim, the specimens shall

[3] Option 1 of ASTM D 2654–67T, "Method of Test for Amount of Moisture in Textile Materials," describes a satisfactory oven. ("1970 Book of ASTM Standards," Part 24, published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103).

[4] For pretesting, it is recommended that five specimens be cut from each significantly different part of the item.

be cut such that the seam or trim is down the center of the long dimension of the specimen.

For items with attached trim whose configuration does not allow placement in the specimen holder as described above, specimens shall be prepared by sewing or attaching the trim to the center of the vertical axis of an appropriate sample of untrimmed fabric chosen from another portion of the item, beginning the sewing or attachment at the lower edge of each specimen. The sewing or attachment shall be made in a manner as nearly identical as possible to the manner in which trim was attached in the item. In such cases, trim shall be removed from the item with due care to avoid damage to the trim, and with due care to remove all remnants of thread, other fastening material and base fabric from the trim. Sewing or otherwise attaching the trim shall be done with thread or fastening material of the same (or as close to the same as possible) composition and size as used for this purpose in the original item. The trim shall be sewed the entire length (if possible) of representative samples of the item. For items in which the seam length is less than 25.4 cm. (10 in.) specimens shall be cut with the seam beginning at the lower edge of each specimen.

(c) *Mounting and conditioning of specimens.* The specimens shall be placed in specimen holders so that the bottom edge of each specimen is even with the bottom edge of the specimen holder. Mount the specimens in as close to a flat configuration as possible. The sides of the specimen holder shall cover 1 cm. (⅜ in.) of the specimen width along each long edge of the specimens, and thus shall expose 5.1 cm. (2 in.) of the specimen width. The sides of the specimen holder shall be clamped with a sufficient number of clamps or with tape to prevent the specimen from being displaced during handling and testing. The specimens may be taped in the holders if the clamps fail to hold them.

Place the mounted specimens in the drying oven in a manner that will permit free circulation of air at 105° C. (221° F.) around them for 30 minutes.[6]

(d) *Testing*—(1) *Burner adjustment.* With the hood fan turned off, use the variable orifice at the burner to adjust the flame height to be 3.8 cm. (1½ in.). Move the burner so it is not in the center of the cabinet.

(2) *Specimen burning and evaluation.* Remove the mounted specimens from the oven and place them in the desiccator for 30 minutes to cool. No more than five specimens shall be placed in a desiccator at one time. Specimens shall remain in the desiccator no more than 60 minutes. One at a time, the mounted specimens shall be removed from the desiccator and suspended in the cabinet. The cabinet door shall be closed and the burner flame impinged on the bottom edge of the sample for 3.0±0.2 seconds.[6] Flame impingement is accomplished by moving the burner under the specimen for this length of time, and then removing it. Afterflame time shall be measured to the nearest 0.1 second. If the char length of an individual specimen equals 25.4 cm. (10 in.) that item fails to meet the acceptance criterion and testing may be stopped. If the visual estimate of the char length caused by 3 seconds exposure to the flame is less than 25.4 cm. (10 in.) immediately apply the flame to that same specimen for an additional 12 seconds. Afterflame time shall be measured to the nearest 0.1 second.

When afterglow has ceased, remove the specimen from the cabinet and holder, and place it on a clean flat surface. Fold the specimen lengthwise along a line through the highest peak of the charred area; crease the specimen firmly by hand. Unfold the specimen and insert the hook with the correct weight as shown in Table 2 in the specimen on one side of the charred area 6.4 mm. (¼ in.) from the lower edge. Tear the specimen by grasping the corner of the fabric at the opposite edge of the char from the weight and gently raising the specimen and weight clear of the supporting surface.[7] Measure the char length as the distance from the edge of the specimen exposed to the flame to the end of the tear.

(3) *Report.* Report separately the values of char length in centimeters (inches), and afterflame time in seconds, for each specimen as well as the average of these quantities for the set of five specimens.

(4) *Laundering.* The procedures described under .4 (b), (c) and (d) shall be carried out on items in the condition in which they are intended to be sold, and after they have been washed and dried 50 times[8] according to Test Method AATCC 124–1967.[9] Washing procedure 6.2(III) with a water temperature of 60°±2.8° C. (140°±5° F.) drying procedure 6.3.2 (B), maximum load 3.64 kg. (8 pounds) shall be used. Alternatively, a different number of times under another washing and drying procedure may be specified and used, if that procedure has previously been found to be equivalent by the Federal Trade Commission.

.5 *Labeling requirements.* All items of children's sleepwear shall be labeled with precautionary instructions to protect the items from agents or treatments which are known to cause deterioration of their flame resistance. Such labels shall be permanent and otherwise in accordance with rules and regulations established by the Federal Trade Commission.

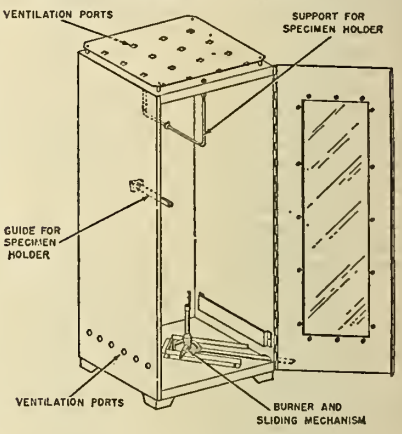

FIGURE 1
VERTICAL TEST CABINET

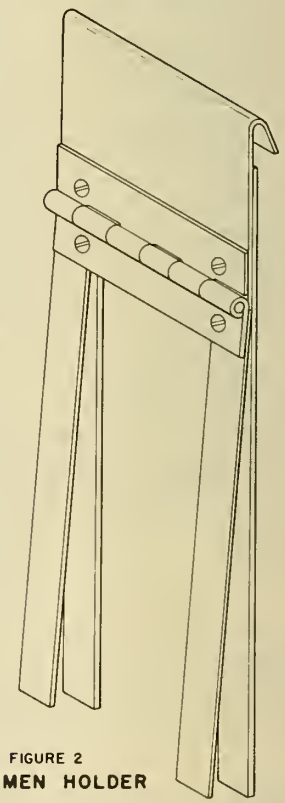

FIGURE 2
SPECIMEN HOLDER

[F.R. Doc. 70–15426; Filed, Nov. 16, 1970; 8:45 a.m.]

[5] If the specimens are moist when received, permit them to air-dry at laboratory conditions prior to placement in the oven. A satisfactory pre-conditioning procedure may be found in ASTM D 1776–67, "Conditioning Textiles and Textile Products for Testing." ("1969 Book of ASTM Standards", Part 24, published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

[6] If more than 15 seconds elapse between removal of a specimen from the desiccator and the initial flame impingement, that specimen shall be reconditioned prior to testing.

[7] A figure showing how this is done is given in AATCC 34–1969, Technical Manual of the American Association of Textile Chemists and Colorists, Vol. 45, 1969, published by AATCC, Post Office Box 12215, Research Triangle Park, N.C. 27709.

[8] If changes in an item occur during laundering which appear to affect the flammability of that item sufficiently to make it fail the acceptance criterion, that item may be tested after fewer than 50 launderings. If the item fails, further launderings are unnecessary.

[9] Technical Manual of the American Association of Textile Chemists and Colorists, Vol. 45, 1969, published by AATCC, Post Office Box 12215, Research Triangle Park, N.C. 27709.

[15 CFR Part 7]

MATTRESSES

Notice of Finding That Flammability Standards or Other Regulations May Be Needed and Institution of Proceedings

Finding. Pursuant to section 4(a) of the Flammable Fabrics Act, as amended (sec. 3, 81 Stat. 569; 15 U.S.C. 1193) and § 7.5 of the Flammable Fabrics Act Procedures (33 F.R. 14642, Oct. 1, 1968), and upon the basis of investigations or research conducted pursuant to section 14 of the Flammable Fabrics Act, as amended (sec. 10, 81 Stat. 573; 15 U.S.C. 1201), it is hereby found that a flammability standard or standards, or other regulations, including labeling, may be needed for mattresses, used either alone or as a component of a bedding assembly, and fabrics or related materials intended to be used, or which may reasonably be expected to be used, in these products, to protect the public against unreasonable risk of the occurrence of fire leading to death or personal injury, or significant property damage.

There now exists no national flammability standard for mattresses affording the general public protection from an unreasonable risk of fire. Mattresses, therefore, might be produced and made available for consumer purchase, which, when used alone or in a bedding assembly, present through ordinary use such foreseeable hazards as rapid burning, continuous slow burning or smoldering or smoke or toxic atmospheres resulting therefrom.

Data obtained from the State of Oregon, the District of Columbia, the cities of Arlington, Va., and Los Angeles, Calif., and Montgomery County, Md., were analyzed to determine the incidence of bed fires and the resulting risk to the public. Los Angeles, Calif., Arlington, Va., and the District of Columbia are primarily urban areas, while Oregon and Montgomery County, Md., are primarily mixtures of suburban and rural areas. For Los Angeles in calendar year 1968, fires started by ignition of bedding represented 16 percent of all fires in buildings. For Arlington, Va., in calendar year 1968, fires started by ignition of bedding represented 26 percent of all fires in buildings. For the District of Columbia for a portion of calendar year 1968, fires started by ignition of bedding represented 24 percent of all building fires. For calendar year 1968, fires started by ignition of bedding represented 3.9 percent of all building fires in Oregon and 2.9 percent of all building fires in Montgomery County, Md.

The National Fire Protection Association reported (January 1969 Fire Journal) a summary of data from 2,620 single-fatality, nonclothing fire deaths. In 1,173 of these cases, the item ignited was reported as "other" or "undetermined." Bed fires were the cause of 307, or 21 percent, of the remaining 1,447 deaths.

Detroit Fire Department officials reported that of 159 hotel fires in 1966, 99 were bedding fires, leading to 35 deaths.

All the above, and similar reported data, do not indicate which of the bedding components were important in the development of the fire and the resulting hazards.

In a study carried out by the Southwest Research Institute of San Antonio, Tex., under contract to the National Bureau of Standards, the life hazards resulting from the ignition and burning of typical bed assemblies in a typical room were studied. The study involved 22 experiments, in each of which a representative bed assembly was ignited, by one of several small ignition sources such as cigarettes, matches, or methenamine tablets. Measurements made showed that the hazards to life were from toxic fumes, nonviable atmospheres (reduced oxygen or suffocating concentrations of carbon dioxide), smoke, and excessive temperatures. Lethal conditions were developed in each experiment, except one of two in which flame-retardant treated blankets, sheets, and mattresses were used. Observations during the study indicated that the burning mattresses were the primary causes of the lethal conditions.

The results of laboratory studies at the National Bureau of Standards showed that the presence of sheets, and blankets, on certain mattresses were influential in determining whether or not the mattress was ignited by a cigarette.

Institution of proceedings. Pursuant to section 4(a) of the Flammable Fabrics Act, as amended (sec. 3, 81 Stat. 569; 15 U.S.C. 1193) and § 7.6(a) of the Flammable Fabrics Act Procedures (33 F.R. 14642, Oct. 1, 1968), notice is hereby given of the institution of proceedings for the development of an appropriate flammability standard or standards, or other regulations, including labeling, for mattresses, used either alone or as a component of a bedding assembly, and fabrics or related materials intended to be used, or which may reasonably be expected to be used, in these products.

Participation in proceedings. All interested persons are invited to submit written comments or suggestions within 30 days after the date of publication of this notice in the FEDERAL REGISTER relative to (1) the above finding that a new flammability standard or standards, or other regulations, including labeling, may be needed; and (2) the terms or substance of a flammability standard or standards, or other regulations, including labeling, that might be adopted in the event that a final finding is made by the Secretary of Commerce that such a standard or standards, or other regulations, are needed to adequately protect the public against the unreasonable risk of the occurrence of fire leading to death, injury, or significant property damage. Written comments or suggestions should be submitted in at least four (4) copies to the Assistant Secretary for Science and Technology, Room 5051, U.S. Department of Commerce, Washington, D.C. 20230, and should include any data or other information pertinent to the subject.

Inspection of relevant documents. The written comments received pursuant to this notice will be available for public inspection at the Central Reference and Records Inspection Facility of the Department of Commerce, Room 2122, Main Commerce Building, 14th Street between E Street and Constitution Avenue NW., Washington, D.C. 20230.

A supporting document is available for inspection in the above facility. It contains (1) a table of data on bedding fires in 1968 compared to all building fires, in several reporting areas, (2) data from tests on mattresses carried out at the National Bureau of Standards, and (3) a final report by the Southwest Research Institute on "Characterization of Bedding and Upholstery Fires," performed under Contract with the National Bureau of Standards (No. CST-792-5-69, with a release statement).

Issued: June 5, 1970.

MYRON TRIBUS,
Assistant Secretary
for Science and Technology.

[F.R. Doc. 70-7222; Filed, June 9, 1970; 8:52 a.m.]

DEPARTMENT OF COMMERCE

Office of the Secretary

[15 CFR Part 7]

BLANKETS

Notice of Finding That Flammability Standards or Other Regulations May Be Needed and Institution of Proceedings

Finding. Pursuant to section 4(a) of the Flammable Fabrics Act, as amended (sec. 3, 81 Stat. 569; 15 U.S.C. 1193) and § 7.5 of the Flammable Fabrics Act Procedures (33 F.R. 14642, Oct. 1, 1968), and upon the basis of investigations or research conducted pursuant to section 14 of the Flammable Fabrics Act, as amended (sec. 10, 81 Stat. 573; 15 U.S.C. 1201), it is hereby found that a flammability standard or standards, or other regulations, including labeling, may be needed for blankets (including electric blankets), and fabrics or related materials intended to be used, or which may reasonably be expected to be used, in these products, to protect the public against unreasonable risk of the occurrence of fire leading to death or personal injury, or significant property damage.

There now exists no national flammability standard for blankets affording the general public protection from an unreasonable risk of fire. Blankets, therefore, might be produced and made available for consumer purchase, which, when used alone or in a bedding assembly, present through ordinary use such foreseeable hazards as flash burning, rapid burning, continuous slow burning or smoldering or smoke or toxic atmospheres resulting therefrom.

The Department of Commerce has been provided data on tests of the flammability of 121 blankets of various types conducted by Consumer's Union, Mount Vernon, N.Y., and the Department of Commerce has had two meetings with representatives of blanket manufacturers. As a result of the Department's review of the Consumer's Union data, and of the meetings with the representatives of blanket manufacturers, the National Bureau of Standards made two series of purchases of blankets being offered for sale in retail outlets in the suburban Washington, D.C. area, and tested these blankets by the procedures of the present flammability standard for wearing apparel. In the first series of purchases, made on January 24, 1969, 37.5 percent of the blankets failed to comply with the present standard for wearing apparel. In the second series of purchases, made on October 6, 1969, 42 percent of the blankets failed to comply with the present standard for wearing apparel.

Data obtained from the State of Oregon, the District of Columbia, the cities of Arlington, Va., and Los Angeles, Calif., and Montgomery County, Md., were analyzed to determine the incidence of bed fires and the resulting risk to the public. Los Angeles, Calif., Arlington, Va., and the District of Columbia are primarily urban areas, while Oregon and Montgomery County, Md., are primarily mixtures of suburban and rural areas. For Los Angeles in calendar year 1968, fires started by ignition of bedding represented 16 percent of all fires in buildings. For Arlington, Va., in calendar year 1968, fires started by ignition of bedding represented 26 percent of all fires in buildings. For the District of Columbia for a portion of calendar year 1968, fires started by ignition of bedding represented 24 percent of all bedding fires. For calendar year 1968, fires started by ignition of bedding represented 3.9 percent of all building fires in Oregon and 2.9 percent of all building fires in Montgomery County, Md.

The National Fire Protection Association reported (January 1969 Fire Journal) a summary of data from 2,620 single-fatality, nonclothing fire deaths. In 1,173 of these cases, the item ignited was reported as "other" or "undetermined." Bed fires were the cause of 307, or 21 percent, of the remaining 1,447 deaths.

Detroit Fire Department officials reported that of 159 hotel fires in 1966, 99 were bedding fires, leading to 35 deaths.

All the above, and similar reported data, do not indicate which of the bedding components were important in the development of the fire and the resulting hazards.

Institution of proceedings. Pursuant to section 4(a) of the Flammable Fabrics Act, as amended (sec. 3, 81 Stat. 569; 15 U.S.C. 1193) and § 7.6(a) of the Flammable Fabrics Act Procedures (33 F.R. 14642, Oct. 1, 1968), notice is hereby given of the institution of proceedings for the development of an appropriate flammability standard or standards, or other regulations, including labeling, for blankets, and fabrics or related materials intended to be used, or which may reasonably be expected to be used, in these products.

Participation in proceedings. All interested persons are invited to submit written comments or suggestions within 30 days after the date of publication of this notice in the FEDERAL REGISTER relative to (1) the above finding that a new flammability standard or standards, or other regulations, including labeling, may be needed; and (2) the terms or substance of a flammability standard or standards, or other regulations, including labeling, that might be adopted in the event that a final finding is made by the Secretary of Commerce that such a standard or standards, or other regulations, are needed to adequately protect the public against the unreasonable risk of the occurrence of fire leading to death, injury, or significant property damage. Written comments or suggestions should be submitted in at least four (4) copies to the Assistant Secretary for Science and Technology, Room 5051, U.S. Department of Commerce, Washington, D.C. 20230, and should include any data or other information pertinent to the subject.

Inspection of relevant documents. The written comments received pursuant to this notice will be available for public inspection at the Central Reference and Records Inspection Facility of the Department of Commerce, Room 2122, Main Commerce Building, 14th Street between E Street and Constitution Avenue NW., Washington, D.C. 20230.

A supporting document is available for inspection in the above facility. It contains (1) data from tests on blankets carried out by Consumer's Union, Mount Vernon, N.Y., (2) data from tests carried out by the National Bureau of Standards on blankets purchased on January 24, 1969, (3) data from tests carried out by the National Bureau of Standards on blankets purchased on October 6, 1969, and (4) the results of a limited market survey of blankets carried out in the Washington, D.C. suburbs by the National Bureau of Standards.

Issued: June 5, 1970.

MYRON TRIBUS,
Assistant Secretary for Science and Technology.

[F.R. Doc. 70-7223; Filed, June 9, 1970; 8:52 a.m.]

APPENDIX VI

NATIONAL ADVISORY COMMITTEE FOR THE FLAMMABLE FABRICS ACT - 1970

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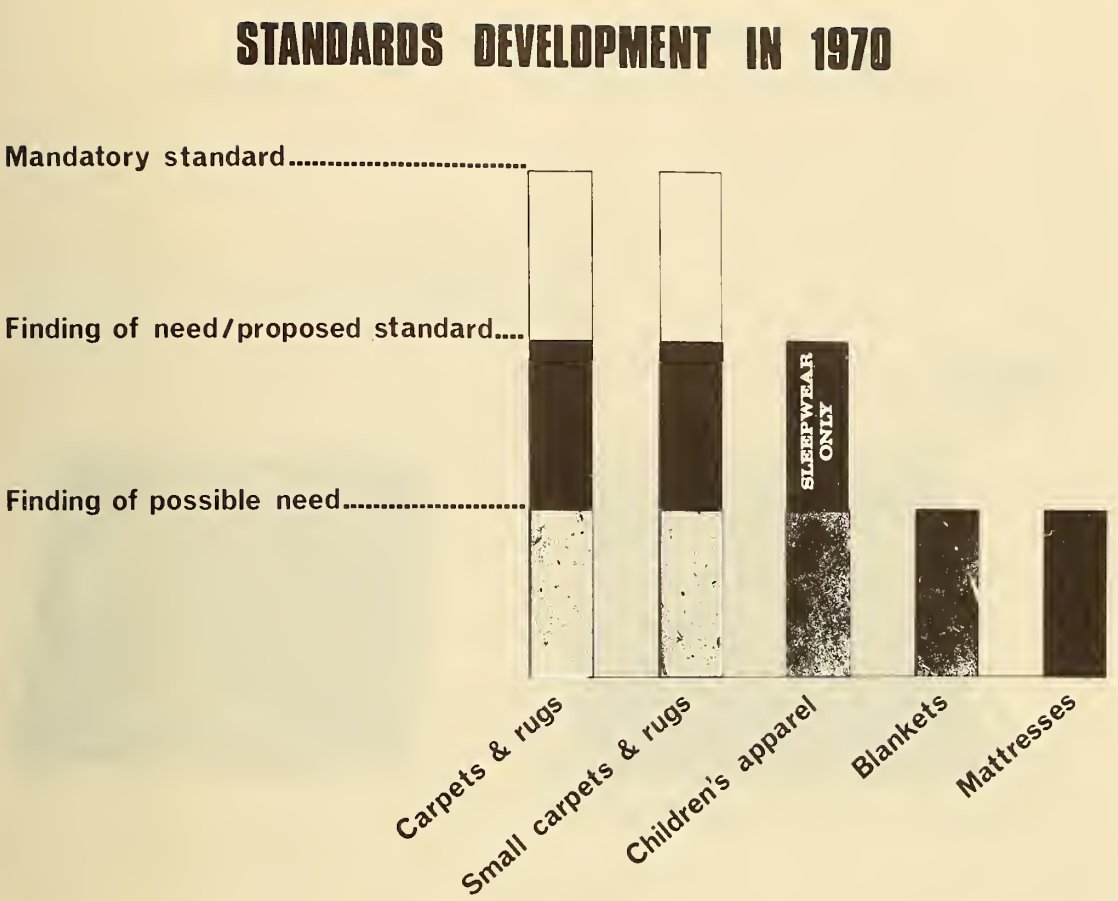


FIGURE 1

LEVELS OF STANDARD DEVELOPMENT ATTAINED DURING 1970.

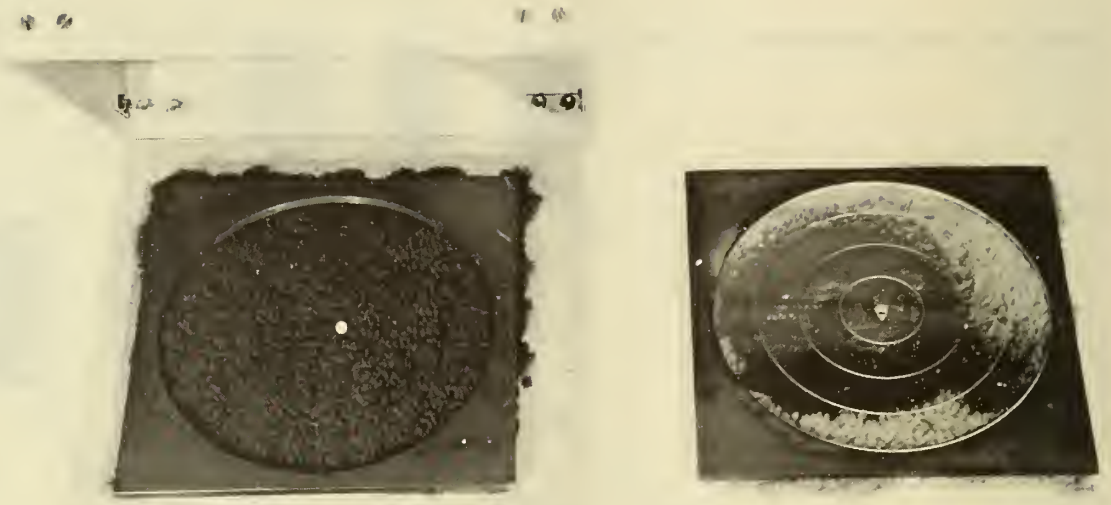


FIGURE 2

APPARATUS FOR CARPET FLAMMABILITY STANDARDS DOC FF 1-70 AND DOC FF 2-70, SHOWING AT LEFT SPECIMEN, FLATTENING FRAME, AND TIMED BURNING TABLET IN PLACE WITH DRAFT SHIELD TIPPED BACK. AT RIGHT, A BURNED SPECIMEN WITH PLASTIC TEMPLATE SHOWING 1 IN., 2 IN., AND 3 IN., RADII CIRCLES.

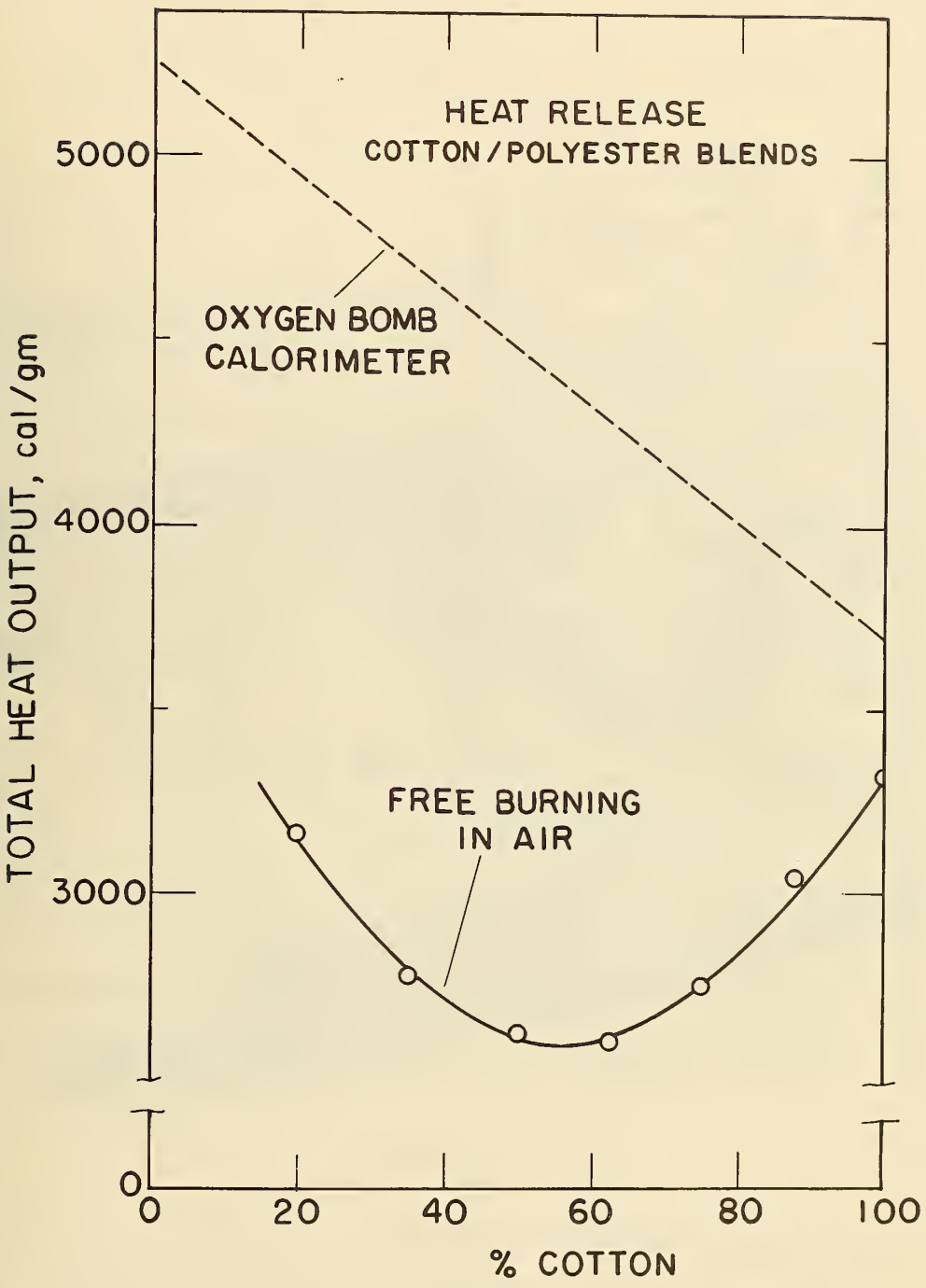
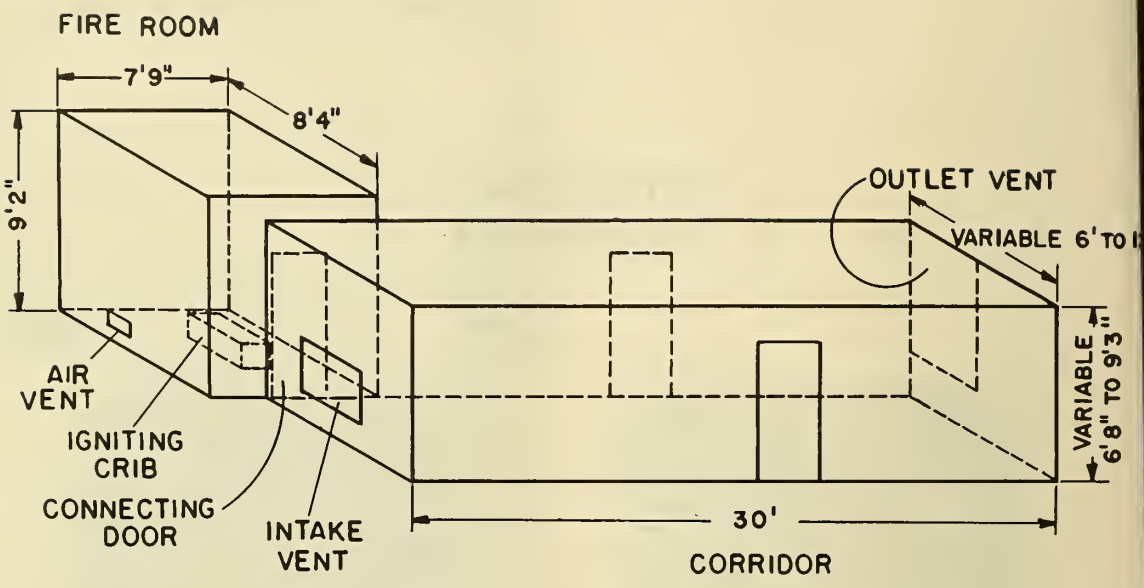


FIGURE 3

DISTRIBUTION OF RELATIVE INVOLVEMENT OF GARMENTS BY AGE OF VICTIM IN BURN CASES INVESTIGATED BY FDA AND REPORTED TO OFF.



CORRIDOR FACILITY

FIGURE '

DIAGRAM OF CORRIDOR AND BURN ROOM RESEARCH FACILITY FOR STUDY OF HAZARDS DEVELOPED DURING FULL-SCALE CORRIDOR FIRES.

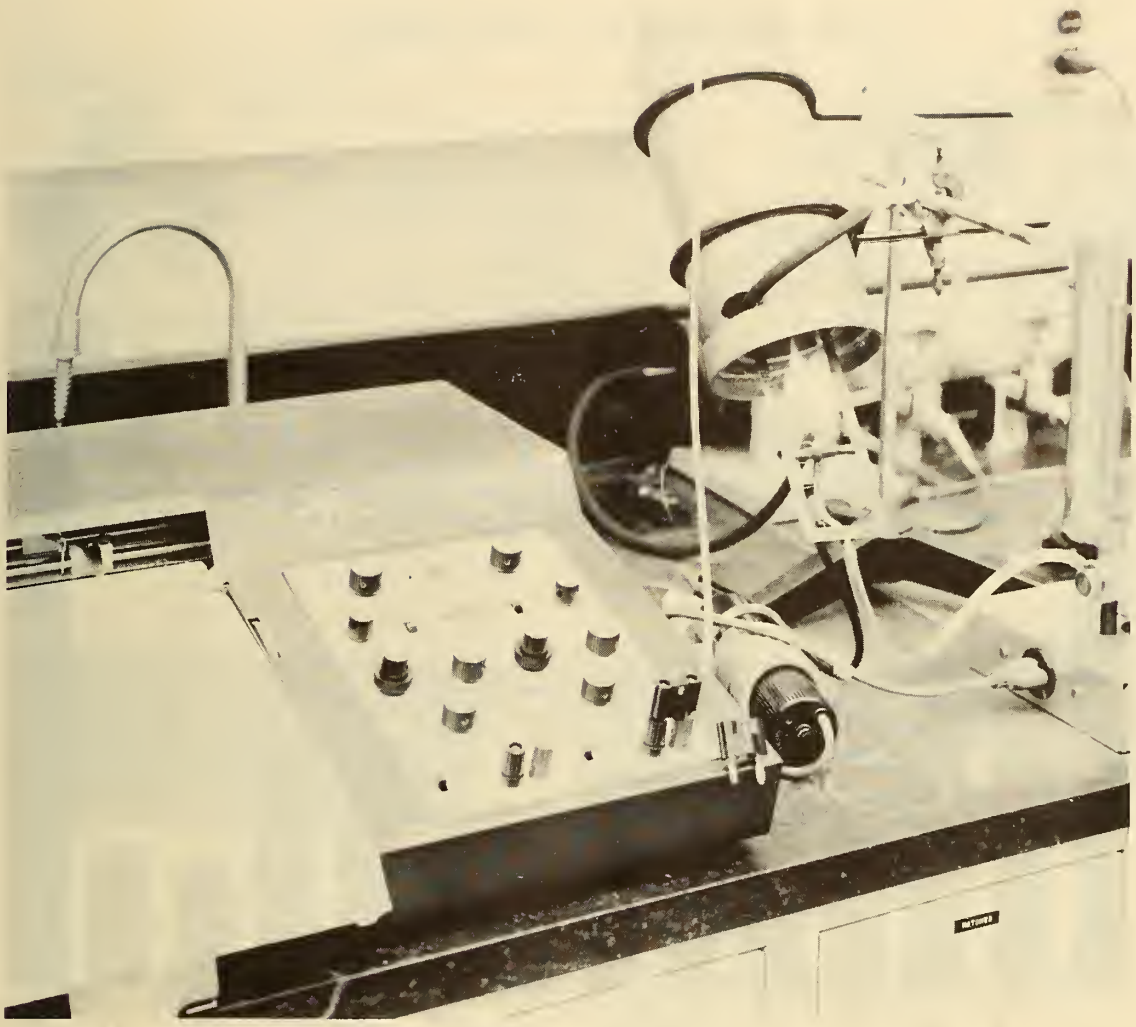


FIGURE 5

IMPROVED ISOPERIBOL CALORIMETER, FOR MEASUREMENT OF HEAT RELEASE FROM FABRICS BURNING FREELY IN AIR.

DISTRIBUTION OF GARMENTS IDENTIFIED IN CASE REPORTS BY AGE GROUPS

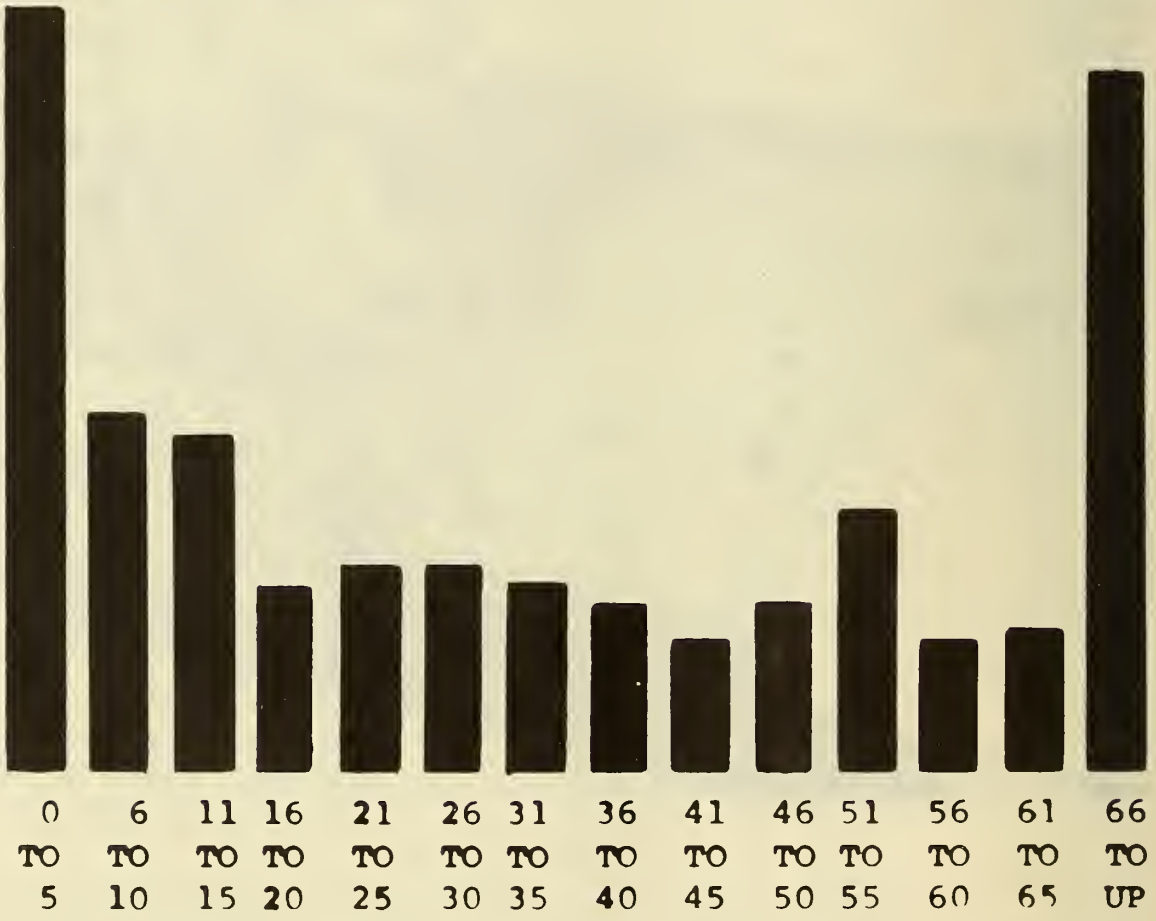


FIGURE 6

HEAT RELEASE FROM COTTON-POLYESTER BLEND FABRICS AS FUNCTION OF PERCENT COTTON, BOTH FOR ISOPERIBOL (FREE BURNING IN AIR) AND OXYGEN BOMB CALORIMETER.

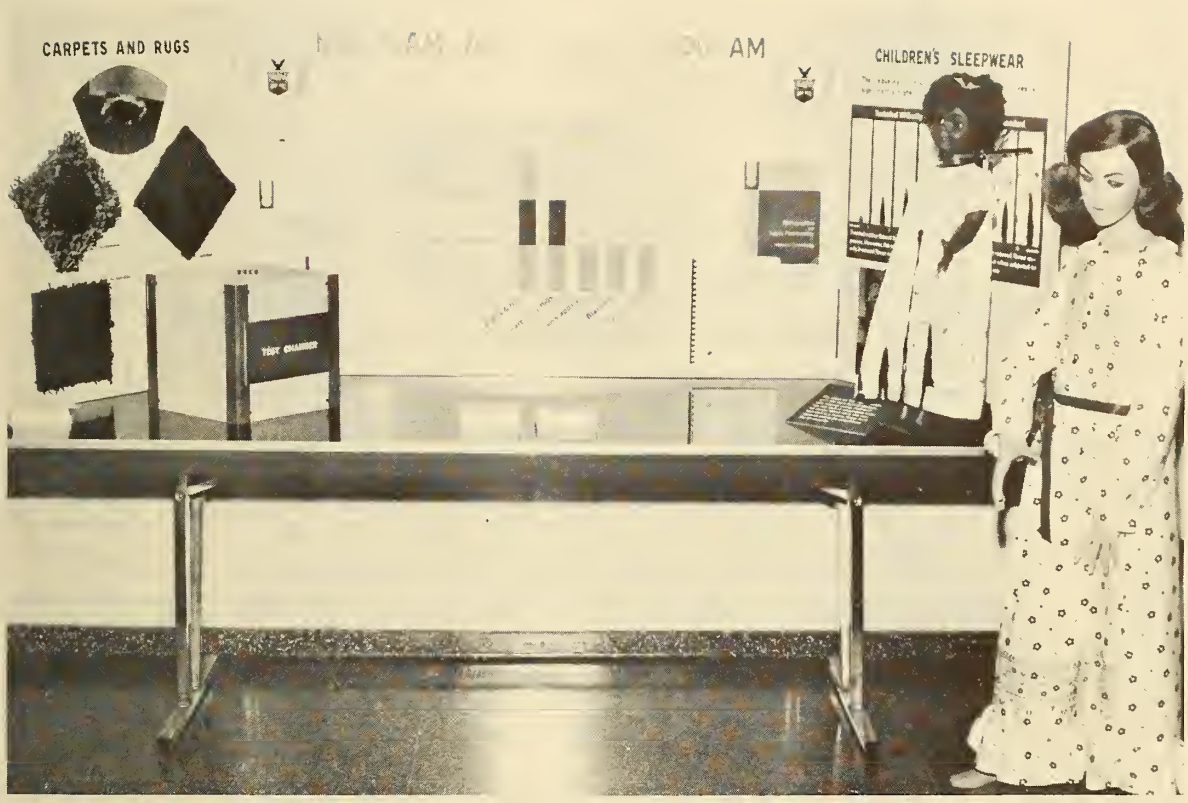


FIGURE 7

FLAMMABLE FABRICS PROGRAM DISPLAY FOR USE AT EXHIBITS, CONVENTIONS, AND OTHER MEETINGS.

CASE HISTORY

PROCESSING CYCLE

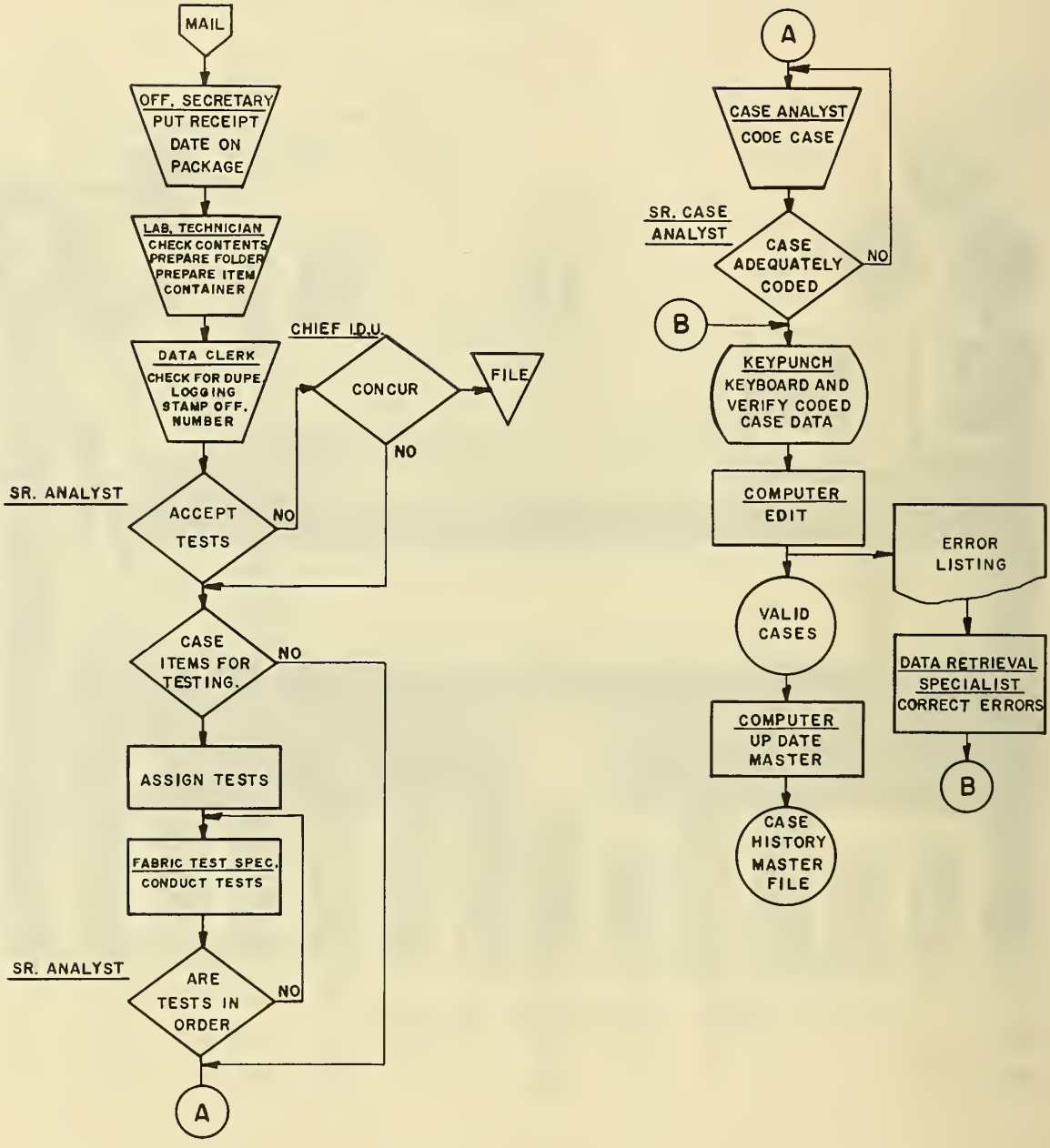


FIGURE 8

DETAILS OF PROCESSING FOR A BURN CASE HISTORY, FROM RECEIPT OF REPORT TO ENTRY INTO DATA BASE MASTER FILE (COMPUTER TAPE).

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14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

Publication of Annual Report to Congress required by Flammable Fabrics Act as amended.

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.)

This Annual Report to the Congress, required by the Flammable Fabrics Act, covers calendar year 1970. Specific flammability standards outputs were standards for carpets and rugs and for small carpets and rugs, a proposed standard for children's sleepwear, and notices of possible need and institution of proceedings for standards for certain items of children's apparel, all blankets, and all mattresses. Research included studies, in-house and by contract, on subjects such as full scale carpet burn experiments and heat transfer from burning fabrics. Studies of the feasibility of reducing flammability included pyrolysis of textile materials and chemical aspects of fire retardancy. Test development was completely related to the standards outputs, and training ranged from the preparation of bibliographies through Congressional and public presentations to full time Research Associateship participation in the program. Cooperation was carried out with HEW, the public, industry, and voluntary standards groups.

17. KEY WORDS (Alphabetical order, separated by semicolons) Annual report to Congress; blankets; carpets and rugs; children's sleepwear; cooperation; flammability; flammability reduction; mattresses; research; small carpets and rugs; standards; test development.

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