# NATIONAL BUREAU OF STANDARDS REPORT

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## FLAME RESISTANT TEXTILE STANDARDS IN THE UNITED STATES OF AMERICA


U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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## FLAME RESISTANT TEXTILE STANDARDS IN THE UNITED STATES OF AMERICA

by

Mr. James V. Ryan

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U.S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

## Author's Supplementary Statement

Further steps have been taken under the Flammable Fabrics Act since the text of this report was given as a talk early in November 1970. This supplement brings the information up to date.

A proposed standard for children's sleepwear was published in the Federal Register on November 17, 1970 [28]. The proposed standard is based on the vertical bunsen burner test, requires testing of five oven dried specimens in the direction of greatest flammability, both in the new condition and after 50 launderings, and places limits on char length and the continued flaming of molten or other material that falls from the specimen. Flame impingement is made for 3 seconds, followed by a subsequent impingement of 12 seconds if the specimen passes the 3 second impingement. The period for public comments on the proposed standard was extended to January 29, 1971, and over 200 comments were received. Public hearings were held January 14 and 15, 1971, and 16 individuals or groups made presentations at those hearings. In the light of the comments, additional laboratory work was undertaken. Several substantial changes are likely to be made in the proposed standard.

An interlaboratory evaluation was made on a preliminary test for mattresses. The method involved placing five lighted cigarettes on each mattress, at each of three representative locations, with and without sheets. The results of the statistical analysis of the data showed that the method has good repeatability and reproducibility, that mattresses need to be tested at taped edges, in depressions caused by quilting or tufting, and on smooth surfaces, that mattresses need to be tested bare and with two sheets, and that at least three cigarettes should be placed at each location with and without sheets.

The National Advisory Committee for the Flammable Fabrics Act was reconstituted by Secretary of Commerce Maurice H. Stans. He reappointed nine members of the original Committee and appointed ten other individuals.

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A flammability standard was published December 29, 1970, for small carpets and rugs [29]. It uses the same test method, the pill test, as was used in the large carpet and rug standard, but permits the manufacture of small carpets and rugs that do not pass the test if they carry a permanent label warning the consumer of the potential hazard associated with indescriminate use of such small carpets and rugs near sources of ignition.

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## Abstract

Mandatory standards for flame-resistant textiles, or related materials, are authorized under the Flammable Fabrics Act (Department of Commerce), the Child Protection Act amendments to the Federal Hazardous Substances Act (Department of Health, Education, and Welfare), the Hill-Burton and Medicare Acts (Department of Health, Education, and Welfare), the National Highway Safety Act (Department of Transportation), and the basic Acts of the U.S. Coast Guard and the Federal Aviation Administration. Of these Statutes, the Flammable Fabrics Act is the most comprehensive, including within its scope all wearing apparel and interior furnishings, for homes, offices, and places of assembly or accommodation. Standards are authorized also under State and local laws, particularly those relating to building or fire codes. Flammability requirements in purchase specifications have the force of law when made part of a contract.

Standards or proposed standards have been published for wearing apparel, carpets and rugs, small carpets and rugs, toys, floor coverings in hospitals and long term care facilities, merchant ships, aircraft cabin liners and furnishings, and motor vehicles. Building and fire codes usually set requirements only for textile furnishings in places of assembly. Purchase specifications rarely include flammability requirements except when the intended use is regulated by statutory requirements.

# FLAME RESISTANT TEXTILE STANDARDS IN THE UNITED STATES OF AMERICA

by

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## 1. Basic Concepts

Until a few years ago "flame-resistant textiles" meant merely textiles which would not ignite easily from a flame. Few textiles met that definition and those that did were used for tents, drapes in public places, and other specialized purposes. Today we are concerned with ignition from exposure to flames, or to smoldering sources or to hot surfaces; and with all the effects of combustion of the textiles, such as slow or rapid flaming, smoldering, heat transfer, smoke, toxic or irritant products of combustion, and the depletion of oxygen in the atmosphere. Any of these can represent hazard to life or property. "Flammability" has come to encompass all these properties which may, under some circumstances, become hazards. "Nonflammable" is not acceptable for designating low, but not complete freedom from hazard, for the term connotes a complete inability to be ignited and sustain burning under all exposure conditions. In the absence of a fully descriptive term, "flame resistant" will be used herein to denote the inability to sustain combustion when exposed to an ignition source, which may be other than an open flame.

## 2. Laws and Statutes in the United States

There are laws designed to encourage safety from fire by research and education. There are laws relating to safety from forest fires, oil fires, mine fires, etc. However, the discussion herein will be limited to those that provide for or permit the setting of mandatory standards for textile products. These laws exist at the Federal level, and at the State and local levels.

### 2.1 Federal Laws and Statutes

The Flammable Fabrics Act [1] is the law of broadest scope and applicability. Enacted in 1953, and amended in 1954 and 1967, the Act gives the Secretary of Commerce the authority and duty to set mandatory flammability standards when he determines they are needed to protect the public

against unreasonable risk, with the stipulation that the standards must be reasonable, appropriate, and technologically practicable. He may set standards applicable to wearing apparel and to interior furnishings for homes, offices, and places of assembly or accommodation. This law has been interpreted as not being applicable to transportation, even though large groups of the public are assembled in aircraft, ships, trains, and buses. Other federal legislation applies to transportation. The Flammable Fabrics Act authorizes investigations of deaths and injuries, research, studies of the feasibility of reducing flammability, and the development of test methods and devices, all necessary adjuncts to the setting of reasonable and appropriate standards. The responsibility for investigations is shared between the Department of Commerce and the Department of Health, Education and Welfare. Administration of the standards set under the Act is the responsibility of the Federal Trade Commission except as they apply to imports. The Bureau of Customs has jurisdiction over imports. Progress under this Act, and the other laws to be mentioned, will be described in a later section of this paper.

Three agencies within the Department of Transportation have responsibilities for vehicular safety: The U.S. Coast Guard is charged with safety aboard ships of American registry, including those operating in international waters; the Federal Highway Administration is charged with improving the safety of motor vehicles; and the Federal Aviation Agency is charged with improving the safety of aircraft. These agencies are responsible for all aspects of safety, including fire safety. Each agency has taken actions toward fire safety with regard to textiles or related products.

The Federal Hazardous Substances Act, with specific amendments on child protection and toy safety [2], authorizes the Food and Drug Administration of the Department of Health, Education, and Welfare to set standards on the flammability of toys and other items used by or for children, and for other household items.

The Hill-Burton Act authorized a program of federal assistance for the construction of hospitals and long term medical care facilities [3]. The Medicare program is designed to provide federal assistance for the medical care of the aged. Although the hospital and medical facilities receiving the assistance are not federally owned, the two laws authorizing these two programs also authorized the setting of federal safety requirements as conditions for eligibility to receive the assistance.

## 2.2 State and Local Laws and Statutes

Four of the States (California, Illinois, New Jersey, and New York) have laws which can be described as flammable fabrics acts, and a fifth State (Michigan) has such a law under activit consideration in the State legislature. California added a flammability requirement for mattresses a few months ago. In general, the scopes of these laws are comparable to that of the Flammable Fabrics Act of the Federal Government. New York's law provides for the automatic adoption by the State of standards set under the Federal law.

The Federal law contains a section on preemption that says it supersedes any inconsistent State or local law. This provision of the law has not been subjected to interpretation in the courts, so it is not entirely clear if a State or locality may set a more stringent standard than one set under the Federal law.

Many of the States and major cities have fire codes and building codes with fire provisions that are laws or are set under laws. In general, these apply more to the materials used in the construction of buildings than to interior furnishings put into those buildings. However, because of increased interest in the contribution of interior furnishings to the start and growth of building fires, there are indications that more provisions of these State and local laws will deal with textiles and related materials.

# 3. Standards and Regulations to Implement Laws

The Flammable Fabrics Act as originally enacted in 1953 set a standard for the flammability of wearing apparel fabrics, and some State and local laws have set standards directly. However, most laws, including the 1967 amendments to the Flammable Fabrics Act, are implemented through the setting of standards and regulations by the agency authorized to do so under the law.

## 3.1 Flammable Fabrics Act

The procedures for the development of flammability standards under the Flammable Fabrics Act [4] provide for several steps intended to assure all interested parties the opportunity to participate. These include (1) a notice that there may be need for a standard for particular categories of items, (2) a notice that there is need accompanied by a proposed standard, (3) consultation with the National Advisory Committee establish under the Act [5], and

(4) notice setting the standard and its effective date. Ordinarily the effective date will be 12 months after the date of publication, and items are exempt from the standard if in inventory as of the effective date. The first two steps include invitations for all interested parties to submit written comments on the need for a standard and on the terms or substance of the standard. The procedures provide for public hearings on a proposed standard, if requested.

Much of the testimony presented in favor of the amendments enacted in 1967, argued that the 1953 standard for wearing apparel [6] was inadequate and should be improved or replaced. Attention was given first to wearing apparel [7], with concentration now on children's apparel in the categories of sleepwear, underwear, and dresses [8]. The involvement of these garments in fire injuries was found to be far out of proportion to what would have been expected as random occurrences. Although the final standard has not been set for any of these categories, considerable progress has been made toward a standard for sleepwear, which would be applicable to sizes up through 6X, sizes described in a voluntary standard on garment sizes for children [9]. The current thinking on the standard for sleepwear is centered around the vertical strip bunsen burner test. Several versions of this test exist or are under development [10] in which one of the parameters measured is char length. Although an interesting version of this test is being developed by Dr. Ernst P. Martin of Basle, Switzerland, in which version rate of burning is measured in addition to length of char, the philosophy underlying the test development in the USA is that children in the early age groups are not capable of being educated to safety and, therefore, the standard should provide a very high level of protection. It is felt that a maximum char length standard is the appropriate protection for the very young.

A large proportion of the interior furnishings fires is believed to start as bed fires and action has been started toward standards for mattresses and for blankets [11] [12]. A research study [13] showed that these two items are primary sources of the hazards associated with bed fires. When cigarettes are the ignition source, the hazard is that of a smoldering mattress fire producing lethal concentrations of carbon monoxide, carbon dioxide, lethal temperature levels, and reduction of oxygen concentration to the point that the atmosphere is no longer viable. Lethal levels of one or more of these parameters, and blinding concentrations of smoke, were developed in 21 of 22 experiments. Not

enough is known about the synergistic effects among these parameters, but it is known that synergism may make the combinations even more dangerous, so the combined effects in the 22nd experiment may also have been lethal. On the other hand, if the ignition source is flaming (for example a match dropped while a person is lighting his cigarette, pipe, or cigar), the hazard first may be that of a flash or rapid fire of the blanket or other top layers of the bedding assembly, possibly igniting the apparel of the victim or other combustibles in the room. Less progress has been made toward standards for mattresses and for blankets than for children's sleepwear because of highest priority being given to work on the latter. However, current thinking is toward a cigarette test for mattresses with the requirement that any burning or smoldering shall have ceased shortly after the cigarette burns out. The Canadian Government Specifications Board has established a similar test as a voluntary standard [14]. Thoughts on possible blanket tests include a flaming source of ignition and a limiting rate of burning. This could be a 45° test or one employing another orientation.

A final standard has been developed and issued for carpets and rugs [15]. It becomes effective in April 1971. This standard requires that each of eight oven dried specimens be placed horizontally, with traffic surface up, in a draft shield and be subjected to the burning of a methenamine tablet [16] on the top surface. If burning progresses radially more than three inches on more than two of the eight specimens, the carpet fails to meet the standard and may not be offered for sale. The test is intended to simulate, and the standard to protect against, such ignition sources as a dropped match, a small ember from a fireplace, or other similar small sources. It is not intended to simulate larger and more intense ignition sources such as burning wastebaskets or furniture, nor does it measure such parameters as development of smoke, liberation of hazardous products of combusion, or the performance of an underlayment used with the carpet or rug. Although these hazards were recognized, it was not clear that they occured in homes with sufficient frequency to constitute unreasonable risk to the general public. Such hazards would be of relatively greater importance in hospitals, nursing homes, and other institutions in which are concentrated groups of persons suffering physical or mental disabilities.

The statistical probability of a hazardous carpet fire is a product of several factors, including the probability that an ignition source will land on the carpet and the

probability that the carpet will extend under other combustibles in the room, such as chairs, beds, drapes, etc. Each of these probabilities is related to the size of the carpet, being smaller for smaller carpets. In recognition of this fact, it was felt that the carpet and rug standard, designated DOC FF 1-70, was not reasonable for small carpets and rugs, and a different standard was proposed for them [17]. This proposed standard is different from DOC FF 1-70 primarily in the requirement that small carpets and rugs that fail the test (same as that used for large carpets and rugs) may be offered for sale (rather than being banned from sale) but must then be labeled to warn the consumer that care should be taken to avoid uses such that the small carpet could ignite and spread fire to other combustibles.

These are the only categories of items for which formal steps have been taken toward the establishment of standards under the Flammable Fabrics Act. However, available data suggest the possible need for standards for wearing apparel for our senior adults, for upholstered furniture, and for drapes.

### 3.2 Hill-Burton and Medicare Programs

These two programs are covered together in this section because both are administered by agencies of the Department of Health, Education, and Welfare and because nearly identical actions have been taken under them. In 1965, regulations were set under the Hill-Burton program [18] that included requirements for the flammability of floor coverings, as measured by ASTM E84 [19], the so called "tunnel test." Carpets are finding increasing use in hospitals and long term medical care facilities and are the floor coverings on which these requirements have the greatest impact. The tunnel test requires that one conditioned specimen 7.62 m (25 ft) long by 50.8 cm (20 in.) wide, attached to a suitable rigid backing, be placed face down to form the horizontal top of the rectangular test section of the apparatus. With a draft of 73.2 ± 1.5 m/min. (240 ± 5 ft/min.), a flame 1.37 m (4.5 ft. long is applied to the face of the specimen near one end. The performance is judged in terms of the time it takes for flames from the burning specimen to extend to the end of the test length, if 10 minutes or less, or the maximum distance of flame length during the 10 minute duration of the test. The results are expressed as a number; zero corresponding to no flame spread, 77.5 corresponding to flame spread the full test length in just 10 min., 100 corresponding to flame spread the full test length in 5.5 min., and higher numbers corresponding to faster flame spread. Measurements are made also of

temperature at the end of the test length, and of smoke in terms of light obscuration in the exhaust vent beyond the test section. Numerical values derived from temperature and light obscuration, relative to values derived using red oak as a specimen, are considered indications of the fuel contributed by the specimen and the smoke produced from it. The requirements under the Hill-Burton program are that carpets have a flame spread of 75 or less. No requirements are set for fuel contribution or smoke. The same requirements were proposed recently for the Medicare program [20], with additional recognition of the Department of Commerce standard, DOC FF 1-70, and of a new test developed by the Underwriters' Laboratories, who developed the tunnel test originally. The new test, called the chamber test, is similar to the tunnel test, but the specimen forms the bottom or floor of the test section in the apparatus. There are differences in specimen size, chamber size, draft velocity, and numerical calculation of the results. However, these are primarily changes of degree rather than fundamental changes.

### 3.3 Toys and Related Products

Standards set under the Federal Hazardous Substances Act became applicable to toys when the Act was amended in 1966 by the Child Protection Act [21]. These standards set a limit of 2.54 mm/sec. (0.1 in./sec.) on the rate of flame spread when the flame of a candle is applied to one end of a specimen supported in a horizontal position. The specimen dimensions are approximately 150 by 25 by 6 mm (6 by 1 by 1/4 in.). Rigid or pliable solids are supported by a metal ring stand, clamps, or other suitable devices; granules, powders, and pastes are packed into a rectangular crucible or "boat" [22]. The Federal Hazardous Substances Act was further amended in 1969 by the Toy Safety Act which provided for standards on thermal and other hazards. However, the thermal hazards relate to the danger of direct burns by hot surfaces that exist in the toy, such as light bulbs or other heat sources. Standards that may be set under this latest amendment to the Hazardous Substances Act are not likely to involve the flammability of textiles or other materials used in the toy.

### 3.4 Surface and Air Vehicles

The Federal Highway Administration has proposed a standard on the flammability of materials for use inside automobiles and other motor vehicles. The standard places an upper limit of 10.2 cm/min. (4 in./min.) on the horizontal flame spread rate of such materials when exposed to a

bunsen burner flame at one end of a conditioned specimen held in a metal U-shaped clamp having an opening 35.6 by 10.2 cm (13 by 2 in.). The specimen is in a horizontal plane. This is proposed to be a mandatory standard and materials that failed it would not be permitted to be used.

Aircraft accidents have happened in which passengers were killed or injured because of the burning of cabin furnishings. For several years, the Federal Aviation Administration has required flammability tests of materials for use in aircraft cabins. Materials for use on ceilings and walls, including window curtains, are designated as Class A materials. They must be tested by the vertical bunsen burner test, with 12 second flame exposure, must cease flaming within 15 seconds thereafter, and must not show char, melt, or other damage for more than 20.3 cm (8 in.) from the bottom edge. Any material that drips from the specimen must not continue flaming for more than 3 seconds. Class B materials, for seats, carpets, etc., must not have a burn rate of more than 10.2 cm/min. (4 in./min.) when tested by the horizontal burn test [23]. The Federal Aviation Administration recently has carried out extensive studies of the flame spread rates and the production of smoke and toxic fumes resulting from tests of materials and assemblies used in aircraft interiors [24] [25]. As a follow up to those studies, flammability standards have been proposed [26]. These involve strengthening the Class A requirements by increasing the flame exposure time to 60 seconds and lowering to 15.2 cm (6 in.) the allowed length of char, melt, etc., and raising the requirements for Class B materials to those now in effect for Class A materials.

Ships of United States registry are subject to standards set by the Coast Guard. Most of the fire standards have to do with the integrity of bulkheads and other ship elements in confining a fire to the compartment of origin, but some have to do with the flammability of the materials used in drapes and furniture. The Flammability test method is the vertical bunsen burner test with limits on char length, afterflame, and afterglow [27].

### 3.5 State and Local Standards and Regulations

Following the disastrous Coconut Grove nightclub fire in Boston in 1942, and the Ringling Brothers Circus tent fire in 1944, the vertical flammability test was required by many State and local ordinances or codes for places of assembly. It was made applicable to drapes, tents, decorations, and other items. Also, over the years, several versions of the test were developed by various groups

working within the U.S. voluntary standards effort [10]. But, basically, all require the hanging of a vertical strip of test material, 25.4 - 30.5 cm (10-12 in.) long, in a draft-free cabinet and subjecting the lower edge of the specimen to 12 sec. impingement of the upper half of a bunsen burner flame 3.8 cm (1.5 in.) high. Smoldering or glow, if any, is allowed to continue as long as it will after the burner is removed. The performance criterion is a limiting char length. The particular length depends on the version of the method, the weight of the fabric, and the intended use of the fabric, but they are in the range of 8.9 to 16.5 cm (3-1/2 to 6-1/2 in.). Prior to testing, the specimens are dried in an oven, removed one at a time, and tested as promptly as possible.

As already mentioned, some State and local ordinances or codes require flammability tests for wearing apparel and/or interior furnishings. Generally, these require the 45 degree test for apparel. Tests for furnishings, toys, etc., range from the 45 degree test to candle or bunsen burner tests of fabrics or loose fill materials in a horizontal position, setting a limiting rate of burning. The details vary among the localities and setting them forth is beyond the scope of this paper.

### 4. Purchase Specifications

The individual or corporate purchaser of any product may set the performance requirements of the product he wishes to purchase. If a manufacturer is willing and able to produce the item to the purchaser's specifications, at a price acceptable to both parties, they may enter into a contract incorporating the specification directly, or by reference if the purchaser has selected a specification that has achieved some recognition. Although the specification (and test methods on which it is based) may be purely voluntary in origin, the fact that it has been incorporated in a contract makes it binding in law upon the parties to the contract. Therefore, when purchase specifications are part of a contract, they have the same force as statutory standards and codes. The prime difference is that, in the case of a contract, the party suffering as a result of failure to meet the contract must seek his own redress in the courts, whereas, in the case of government standards or codes, the Federal, State or local government enters as a third party, and may have statutory authority to assess penalties without recourse to the courts. Penalties assessed by administrative authority are usually subject to review by the courts upon petition of the penalized party.

In fact, the individual consumer rarely sets a specification and negotiates a contract for the items he wishes to purchase. He purchases a product "off the shelf" or "off the hook", relying on his own judgement, the good name of the manufacturer or the seller, the warranty that accompanies the product, or just luck. Generally, the American consumer does not think about the flammability of the wearing apparel or interior furnishings he buys. In the few instances in which he has been offered flame-resistant apparel, few have been willing to pay a higher price for it. There is a strong suspicion that the large corporate consumer is not much more conscious of flammability, and therefore, not likely to include it in the contracts he does negotiate, except for products subject to government codes or standards. This indifference is difficult to reconcile with the thousands of deaths and hundreds of thousand of injuries attributed to clothing and interior furnishings fires annually. The frequent news accounts of fire deaths and injuries seem not to impress the public. Yet when individual consumers have spoken out on the issue of flammability legislation they have favored government action. In the reports of the Congress on the 1967 legislation to amend the Flammable Fabrics Act, it was recognized that valiant efforts to educate the public for many years have not been completely successful. The public, through its elected representatives, has said that government, whether Federal, State, or local, should take action to protect the public from unreasonably flammable fabrics and products.

### 5. Summary

Government action at the Federal, State, and local levels, has led to many standards, codes and specifications relating to the flammability of textiles and textile products. The most comprehensive of the laws authorizing flammability standards is the Flammable Fabrics Act as amended.

The Secretary of Commerce is authorized by the Flammable Fabrics act to set standards on the flammability of wearing apparel and interior furnishings when needed to protect the public against unreasonable risk. He has set a standard for carpets, has proposed one for small carpets, and has initiated proceedings for the development of standards for children's apparel in certain categories; for mattresses, and for blankets. The 45 degree test of all apparel, set by the Congress in 1953, remains in effect until specific action is taken by the Secretary of Commerce.

Other government agencies have set or are authorized to set flammability standards applicable to transportation, toys, and other household products.

A significant number of different test methods have been developed. Standards differ among various jurisdictions, not only as to the type of test method, but also as to the required level of performance. It is hoped that the establishment of nationwide standards under the Flammable Fabrics Act, and other federal statutes, will produce simplification among the many local standards now existing, uniform protection to all the public, and uniform requirements to be met by the affected industries.

## REFERENCES


1. The Flammable Fabrics Act as amended, 15 U.S.C. 1191, 81 Stat. 568.

2. The Federal Hazardous Substances Act, 15, U.S.C. 1261, 80 Stat. 1303.

3. Public Health Service Act, Title IV, Construction and Modernization of Hospitals & Other Medical Facilities, 42 U.S.C.A. 291, 78 Stat.

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

5. The Flammable Fabrics Act as amended, Sec. 17, 15 U.S.C. 1191, 81 Stat. 574.

6. Flammability of Clothing Textiles, Commercial Standard CS 191-53, U.S. Department of Commerce.

7. Wearing Apparel, Notice of Finding that Flammability Standard or Other Regulations May Be Needed and Institution of Proceedings, Federal Register, Vol. 33, No. 207, Page 15662, October 23, 1968.

8. Childrens' Wearing Apparel, Notice of Finding That Flammability Standard or Other Regulations May Be Needed and Institution of Proceedings, Federal Register, Vol. 35, No. 17, page 1019, January 24, 1970.

9. Body Measurements for the Sizing of Apparel for Infants, Babies, Toddlers, and Children, Commercial Standard 151-50.

10. American Association of Textile Chemists and Colorists 34-1969; American Society for Testing and Materials, D626-55T; National Fire Protection Association No. 701-1968; Federal Test Method Standard 191, Method 5903 (superseded Method 5902)

11. Mattresses, Notice of Finding That Flammability Standard or Other Regulation May Be Needed and Institution of Proceedings, Federal Register, Vol. 35, No. 112, Page 8944, June 10, 1970.

12. Blankets, Notice of Finding That Flammability Standard or Other Regulation May Be Needed and Institution of Proceedings, Federal Register, Vol. 35, No. 122 page, 8943, June 10, 1970.

13. Characterization of Bedding and Upholstery Fires; C. A. Hafer and C. H. Yuill; Southwest Research Institute, San Antonio, Texas, March 31, 1970.

14. Combustion Resistance of Mattresses: Cigarette Test, 35-GP-1, 19 July 1968, Canadian Government Specifications Board.

15. Standard for the Surface Flammability of Carpets and Rugs, DOC FF 1-70, Federal Register, Vol. 35, No. 74, pages 6211-6212, April 16, 1970.

16. Timed Burning Tablet, Product No. 1588, Catalog No. 79, December 1, 1969, Eli Lilly Co., Indianapolis, Indiana 46206.

17. Proposed Standard for the Surface Flammability of Small Carpets and Rugs (Pill Test), DOC FF 2-70, Federal Register, Vol. 35, No. 74, pages 6213-6214, April 16, 1970.

18. General Standards of Construction and Equipment for Hospital and Medical Facilities, Public Health Service Publication No. 930-A-7, U.S. Department of Health, Education, & Welfare.

19. Standard Method of Test for Surface Burning Characteristics of Building Materials, ASTM Designation: E84-68, 1968 Book of ASTM Standards, Part 14, November 1968, American Society for Testing and Materials, Philadelphia, Pennsylvania.

20. Fire and Safety Requirements for Extended Care Facilities and for Hospitals Not Accredited by Joint Commission on Accreditation of Hospitals or American Osteopathic Association, Federal Health Insurance for the Aged, Federal Register, Vol. 35, No. 171, page 13888, September 2, 1970.

21. The Child Protection Act of 1966, PL89-756, 15 U.S.C. 1261, 80 Stat. 1305.

22. Regulations Under the Federal Hazardous Substances Act, paragraphs 191.1(k) and 191.14, Food and Drug Administration, U.S. Department of Health, Education and Welfare.

23. Crashworthiness and Passenger Evacuation Standards: Transport Category Airplanes; Part 25, Section 25.853; Federal Register, Vol. 32, page 13266, September 20, 1967.

24. Flaming and Self-Extinguishing Characteristics of Aircraft Cabin Interior Materials, Federal Aviation Administration, Report No. NA-68-30.

25. Smoke and Gases Produced by Burning Aircraft Interior Materials, Federal Aviation Administration Report No. NA-68-36; also same title, Building Science Services 18, National Bureau of Standards.

26. Transport Category Airplanes; Crashworthiness and Passenger Evacuation; Notice of Proposed Rule Making, Section 25,853, Federal Register, Vol. 34, page 13042, August 12, 1969.

27. Specification for Fabrics, Fire Resistant for Merchant Vessels; Subpart 164.011-10, United States Coast Guard, Washington, D.C.

28. Children's Sleepwear, Proposed Flammability Standard, Federal Register, Vol. 35, No. 223, page 17670, November 17, 1970.

29. Small Carpets and Rugs, Notice of Standard, Federal Register, Vol. 35, No. 251, page 19702, December 29, 1970.


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