

Report No. NA-68-30
(DS-68-13)

FSS000282R
c

FINAL REPORT

Project No. 510-001-11X

**FLAMING AND SELF-EXTINGUISHING CHARACTERISTICS
OF AIRCRAFT CABIN INTERIOR MATERIALS**



JULY 1968

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
National Aviation Facilities Experimental Center
Atlantic City, New Jersey 08405

"The Federal Aviation Administration is responsible for the promotion, regulation and safety of civil aviation and for the development and operation of a common system of air navigation and air traffic control facilities which provides for the safe and efficient use of airspace by both civil and military aircraft."

"The National Aviation Facilities Experimental Center maintains laboratories, facilities, skills and services to support FAA research, development and implementation programs through analysis, experimentation and evaluation of aviation concepts, procedures, systems and equipment."

FINAL REPORT

FLAMING AND SELF-EXTINGUISHING CHARACTERISTICS
OF AIRCRAFT CABIN INTERIOR MATERIALS

PROJECT NO. 510-001-11X

REPORT NO. NA-68-30
(DS-68-13)

Prepared by:
JOHN F. MARCY
RICHARD JOHNSON

for

AIRCRAFT DEVELOPMENT SERVICE

July 1968

This report is approved for unlimited availability. It does not necessarily reflect Federal Aviation Administration policy in all respects, and it does not, in itself, constitute a standard, specification, or regulation.

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
National Aviation Facilities Experimental Center
Atlantic City, New Jersey 08405

ABSTRACT

A study was made of the burning characteristics of some 140 different materials for the purpose of obtaining technical data and criteria needed to support current efforts to improve existing Federal Air Regulations governing the use of cabin interior materials in aviation.

Comparative tests were conducted on two groups of materials; one consisting of materials now in use in air transport, and the second materials proposed for future use with superior fire resistance. Measurements were made of ignition time, burn and char lengths, flame-out time, burn rate, heat of combustion, flame-spread index, etc. Two standard laboratory test methods were employed; namely, (1) Federal Standard CCC-T-191b, Test Method 5902, Vertical Burning Apparatus, and (2) Federal Standard 00136b (ASTM E-162), Radiant Panel Apparatus.

Results of the tests were analyzed to indicate major flammability trends for different material classifications. Practical allowable flammability limits based on available materials technology were recommended for increasing the present fire protection requirements of interior materials.

TABLE OF CONTENTS

	Page
ABSTRACT	iii
INTRODUCTION	1
Purpose	1
Background	1
DISCUSSION	3
Fire Testing	3
Materials Description	5
Equipment Description	6
Laboratory Tests and Measurements	9
SUMMARY OF RESULTS	13
CONCLUSIONS	31
RECOMMENDATIONS	32
REFERENCES	33
APPENDIX I Tables of Material Description and Laboratory Fire Test Data (52 pages)	1-1

LIST OF ILLUSTRATIONS

Figure		Page
1	Vertical Burning Test Apparatus	7
2	Radiant Panel Flame-Spread Test Apparatus	8
3	Frequency Distribution of Char Length by Material Classification - Test Method 5903T	18
4	Frequency Distribution of Flame-Out Time by Material Classification - Test Method 5903T	19
5	Frequency Distribution of Flame-Spread Index Values by Material Classification - Radiant Panel Test	27

LIST OF TABLES

Table		Page
I	Data Summary for Vertical Tests - Method 5903T Group I - Materials (Current)	14
II	Data Summary for Vertical Tests - Method 5903T Group II - Materials (Special)	16
III	Data Summary for Radiant Panel Tests Group I - Materials (Current)	23
IV	Data Summary for Radiant Panel Tests Group II - Materials (Special)	25

INTRODUCTION

Purpose

The test program covered by this report is part of a continuing project effort first initiated in 1963 to investigate possible fire, smoke, and toxic gas hazards resulting from the use of combustible interior cabin furnishings and construction materials. This particular phase of the project was concerned primarily with a study of the flammability and burning characteristics of individual materials by means of standard laboratory test methods and procedures. Fire tests were conducted on two large groups of materials for comparison in performance. The first group consisted of materials typical of those in current use in aviation, while the second group consisted primarily of newer or experimental materials that are more representative of the current state of the art of materials technology.

The findings presented in the report were intended to provide background information and criteria needed to support current efforts by the Federal Aviation Administration (FAA) in cooperation with the aviation industry to improve and update regulations governing the use of safer cabin interior materials in aircraft as part of general revisions of the Crashworthiness and Passenger Evacuation Standards - Transport Category Airplanes. Specific goals of the program were to establish appropriate test methods and set realistic flammability limits covering the entire range of cabin interior materials.

Background

Since much of the interior construction and furnishings of airplane cabins are not only combustible but also are contained within the same close environment with passengers, the presence of a fire condition may be suspected of sufficient severity to cause some concern over safety. It is understandable that the major emphasis on fire protection in the past would have been associated with fear of ignition of the large quantities of highly flammable fuels carried aboard aircraft. Major fires involving cabin interior materials would normally be expected to originate outside the cabin from a fuel fire spreading through the interior materials from an opening or break in the fuselage following a crash landing and fuel spill fire accident. In comparison, only minor significance was attached to any possibility of severe fires originating entirely within the cabin materials proper. Notwithstanding this low incident appraisal, regulations had been adopted to limit the degree of flammability of interior materials to controllable levels by requiring the use of materials designated as flame-resistant or slow burning. Regulations establishing minimum standards for these materials were contained in an early Flight Standards Service Release No. 259, dated August 26, 1947. The document established a maximum horizontal burn rate of 4 inches per minute for showing compliance with the regulations. Despite recent amendments this past year, the above burn rate remains in effect for some materials (Reference 1).

Interest in the burning characteristics of interior materials has accelerated since 1960 with the occurrence of a series of major cabin fires in parked jet transports (Reference 2). Losses from such sporadic fires have been so severe as to encourage some airlines to provide their overhaul bases with rapid means of inerting unoccupied cabins with an extinguishing foam agent in case of internal fire (Reference 3). As a result of past fire experience and the implied threat to passenger safety, both Government and major airplane companies in recent years have embarked on extensive test programs to investigate the combustible characteristics of materials by utilizing standard laboratory tests (References 4, 5, 6, and 7). Supplementing evaluation tests on separate materials, full-scale cabin fire tests were conducted on completely furnished transport cabins to obtain a better understanding of the nature and extent of the hazards to which passengers may be exposed (References 8 and 9). This earlier work has been greatly expanded during the past 2 years to include other phases of the general problems that pertain to control and extinguishment of post-crash or inflight cabin fires (References 10 and 11).

Much of the impetus for the present increase in cabin fire research and materials investigation designed to improve existing regulations developed as an aftermath of the Boeing 727 crash landing and resulting fire at Salt Lake City in November 1965. Experience gained from a study of this accident opened up other areas of interest in fire protection such as the smoke and toxic hazards which accompany fire (References 12 and 13). This has led to a cooperative project effort with the Fire Research Section of the National Bureau of Standards to study and measure the smoke and toxic characteristics of burning interior materials. The results of this work will be the subject of a separate report (Reference 14).

DISCUSSION

Fire Testing

Aviation safety, following a survivable crash landing accident, may be largely dependent on the ability of materials to resist and contain the effects of fire. Federal Aviation Regulations Part 25 - Airworthiness Standards for Fire Protection, specify four separate materials categories depending upon their intended use or location in the aircraft. In order of decreasing severity of application, these are listed as follows: (1) fireproof, (2) fire-resistant, (3) flame-resistant, and (4) flash-resistant. The first two categories are for materials either completely or largely noncombustible in composition. Materials so classified are required to show resistance to flame penetration from either the standard 2000°F - 2.0 gph kerosene torch or a Bunsen burner. Materials in this group include metals, glass and asbestos, used either separately or in combination with some organic binder, as with certain fire-resistant composites. In contrast, flame- and flash-resistant materials are primarily organic in composition and, therefore, basically combustible. The maximum burn rate permitted under present Federal Regulation, adopted in 1947 for rating materials designated as flame-resistant, has remained at 4 inches per minute as tested in the horizontal position. This regulation has made possible the use of a wide selection of plastics which proved to be well suited to meet the demands of modern air travel for both cabin comfort and decor. However, subsequent tests on a large selection of cabin interior materials had shown that, for the majority of such materials, the above burn rate figure was too lenient. With the exception of certain types of materials, notably seat upholstery and foam padding, most materials were found to be self-extinguishing with a zero horizontal burn rate. Lately, in response to the greater awareness of cabin fire dangers and also to take full advantage of the latest developments of materials technology, a goal was set that would require that all interior materials eventually be self-extinguishing (Reference 15). This has already resulted in a recent revision to the Federal Standards requiring that certain types of interior materials used mainly for wall, ceiling, partition, and floor construction be self-extinguishing in the vertical position within an 8-inch char length (Reference 1). The improved regulations are intended to reflect gains in fire resistance from the present state-of-the-art materials technology. The revised standards have also eliminated the lowest category of flash-resistant materials which permitted a burn rate as high as 20 inches per minute for materials such as seat padding.

Choice of any one particular fire test method generally accepted as valid for rating all materials is complicated by the extreme range and complexity of cabin materials in relation to composition and form. For example, interior materials may range from light weight fabrics and films only a few thousandths of an inch thick to seat padding and complicated

honeycomb assemblies with thicknesses of 1 to 4 inches. Many different test methods, depending on the particular type of material and severity of application, have been devised and sponsored by both Government agencies and technical societies. Standards issued by these organizations frequently specify the same method under different designations. An example of such universality is Test Method 5902 for measuring char length under such various designations as: ASTM 626-55T, NFPA Standard No. 701, AATCC Standard 34-1952, MIL-C-20696, MIL-C-7514B (ASG), CCC-A-680a, Standard 3119 (England), DIN 53906 (Germany), etc. Since it is virtually impossible to equate the severity of one test method with that of another for comparison, it becomes necessary, if possible, to select a single method that will best evaluate and cover the entire range of cabin materials regardless of type or use. This was in accordance with past regulations which specified the use of only one common test method for all materials designated as flame-resistant. It should be noted that although this test method had been designed originally for measuring the burn rate of fabrics, it was applied equally to all cabin materials without distinction.

Major factors related to fire which may provide useful data for a materials rating system are as follows: (1) minimum heat, temperature and time required for ignition, (2) rapidity by which flames propagate following ignition, (3) tendency for flash fire to suddenly erupt, (4) tendency for flaming to become self-extinguishing upon removal of the ignition source, and (5) rate and total heat generated by the combustion process. Other factors of increasing interest to aviation safety are measurements of smoke and other combustion product concentrations as these affect either visibility or indicate a toxic hazard.

The single most significant factor listed above in considering improved standards is that of the ability of the material to become self-extinguishing within both a short char length and rapid flame-out time following removal of the ignition source. Laboratory tests utilizing a small ignition source such as a Bunsen burner flame on which present regulations are based have been supplemented with other test methods utilizing a much larger source of heat including radiant and convective which would be more representative of an actual cabin fire environment. Materials at elevated temperatures are known to be much more flammable than that indicated by the Bunsen burner tests under normal ambient temperature conditions typical of an incipient fire. A test method of the more severe type most widely recognized by the building fire codes specifies a gas-fired, 25-foot long tunnel for rating materials (Reference 16). The radiant panel test method (Reference 17) used in this investigation was designed to simulate the severity of the tunnel and provide more conveniently the same type of flame-spread index data. In addition to the comparative laboratory tests on individual materials, it is desirable that materials be evaluated on location under conditions typical of full-scale fire. The results of such tests will be contained in separate reports to be presented at a later date.

Materials Description

A total of nearly 150 materials designated as cabin interior materials and listed in Table I of the appendix were investigated for their flammability and burning characteristics. For purposes of analysis and comparison, the materials were divided into five main classifications based on use and physical structure: (1) fabrics, (2) rugs, (3) sheets, (4) laminates, and (5) assemblies. For better identification, each of the above classifications were subdivided as follows: (1) coated and uncoated for the fabrics, (2) padded or unpadded for the rugs, and (3) rigid, semirigid or flexible for the sheets and laminates.

Materials numbered below 100 are listed as Group I in the table containing 76 materials. These were obtained from four different suppliers consisting of two major commercial airplane companies, one airline, and one seat manufacturer. As such, the list should constitute a representative cross section of materials in current use in air transports. Materials numbered above 100 are listed as Group II containing 65 materials. These were obtained directly from materials manufacturers including most of the major chemical companies among the total of 24 different suppliers. For purposes of this test program, the latter group of materials were considered experimental and representative for the most part of recently developed materials with superior fire resistance.

The chemical compositions listed for the materials were obtained by the National Bureau of Standards by utilizing mainly infrared spectrophotometer techniques supplemented by manufacturers' data when available. The most striking feature in the compilation of the data in Table I is the extreme variation between different materials not only in physical properties but also in chemical composition. Almost all of the materials were composed either entirely or in part of organics and were thus combustible to some degree. Most of these organics were synthetic in origin.

The most typical plastics encountered in the analysis of the materials were the vinyls, acrylics, and acrylonitrile/butadiene/styrenes (ABS). Of special interest were the more recently developed high temperature polymers: namely, aromatic polyamide, polyimide, polycarbonate, polysulfone and the fluorocarbons (References 18 and 19). Also, Group II, consisting of the newer and more fire-resistant materials, is distinguished from the first group by the greater use of noncombustibles in the construction of the materials.

Equipment Description

Vertical Flammability Test Method Apparatus: This apparatus is used in Federal Specification CCC-T-191b, Method 5902 (and 5903T), and is shown by photograph in Figure 1. The essential parts of the apparatus consist of a Bunsen burner ignition source, a ventilated metal cabinet to provide a draft-free environment, a rigid specimen holder to assure rigid specimen support, a set of weights and a timer. The Bunsen burner was fed from a tank of compressed synthetic gas of known composition (H_2 - 55%, CH_4 - 24%, CO - 18%, C_2H_6 - 3%) and heat content of 540 Btu per cubic foot at standard atmospheric conditions. Method 5903T differs from Method 5902 only in that the composition of the gas is specified, instead of being optional, and as such represents the latest revision to the basic test method.

Radiant Panel Flame-Spread Method Apparatus: This apparatus is used in Federal Standard No. 00136b (ASTM E-162) and is shown by photograph in Figure 2. The essential parts of the apparatus consist of a gas-fired porous refractory panel heat source, an acetylene pilot torch ignition source, a specimen holder, a temperature instrumented stack, and a timer. A brief description of the major parts of the apparatus follows:

Radiant Panel - This provides a radiant heat source environment to the burning test specimen. The panel consists of a porous refractory ceramic surface fed from the rear with a premixed propane/air supply. Combustion is nearly completed within the pores of the ceramic panel providing a uniform black body glow temperature of $1238^{\circ}F$ over the entire panel area measuring 18 by 12 inches. A radiation pyrometer shown in the photograph is used to adjust the correct operating temperature of the panel.

Pilot Burner - This provides a flame to force ignition at the top of the specimen. The burner consists of a short length of 1/8-inch I.D. stainless steel tube with a porcelain nozzle attachment. The burner is fed with acetylene premixed with air and the flame adjusted to a length of 2 to 3 inches.

Specimen Holder - This provides a rigid support for the test specimens and consists of a frame with a clamping arrangement. Overall size of the holder is 19-3/8 by 6-1/4 inches, allowing an exposed surface of 17-5/8 by 5-1/4 inches. The holder is inclined at an angle of 30 degrees away from the radiant panel which is in a vertical position. This method of mounting assures a graduated heat flux from top to bottom of the test specimen in the ratio of about 10 to 1 with a maximum value of about $3.0 \text{ Btu/ft}^2/\text{sec}$. Markings on the holder at 3-inch intervals are provided for timing flame propagation.

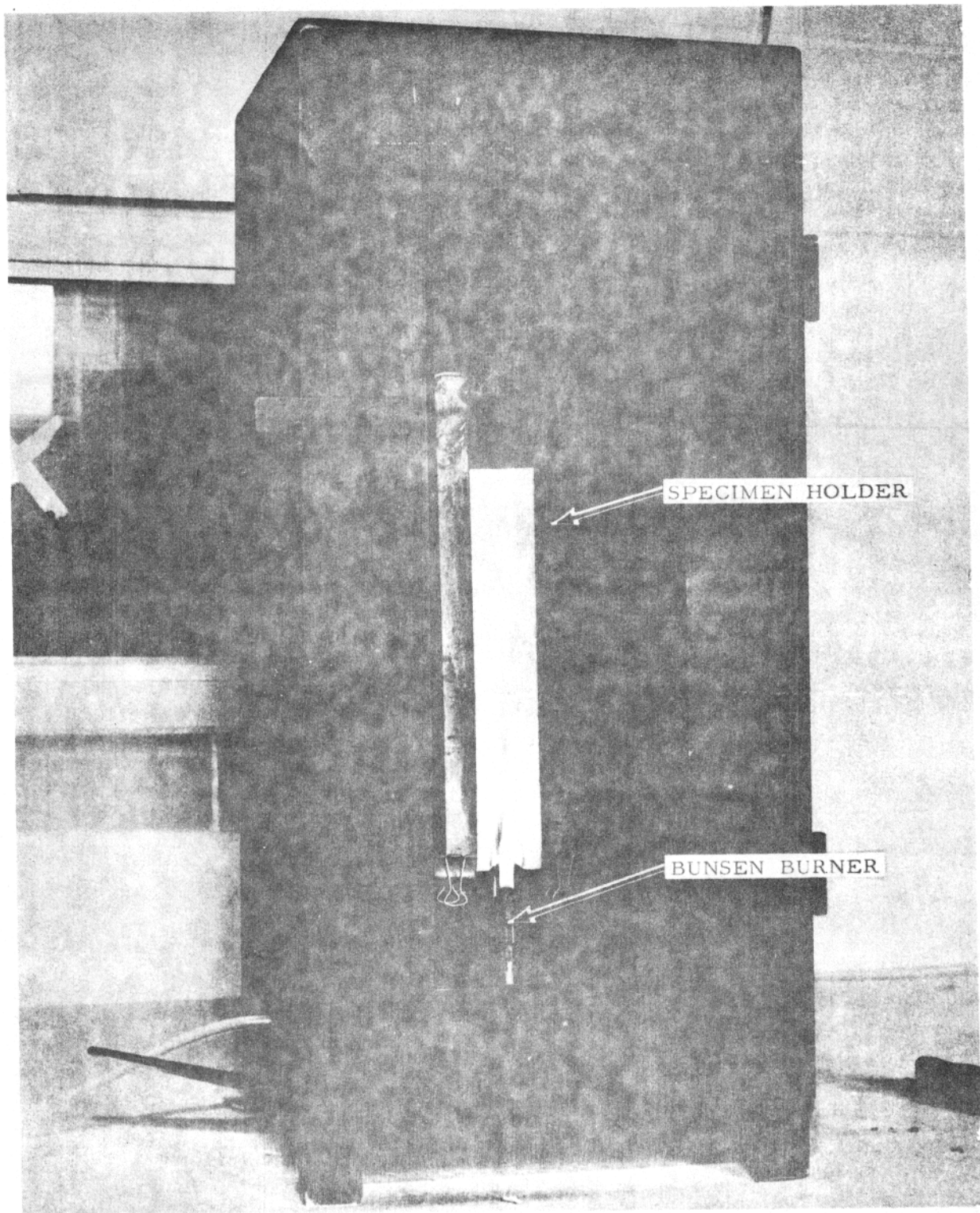


FIG. 1 VERTICAL BURNING TEST APPARATUS

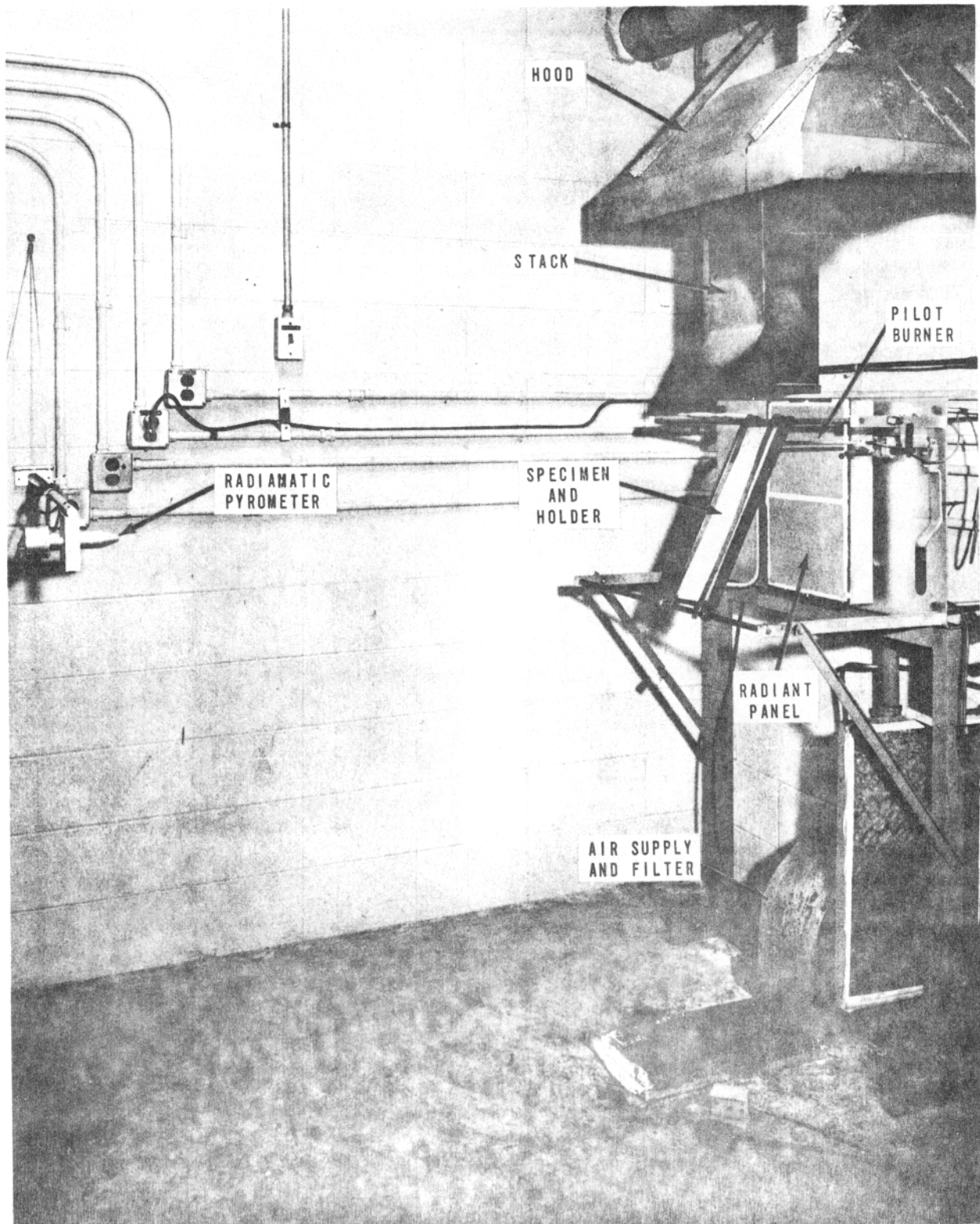


FIG. 2 RADIANT PANEL FLAME-SPREAD TEST APPARATUS

Instrumented Stack - This provides the means for measuring the heat rise in the exhaust stack caused by the combustion of the test specimen. Eight chromel-alumel thermocouples connected in parallel are placed in the stack to provide an average air temperature which is recorded continuously during the entire test. Airflow through the stack is provided by a centrifugal blower rated at an initial minimum velocity of 100 feet per minute (250 feet per minute hot).

Laboratory Tests and Measurements

Vertical Flammability Test Procedure:

1. Three specimens, 12 by 3 inches, were cut from the same sample material lengthwise to the most critical burning dimension.

2. The specimens then were placed in a conditioning chamber for at least 12 hours set at a relative humidity of 50 percent and a temperature of 70°F.

3. One specimen at a time was removed from the conditioning chamber, clamped in the holder, placed inside the cabinet, and hung vertically from a horizontal bar. The specimen was positioned so that its edge was three-fourths of an inch directly above the center of the burner barrel. The burner was adjusted to a height of 1-1/2 inches with no premixed air and then slid into position by means of the handle attached to the burner to start the test. The specimen was exposed to the burner flame for 12 seconds only.

4. Ignition time was measured from the instant the burner was placed under the specimen until the time the specimen began to flame or until a definite change was observed in the size and color of the burner flame.

5. Total flaming time was measured from the instant flaming was observed until the time that flaming ceased.

6. Flame-out time or flame time was measured from the instant the burner flame was removed until the time flaming of the material ceased.

Materials which flamed out before the burner was removed are shown in the data with minus (-) readings to indicate this event. Flame-out time is one of the most important measurements specified by this particular test method, the other being char length.

7. Glow time was measured from the instant flaming stopped until the time the specimen ceased to emit light.

8. Burn length was measured as the total length of the specimen exhibiting some physical change resulting in structural damage or color change apparent to the eye. In the case of the more flammable materials with a well defined flame front, burn length may be measured visually by observing the maximum distance of flame propagation. Specimens which did not burn completely (less than 12 inches) were classified in the test data as self-extinguishing while complete burning was denoted by an X.

9. Char length was measured as the total length of the specimen exhibiting essentially total destruction of some portion of the body or surface area of the material as evidenced by melting or carbon formation. A pointed probe similar to a ball point pen was used to dig into the carbonized surface to determine the limits of char formation. Char length as determined above would always be shorter than burn length since it represents the more heavily damaged part of the material.

For uncoated fabrics, char length was measured in accordance with standard procedures by measuring the total tear length obtained by supporting a known weight by one edge of the damaged specimen as specified by the test method. For coated fabrics with glass, asbestos, or metal backing which resisted fire, char length was measured over the surface area of the organic coating which was completely destroyed. It should be recognized that for many of the materials, char measurement could be influenced by personal choice. Thus, a more liberal measurement of char length by one experimenter could approach that of the corresponding burn length by another.

10. Maximum flame height was measured as the maximum height of the flame observed during the entire duration of the test. The ceiling height of the chamber limited the measurements of the more flammable materials as indicated in the test data.

11. Burn rate was calculated by dividing the burn length by the total flaming time including the 12-second burner exposure time.

12. Smoke, odor and other burning characteristics of the specimen were noted and recorded.

Radiant Panel Flame-Spread Test Procedure:

1. Three specimens, 18 by 6 inches, were cut from the sample material lengthwise to the most critical burning dimension.

2. The specimens prior to fire testing were conditioned as in Test Method 5903T.

3. A calibration of the apparatus was made to determine proper operating temperatures and airflow.

4. The specimen covered by a 1-inch mesh poultry netting for mechanical support was next placed in the holder. A 1/2-inch thick asbestos millboard was then placed in the holder for backing up the specimen with a 1/2-inch air gap separating the specimen from the millboard.

5. The pilot burner was ignited and adjusted to proper length and intensity.

6. The specimen holder was next placed into position with the pilot flame to initiate the fire test.

7. Ignition time was measured from the instant the specimen was placed in contact with the pilot flame until the time flaming of the specimen was observed. For materials that did not show a definite flame pattern, ignition time was measured by noting the occurrence of an increase in the size of the pilot flame or change of color.

8. Total flaming time was measured for the periods of time when flaming of the specimen was visible to the eye.

9. Maximum flame propagation was measured by observing the farthest penetration of flame down the length of the specimen, as noted against the scale engraved on the side of the holder. Flaming extending beyond the 15-inch mark was indicated by an "X" to denote that it was not self-extinguishing.

10. Glow time was measured from the instant open flaming stopped until the time the specimen ceased to emit light.

11. Total burning time or test duration was measured from the instant the specimen was placed in front of the radiant panel until the time the specimen was removed at the end of the test. The test was terminated when flame propagation reached a distance of 15 inches or, failing this, when complete charring of the specimen became evident. Low flammable materials were exposed to the radiant panel for a total exposure of 15 minutes before termination of the test.

12. Char length was measured as in Test Method 5903T and represented essentially total destruction of the surface of the specimen. Because of severe exposure to an external radiant heat source, materials exhibited considerable charring even in the absence of open flaming by the test specimen contrary to the experience with Test Method 5903T.

13. Total heat contributed during the total burning time was calculated from the area under the stack temperature-time curve multiplied by the radiant panel calibration factor.

14. Maximum temperature rise was measured from the peak stack temperature recorded above a baseline temperature for a totally noncombustible specimen.

15. Flame-spread factor (F_g) was calculated from flame propagation data for 3-inch increments of distance along the specimen length.

16. Flame-spread index (I_g) was calculated from the product of the flame-spread factor, the maximum rise in stack temperature and a calibration factor as shown by formulas contained in Federal Standard No. 00136b. The index scale is based on a zero rating for an asbestos/cement panel and 100 as a representative value for untreated wood test specimens. Thereby, a direct numerical comparison is provided for flammability rating over a wide range.

17. Coefficient of variation for flame-spread indices was calculated by standard statistical methods.

18. Smoke, odor and other burning characteristics of the specimen were noted and recorded.

SUMMARY OF RESULTS

Vertical Flammability Tests

Materials investigated are described in Table I of the appendix. The extensive laboratory test data obtained for the materials are contained in Table II of the appendix. A summary of these data is presented in Tables I and II and Figures 3 and 4 of the text for greater convenience in interpreting and comparing the various test results for different materials.

A total of 134 different materials was tested. These were divided into two major groups with Group I comprising materials typical of current usage and Group II comprising materials considered new or experimental. The flammability ratings for each group are highlighted by the following general statistical figures:

Group I - Materials Nos. 1 - 76 of which:

<u>56</u> were self-extinguishing and did not burn completely	<u>78% of total</u>
<u>53</u> were self-extinguishing within a char length of 6 inches	<u>74% of total</u>
<u>20</u> were self-extinguishing within a char length of 1 inch	<u>28% of total</u>
<u>47</u> were self-extinguishing within a char length of 12 inches and a flame-out time of 30 seconds	<u>65% of total</u>
<u>44</u> were self-extinguishing within a char length of 6 inches and a flame-out time of 15 seconds	<u>61% of total</u>
<u>16</u> were not self-extinguishing and burned completely	<u>22% of total</u>

Group II - Materials Nos. 100 - 164 of which:

<u>62</u> were self-extinguishing within a char length of 6 inches	<u>100% of total</u>
<u>47</u> were self-extinguishing within a char length of 3 inches	<u>76% of total</u>
<u>21</u> were self-extinguishing within a char length of 1 inch	<u>34% of total</u>

TABLE I

DATA SUMMARY FOR VERTICAL TESTS - METHOD 5903T

GROUP I MATERIALS (CURRENT)

Material No. Code	Self-extinguishing (1)	Flame-out Time (2) (sec)						Char Length (in.)						Burn Length (in.)					
		0	0-2	2-5	5-15	15-30	30-60	60+	0-.5	.5-1	1-3	3-6	6-12	12+	0-1	1-2	2-4	4-8	8-12
1 F1	No																		
2	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	No																		
4	Yes																		
28	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	No																		
63	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	No																		
Sub-Total	6 4	2	2	1	4	1	0	1	1	5	4	4	1	1	5	4	1	5	4
5 F2	Yes																		
6	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
55	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
56	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
57	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub-Total	6	4	4	1	1	1	0	1	2	3	3	3	3	3	3	3	3	3	
8 R1	No																		
18	No																		
64	No																		
65	No																		
7 R2	No																		
17	No																		
Sub-Total	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9 S1	Yes																		
15	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
19	Yes																		
31	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
40	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
44	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
52	No																		
59	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
66	No																		
Sub-Total	6 3	3	2	1	2	1	0	1	2	1	2	3	1	2	2	1	3	1	3
10 S2	No																		
13	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
51	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub-Total	3 1	1	1	1	2	1	0	1	1	1	1	1	1	1	1	1	1	1	

NOTES:
 (1) Self-extinguishing: Yes - Burns less than 12 inches; No - Burns completely
 (2) Flame-out Time: measured after 12-second burner removal

ABBREVIATIONS:
 F1, F2 - Uncoated and coated fabric; R1, R2 - Unpadded and padded rug;
 S1, S2, S3 - Flexible, semi-rigid and rigid sheet;
 L1, L2, L3 - Flexible, semi-rigid and rigid laminate; A - Assembly

TABLE I
 DATA SUMMARY FOR VERTICAL TESTS - METHOD 5903T
 GROUP I MATERIALS (CURRENT)

Material No. Code	Self-Extinguishing (1)	Flame-out Time (2) (sec)						Char Length (in.)						Burn Length (in.)						
		0-2	2-5	5-15	15-30	30-60	60+	0-.5	.5-1	1-3	3-6	6-12	12+	0-1	1-2	2-4	4-8	8-12	12+	
11 S3	No						0													
12	Yes	0						0						0						
33	Yes	0						0						0						
35	Yes						0							0						
37	Yes						0							0						
38	No																			
39	Yes						0							0						
45	Yes													0						
46	Yes													0						
50	Yes						0							0						
60	Yes													0						
61	Yes													0						
62	Yes													0						
73	Yes													0						
Sub-Total	12	6	3	1			4	4	4	2	1	1	2	5	5	1	1	1	2	
22 L1	Yes													0						
67 L2	Yes													0						
68	Yes													0						
69	Yes													0						
70	Yes													0						
71	Yes													0						
Sub-Total	6	1	2	1	1		1	1	1	3	2			3	3	3				
20 L3	Yes													0						
21	Yes													0						
25	Yes													0						
26	Yes													0						
32	Yes													0						
72	Yes													0						
Sub-Total	6	4					1	1	2	1	2	1	2	3	2	1				
23 A	Yes													0						
24	Yes													0						
30	Yes													0						
41	Yes													0						
42	Yes													0						
43	Yes													0						
48	Yes													0						
49	Yes													0						
53	Yes													0						
54	Yes													0						
76	Yes													0						
Sub-Total	11	6	1	2			2	2	2	5	2			3	1	4	3			
Total	56	27	10	2	7	1	10	15	10	17	16	3	16	11	9	15	19	2	16	

TABLE II

DATA SUMMARY FOR VERTICAL TESTS - METHOD 5903T
GROUP II MATERIALS (SPECIAL)

Material No. Code	Self-extinguishing (1)	Flame-out Time ⁽²⁾ (sec)				Char Length (in.)				Burn Length (in.)									
		0-2	2-5	5-15	15-30	30-60	60+	0-.5	.5-1	1-3	3-6	6-12	12+	0-1	1-2	2-4	4-8	8-12	12+
101 F1	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
108	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
124	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
138	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
144	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
146	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
149	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
153	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
157	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
162	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	13	11	1	1	1	0	0	1	5	7	1	1	6	6	0	0	0	0	0
105 F2	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
114	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
119	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
126	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
139	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
156	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	8	6	2	2	2	0	0	1	6	1	1	2	4	1	0	0	0	0	0
143 R1	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
148	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
113 S1	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
118	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
123	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
128	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
131	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
154	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	10	7	1	1	1	0	0	1	5	1	1	1	3	2	4	1	3	2	2

NOTES:
 (1) Self-extinguishing: Yes - Burns less than 12 inches; No - Burns completely
 (2) Flame-out Time: measured after 12-second burner removal

TABLE II

DATA SUMMARY FOR VERTICAL TESTS - METHOD 5903T

GROUP II MATERIALS (SPECIAL)

Material No. Code	Self-Extinguishing (1)	Flame-out Time (2) (sec)				Char Length (in.)				Burn Length (in.)										
		0-2	2-5	5-15	15-30	30-60	60+	0-.5	.5-1	1-3	3-6	6-12	12+	0-1	1-2	2-4	4-8	8-12	12+	
112 S2	Yes		0					0												
116	Yes	0					0													
120	Yes	0																		
127	Yes	0																		
141	Yes	0																		
158	Yes	0																		
159	Yes	4	1	2				1	6											
Sub-Total	7																			
103 S3	Yes	0						0												
106	Yes	0						0												
109	Yes	0						0												
110	Yes	0																		
111	Yes	0																		
117	Yes	0																		
121	Yes	0																		
122	Yes	0																		
142	Yes	0																		
147	Yes	0																		
155	Yes	0																		
160	Yes	0																		
164	Yes	7	3	1			1	6	1	4	2									
Sub-Total	13																			
133 L1	Yes																			
134	Yes																			
135 L2	Yes	0																		
152	Yes	0																		
163	Yes	0																		
136 L3	Yes	0																		
137	Yes	0																		
151	Yes	0																		
161	Yes	5	2	1	1			1	2	4	2									
Sub-Total	9																			
Total	62	41	11	3	4		1	2	16	5	26	15								

LEGEND

GROUP I

GROUP II

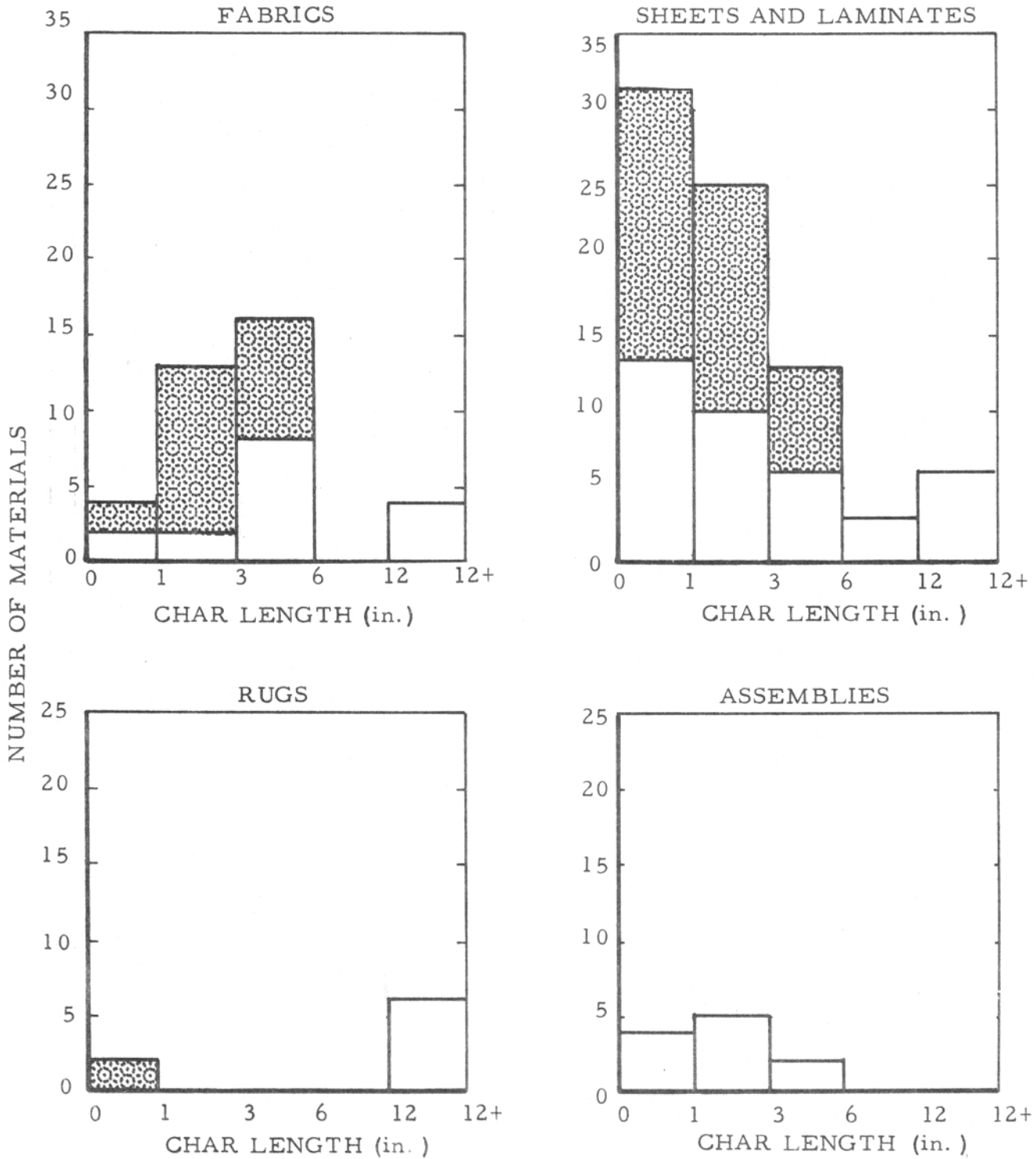


FIG. 3 - FREQUENCY DISTRIBUTION OF CHAR LENGTH BY MATERIAL CLASSIFICATION - TEST METHOD 5903T

LEGEND

GROUP I

GROUP II

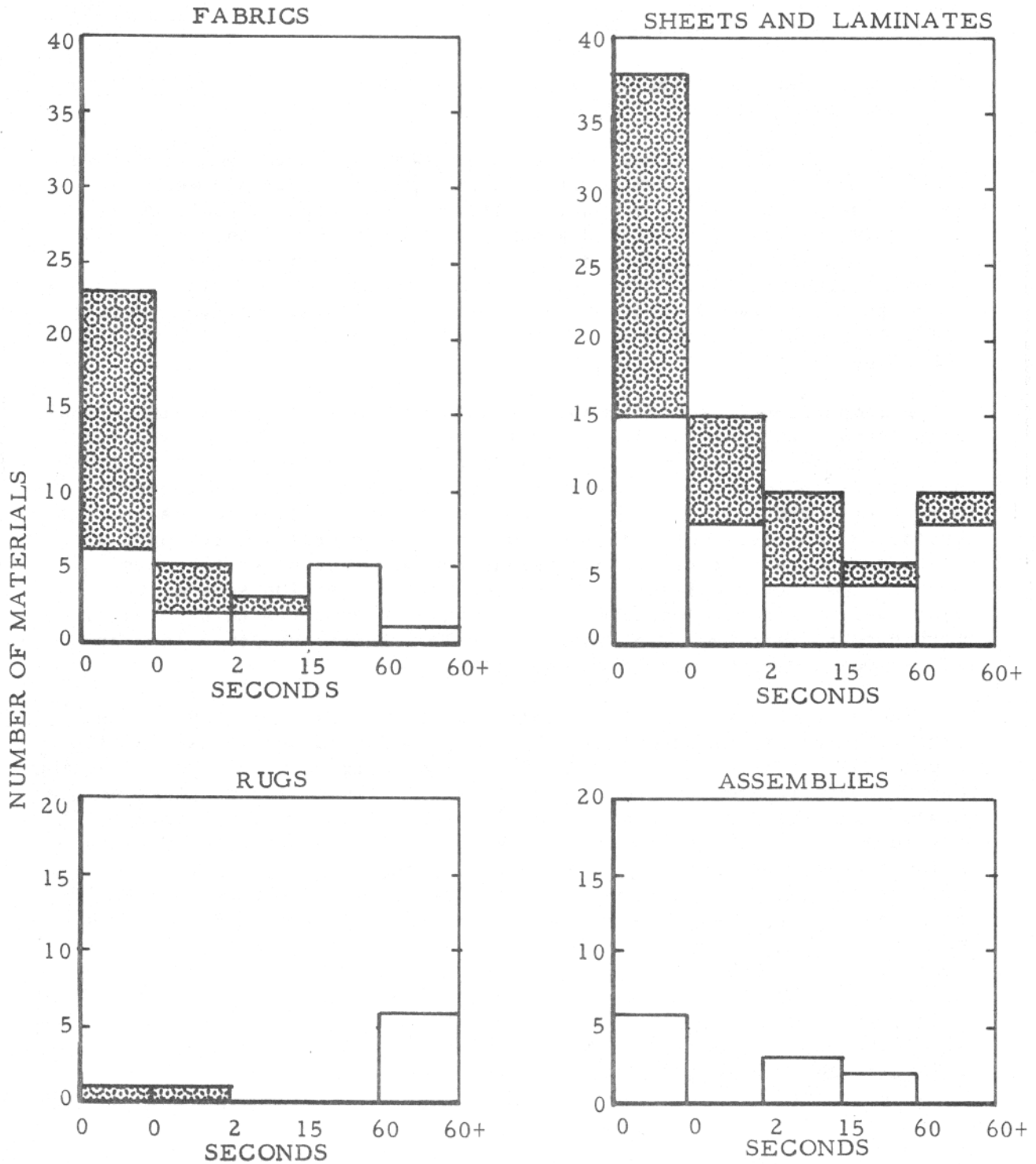


FIG. 4 - FREQUENCY DISTRIBUTION OF FLAME-OUT TIMES BY MATERIAL CLASSIFICATION - TEST METHOD 5903T

<u>59</u> were self-extinguishing within a char length of 6 inches and a flame-out time of 15 seconds	<u>95% of total</u>
<u>55</u> were self-extinguishing within a char length of 6 inches and a flame-out time of 2 seconds	<u>89% of total</u>
<u>19</u> were self-extinguishing within a char length of 1 inch and a flame-out time of 2 seconds.	<u>31% of total</u>

The totals listed above, without consideration regarding particular material type or usage, demonstrated that interior materials were for the most part self-extinguishing. A direct comparison of the figures for the two groups of materials shows the superiority of the second group consisting of the newer materials, many of which incorporate noncombustibles such as glass, asbestos, and metal. Particularly, it should be noted that without exception all materials in Group II were self-extinguishing within the 6-inch char/burn requirement proposed in NPRM 66-26.

A comparison of the flammability data for materials on an individual basis reveals extreme variation to fire exposure as expressed by a burn/char length and a corresponding flame-out time. In general, the thicker and heavier solid materials exhibited the shortest burn/char lengths. In contrast, the materials which burned most completely were the typical upholstery fabrics, rugs, and low density foam materials which have a relatively large surface area to weight ratio. Because of the very limited time that specimens were exposed to the ignition source, the higher weight and more dense materials would be expected to be favored by this test, which was the case. Generally, short burn/char lengths were associated with short flame-out times.

Table II of the appendix contains additional data related to the combustibility of the materials. Ignition of the materials was usually accomplished within 2 seconds. Maximum flame heights were recorded during the fire test in addition to char/burn data. Time during which materials glowed after the flaming ceased was recorded. More than one-third of all materials tested exhibited some degree of glowing with eight materials having a glow time exceeding 15 seconds. Observations were also made of the type of smoke generated during the fire tests as related to quantity, color, and odor. Very heavy smoke was usually observed with the thicker and more flammable plastics. The ABS plastics produced the densest black smoke recorded. The most acrid smoke was produced by the vinyls, especially those that had been apparently chlorinated for greater fire resistance. In addition, peculiar burning characteristics of the materials such as tendency to melt, shrink, form flaming droplets, extinguish the burner flame, etc., were noted.

An analysis of the performance of the materials on the basis of separate classifications follows:

Uncoated Fabrics: Typical upholstery and drapery fabrics of either wool, cotton, nylon, acrylic, or other types of common synthetic construction, alone or blended, were not normally self-extinguishing and burned completely when exposed to the standard vertical test. For some fibers, especially the natural types, chemical additives such as borax and phosphate salts may have been employed to achieve some degree of fire resistance (Reference 20). Out of 10 fabrics in Group I, only one-half were self-extinguishing within the 6-inch char length and 4 of these were constructed of modacrylic fiber which is basically self-extinguishing and has been used for aircraft drapery. All 13 fabrics in Group II were self-extinguishing within the 6-inch char length and of these only 2 did not extinguish in zero flame-out time. In addition to the more common modacrylics, this group included two new types of high temperature aromatic polyamides. The most fire-resistant fabric consisted of an asbestos/glass/organic fiber blend.

Coated Fabric: All fabrics in both groups were found to be self-extinguishing within the 6-inch char length. Except for two cotton backed fabrics, the fabrics exhibited zero flame-out time. Typical materials in this classification were the vinyl and acrylic surface coated glass fabrics.

Rugs: None of the six rugs in the first group constructed of conventional fibers including wool were self-extinguishing. These burned completely with flame-out times exceeding 1 minute. Rugs in the second group constructed of either modacrylic (100 percent) or aromatic polyamide fibers were self-extinguishing within less than 1/2-inch char length and 2-second flame-out time.

Sheets: Out of 27 sheets in the first group, only 7 were found not to be self-extinguishing within the 6-inch char length limit. All these sheets except three had a flame-out time within 2 seconds. The most flammable materials in this classification were the foam seat padding, window transparencies, and ABS panels.

All 30 sheets in the second group met the 6-inch char length criteria and of these only 5 exceeded the 2-second flame-out time. Nearly two-thirds or 14 materials in this group exhibited char lengths of less than 1 inch. Many of these materials were composed of the more typical vinyl, acrylic, and ABS plastics found in Group I containing halogens or various oxides of antimony and phosphorus as fire-retardant additives (References 21 and 22). The most interesting sheet materials tested with superior fire resistance were several new types of high temperature plastics and two fire-retardant foams.

Laminates: All 21 materials in both groups met the 6-inch char length criteria. Only four of the laminates did not extinguish within the 2-second flame-out time. The most fire-resistant materials in this classification were the plastic coated aluminum sheets in addition to the glass and asbestos filled plastics which were outstanding in this respect.

Assemblies: All 10 materials tested met the 6-inch char length criteria and 7 of these assemblies had flame-out times of less than 2 seconds. This classification constituted the thicker and heavier materials and, as such, would not ordinarily be expected to be very flammable by this test method.

Radiant Panel Flammability Tests

The materials investigated are described in Table I of the appendix. Complete test data on the materials are contained in Table III of the appendix. As an aid toward facilitating analysis and comparison of test results for different materials, a summary of the data was prepared which is presented in Tables III and IV and Figure 5 of the text.

Performance characteristics of the two separate groups of materials are highlighted by the following general statistical figures:

Group I - Materials Nos. 1 - 76 of which:

<u>48</u> were self-extinguishing	<u>73% of total</u>
Twenty-four of these materials (one half), however, charred completely from heat exposure to the radiant panel in the absence of open flaming.	
<u>43</u> had a flame-spread index of less than 100	<u>65% of total</u>
<u>26</u> had a flame-spread index of less than 25	<u>40% of total</u>
<u>17</u> had a flame-spread index of less than 10	<u>26% of total</u>
<u>15</u> showed a flame propagation of less than 6 inches	<u>23% of total</u>
<u>18</u> caused a maximum temperature rise of less than 10°C	<u>27% of total</u>

Group II - Materials Nos. 100 - 164 of which:

<u>53</u> were self-extinguishing	<u>90% of total</u>
Twenty-two of these materials (about one-third), however, charred completely from heat exposure to the radiant panel in the absence of open flaming.	

TABLE III

DATA SUMMARY FOR RADIANT PANEL TESTS
GROUP I MATERIALS (CURRENT)

Material No. Code	Self-Extinguishing (1)	Flame-Spread Index (Is)				Maximum Flame Propagation (in.)				Maximum Temperature Rise °C								
		0-10	10-25	25-50	50-100	100-300	300+	0-3	3-6	6-10	10-15	15+	0-10	10-25	25-50	50-100	100+	
1 F1	No	0				0				0			0				0	
2	Yes																	
3	Yes					0				0			0				0	
4	Yes*																	
28	Yes*	0								0			0				0	
29	Yes*	0								0			0				0	
47	Yes*	0								0			0				0	
58	Yes*	0				0				0			0				0	
63	Yes*	5	1	1	2	2	1	2	1	4	1	2	1	1	4	3	1	1
Sub-Total	8	1								0			0				0	
5 F2	No					0				0			0				0	
6	No					0				0			0				0	
34	Yes																	
55	Yes	0								0			0				0	
56	Yes*	0								0			0				0	
57	Yes	0				0				0			0				0	
Sub-Total	4	2				2	1	2	1	3	1	2	2	3	1	1	2	
8 R1	No					0				0			0				0	
18	No					0				0			0				0	
64	No					0				0			0				0	
65	No					0				0			0				0	
7 R2	No					0				0			0				0	
17	Yes*	1				6				1			3				3	
Sub-Total	1	5								1			5				3	
9 S1	Yes					0				0			0				0	
19	No					0				0			0				0	
31	Yes					0				0			0				0	
40	Yes*	0								0			0				0	
44	Yes*					0				0			0				0	
52	No					0				0			0				0	
59	Yes*	0								0			0				0	
66	No					0				0			0				0	
Sub-Total	5	3				2	1	1	3	1	2	1	2	1	3	2	2	
10 S2	No					0				0			0				0	
14	Yes	0								0			0				0	
51	Yes					0				0			0				0	
Sub-Total	2	1				1				1	1	1	1	1	1	1	2	

NOTES: (1) Self-extinguishing:
 F1, F2 - Uncoated and coated fabric; R1, R2 - Unpadded and padded rug;
 S1, S2, S3 - Flexible, semi-rigid and rigid sheet;
 L1, L2, L3 - Flexible, semi-rigid and rigid laminate; A - Assembly.

TABLE IV

DATA SUMMARY FOR RADIANT PANEL TESTS

GROUP II MATERIALS (SPECIAL)

Material No. Code	Self-Extinguishing (1)	Flame-Spread Index (Is)			Maximum Flame Propagation (in.)					Maximum Temperature Rise °C							
		0-10	10-25	25-50	50-100	100-300	300+	0-3	3-6	6-10	10-15	15+	0-10	10-25	25-50	50-100	100+
101 F1	Yes	0						0	0	0							0
102	Yes	0						0	0								0
108	Yes*	0						0	0								0
124	Yes*	0						0	0								0
132	Yes*	0		0				0	0								0
138	Yes	0						0	0								0
140	Yes*	0						0	0								0
144	Yes	0						0	0								0
146	Yes	0						0	0								0
149	Yes*	0						0	0								0
153	Yes*	0			0			0	0								0
157	Yes*	0						0	0								0
162	Yes	0						0	0								0
Sub-Total	13	11	1	1	1	1	8	2	3	9	4						4
105 F2	Yes	0						0	0								0
114	Yes	0						0	0								0
119	Yes	0						0	0								0
125	Yes	0						0	0								0
126	Yes	0						0	0								0
145	Yes	0						0	0								0
Sub-Total	6	6					6	6		6							6
143 R1	Yes	0						0	0								0
148	Yes*	0			0			0	0								0
Sub-Total	2	1			1		1	1		1							1
113 S1	Yes	0						0	0								0
115	Yes*	0						0	0								0
118	Yes	0						0	0								0
123	No	0				0		0	0								0
128	No	0				0		0	0								0
129	Yes	0						0	0								0
130	Yes	0						0	0								0
131	Yes	0						0	0								0
150	No	0				0		0	0								0
154	Yes	0				0		0	0								0
Sub-Total	7	6	1		3	3	4	2	1	3	3	3	3	1	2		1

ABBREVIATIONS:

F1, F2 - Uncoated and coated fabric; R1, R2 - Unpadded and padded rug;
 S1, S2, S3 - Flexible, semi-rigid and rigid sheet;
 L1, L2, L3 - Flexible, semi-rigid and rigid laminate; A - Assembly.

NOTES:

(1) Self-extinguishing:
 Yes - Neither flames or chars over entire specimen length.
 Yes* - Chars but does not flame over entire specimen length.
 No - Flames and chars over entire specimen length.

TABLE IV
 DATA SUMMARY FOR RADIANT PANEL TESTS
 GROUP II MATERIALS (SPECIAL)

Material No. Code	Self-Extinguishing (1)	Flame-Spread Index (Is)				Maximum Flame Propagation (In.)				Maximum Temperature Rise°C								
		0-10	10-25	25-50	50-100	100-300	300+	0-3	3-6	6-10	10-15	15+	0-10	10-25	25-50	50-100	100+	
112 S2	Yes*	0						0										
116	Yes	0						0										
120	Yes	0						0										
141	Yes	0						0										
158	Yes*			0				0										
159	Yes*			0				0										
Sub-Total	6	3	1	2				2	2	2	2		2	2	2			
103 S3	Yes*	0						0										
109	Yes			0				0										
110	Yes			0				0										
111	Yes			0				0										
117	Yes			0				0										
121	Yes			0				0										
122	Yes			0				0										
142	Yes*			0				0										
147	No			0				0										
155	Yes			0				0										
160	Yes*			0				0										
164	Yes*			0				0										
Sub-Total	11	1	3	2	3	2	2	3	4	4	1		4	4	3			
133 L1	No			0				0										
134	No			0				0										
Sub-Total	2			2				2										
135 L2	Yes*			0				0										
152	Yes*			0				0										
163	Yes*			0				0										
Sub-Total	3			1				1										
136 L3	Yes			0				0										
137	Yes*			0				0										
151	Yes*			0				0										
161	Yes*			0				0										
Sub-Total	4			2				2										
104 A	Yes			0				0										
Sub-Total	1			1				1										
Total	53	6	33	5	8	4	6	3	25	5	12	11	6	24	14	11	8	2

LEGEND

GROUP I

GROUP II

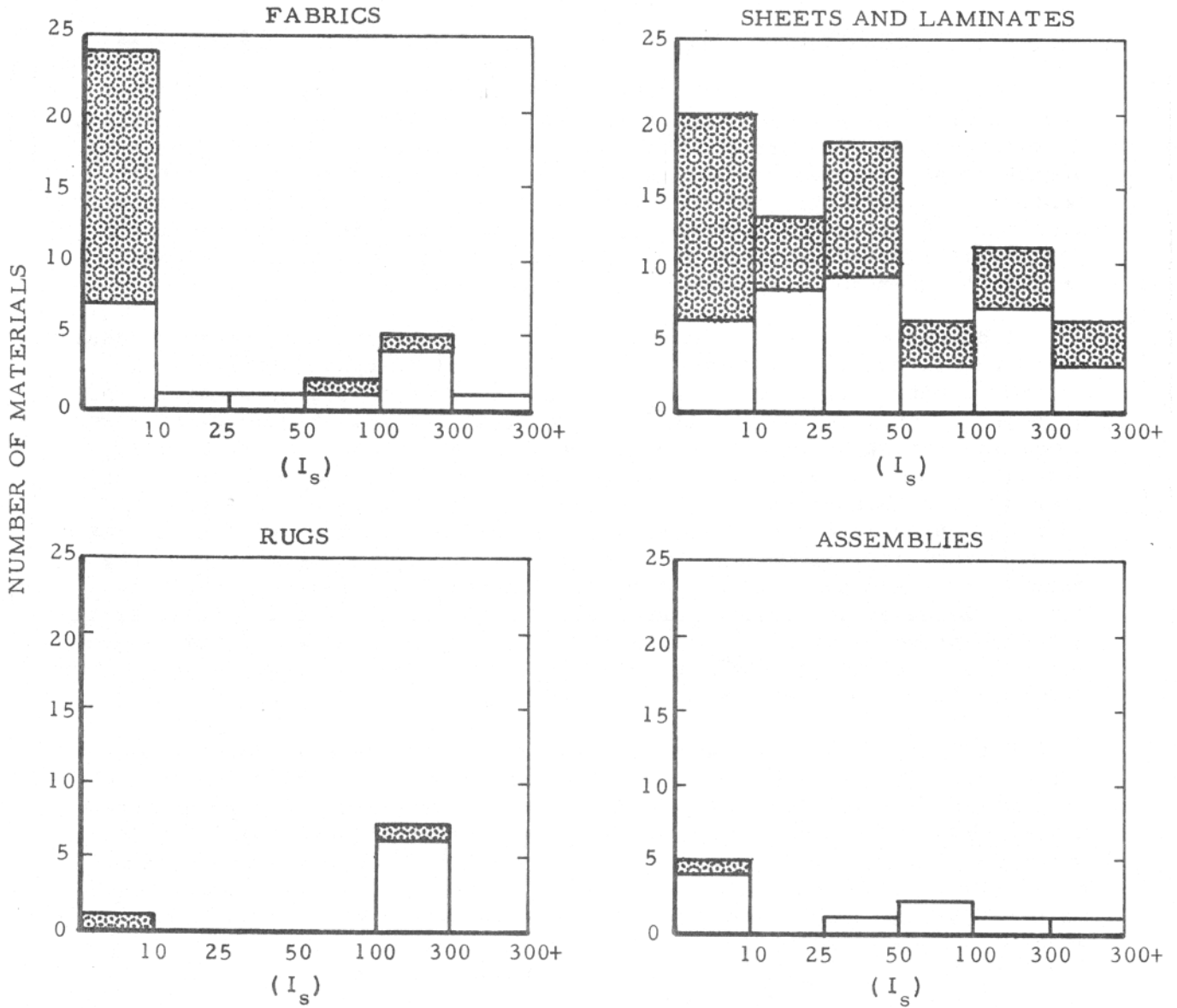


FIG. 5 - FREQUENCY DISTRIBUTION OF FLAME-SPREAD INDEX VALUES BY MATERIAL CLASSIFICATION - RADIANT PANEL TEST

<u>50</u> had a flame-spread index of less than 100	<u>85% of total</u>
<u>38</u> had a flame-spread index of less than 25	<u>64% of total</u>
<u>33</u> had a flame-spread index of less than 10	<u>56% of total</u>
<u>30</u> showed a flame propagation of less than 6 inches	<u>51% of total</u>
<u>24</u> caused a maximum temperature rise of less than 10°C	<u>41% of total</u>

The totals listed above for the materials on a group basis again demonstrated the self-extinguishing characteristics of interior materials. A comparison of the corresponding percentages of total materials meeting various test criteria reveals very definitely the superiority of the second group consisting of the newer materials. Of particular interest, it should be noted that two-thirds of the materials in the second group had a flame-spread index of less than 25 and did not char completely during the 15-minute exposure to the radiant panel.

A comparison of the flammability data for materials on an individual basis shows, as before, a very wide range in flame-spread indices and in the burning characteristics observed. Because of the much more severe environment provided by the radiant panel, it was possible to obtain more complete combustion of the heavier materials which had been relatively insensitive in the vertical tests to exposure of the Bunsen burner. In general, the thinner materials, neglecting the effects of different chemical compositions on flammability, should be expected to exhibit low flame-spread indices because of the low heat factor associated with the burning of these materials. In part, this would be offset by the more rapid flaming of the thinner materials. However, the net effect of using a flame-spread index system tends to favor the minimum use of combustible materials on a weight basis in interior furnishings which would bring about the benefit of increased cabin fire protection.

Table III of the appendix contains additional data related to the combustibility of the materials. Very low index numbers are indicative of superior fire resistance. Ignition of the materials usually occurred within about 5 seconds. Some materials exhibited considerable glowing which was almost always associated with the less combustible materials. Materials with short burning times usually had high flame-spread indices as would be expected. The total heat contributed by the combustion of the materials varied widely with the chemical composition and thickness of the materials. The highest temperatures and Btu readings were recorded for the clear acrylic sheets followed by foam padding. Observations were also made of the individual burning characteristics such as tendency of the materials to flash, melt, drip, etc. Density, color, and odor of smoke produced during the fire tests were observed and recorded. Very heavy black, sooty smoke occurred with many of the ABS sheets. A very acrid smoke usually light in color which frequently snuffed out the acetylene torch was observed with the more fire-resistant

plastics. This effect was associated with hydrochloric acid (HCl) vapor produced from thermal decomposition of chlorinated plastics, especially vinyls.

An analysis of the performance ratings of the materials on the basis of separate classifications follows:

Uncoated Fabrics: The five materials in Group I with an index of 0-10 were modacrylic drapery fabrics. This type of synthetic fiber yielded a low index because of the absence of sustained flaming of the material and the low heat of combustion. Materials with high indices consisted of wool, cotton, nylon, and rayon fibers used for typical seat upholstery. In addition to the modacrylics, the most promising fabrics in Group II were the aromatic polyamides. These new high temperature polymers not only yielded low indices, but unlike the modacrylics, resisted the charring effect of the radiant panel. Both flaming and heat contribution factors were sufficiently low for this new type of nylon to insure an extremely low index.

Coated Fabrics: In Group I, only three fabrics had indices exceeding 100. Responsible for most of this high index figure were the cotton fabric backing materials. None of the six fabrics in Group II, which as a group were the most fire-resistant of all materials, had an index exceeding 10 or produced a stack temperature rise above 10°C. These materials consisted in large part of the thinly coated acrylic glass fabrics in addition to two types of aluminized asbestos fabrics.

Rugs: A total of eight rugs was tested of which seven had high indices of over 100 and burned completely with high flames and temperatures to make this the most flammable classification. The backing and foam padding of rugs were responsible for much of the flammability of the pile. The only rug which exhibited outstanding fire resistance utilized aromatic polyamide in the construction of the pile. This particular rug had an index of less than 10 and burned less than 3 inches in length.

Sheets: A total of 24 sheets in Group I and 28 sheets in Group II was tested. Of this number, 8 sheets in Group I and 15 sheets in Group II had indices of less than 25. The most flammable materials consisted of seat foam, acrylic transparencies and various formulations of plasticized PVC/ABS sheets. Omitting seat foam and clear acrylic plastics from consideration, all of the sheets in Group II had indices of less than 50 except for three materials. The lowest indices were usually recorded for the very thin plastic films and also noncombustibles such as glass or asbestos. Outstanding plastics with indices below 10 were aromatic polyamide, polysulfone, polyvinyl dichloride, and the three halogenated plastic elastomers.

Laminates: A total of 12 laminates in Group I and 9 laminates in Group II was tested. Of this number, six laminates in Group I and four laminates in Group II had indices of less than 25. Moreover, all nine laminates in Group II had indices of less than 50. Laminates with the lowest indices consisted of plastic coated aluminum sheets. Other laminates with a low flame-spread index were constructed with either asbestos or aromatic polyamide substrates.

Seat Cushion Assembly: A series of tests on eight different combinations of upholstery fabric, ticking fabric and polyurethane foam comprising various experimental types of seat assemblies was conducted. Flame-spread index numbers, temperature rise, flame propagation and other data are presented at the end of Table III in the appendix. Substantial improvement was achieved in the flame-spread index numbers and decrease in flammability by replacing the more conventional component materials in seat cushion construction with glass/asbestos ticking fabric and flame-retardant foam. The only goal of the tests was to achieve optimum fire resistance. Practicability of the materials for use in passenger seating was of secondary importance.

CONCLUSIONS

Within the scope of the test program and an analysis of the test results, it is concluded that:

1. Test Method 5902 (5903T latest revision) specified in recent amendments to Federal Air Regulations (Part 25) is satisfactory for establishing minimum self-extinguishing requirements. It is particularly useful as a convenient and relatively simple device for effectively screening interior materials.
2. A supplemental test method is needed to establish additional minimum requirements based on a flame-spread index rating system for the heavier composite and assembly materials as these are actually installed in the aircraft cabin.
3. Substantial increase in the fire resistance of materials has been achieved with the development of the new high temperature plastics in addition to advances in the use of flame-retardant additives to the more conventional plastics.
4. Recently developed synthetic fibers now reaching large-scale production make possible upholstery fabric and rug materials that are basically self-extinguishing and thus capable of meeting the more stringent requirements that were recently proposed (Notice of Proposed Rule Making - NPRM 66-26).
5. Char length measurements obtained for materials designated under paragraph 25.853a of the regulations indicate that the 8-inch limit is excessive and that a reduction in char length and the addition of a flame-out time requirement would be more realistic as originally proposed (NPRM 66-26).
6. New types of plastic sheets and laminates are available that are self-extinguishing within a 1-inch char length and a 2-second flame-out time.
7. Flame-retardant types of polyurethane seat foam are available that are self-extinguishing within a 6-inch char length and zero flame-out time.
8. High temperature polymer chemistry has made possible materials with low flame-spread indices and low heat of combustion.
9. Very low flame-spread indices are obtained with composite plastic materials composed in large part of noncombustibles such as metal, glass, or asbestos.
10. Many of the plastic materials exhibit both heavy smoke and acrid odor.

RECOMMENDATIONS

Based on the conclusions reached from the test results, it is recommended that:

1. Self-extinguishing requirements by Test Method 5902 be extended to include materials now exempt and designated as only flame-resistant under paragraph 25.853b of the regulations.

2. Char length requirements be made more stringent by further limiting the maximum allowable char length.

3. Flame-out time requirements in addition to char length limits be specified.

4. Flame-spread index requirements by the Radiant Panel Test Apparatus be adopted in addition to self-extinguishing requirements by Test Method 5902. This is to provide a more severe fire environment needed to rate more adequately the heavier and composite type of materials as used in the interior construction and furnishings of airplanes.

5. New test methods and requirements be developed to limit the maximum allowable smoke and toxic combustion products below hazardous levels.

REFERENCES

1. Federal Aviation Regulations (FAR) Part 25, Airworthiness Standards Transport Category Airplanes, (Amended October 24, 1967, as per Docket 7522).
2. Cabin Fire Incident and Investigation TWA Boeing 707-131, Plane 7739, Trans World Airlines, Inc., Engineering Report No. 1203.
3. Aviation Daily, November 2, 1967, pp. 12.
4. Marcy, J. F., Flammability and Smoke Characteristics of Aircraft Interior Materials, Federal Aviation Administration, Report ADS-3, 1964.
5. Burn Characteristics - DC 8/9 Interior Materials, Douglas Aircraft Division, Laboratory Report No. LR-AD-2785 (1966).
6. Evaluation of Interior Materials, Boeing Airplane Company, Document No. D6-1084.
7. Convair 880 Cabin Interior Furnishings Flame Tests, General Dynamics/Convair, Reports ZM-22-086 and MP-61-098M.
8. Marcy, J. F., A Study of Air Transport Passenger Cabin Fires and Materials, Federal Aviation Agency, Report ADS-44, 1965.
9. Cabin Fire Mockup Test, Boeing Airplane Company, Test No. T6-2447.
10. Lea, J. M., Fire Protection for Aircraft Interiors Presented to SAE S-9 Committee on Cabin Safety Provisions on October 13, 1966.
11. Heine, D. and Brenneman, J., ALPA Cleveland Fire Test Results Presented at 13th ALPA Air Safety Forum October 4 and 5, 1966.
12. FAA - Industry Conference on Crashworthiness and Passenger Evacuation Standards, March 29 and 30, 1966, Washington, D. C.
13. Leroy, H. C., Survival Study: Modern Jet Aircraft Landing Accidents with Subsequent Interior Fire - Presented Aerospace Medical Association 38th Annual Scientific Meeting, April 1967.
14. Gross, D., Smoke and Gases Produced by Burning Aircraft Interior Materials, Federal Aviation Administration, Report No. NA-68-36.
15. FAA Notice of Proposed Rule Making - NPRM No. 66-26, Federal Register (31 FR 10275, July 29, 1966).

REFERENCES (Continued)

16. Test for Surface Burning Characteristics of Building Materials, ASTM 84.
17. Flame-Spread Properties of Materials, Federal Standard No. 00136 and ASTM E-162.
18. Denney, M. A., The Use of Low-Flammability Materials in Aircraft, Transactions Plastics Institute (Great Britain), January 1967, pp. 67-69.
19. Dunnavant, W., Polymers and the Thermal Barrier, Industrial Research, March 1965, pp. 50-59.
20. Standard for Flameproofed Textiles, National Fire Protection Association, NFPA No. 701 (1951).
21. Mack, G. P., Methods of Flameproofing Plastic Materials, Modern Plastics Encyclopedia, 1963.
22. Flame Resistance with Polymers, Plastics Institute Conference March 15 and 16, 1966, Rubber and Plastics Age, April 1966, pp. 395-397.

APPENDIX I

TABLES OF MATERIALS DESCRIPTION AND LABORATORY FIRE TEST DATA

LIST OF TABLES

Table		Page
I	Materials Description	1-1
II	Flammability Data by 1-1/2 inch Bunsen Burner Flame - Vertical Test Method No. 5903T	1-17
III	Flammability Data by NBS Radiant Panel Apparatus - Federal Standard Test Method No. 00136b (ASTM E-162)	1-37

TABLE I

MATERIALS DESCRIPTION

<u>No.</u>	<u>Code</u>	<u>Thickness (in)</u>	<u>Weight (oz/yd²)</u>	<u>Color and Surface</u>	<u>Designation</u>	<u>Present or Intended Use</u>	<u>Chemical Composition⁽¹⁾</u>
1	F1	.035	11	Light Blue	Fabric (UC)	Drapery	Wool/Cotton (75:25)
2	F1	.030	9.6	Light Blue	Fabric (UC)	Drapery	Modacrylic
3	F1	.055	14	Blue (Multi- Color) Pattern	Fabric (UC)	Drapery	Modacrylic/Nylon/Cotton
4	F1	.050	13	Tan Corduroy	Fabric (UC)	Upholstery	Polyamide (Nylon-type)
5	F2	.030	12	Blue Matte	Fabric (C)	Upholstery	Polyvinyl chloride/Methyl methacrylate/Ester plasticizer on Cotton
6	F2	.045	26	Gold Matte	Fabric (C)	Upholstery	Polyester plasticizer (Phthalate-type), possible PVC, on Cotton

(1) Based on infrared spectroscopy and information from supplier.

ABBREVIATIONS:

F1, F2 - Uncoated and coated fabric

R1, R2 - Unpadded and padded rug

S1, S2, S3 - Flexible, semi-rigid and rigid sheet

L1, L2, L3 - Flexible, semi-rigid and rigid laminate

FR - Fire retardant treated

A - Assembly

PMMA - Polymethyl methacrylate

PVC - Polyvinyl chloride

PVA - Polyvinyl acetate

ABS - Acrylonitrile/Butadiene/Styrene

PETP - Polyethylene terephthalate

polyester

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and Surface</u>	<u>Designation</u>	<u>Present or Intended Use</u>	<u>Chemical Composition (1)</u>
7	R2	.33	62	Blue/Gray Loop	Rug (P)	Flooring	Pile: Modacrylic/Acrylic Back: Polyester/Fiber Pad: Polyester Urethane
8	R1	.18	31	Blue/Green Loop	Rug (UP)	Flooring	Pile: Copolymer Poly(propylene-butylene) Center: Cellulosic Back: Polyethylene
9	S1	.046	46	Tan Matte	Sheet (F)	Panel and Door Covering	PVA/ABS, china clay pigmented possible PVC
10	S2	.045	38	Dark Gray	Sheet (SR)	Food Trays, Window Frames	ABS (~ 25%:10%:65%)
11	S3	.080	67	Green	Sheet (R)	Food Trays, Window Frames	ABS (~ 25:10:65)
12	S3	.080	81	Tan Matte	Sheet (R)	Ceilings, Seat Panels	Copolymer: PVC/Polymethyl methacrylate (~95:5)
13	S2	.030	26	Gold Shiny	Sheet (SR)	Trim	PVC and Polyvinyl acetate base with some ABS plastic added. Film: Polyethylene terephthalate (PETP) polyester
14	S2	.020	20	White/Green Smooth	Sheet (SR)	Sides, Ceiling, Seat Panels	Polyvinyl chloride/Vinyl acetate (~89:11)

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> <u>(in)</u>	<u>Weight</u> <u>(oz/yd²)</u>	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> ⁽¹⁾
15	S1	4.0	110	White Open Cell	Foam (F)	Seat Cushion Padding	Polyether urethane
16	R1	.22	44	Blue/Loop	Rug (UP)	Flooring	Wool
17	R2	.43	83	Multi-Color Loop	Rug (P)	Flooring	Pile: Wool Back: Polyester Pad: Urethane foam
18	R1	.22	59	Black/Gray Loop	Rug (UP)	Flooring	Modacrylic/Acrylic
19	S1	.21	9.2	Green Open Cell	Pad (F)	Carpet underlay	Polyester urethane foam
20	L3	.042	68	Gold Embossed	Laminate (R)	Panels - Overhead and sides	Face: Polyvinyl acetate with trace of ABS covered with PETP Polyester Back: Aluminum sheet
21	L3	.044	79	Tan/Dull Brushed	Laminate (R)	Panels - Overhead and sides	Face: Vinyl chloride/ Acrylate copolymer (80:20) on Back: Aluminum sheet
22	L1	.009	8.1	Aluminum Matte Shiny	Laminate (F)	Window Shades	Face: PETP Polyester Back: Vinyl acetate, PVC copolymer

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> ⁽¹⁾
23	A	Irregular		White Smooth	Assembly (molded)	Assist Handles	Polyamide (nylon-type)
24	A	Irregular		Green	Assembly (molded)	Seat Track Covers	Polyvinyl chloride, ABS terpolymer (94:6)
25	L3	.035	39	Gray Glossy	Laminate (R)	Galley Area	Face: Melamine formaldehyde Back: Urea formaldehyde
26	L3	.032	35	Blue Glossy	Laminate (R)	Galley Area	Face: Melamine formaldehyde Back: Urea formaldehyde
27	S2	Irregular		White	Sheet (SR)	Passenger Service Units	Rigid part: ABS (40:40:20) possible PVC Flex part: Plasticized PVC possible some Vinyl acetate
28	F1	.028	8.0	Tan Gold Trace	Fabric (UC)	Drapery	Modacrylic
29	F1	.030	9.3	Turquoise Gold Trace	Fabric (UC)	Drapery	Modacrylic
30	A	.41	62	Tan Matte	Assembly (honeycomb)	Ceilings Bulkheads	Face: Coated glass fabric (Polyester or cross-linked Acrylic) Core: Paper honeycomb Back: Plastic-impregnated Glass fabric

TABLE I (Continued)

No.	Code	Thickness (in)	Weight (oz/yd ²)	Color and Surface	Designation	Present or Intended Use	Chemical Composition ⁽¹⁾
31	S1	.010	9.6	White Matte	Sheet (F)	Lowered Ceilings	Vinyl chloride/Acrylate, possible Polyvinyl acetate
32	L3	.045	75	Light Blue Matte	Laminate (R)	Lowered Ceilings	Vinyl chloride/Acrylate copolymer film on Aluminum sheet
33	S3	.093	91	White Matte	Sheet (R)	Hatrack	ABS (40:40:20), possible PVC
34	F2	.010	10	Tan Smooth	Fabric (C)	Underside Hatrack Bullnose	Vinyl chloride/Acrylate copolymer on Glass fabric (28%) plus pigment (13%)
35	S3	.095	90	Gray Dull	Sheet (R)	Toilet Floor Pans	ABS (40:40:20), possible PVC
36	A	.063		Tan Smooth	Assembly (molded)	Ceiling Panel Joint	Plasticized PVC/ Plasticized di - (2 Ethyl-Hexyl) phthalate
37	S3	.097	92	White Matte	Sheet (R)	Magazine Rack	ABS (40:40:20)/PVC
38	S3	.063	53	Clear Polished	Sheet (R)	Window Pane	Methyl methacrylate/ Methyl acrylate copolymer (90:10)
39	S3	.064	62	Tan Matte	Sheet (R)	Control Panel	ABS (40:40:20%), possible PVC

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> (1)
40	S1	.002	1.3	Clear Smooth	Film (F)	Protective Coating	Polyvinyl fluoride
41	A	.35	95	Tan	Assembly (molded)	Bullnose	Face: ABS Back: Polyether urethane foam
42	A	1.3	35	Yellow Fibrous	Pad	Insulation	Glass fiber (plus organic binder)
43	A	2.5	150	Yellow Fibrous	Assembly	Insulation	Glass fiber with Lead sheet
44	S1	.046	44	Tan Matte	Sheet (F)	Seat Panels	PVA/ABS, china clay pigmented, possible PVC
45	S3	.063	60	Tan Matte	Sheet (R)	Seat Panels	PVC/ABS
46	S3	.057	55	White Matte	Sheet (R)	Seat Panels	PVC/PMMA (90:10)
47	F1	.012	4.0	White Matte	Fabric (UC)	Lining for Seat Pads	Cotton
48	A	.57	82	Tan Matte	Assembly	Seat Panels	Face: PVC/ABS Back: Polyurethane
49	A	.52	120	White Matte	Assembly	Seat Panels	Face: PVC/PMMA (90:10) Back: Urethane foam - Polyether-type
50	S3	.60	35	White Open Cell	Sheet (R)	Seat Construction	Urethane foam - Polyether-type

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> (1)
51	S2	1.0	88	White Closed Cell	Foam (SR)	Seat Construction	Plasticized foam containing PVC/PVA and Nitrile groups
52	S1	4.0	90	White Open Cell	Pad (F)	Seat Construction	Urethane foam - Polyether-type (FR)
53	A	3.0	44	Tan Smooth	Assembly	Insulation	Face: Filled Rubber on Nylon 6-6 fabric Back: Glass fiber batt
54	A	1.3	28	Blue Smooth	Assembly	Insulation	Face: Organic-filled Nylon fabric Back: Glass fiber batt
55	F2	.004	4.2	Tan Smooth	Fabric (C)	Cover for Insulation Batt	Polyethylene film over Nylon fabric (filled rubber)
56	F2	.004	2.9	Light Blue Smooth	Fabric (C)	Cover for Insulation Batt	Organic-filled Nylon 6-6 fabric
57	F2	.006	6.1	Green Smooth	Fabric (C)	Bulkhead Assembly, Lining	Plasticized PVC on Glass fabric
58	F1	.054	14	Bluish Multi-colored Weave	Fabric (UC)	Drapery	Modacrylic/Nylon/Cotton
59	S1	.020	16	White/Color Pattern	Sheet (F)	Partitions	PVC/PVA (89:11)

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> ⁽¹⁾
60	S3	.060	64	Gold Glossy	Sheet (R)	Side Panels	Plasticized PVC/PVA with ABS
61	S3	.060	62	Blue Glossy	Sheet (R)	Side Panels	PVC/PVA (Small amount of ABS)
62	S3	.069	70	White with Pattern	Sheet (R)	Window Panel	Polyvinyl butyral film on PVC/PVA (90:10)
63	F1	.030	9.5	Yellow/Gold Trace	Fabric (UC)	Drapery	Modacrylic/Polyester
64	R1	.33	64	Blue/Green Loop	Rug (UP)	Flooring	Modacrylic/Acrylic
65	R1	.23	41	Brown/White Black Loop	Rug (UP)	Flooring	Modacrylic/Acrylic
66	S1	.032	25	Tan/Yellow Burlap	Sheet (F)	Sidewall	Plasticized PVC
67	L2	.022	24	White Burlap	Laminate (SR)	Baggage Liner	Polyester plastic filled Glass fiber fabric
68	L2	.038	34	Blue/White/ Yellow Simulated Fabric	Laminate (SR)	Sidewall, Partition Liner	Face: PVC/PVA (89:11) Back: Cotton fabric and Paper

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> (1)
69	L2	.026	24	Blue/White Simulated Fabric	Laminate (SR)	Sidewall, Partition Liner	PVC/PVA
70	L2	.031	28	Gray Glossy	Laminate (SR)	Sidewall, Partition Liner	Face: Acrylate Back: PVC/PVA
71	L2	.033	31	Tan/White Embossed	Laminate (SR)	Sidewall, Partition Liner	PVC/PVA (93:7)
72	L3	.075	71	Red Matte	Laminate (R)	Door Liners	Face: PVC/PVA Back: ABS/PVC
73	S3	.11	110	Gray Glossy	Sheet (R)	Cockpit Liner	ABS/PVC
74	S3	.50	440	Clear Glossy	Sheet (R)	Window Panes	Methyl methacrylate
75	F1	.060	19	Turquoise Corrugated	Fabric (UC)	Upholstery	Cotton/Nylon (Small amount of Polyester)
76	A	.38	76	White Smooth	Assembly (Honeycomb)	Ceiling Panel	Face: Acrylic/Vinyl coating over plywood (paper) Core: Paper with Cresolformaldehyde resin adhesive

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> (1)
100	S3	.18	180	Clear Polished	Sheet (R)	Window Panes	Methyl methacrylate
101	F1	.015	4.4	White	Fabric (UC)	Drapery	Polyamide (Aromatic-type)
102	F1	.015	6.1	Green	Fabric (UC)	Drapery	Polyamide (Aromatic-type)
103	S3	1.0	28	White Porous	Foam (R)	Foam Insulation	Chlorinated PVC
104	A	1.0	42	White Embossed	Assembly	Wall Insulation	Glass fabric (100%) Bonded to Glass fiber batt
105	F2	.033	26	Aluminum Glossy	Fabric (C)	High Temperature Liner	Aluminum on asbestos
106	S3	.13	120	Clear Glossy	Sheet (R)	Window Panes, Fabricated Parts	Poly (diphenylol propane) carbonate
107	F1	.013	5.8	White	Fabric (UC)	Drapery	Modacrylic (100%)
108	F1	.013	5.9	Orange	Fabric (UC)	Drapery	Modacrylic (100%)
109	S3	.080	62	Yellow Glossy	Sheet (R)	Paneling	Poly (phenylene oxide)
110	S3	.13	110	Dark Gray Matte	Sheet (R)	Paneling	PVC/PMMA plus ABS

TABLE I (Continued)

No.	Code	Thickness (in)	Weight (oz/yd ²)	Color and Surface	Designation	Present or Intended Use	Chemical Composition ⁽¹⁾
111	S3	.060	57	Green Matte	Sheet (R)	Paneling	PVC/PMMA plus ABS
112A	S2	.060	54	Clear	Sheet (SR)	Fabricated Parts	Polysulfone
B		.020	18	Glossy			
113	S1	.30	11	White Fluffy	Pad	Seat Padding, Wall Insulation	Glass fiber (100%)
114	F2	.010	7.8	White Matte	Fabric (C)	Headliner	Glass fabric coated with Acrylic (Aromatic plasticizer)
115	S1	.0015	2.2	Clear Smooth	Film (F)	Protective Cover	Poly (difluorochloro- ethylene)
116	S2	.020	17	Tan Smooth	Sheet (SR)	Panel Sub-Strate	Polyamide (Aromatic-type)
117	S3	.045	50	White Glossy	Sheet (R)	Paneling	PVC/Poly(vinylidene chloride)
118A	S1	.002	2.1	Amber	Sheet (F)	High Temperature Insulation	Polytetrafluoroethylene films over Polyimide
B		.005	5.4	Clear			
C		.003	3.5				
D		.005	5.9	Glossy			
119	F2	.007	5.0	Blue	Fabric (C)	Headliner	Glass fabric (97%) with organic finish
120	S2	.23	20	Gray Fibrous	Pad	Insulation	Asbestos fiber

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and Surface</u>	<u>Designation</u>	<u>Present or Intended Use</u>	<u>Chemical Composition</u> ⁽¹⁾
121	S3	.063	64	Tan Smooth	Sheet (R)	Panel Sub-Strate	Polyamide (Aromatic-type)
122	S3	.11	130	Gray Glossy	Sheet (R)	Paneling	Polyvinyl dichloride
123	S1	4.0	380	Black Open Cell	Foam (F)	Seat Padding	Chloroprene
124	F1	.012	9.2	Maroon Glossy	Fabric (UC)	Wall Covering	Plasticized poly (vinylidene chloride)
125	F2	.005	4.0	Light Green Glossy	Fabric (C)	Headliner	Glass fabric (97%) with organic finish
126	F2	.006	4.2	Light Grey Glossy	Fabric (C)	Headliner	Glass fabric (83%) with organic finish
127	S2	.034	29	Blue Matte	Sheet (SR)	Paneling	Face: Plasticized PVC/PVA (90:10) Back: Polyamide (Aromatic-type)
128A	S1	4.0	89	White Open Cell	Foam (F)	Seat Padding	Polyether Urethane (FR)
B		4.0	67	White Open Cell			Polyether Urethane
129	S1	.071	99	Black Smooth	Sheet (F)	Elastomer, Seals	Copolymer of Tetrafluoroethylene/Vinylidene fluoride
130	S1	.067	83	Tan Smooth	Sheet (F)	Elastomer, Gaskets	Chlorosulfonated polyethylene

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> (1)
131	S1	.065	82	Black Smooth	Sheet (F)	Elastomer, Hoses	Chloroprene
132	F1	.028	8.7	Green	Fabric (UC)	Drapery	Modacrylic and metallized fiber (94:6)
133	L1	.040	36	Copper Glossy	Laminate (F)	Dado Paneling	Face: Plasticized PVC/ PVA Back: Polyamide (Aromatic-type) paper
134	L1	.032	27	Light Tan Glossy	Laminate (F)	Hatrack	Face: Plasticized PVC/ PVA and Cotton fiber Back: Polyamide (Aromatic-type) paper
135	L2	.029	26	Blue/White Pattern Smooth	Laminate (SR)	Paneling, Bulkhead Dividers	Face: PVC/PVA (90:10) Back: Polyamide (Aromatic-type) paper
136	L3	.099	84	Light Gray/ Gold Pattern Rough	Laminate (R)	Flooring	Plasticized PVC/PVA Top Coating - mostly plasticized
137	L3	.074	72	Clear/White/ Blue Smooth	Laminate (R)	Window Reveals, Dado, Seat Backs	Plasticized PVC/PVA (90:10) over pigmented ABS, Asbestos-filled

TABLE I (Continued)

<u>No.</u>	<u>Code</u>	<u>Thickness</u> (in)	<u>Weight</u> (oz/yd ²)	<u>Color and</u> <u>Surface</u>	<u>Designation</u>	<u>Present or</u> <u>Intended Use</u>	<u>Chemical Composition</u> ⁽¹⁾
138	F1	.015	5.8	Green Smooth	Fabric (UC)	Drapery (FR)	Polyamide (Aromatic- type) Cotton (50%:50%)
139	F2	.007	6.6	White Smooth	Fabric (C)	Headliner, Baggage Liner	Glass fabric (60%) coated with Polyvinyl- idene fluoride
140	F1	.024	12	White/Blue Smooth	Fabric (UC)	Mattress Ticking (FR)	Cotton
141	S2	.031	28	Cream Semi-Clear Glossy	Sheet (SR)	Fabricated Parts (FR)	Polysulfone
142	S3	1.0	12	White Fine Grain	Foam (R)	Insulation	Urea formaldehyde
143	R1	.30	45	Green Loop	Rug (UP)	Flooring	Polyamide (Aromatic- type)
144	F1	.035	11	Green/ White/Orange	Fabric (UC)	Upholstery	Polyamide (Aromatic- type)
145	F2	.031	18	Silver Reflective	Fabric (C)	Insulation, Baggage Liner	Aluminum/Polyester film on Asbestos fabric
146	F1	.035	9.9	White	Fabric (UC)	Upholstery, Drapery	Polyamide (more Aromatic groups than 143 & 144)

TABLE I (Continued)

No.	Code	Thickness (in)	Weight (oz/yd ²)	Color and Surface	Designation	Present or Intended Use	Chemical Composition (1)
147	S3	.23	210	Clear Glossy	Sheet (R)	Window Panes, Fabricated Parts	Polymethyl methacrylate
148	R1	.25	56	(A) Blue (B) Brown (C) Green Loop	Rug (UP)	Flooring	Pile: Modacrylic (100%)
149	F1	.15	10	Cream Fluffy	Fabric (UC)	Blanket	Modacrylic (100%)
150	S1	4.0	89	White Open Cell	Foam (F)	Seat Padding (FR)	Polyether urethane
151	L3	.054	75	Light Tan Matte	Laminate (R)	Paneling	Plasticized PVC/PVA on aluminum sheet
152	L2	.057	52	Light Blue Matte	Laminate (SR)	Paneling	Face:(blue) PVC/PVA (89:11) Back:(tan) PVC/PMMA (90:10)
153	F1	.033	6.8	White Open Weave	Fabric (UC)	Casement Drapery	Modacrylic/Rayon/Poly (vinylidene chloride) 20%
154	S1	.11	63	Red Closed Cell	Sheet (F)	Padding	Silicone rubber
155	S3	.060	53	Clear Glossy	Sheet (R)	Window Panes, Fabricated Parts	Polycarbonate

TABLE I (Continued)

No.	Code	Thickness (in)	Weight (oz/yd ²)	Color and Surface	Designation	Present or Intended Use	Chemical Composition ⁽¹⁾
156	F2	.007	6.3	White Smooth	Fabric (C)	Headliner	Poly(vinylidene fluoride) coating on Polyamide (Aromatic-type) fabric
157	F1	.035	10	White	Fabric (UC)	Drapery	Modacrylic (100%)
158	S2	.028	29	Cream Glossy	Sheet (SR)	Panels, Fabricated Parts	PVC/ABS (94:6)
159	S2	.034	34	Olive Glossy	Sheet (SR)	Panels, Fabricated Parts	PVC/Acrylic (90:10)
160	S3	.055	65	White Glossy	Sheet (R)	Panels, Fabricated Parts	Styrene/Polyester, Glass fiber reinforced (25%), TiO ₂ pigment
161	L3	.032	57	Wood Grain Pattern Smooth	Laminate (R)	Panels, Interior Finish	PVC/Acrylic on Aluminum sheet
162	F1	.020	13	White	Fabric (UC)	High-Temperature Insulation Fabric	Asbestos/Glass/Polyamide (Aromatic-type)
163	L2	.031	39	Wood Grain Pattern Smooth	Laminate (SR)	Panels, Interior Finish	PVC/PVA (95:5) on filled Asbestos (71%)
164	S3	.070	60	White Glossy	Sheet (R)	Fabricated Parts	ABS

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191B)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
1 F1	0.05	0.98	0.83	0.00	X ⁽¹⁾	12.0	N.R. ⁽²⁾	12.2	No	Light smoke.
1	0.08	0.96	0.84	0.00	X	12.0	-	12.4	No	
1	0.07	1.34	1.21	0.00	X	12.0	-	8.7	No	
Avg.	0.07	1.09	0.96	0.00	X	12.0	-	11.1	No	
2 F1	0.04	0.16	0.00	0.04	1.8	0.5	-	11.2	Yes	Light smoke.
2	0.04	0.16	0.00	0.04	1.7	1.0	-	10.6	Yes	Shrinks from burner.
2	0.04	0.16	0.00	0.04	1.4	0.5	-	8.8	Yes	Flaming visible as pilot flame enlargement.
Avg.	0.04	0.16	0.00	0.04	1.6	0.7	-	10.2	Yes	
3 F1	0.10	0.85	0.75	0.00	X	12.0	-	14.1	No	Light smoke.
3	0.10	0.85	0.75	0.00	X	12.0	-	14.1	No	
3	0.05	1.16	1.01	0.00	X	12.0	-	10.4	No	
Avg.	0.08	0.96	0.84	0.00	X	12.0	-	12.9	No	
4 F1	0.05	0.70	0.55	0.00	5.1	5.1	-	7.3	Yes	Very light smoke.
4	0.05	0.63	0.48	0.00	5.1	5.1	-	8.1	Yes	Melts and drips burning droplets.
4	0.05	0.81	0.66	0.00	6.2	6.2	-	7.7	Yes	
Avg.	0.05	0.71	0.56	0.00	5.5	5.5	-	7.7	Yes	
5 F2	0.10	0.19	0.09	0.00	3.1	2.5	-	16.3	Yes	Heavy smoke.
5	0.10	0.24	0.14	0.00	2.0	1.5	-	8.3	Yes	
5	0.10	0.23	0.13	0.00	2.6	2.0	-	11.3	Yes	
Avg.	0.10	0.22	0.12	0.00	2.6	2.0	-	12.0	Yes	

Abbreviations:

F1, F2 - Uncoated and coated fabric.
R1, R2 - Unpadded and padded rug.
S1, S2, S3 - Flexible, semi-rigid and rigid sheet.
L1, L2, L3 - Flexible, semi-rigid and rigid laminate.
A - Assembly.

Notes:

- (1) X - Burns completely.
(2) NR - No record of flame height data for first 15 materials.

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER PLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-F-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
6 P2	0.10	0.45	0.35	0.00	6.8	5.7	-	10.5	Yes	Heavy smoke.
6	0.10	0.52	0.42	0.00	8.1	5.0	-	15.5	Yes	Flames snuffed out by gases.
6	0.10	0.57	0.47	0.00	5.1	3.1	-	9.0	Yes	Backing the more flammable side.
Avg.	0.10	0.58	0.48	0.00	6.7	4.6	-	11.7	Yes	
7 R2	0.20	4.95	4.95	0.00	X	12.0	-	2.4	No	Very heavy smoke.
7	0.20	5.45	5.45	0.00	X	12.0	-	2.2	No	
7	0.10	4.78	4.68	0.00	X	12.0	-	2.5	No	
Avg.	0.16	5.07	5.03	0.00	X	12.0	-	2.4	No	
8 R1	0.10	4.95	4.85	0.00	X	12.0	-	2.4	No	Very heavy smoke.
8	0.02	3.57	3.39	5.20	X	12.0	-	3.5	No	
8	0.02	3.57	3.39	5.56	X	12.0	-	3.5	No	
Avg.	0.05	3.99	3.84	3.55	X	12.0	-	3.1	No	
9 S1	0.07	0.13	0.00	0.05	1.1	0.6	-	8.5	Yes	Very heavy smoke.
9	0.05	0.15	0.00	0.05	1.1	0.5	-	7.3	Yes	Flashes.
9	0.02	0.26	0.08	0.05	1.2	0.8	-	4.6	Yes	
Avg.	0.05	0.18	0.03	0.05	1.1	0.6	-	6.8	Yes	
10 S2	0.08	2.11	1.99	0.00	X	12.0	-	5.8	No	Very heavy and sooty smoke.
10	0.08	1.17	1.05	0.00	X	12.0	-	10.3	No	Melts and drips burning droplets.
10	0.05	3.03	2.88	0.00	X	12.0	-	4.0	No	
Avg.	0.07	2.13	2.00	0.00	X	12.0	-	6.7	No	
11 S3	0.05	1.57	1.42	0.00	X	12.0	-	7.7	No	Very heavy smoke.
11	0.05	1.34	1.19	0.00	X	12.0	-	9.0	No	Melts and drips burning droplets.
11	0.05	1.98	1.83	0.00	X	12.0	-	6.0	No	
Avg.	0.05	1.63	1.48	0.00	X	12.0	-	7.6	No	
12 S3	0.02	0.18	0.00	0.00	2.1	1.2	-	11.6	Yes	Light smoke.
12	0.02	0.18	0.00	0.00	0.6	0.2	-	3.3	Yes	Softens.
12	0.04	0.18	0.02	0.00	0.3	0.1	-	12.5	Yes	
Avg.	0.03	0.18	0.01	0.00	1.0	0.5	-	9.1	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BURSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
13 S2	0.02	0.80	0.62	0.00	4.2	2.1	-	5.3	Yes	Moderate and sooty smoke.
13	0.02	1.56	1.38	0.00	6.6	5.5	-	4.2	Yes	Flashes.
13	0.02	2.07	1.84	0.00	6.6	5.5	-	3.1	Yes	
Avg.	0.02	1.48	1.30	0.00	5.8	4.4	-	4.2	Yes	
14 S2	0.02	0.18	0.00	0.00	2.8	1.1	-	15.6	Yes	Light smoke.
14	0.02	0.18	0.00	0.00	2.2	1.1	-	12.2	Yes	
14	0.02	0.20	0.02	0.00	2.8	1.6	-	14.0	Yes	
Avg.	0.02	0.19	0.01	0.00	2.6	1.3	-	14.0	Yes	
15 S1	0.01	0.29	0.10	0.00	X	12.0	-	41.0	No	Light smoke.
15	0.01	0.26	0.07	0.00	X	12.0	-	43.0	No	Sample only 0.5 inch thick.
Avg.	0.01	0.28	0.09	0.00	X	12.0	-	42.0	No	Burns very rapidly.
17 R2	0.02	2.38	2.20	0.58	(3.0 F) (X B)(4)	1.0 F (12.0 B)	8	1.2 F (5.0 B)	Yes	Moderate white smoke.
17	0.01	5.09	4.90	0.00	(4.0 F) (X B)	2.0 F (12.0 B)	8	0.8 F (2.4 B)	Yes	Rug padding side burns completely.
17	0.01	3.85	3.66	0.00	(4.0 F) (X B)	1.5 F (12.0 B)	8	1.0 F (3.1 B)	Yes	
Avg.	0.01	3.77	3.59	0.19	(3.7 F) (X B)	1.5 F (12.0 B)	8	1.0 F (3.5 B)	Yes	
18 R1	0.01	4.44	4.25	0.00	X	12.0	10	2.7	No	Heavy gray sooty smoke.
18	0.01	3.29	3.10	0.00	X	12.0	10	3.6	No	
18	0.01	2.79	2.60	0.00	X	12.0	10	4.3	No	
Avg.	0.01	3.51	3.32	0.00	X	12.0	10	3.5	No	
19 S1	0.01	0.29	0.10	0.00	2.0	1.0	9	6.9	Yes	Light to heavy white smoke with sweet odor.
19	0.01	0.89	0.70	0.00	11.0	9.0	12+(5)	12.3	Yes	
19	0.01	0.93	0.74	0.00	12.0	10.0	12+	12.9	Yes	
Avg.	0.01	0.70	0.51	0.00	8.3	6.7	12+	10.7	Yes	
20 L3	0.01	0.19	0.00	0.00	0.9	0.7	<1	4.7	Yes	No smoke or odor.
20	0.03	0.17	0.00	0.00	1.0	0.8	<1	5.8	Yes	Flaming difficult to identify.
20	0.03	0.17	0.00	0.00	1.0	0.8	<1	5.8	Yes	
Avg.	0.02	0.18	0.00	0.00	1.0	0.8	<1	5.4	Yes	

(3) F - Facing of test sample.

(4) B - Backing of test sample.

(5) 12+ - Plus sign indicates that flame height exceeds limit of measurement which is 12 inches.

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BURSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
21 L3	0.03	0.17	0.00	0.00	0.3	0.1	<1	1.8	Yes	No smoke or odor. Flames small.
21	0.04	0.16	0.00	0.00	0.4	0.1	<1	2.5	Yes	
21	0.03	0.17	0.00	0.00	0.4	0.1	<1	2.4	Yes	
AVG.	0.03	0.17	0.00	0.00	0.4	0.1	<1	2.2	Yes	
22 L1	0.01	0.19	0.00	0.00	0.7 F (3.5 B)	0.7 F (3.5 B)	3	3.7 F (18.4 B)	Yes	Light white smoke with acrid odor.
22	0.01	0.19	0.00	0.00	0.7 F (3.5 B)	0.7 F (3.5 B)	3	3.7 F (18.4 B)	Yes	Aluminized facing the less flammable side.
22	0.01	0.19	0.00	0.00	0.7 F (3.6 B)	0.7 F (3.6 B)	3	3.7 F (18.9 B)	Yes	
AVG.	0.01	0.19	0.00	0.00	0.7 F (3.5 B)	0.7 F (3.5 B)	3	3.7 F (18.6 B)	Yes	
23 A	0.05	0.15	0.00	0.00	0.2	0.1	1	1.3	Yes	Very light smoke with slight odor. Not standard size sample (actual size).
24 A	0.01	0.19	0.00	0.00	1.3	1.0	3	6.8	Yes	Light white very acrid smoke. Not standard size sample (actual size).
25 L3	0.02	1.71	1.53	1.02	6.0	5.0	4	3.5	Yes	Light to moderate white smoke.
25	0.03	0.66	0.49	1.00	2.0	1.5	3	3.0	Yes	
25	0.04	0.46	0.30	0.55	1.5	1.0	3	3.3	Yes	
AVG.	0.03	0.94	0.77	0.86	3.2	2.5	3	3.3	Yes	
26 L3	0.04	2.88	2.72	1.50	12.0	11.0	12	4.2	Yes	Light to heavy white smoke.
26	0.02	0.57	0.39	0.90	2.0	1.5	3	3.5	Yes	
26	0.02	0.55	0.37	0.70	2.5	2.0	3	4.5	Yes	
AVG.	0.03	1.33	1.16	1.03	5.5	4.8	6	4.1	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
28 F1	0.01	0.19	0.00	0.00	5.0	5.0	1	26.3	Yes	Moderate white smoke.
28	0.01	0.23	0.04	0.00	5.6	5.6	1	24.3	Yes	Flames short and flickering.
28	0.01	0.24	0.05	0.00	5.5	5.5	1	22.9	Yes	
Avg.	0.01	0.22	0.03	0.00	5.4	5.4	1	24.5	Yes	
29 F1	0.01	0.19	0.00	0.02	6.1	6.0	1	32.1	Yes	Moderate white smoke.
29	0.01	0.19	0.00	0.02	5.8	5.7	1	30.5	Yes	Flames short and flickering.
29	0.01	0.22	0.03	0.00	5.2	5.2	1	24.1	Yes	
Avg.	0.01	0.20	0.01	0.01	5.7	5.6	1	28.9	Yes	
30 A	0.01	1.15	0.96	0.00	4.0	2.0	4	3.4	Yes	Heavy black acrid sooty smoke.
30	0.01	1.18	0.99	0.00	3.6	1.8	4	3.1	Yes	Honeycomb paper core char 2.0
30	0.01	1.21	1.02	0.00	4.0	2.0	4	3.3	Yes	inches.
Avg.	0.01	1.18	0.99	0.00	3.9	1.9	4	3.3	Yes	
31 S1	0.01	0.19	0.00	0.10	5.0	4.0	8	26.3	Yes	Heavy gray smoke with heavy soot.
31	0.01	0.19	0.00	0.10	5.5	4.5	8	28.9	Yes	
31	0.01	0.19	0.00	0.14	6.0	4.0	8	31.6	Yes	
Avg.	0.01	0.19	0.00	0.11	5.5	4.2	8	28.9	Yes	
32 L3	0.02	0.18	0.00	0.00	0.3	0.1	<1	1.7	Yes	No smoke or odor.
32	0.02	0.18	0.00	0.00	0.3	0.1	<1	1.7	Yes	Very small flames.
32	0.02	0.18	0.00	0.00	0.3	0.1	<1	1.7	Yes	
Avg.	0.02	0.18	0.00	0.00	0.3	0.1	<1	1.7	Yes	
33 S3	0.02	0.18	0.00	0.01	1.0	0.1	3	5.6	Yes	Light white smoke.
33	0.02	0.19	0.01	0.01	1.0	0.1	3	5.3	Yes	
33	0.02	0.18	0.00	0.01	1.0	0.1	3	5.6	Yes	
Avg.	0.02	0.18	0.00	0.01	1.0	0.1	3	5.5	Yes	
34 F2	0.01	0.19	0.00	0.09	3.0	2.5	3	15.8	Yes	Moderate white smoke.
34	0.01	0.19	0.00	0.10	3.5	3.0	3	18.4	Yes	Plastic cover chars.
34	0.01	0.19	0.00	0.10	3.5	3.0	3	18.4	Yes	Glass fabric.
Avg.	0.01	0.19	0.00	0.10	3.3	2.8	3	17.5	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
35 S3	0.03	2.23	2.06	1.25	2.0	1.5	<1	0.9	Yes	Moderate gray acrid smoke with heavy soot.
35	0.03	2.24	2.07	1.25	2.0	1.5	<1	0.9	Yes	
Avg.	0.03	2.24	2.07	1.25	2.0	1.5	<1	0.9	Yes	
37 S3	0.03	0.21	0.04	0.04	0.5	0.1	<1	2.4	Yes	Very light white smoke.
37	0.03	0.18	0.01	0.01	0.5	0.1	<1	2.8	Yes	
Avg.	0.03	0.20	0.03	0.03	0.5	0.1	<1	2.6	Yes	
38 S3	0.01	1.29	1.10	0.00	X	12.0	12+	9.3	No	Light white smoke with sweet odor. Drips and burns on floor. Not standard size sample.
39 S3	0.03	0.19	0.02	0.06	1.0	0.1	<1	5.3	Yes	Very light to light white smoke.
39	0.03	0.19	0.02	0.02	1.0	0.5	<1	5.3	Yes	
Avg.	0.03	0.19	0.02	0.04	1.0	0.3	<1	5.3	Yes	
40 S1	0.02	0.21	0.03	0.00	7.0	7.0	<1	33.3	Yes	Very light smoke. Flaming very rapid.
40	0.02	0.18	0.00	0.00	6.5	6.5	<1	36.1	Yes	
40	0.02	0.12	- 0.06(6)	0.00	6.5	6.5	<1	54.2	Yes	
Avg.	0.02	0.17	- 0.01	0.00	6.7	6.7	<1	41.2	Yes	
41 A	0.01	0.21	0.00	0.00	1.5 F 3.5 B	1.0 F 3.0 B	3	7.5 F (17.5 B)	Yes	Moderate gray acrid smoke. Plastic cover without glass fiber batt burns completely in separate test.
42 A	0.04	0.16	0.00	0.00	0.5	0.3	<1	3.1	Yes	Light white acrid smoke. Flaming difficult to identify.

(6) Negative (-) sign indicates flame-out time occurs before removal of Bunsen burner ignition source.

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
43 A	0.03	0.17	0.00	0.00	(1.0 F 0.5 B)	(1.0 F 0.3 B)	1	(5.9 F 2.9 B)	Yes Yes	Very light white acrid smoke. Lead sheet facing melts.
44 S1	0.01	0.19	0.00	0.19	2.5	1.5	5	13.2	Yes	Heavy white sooty smoke.
44	0.01	0.19	0.00	0.27	2.5	1.0	5	13.2	Yes	
44	0.01	0.22	0.03	0.25	2.5	1.5	5	11.4	Yes	
AVG.	0.01	0.20	0.01	0.25	2.5	1.3	5	12.6	Yes	
45 S3	0.01	1.48	1.29	0.02	4.0	3.0	4	2.7	Yes	Moderate to heavy gray acrid smoke with heavy soot.
45	0.01	2.92	2.73	0.02	8.0	7.0	5	2.7	Yes	
45	0.01	2.53	2.34	0.02	9.0	7.5	5	3.6	Yes	
AVG.	0.01	2.31	2.12	0.02	7.0	5.8	5	3.0	Yes	
46 S3	0.01	0.19	0.00	0.00	1.1	0.8	< 1	5.8	Yes	Light white smoke.
46	0.01	0.19	0.00	0.00	1.1	0.8	< 1	5.8	Yes	
46	0.01	0.19	0.00	0.00	1.0	0.7	< 1	5.3	Yes	
AVG.	0.01	0.19	0.00	0.00	1.1	0.8	< 1	5.6	Yes	
47 F1	0.01	0.11	- 0.08	0.01	5.5	5.0	4	50.0	Yes	Light white smoke with pungent odor.
47	0.01	0.11	- 0.08	0.01	5.0	4.3	4	45.4	Yes	
47	0.01	0.09	- 0.10	0.01	5.3	4.5	4	58.9	Yes	
AVG.	0.01	0.10	- 0.09	0.01	5.3	4.6	4	51.4	Yes	
48 A	0.01	0.23	0.04	0.01	1.5 F (8.0 B)	0.5 F (3.0 B)	3 F (10 B)	6.5 F (34.8 B)	Yes	Heavy white smoke with very sweet odor.
48	0.01	0.34	0.15	0.01	1.5 F (6.5 B)	0.5 F (2.0 B)	2 F (7 B)	4.4 F (19.1 B)	Yes	Rigid polyurethane backing the more flammable side.
AVG.	0.01	0.29	0.10	0.01	1.5 F (7.3 B)	0.5 F (2.5 B)	3 F (9 B)	5.5 F (26.9 B)	Yes	
49 A	0.01	0.27	0.08	0.01	1.0 F (6.0 B)	0.2 F (4.0 B)	2 F (7 B)	3.7 F (22.2 B)	Yes Yes	Moderate white smoke with very sweet odor. Rigid polyurethane backing the more flammable side.
50 S3	0.01	0.41	0.22	0.00	8.5	8.0	10	20.7	Yes	Heavy white smoke with sweet odor.
50	0.01	0.37	0.18	0.00	8.5	8.0	12	22.9	Yes	
AVG.	0.01	0.39	0.20	0.00	8.5	8.0	11	21.8	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
51 S2	0.02	0.18	0.00	0.00	1.5	0.5	1	8.3	Yes	Moderate to heavy white smoke.
51	0.01	0.19	0.00	0.00	2.0	0.2	1	10.5	Yes	
Avg.	0.02	0.19	0.00	0.00	1.8	0.4	1	9.4	Yes	
52 S1	0.01	0.58	0.39	0.00	X	12.0	12+	20.7	No	Light white smoke with sweet odor.
52	0.01	1.10	0.91	0.00	X	12.0	12+	10.9	No	Drips and burns on floor for 12
Avg.	0.01	0.84	0.65	0.00	X	12.0	12+	15.8	No	minutes.
53 A	0.01	0.20	0.00	0.05	3.0 F (0.5 B)	2.8 F (0.2 B)	2	15.0 F (2.5 B)	Yes Yes	Moderate white acrid smoke. Facing same as cover material No. 55.
54 A	0.01	0.31	0.12	0.05	7.0 F (3.0 B)	6.0 F (0.2 B)	4	22.5 F (9.6 B)	Yes Yes	Heavy white acrid smoke. Insulation batt cover the more flammable side.
55 F2	0.01	0.14	- 0.05	0.05	5.0	5.0	5	35.7	Yes	Light white smoke with slight odor.
55	0.01	0.14	- 0.05	0.05	5.5	5.5	5	39.2	Yes	
Avg.	0.01	0.14	- 0.05	0.05	5.2	5.2	5	37.4	Yes	
56 F2	0.01	0.15	- 0.04	0.00	6.0	5.5	5	40.0	Yes	Light white smoke.
56	0.01	0.07	- 0.12	0.00	6.5	6.0	5	92.9	Yes	Flaming rapid.
56	0.01	0.08	- 0.11	0.00	6.0	5.5	5	75.0	Yes	
Avg.	0.01	0.10	- 0.10	0.00	6.2	5.7	5	69.3	Yes	
57 F2	0.01	0.09	- 0.10	0.00	3.0 F (2.0 B)	0.1	5 F (1 B)	33.3 F (22.2 B)	Yes	Light white smoke.
57	0.01	0.09	- 0.10	0.00	3.0 F (2.0 B)	0.1	5 F (1 B)	33.3 F (22.2 B)	Yes	Glass fabric backing.
57	0.01	0.09	- 0.10	0.00	3.0 F (2.0 B)	0.1	5 F (1 B)	33.3 F (22.2 B)	Yes	
Avg.	0.01	0.09	- 0.10	0.00	3.0 F (2.0 B)	0.1	5 F (1 B)	33.3 F (22.2 B)	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
58 F1	0.01	0.67	0.48	0.00	9.0	7.5	7	13.4	Yes	Moderate white acrid smoke.
58	0.01	0.32	0.13	0.00	3.5	3.0	3	10.9	Yes	With warp.
Avg.	0.01	0.49	0.30	0.00	6.2	5.2	5	12.1	Yes	
58	0.01	1.18	0.99	0.00	X	12.0	7	10.1	No	Moderate gray acrid smoke. Across warp.
59 S1	0.01	0.19	0.00	0.00	2.5	1.2	3	13.2	Yes	Light white very acrid smoke.
59	0.01	0.19	0.00	0.00	2.5	1.3	3	13.2	Yes	Melts but does not drip.
59	0.01	0.19	0.00	0.00	2.5	1.6	3	13.2	Yes	
Avg.	0.01	0.19	0.00	0.00	2.5	1.4	3	13.2	Yes	
60 S3	0.02	0.18	0.00	0.00	1.0	0.8	1	5.5	Yes	Light white very acrid smoke.
61 S3	0.02	0.18	0.00	0.00	1.3	1.0	2	7.2	Yes	Very light white very acrid smoke.
62 S3	0.02	0.18	0.00	0.00	1.5	1.2	2	8.3	Yes	Very light white very acrid smoke.
62	0.02	0.18	0.00	0.00	1.4	1.2	2	7.8	Yes	
Avg.	0.02	0.18	0.00	0.00	1.5	1.2	2	8.1	Yes	
63 F1	0.01	0.26	0.07	0.02	5.5	5.0	6	21.1	Yes	Moderate to heavy white smoke.
63	0.01	0.29	0.10	0.02	7.0	6.3	7	24.1	Yes	
63	0.01	0.35	0.16	0.02	6.0	5.8	6	17.1	Yes	
Avg.	0.01	0.30	0.11	0.02	6.3	5.7	6	21.1	Yes	
64 R1	0.02	3.96	3.78	0.00	X	12.0	12+	3.0	No	Heavy gray sooty smoke.
64	0.01	2.08	1.89	0.00	X	12.0	12+	5.8	No	
64	0.01	4.40	4.19	0.00	X	12.0	12+	2.7	No	
Avg.	0.01	3.48	3.27	0.00	X	12.0	12+	3.8	No	
65 R1	0.01	3.05	2.86	0.00	X	12.0	12+	3.9	No	Heavy gray smoke.
65	0.01	3.18	2.99	0.00	X	12.0	12+	3.8	No	Boils and melts.
65	0.01	2.04	1.85	0.00	X	12.0	12+	5.9	No	
Avg.	0.01	2.76	2.57	0.00	X	12.0	12+	4.5	No	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (PED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
66 S1	0.01	1.59	1.40	0.00	X	12.0	12+	7.5	No	Heavy gray acrid smoke.
66	0.01	1.74	1.55	0.00	X	12.0	12+	6.9	No	
66	0.01	1.94	1.75	0.00	X	12.0	12+	6.1	No	
Avg.	0.01	1.76	1.57	0.00	X	12.0	12+	6.8	No	
67 L2	0.01	0.22	0.03	0.06	4.0	1.0	7	18.2	Yes	Moderate white smoke with sweet odor.
67	0.01	0.22	0.03	0.04	4.5	1.0	7	20.4	Yes	
Avg.	0.01	0.22	0.03	0.05	4.3	1.0	7	19.3	Yes	
68 L2	0.01	0.27	0.08	0.00	2.8	1.8	4	10.4	Yes	Moderate white acrid smoke.
68	0.01	0.33	0.14	0.00	2.8	2.0	4	8.5	Yes	
68	0.01	0.21	0.02	0.00	2.5	1.8	4	11.9	Yes	
Avg.	0.01	0.27	0.08	0.00	2.7	1.9	4	10.3	Yes	
69 L2	0.01	0.30	0.11	0.00	4.5	3.0	6	15.0	Yes	Moderate white acrid smoke.
69	0.01	0.27	0.08	0.00	3.8	3.0	6	14.1	Yes	
69	0.01	0.27	0.08	0.00	4.0	3.0	6	14.8	Yes	
Avg.	0.01	0.28	0.09	0.00	4.1	3.0	6	14.6	Yes	
70 L2	0.01	1.28	1.09	0.00	5.5	4.5	5	4.3	Yes	Moderate to heavy white acrid sooty smoke.
70	0.01	0.78	0.59	0.00	5.6	4.3	5	7.2	Yes	
Avg.	0.01	1.03	0.84	0.00	5.6	4.4	5	5.8	Yes	
71 L2	0.01	0.20	0.01	0.00	3.5	3.0	4	17.5	Yes	Light white acrid sooty smoke.
71	0.01	0.20	0.01	0.00	3.5	3.0	4	17.5	Yes	
Avg.	0.01	0.20	0.01	0.00	3.5	3.0	4	17.5	Yes	
72 L3	0.01	0.20	0.01	0.00	2.5	1.5	4	12.5	Yes	Light white acrid sooty smoke.
72	0.01	0.19	0.00	0.00	2.3	1.7	4	12.1	Yes	
72	0.01	0.19	0.00	0.00	2.4	1.6	4	12.6	Yes	
Avg.	0.01	0.19	0.00	0.00	2.4	1.6	4	12.4	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
73 S3	0.01	0.19	0.00	0.00	1.5	0.8	3	7.9	Yes	Light white acrid sooty smoke.
73	0.01	0.19	0.00	0.00	1.7	0.9	3	8.9	Yes	
73	0.01	0.19	0.00	0.00	1.5	0.8	3	7.9	Yes	
73	0.01	0.19	0.00	0.00	1.6	0.8	3	8.2	Yes	
Avg.	0.01	0.19	0.00	0.00	1.6	0.8	3	8.2	Yes	
75 F1	0.01	2.04	1.85	0.00	X	12.0	12+	5.8	No	Moderate to heavy white acrid smoke. Boils and melts.
75	0.01	1.34	1.15	0.00	X	12.0	12+	8.9	No	
75	0.01	1.63	1.44	0.00	X	12.0	12+	7.4	No	
75	0.01	1.67	1.48	0.00	X	12.0	12+	7.4	No	
Avg.	0.01	1.67	1.48	0.00	X	12.0	12+	7.4	No	
76 A	0.03	1.11	0.94	1.50	1.5 F	0.4 F	4	1.4 F	Yes	Light to moderate white smoke with pungent odor. Facing less flammable than honey comb core.
76	0.03	1.17	1.00	2.00	(3.0 B)	(1.2 B)	4	(2.7 B)	Yes	
76	0.03	1.17	1.00	2.50	(2.3 B)	(0.8 B)	4	(1.7 B)	Yes	
76	0.03	1.17	1.00	2.50	(2.6 B)	(1.8 B)	4	(2.2 B)	Yes	
76	0.03	1.15	0.98	2.00	(1.9 B)	(0.5 B)	4	(1.5 F)	Yes	
Avg.	0.03	1.15	0.98	2.00	(2.7 B)	(1.7 B)	4	(2.3 B)	Yes	
101 F1	0.01	0.19	0.00	0.05	3.3	3.1	4	17.2	Yes	Light white smoke with slight odor.
101	0.01	0.19	0.00	0.06	3.1	3.0	4	16.3	Yes	
101	0.01	0.19	0.00	0.05	3.1	3.0	4	16.3	Yes	
101	0.01	0.19	0.00	0.05	3.1	3.0	4	16.3	Yes	
101	0.01	0.19	0.00	0.05	3.2	3.0	4	16.6	Yes	
Avg.	0.01	0.19	0.00	0.05	3.2	3.0	4	16.6	Yes	
102 F1	0.01	0.19	0.00	0.24	3.5	3.0	5	15.8	Yes	Very light smoke with slight odor.
102	0.01	0.19	0.00	0.34	3.5	3.0	5	15.8	Yes	
102	0.01	0.19	0.00	0.27	3.5	3.0	5	15.8	Yes	
102	0.01	0.19	0.00	0.28	3.5	3.0	5	15.8	Yes	
102	0.01	0.19	0.00	0.28	3.5	3.0	5	15.8	Yes	
Avg.	0.01	0.19	0.00	0.28	3.5	3.0	5	15.8	Yes	
103A S3	0.01	0.19	0.00	0.01	2.0	1.5	2	10.5	Yes	Light white very acrid smoke Shrinks from burner.
103A	0.01	0.19	0.00	0.01	1.5	1.4	1	7.9	Yes	
103A	0.01	0.19	0.00	0.01	2.0	1.5	1	10.5	Yes	
103A	0.01	0.19	0.00	0.01	1.8	1.5	1	9.6	Yes	
Avg.	0.01	0.19	0.00	0.01	1.8	1.5	1	9.6	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
103B S3	0.01	0.19	0.00	0.01	2.0	1.5	1	10.5	Yes	Light white very acrid smoke.
103B	0.01	0.19	0.00	0.02	2.0	1.5	2	10.5	Yes	Shrinks from burner.
103B	0.01	0.19	0.00	0.01	2.0	1.5	2	10.5	Yes	Slightly thinner than No. 103A.
AVG.	0.01	0.19	0.00	0.01	2.0	1.5	2	10.5	Yes	
105 F2	0.05	0.18	0.03	0.00	0.9 F (0.5 B)	0.8 F (0.0 B)	<1	5.0 F (2.8 B)	Yes	Light white smoke with slight odor.
									Yes	Aluminized facing the more flammable side.
106 S3	0.06	0.14	0.00	0.00	0.3	0.2	<1	2.0	Yes	Very light to moderate gray smoke with sweet odor.
108 F1	0.01	0.16	- 0.03	0.01	6.5	6.1	5	40.6	Yes	Light moderate gray smoke with sweet odor.
108	0.01	0.14	- 0.05	0.01	6.5	6.3	5	46.4	Yes	
108	0.01	0.14	- 0.05	0.01	5.7	5.5	4	40.7	Yes	
AVG.	0.01	0.14	- 0.05	0.01	6.2	6.0	5	42.6	Yes	
109 S3	0.01	0.24	0.05	0.00	1.0	0.1	<1	4.2	Yes	Light black sooty smoke with slight odor.
109	0.01	0.25	0.06	0.00	1.0	0.1	<1	4.0	Yes	
109	0.01	0.27	0.08	0.00	1.0	0.2	<1	3.7	Yes	
AVG.	0.01	0.25	0.06	0.00	1.0	0.1	<1	4.0	Yes	
110 S3	0.02	0.19	0.01	0.00	0.6	0.3	3	3.2	Yes	Very light acrid smoke.
111 S3	0.01	1.43	1.24	0.00	4.7	4.0	4	3.3	Yes	Moderate to heavy gray acrid sooty smoke.
111	0.01	1.73	1.54	0.00	5.0	4.4	4	2.9	Yes	
AVG.	0.01	1.58	1.39	0.00	4.9	4.2	4	3.1	Yes	
112A S2	0.04	0.27	0.11	0.00	1.3	1.2	2	4.8	Yes	Light black sooty smoke with slight odor.
112A	0.04	0.25	0.09	0.00	1.3	1.2	2	5.2	Yes	
112A	0.04	0.60	0.44	0.00	1.3	1.2	2	2.2	Yes	
AVG.	0.04	0.37	0.21	0.00	1.3	1.2	2	4.1	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Flow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
113 S1	-	0.00	-	0.00	0.0	0.0	0	0	Yes	Very light smoke with slight odor. Non combustible
114 F2	0.01	0.06	- 0.13	0.02	3.5	2.0	2	26.7	Yes	Light white smoke with slight odor.
114	0.01	0.06	- 0.13	0.02	3.0	1.8	2	18.3	Yes	Acrylic cover chars.
114	0.01	0.06	- 0.13	0.02	3.0	1.8	2	18.3	Yes	Glass fabric.
Avg.	0.01	0.06	- 0.13	0.02	3.2	1.9	2	21.1	Yes	
115 S1	0.01	0.00	- 0.19	0.00	6.8	5.3	0	0.0	Yes	Very light smoke.
115	0.01	0.00	- 0.19	0.00	7.0	5.4	0	0.0	Yes	Flaming difficult to identify.
115	0.01	0.00	- 0.19	0.00	7.0	5.5	0	0.0	Yes	
Avg.	0.01	0.00	- 0.19	0.00	6.9	5.4	0	0.0	Yes	
116 S2	0.03	0.17	0.00	0.01	2.0	1.3	3	11.8	Yes	Very light smoke with slight odor.
116	0.03	0.25	0.08	0.00	2.5	1.8	3	10.0	Yes	
116	0.03	0.18	0.01	0.00	2.0	1.4	3	11.1	Yes	
Avg.	0.03	0.20	0.03	0.00	2.2	1.5	3	11.0	Yes	
117 S3	0.01	0.19	0.00	0.00	2.0	1.6	3	10.5	Yes	Light white very acrid sooty smoke.
117	0.01	0.19	0.00	0.00	1.9	1.5	3	10.0	Yes	
117	0.01	0.19	0.00	0.00	1.9	1.6	3	10.0	Yes	
Avg.	0.01	0.19	0.00	0.00	1.9	1.6	3	10.2	Yes	
118A S1	0.01	0.09	- 0.10	0.00	2.5	1.5	2	28.0	Yes	Very light smoke.
118A	0.01	0.07	- 0.12	0.00	1.5	0.5	< 1	21.4	Yes	
Avg.	0.01	0.08	- 0.11	0.00	2.0	1.0	2	24.7	Yes	
118E S1	0.01	0.09	- 0.10	0.00	1.0	0.7	< 1	11.1	Yes	Very light smoke.
118E	0.01	0.11	- 0.08	0.00	1.0	0.7	< 1	9.0	Yes	
Avg.	0.01	0.10	- 0.09	0.00	1.0	0.7	< 1	10.1	Yes	
118C S1	0.01	0.14	- 0.05	0.00	1.0	0.5	< 1	7.1	Yes	Very light smoke.
118C	0.01	0.14	- 0.05	0.00	1.2	1.0	< 1	8.6	Yes	
Avg.	0.01	0.14	- 0.05	0.00	1.1	0.8	< 1	7.9	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BURNER BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-1-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
118D S1	0.01	0.18	- 0.01	0.00	1.2	1.0	< 1	6.7	Yes	Very light smoke.
118D	0.01	0.17	- 0.02	0.00	1.2	1.0	< 1	7.0	Yes	
AVG.	0.01	0.18	- 0.01	0.00	1.2	1.0	< 1	6.9	Yes	
119 F2	0.01	0.19	0.00	0.05	1.7	1.5	< 1	4.2	Yes	No smoke.
119	0.01	0.19	0.00	0.03	2.0	1.5	< 1	5.3	Yes	Slight odor.
119	0.01	0.19	0.00	0.04	1.9	1.5	< 1	4.7	Yes	Acrylic cover chars.
AVG.	0.01	0.19	0.00	0.04	1.9	1.5	< 1	4.7	Yes	Glass fabric.
120 S2	0.01	0.19	0.00	0.00	0.1	0.1	< 1	0.5	Yes	No smoke or odor. Flaming difficult to identify.
121 S3	0.04	0.16	0.00	0.00	1.1	1.0	< 1	6.9	Yes	Light white smoke with slight odor.
121	0.05	0.15	0.00	0.00	1.0	0.9	< 1	6.0	Yes	Blisters.
121	0.04	0.16	0.00	0.00	1.2	1.0	< 1	7.5	Yes	
AVG.	0.04	0.16	0.00	0.00	1.1	1.0	< 1	6.8	Yes	
122 S3	0.01	0.19	0.00	0.00	1.3	0.1	2	6.8	Yes	Very light smoke.
122	0.01	0.19	0.00	0.00	1.3	0.1	2	6.8	Yes	
122	0.01	0.19	0.00	0.00	1.3	0.1	2	6.8	Yes	
AVG.	0.01	0.19	0.00	0.00	1.3	0.1	2	6.8	Yes	
123 S1	0.01	0.29	0.10	0.01	2.0	1.0	4	6.9	Yes	Heavy white very acrid smoke.
123	0.01	0.20	0.01	0.02	2.5	0.2	4	12.5	Yes	
123	0.01	0.19	0.00	0.02	2.3	0.3	4	12.1	Yes	
AVG.	0.01	0.23	0.04	0.02	2.3	0.5	4	10.5	Yes	
124 F1	0.01	0.19	0.00	0.02	5.0	4.9	1	26.3	Yes	Light white smoke with slight odor.
124	0.01	0.19	0.00	0.02	5.6	5.5	1	29.5	Yes	
124	0.01	0.19	0.00	0.02	5.5	5.4	1	28.9	Yes	
AVG.	0.01	0.19	0.00	0.02	5.4	5.3	1	28.2	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. COC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
125 F2	0.01	0.19	0.00	0.04	2.0	1.5	< 1	5.2	Yes	No smoke.
125	0.01	0.19	0.00	0.03	2.0	1.5	< 1	5.2	Yes	Slight odor.
125	0.01	0.19	0.00	0.03	2.0	1.5	< 1	5.2	Yes	Acrylic cover chars.
125	0.01	0.19	0.00	0.03	2.0	1.5	< 1	5.2	Yes	Glass fabric.
Avg.	0.01	0.19	0.00	0.03	2.0	1.5	< 1	5.2	Yes	
126 F2	0.01	0.19	0.00	0.04	2.2	1.7	< 1	5.2	Yes	No smoke.
126	0.01	0.19	0.00	0.04	2.2	1.7	< 1	5.2	Yes	Slight odor.
126	0.01	0.19	0.00	0.03	2.2	1.7	< 1	5.2	Yes	Plastic cover chars.
126	0.01	0.19	0.00	0.04	2.2	1.7	< 1	5.2	Yes	Glass fabric.
Avg.	0.01	0.19	0.00	0.04	2.2	1.7	< 1	5.2	Yes	
127 S2	0.01	0.19	0.00	0.00	2.9 F	2.2 F	4	(15.3 F)	Yes	Moderate white acrid sooty smoke.
127	0.01	0.19	0.00	0.00	(1.7 B)	(0.8 B)	4	(8.9 B)	Yes	
127	0.01	0.19	0.00	0.00	(2.7 B)	(2.2 F)	4	(14.2 F)	Yes	
127	0.01	0.19	0.00	0.00	(1.5 B)	(0.8 B)	4	(7.9 B)	Yes	
127	0.01	0.19	0.00	0.00	(2.8 F)	(2.2 F)	4	(14.8 F)	Yes	
Avg.	0.01	0.19	0.00	0.00	(1.6 B)	(0.8 B)	4	(8.4 B)	Yes	
128A S1	0.01	0.19	0.00	0.00	4.0	3.5	5	21.0	Yes	Heavy white smoke with sweet odor.
128A	0.01	0.19	0.00	0.00	4.0	3.5	5	21.0	Yes	Melts 1 inch.
128A	0.01	0.19	0.00	0.00	4.0	3.5	5	21.0	Yes	Does not drip. <u>Self-extinguishing foam.</u>
Avg.	0.01	0.19	0.00	0.00	4.0	3.5	5	21.0	Yes	
128B S1	0.01	0.60	0.41	0.00	X	12.0	12+	20.0	No	Moderate white smoke with sweet odor.
128B	0.01	0.60	0.41	0.00	X	12.0	12+	20.0	No	Drips and burns on floor. <u>Regular foam.</u>
128B	0.01	0.60	0.41	0.00	X	12.0	12+	20.0	No	
Avg.	0.01	0.60	0.41	0.00	X	12.0	12+	20.0	No	
129 S1	0.03	0.17	0.00	0.03	0.3	0.1	< 1	1.8	Yes	No smoke.
129	0.02	0.18	0.00	0.02	0.3	0.1	< 1	1.7	Yes	Acrid odor.
129	0.03	0.17	0.00	0.03	0.3	0.1	< 1	1.8	Yes	
Avg.	0.03	0.17	0.00	0.03	0.3	0.1	< 1	1.8	Yes	
130 S1	0.02	0.18	0.00	0.09	0.5	0.2	2	2.8	Yes	Light white acrid smoke.
130	0.02	0.18	0.00	0.07	0.5	0.2	2	2.8	Yes	
130	0.02	0.18	0.00	0.08	0.5	0.2	2	2.8	Yes	
Avg.	0.02	0.18	0.00	0.08	0.5	0.2	2	2.8	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
131 S1	0.02	0.18	0.00	0.03	0.5	0.2	1	2.8	Yes	Light white acrid smoke.
131	0.02	0.18	0.00	0.07	0.5	0.3	2	2.8	Yes	
Avg.	0.02	0.18	0.00	0.05	0.5	0.3	2	2.8	Yes	
132 F1	0.01	0.14	- 0.05	0.04	5.5	5.4	5	39.3	Yes	Light to moderate smoke with slight odor.
132	0.01	0.17	- 0.02	0.02	5.6	5.4	7	32.9	Yes	
132	0.01	0.19	- 0.00	0.02	5.8	5.7	6	30.5	Yes	
Avg.	0.01	0.17	- 0.02	0.03	5.6	5.5	6	34.2	Yes	
133 L1	0.01	0.27	0.08	0.00	3.3 F (1.4 B)	2.8 P (1.4 B)	5	12.2 P (5.5 B)	Yes	Moderate white very acrid smoke with heavy soot.
133	0.01	0.28	0.09	0.00	3.8 P (1.4 B)	3.2 P (1.4 B)	6	13.6 P (11.5 B)	Yes	
133	0.01	0.33	0.14	0.00	3.8 P (1.5 B)	3.3 P (1.5 B)	6	11.5 P (4.5 B)	Yes	
Avg.	0.01	0.29	0.10	0.00	3.6 P (1.5 B)	3.1 P (1.4 B)	6	12.4 P (5.1 B)	Yes	
134 L1	0.01	0.28	0.09	0.00	4.3 F (1.6 B)	4.0 F (1.6 B)	8	15.4 F (5.7 B)	Yes	Moderate white very acrid smoke with heavy soot.
134	0.01	0.29	0.10	0.00	4.3 F (1.5 B)	3.9 F (1.5 B)	7	14.8 F (5.2 B)	Yes	
134	0.01	0.24	0.05	0.00	4.0 F (1.6 B)	3.7 F (1.6 B)	8	16.7 F (4.2 B)	Yes	
Avg.	0.01	0.27	0.08	0.00	4.2 F (1.4 B)	3.9 F (1.4 B)	8	15.6 F (5.0 B)	Yes	
135 L2	0.01	0.19	0.00	0.01	2.5	1.3	3	13.2	Yes	Moderate black acrid sooty smoke.
135	0.01	0.19	0.00	0.01	2.5	1.4	3	13.2	Yes	
Avg.	0.01	0.19	0.00	0.01	2.5	1.4	3	13.2	Yes	
136 L3	0.01	0.19	0.00	0.00	1.0	0.6	3	5.3	Yes	Light white very acrid smoke.
136	0.01	0.19	0.00	0.00	1.0	0.5	3	5.3	Yes	
136	0.01	0.19	0.00	0.00	1.0	0.6	3	5.3	Yes	
Avg.	0.01	0.19	0.00	0.00	1.0	0.6	3	5.3	Yes	

TABLE II
 FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
 VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self-Extinguishing	General Remarks
137 L3	0.01	0.20	0.01	0.00	(2.0 F 1.6 B)	(1.7 F 1.3 B)	4	(10.0 F 8.0 B)	Yes	Light white very acrid smoke.
137	0.01	0.19	0.00	0.00	(1.8 F 1.5 B)	(1.5 F 1.0 B)	3	(9.5 F 7.9 B)	Yes	
137	0.01	0.19	0.00	0.00	(2.0 F 1.6 B)	(1.8 F 1.0 B)	4	(10.5 F 8.4 B)	Yes	
Avg.	0.01	0.19	0.00	0.00	(1.9 F 1.6 B)	(1.7 F 1.1 B)	4	(10.0 F 8.1 B)	Yes	
138 F1	0.01	0.14	- 0.05	0.02	3.0	2.5	6	21.4	Yes	Light white acrid smoke.
138	0.01	0.14	- 0.05	0.02	3.5	2.6	6	25.0	Yes	
138	0.01	0.14	- 0.05	0.02	3.3	2.6	6	23.6	Yes	
Avg.	0.01	0.14	- 0.05	0.02	3.3	2.6	6	23.3	Yes	
139 F2	0.01	0.06	- 0.13	0.13	2.4	2.1	1	40.0	Yes	Very light acrid smoke.
139	0.01	0.08	- 0.11	0.11	2.2	2.0	2	27.5	Yes	Glow from glass fabric.
139	0.01	0.08	- 0.11	0.11	2.5	2.2	2	31.2	Yes	
Avg.	0.01	0.07	- 0.12	0.12	2.4	2.1	2	32.9	Yes	
140 F1	0.02	0.18	0.00	0.05	4.0	3.3	6	22.2	Yes	Moderate white acrid smoke.
140	0.02	0.18	0.00	0.05	4.0	3.4	6	22.2	Yes	
140	0.02	0.18	0.00	0.05	4.0	3.4	6	22.2	Yes	
Avg.	0.02	0.18	0.00	0.05	4.0	3.4	6	22.2	Yes	
141 S2	0.02	0.32	0.14	0.02	2.5	2.2	5	7.8	Yes	Light gray acrid smoke with heavy soot.
141	0.01	0.30	0.11	0.01	2.5	2.3	3	8.3	Yes	
141	0.01	0.29	0.10	0.01	2.4	2.1	4	8.3	Yes	
Avg.	0.01	0.30	0.12	0.01	2.5	2.2	4	8.1	Yes	
142 S3	0.01	0.20	0.01	0.00	5.0	4.5	6	25.0	Yes	Light white acrid smoke.
142	0.01	0.20	0.01	0.00	4.5	3.0	6	22.5	Yes	
142	0.01	0.20	0.01	0.00	4.3	3.8	6	23.5	Yes	
Avg.	0.01	0.20	0.01	0.00	4.6	3.8	6	24.0	Yes	

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
143 R1	0.03	0.17	0.00	0.06	0.3	0.2	1	1.8	Yes	Very light white smoke with slight odor.
143	0.03	0.17	0.00	0.44	0.3	0.2	1	1.8	Yes	
Avg.	0.03	0.17	0.00	0.25	0.3	0.2	1	1.8	Yes	
144 F1	0.01	0.19	0.00	0.05	3.0	2.0	4	15.8	Yes	Light white smoke with sweet odor.
144	0.01	0.19	0.00	0.04	2.5	1.6	4	13.1	Yes	
144	0.01	0.19	0.00	0.03	3.0	2.0	4	15.8	Yes	
Avg.	0.01	0.19	0.00	0.04	2.8	1.9	4	14.9	Yes	
145 F2	0.02	0.19	0.01	0.03	4.5 F (0.1 B)	4.0 F (0.1 B)	3	23.6 F (0.5 B)	Yes	Light white smoke with slight odor.
145	0.02	0.19	0.01	0.03	4.0 F (0.1 B)	3.3 F (0.1 B)	3	19.0 F (0.5 B)	Yes	
145	0.02	0.19	0.01	0.03	4.5 F (0.1 B)	3.7 F (0.1 B)	3	23.6 F (0.5 B)	Yes	
Avg.	0.02	0.19	0.01	0.03	4.3 F (0.1 B)	3.7 F (0.1 B)	3	22.1 F (0.5 B)	Yes	Aluminized cover more flammable than asbestos fabric backing.
146 F1	0.02	0.21	0.03	0.05	4.0	1.9	6	19.0	Yes	Light white smoke with slight odor.
146	0.02	0.20	0.02	0.05	4.0	2.0	6	20.0	Yes	
146	0.02	0.22	0.04	0.06	4.0	1.5	6	18.2	Yes	
Avg.	0.02	0.21	0.03	0.05	4.0	1.8	6	19.1	Yes	
147 S3	0.02	0.18	0.00	0.00	0.1	0.1	2	0.05	Yes	Very light white smoke with slight odor.
147	0.01	0.19	0.00	0.00	0.1	0.1	2	0.05	Yes	
147	0.01	0.19	0.00	0.00	0.1	0.1	2	0.05	Yes	
Avg.	0.01	0.19	0.00	0.00	0.1	0.1	2	0.05	Yes	
147X S3	0.01	4.00	3.81	0.00	4.5	4.5	7	1.1	Yes	Test same as above except burner exposure increased from 12 secs. to 30 secs.

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCC-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
148A R1	0.01	0.20	0.01	0.00	3.8	0.5	4	20.0	Yes	(A) Blue rug. Light white smoke.
148B	0.01	0.22	0.03	0.01	3.8	0.5	4	18.1	Yes	(B) Brown rug. Light white smoke.
148C	0.01	0.20	0.01	0.00	2.3	0.3	2	20.0	Yes	(C) Green rug. Light white smoke.
Avg.	0.01	0.21	0.02	0.00	3.3	0.4	3	19.4	Yes	
149 F1	0.01	0.17	- 0.02	0.00	4.5	4.3	4	26.5	Yes	Light to moderate white acrid smoke.
149	0.01	0.19	0.00	0.00	4.9	4.5	4	25.8	Yes	
149	0.01	0.19	0.00	0.00	4.4	4.0	4	23.2	Yes	
Avg.	0.01	0.19	0.00	0.00	4.6	4.3	4	25.2	Yes	
150 S1	0.01	0.20	0.01	0.00	4.5	2.5	6	22.5	Yes	Heavy white acrid smoke.
150	0.01	0.20	0.01	0.00	4.5	2.5	6	22.5	Yes	
150	0.01	0.23	0.04	0.00	4.5	2.5	6	19.6	Yes	
Avg.	0.01	0.21	0.02	0.00	4.5	2.5	6	21.5	Yes	
151 L3	0.01	0.21	0.01	0.00	1.6	1.3	3	8.0	Yes	Light black acrid smoke.
151	0.01	0.21	0.01	0.00	1.6	1.3	3	8.0	Yes	
Avg.	0.01	0.21	0.01	0.00	1.6	1.3	3	8.0	Yes	
152 L2	0.01	0.21	0.01	0.00	2.0	1.5	4	10.0	Yes	Moderate white very acrid smoke.
152	0.01	0.21	0.01	0.00	2.0	1.6	4	10.0	Yes	
Avg.	0.01	0.21	0.01	0.00	2.0	1.6	4	10.0	Yes	
153 F1	0.01	0.06	- 0.13	0.00	5.7	5.5	2	81.4	Yes	Light white smoke with slight odor.
153	0.01	0.20	- 0.01	0.00	6.8	6.0	4	32.3	Yes	
153	0.01	0.10	- 0.09	0.00	5.7	5.4	2	51.8	Yes	
Avg.	0.01	0.12	- 0.07	0.00	6.1	5.6	3	55.2	Yes	
154 S1	0.06	5.26	5.12	0.06	3.5	3.0	1	0.6	Yes	Light white smoke with slight odor.
154	0.05	5.24	5.09	0.13	3.5	3.5	3	0.7	Yes	
Avg.	0.06	5.25	5.11	0.10	3.5	3.3	2	0.7	Yes	
155 S3	0.03	1.13	0.96	0.00	2.7	2.5	4	2.3	Yes	Moderate gray sooty smoke with slight odor. Drips and burns on floor.

TABLE II

FLAMMABILITY DATA BY 1 1/2-INCH BUNSEN BURNER FLAME
VERTICAL TEST METHOD 5903T (FED. STAND. CCG-T-191b)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Flame-out Time (after 12-sec. burner removal) (min)	Glow Time (min)	Burn Length (in.)	Char Length (in.)	Maximum Flame Height (in.)	Burn-Rate (12-sec. burner time included) (in./min)	Self- Extinguishing	General Remarks
156 F2	0.02	0.08	- 0.10	0.00	2.8	2.7	< 1	35.0	Yes	Very light acrid smoke. Flaming difficult to identify.
157 F1	0.01	0.17	- 0.02	0.00	6.3	6.0	4	37.0	Yes	Moderate to heavy black acrid smoke.
157	0.01	0.51	0.32	0.00	6.0	5.5	4	11.7	Yes	
157	0.01	0.26	0.07	0.00	6.2	6.2	4	25.7	Yes	
Avg.	0.01	0.31	0.12	0.00	6.2	5.9	4	24.8	Yes	
158 S2	0.01	0.19	0.00	0.00	1.9	1.7	3	10.0	Yes	Light gray acrid sooty smoke.
159 S2	0.01	0.19	0.00	0.00	2.0	1.5	3	10.5	Yes	Light white very acrid smoke.
160 S3	0.02	0.18	0.00	0.00	1.0	0.5	2	5.5	Yes	Very light and very acrid smoke.
161 L3	0.03	0.17	0.00	0.00	0.8	0.2	< 1	4.7	Yes	No smoke.
161	0.03	0.17	0.00	0.00	0.9	0.2	< 1	5.3	Yes	
161	0.03	0.17	0.00	0.00	0.9	0.2	< 1	5.3	Yes	
Avg.	0.03	0.17	0.00	0.00	0.9	0.2	< 1	5.1	Yes	
161X F1	0.01	0.74	0.55	0.00	X	12.0	12+	16.2	No	Heavy gray acrid smoke. Same as #161 without aluminum sheet backing.
161X F1	0.01	0.71	0.52	0.00	X	12.0	12+	16.9	No	
162 F1	0.01	0.19	0.00	0.10	0.8	0.2	1	4.2	Yes	
162	0.01	0.19	0.00	0.04	0.5	0.2	1	2.6	Yes	
162	0.01	0.19	0.00	0.07	0.8	0.2	1	4.2	Yes	
Avg.	0.01	0.19	0.00	0.07	0.7	0.2	1	3.7	Yes	
163 L2	0.01	0.19	0.00	0.02	1.5	0.6	3	7.9	Yes	Trace white very acrid smoke.
163	0.01	0.19	0.00	0.02	1.4	0.6	3	7.4	Yes	
163	0.01	0.19	0.00	0.02	1.8	1.0	3	9.5	Yes	
Avg.	0.01	0.19	0.00	0.02	1.6	0.7	3	8.3	Yes	
164 S3	0.01	0.21	0.01	0.03	3.0	2.4	4	14.3	Yes	Light white acrid smoke.

TABLE III

FLAMMABILITY DATA BY NES RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Is Flame-Spread Index	Coefficient of Variation (%)	General Remarks
1 F1	0.18	2.21	X ⁽¹⁾	NR(2)	2.40	NR(2)		63	20.2	222		Light smoke.
1	0.15	3.69	X	-	3.70	-		63	20.3	224		
Avg.	0.17	2.95	X	-	3.00	-	129	63	20.3	223	1	
2 F1	0.41	-	0	-	15.00	9		5	1.0	1		Very light smoke.
2	0.41	0.68	6	-	15.00	9		11	8.7	17		Flaming noticeable only as burner flame enlargement. Melts and shrinks from burner.
Avg.	0.41	0.68	6	-	15.00	9	39	8	4.9	9	88	
3 F1	0.17	1.03	8	-	15.00	NR		37	10.2	66		Light smoke.
3	0.08	1.44	10	-	15.00	-		46	19.6	157		Moderate to heavy flashing.
3	0.09	1.04	11	-	15.00	-		52	22.7	207		Melts.
Avg.	0.11	1.20	10	-	15.00	-	253	45	17.5	146	41	
4 F1	0.18	3.12	14	-	15.00	-		13	9.0	21		Very light smoke.
4	0.18	2.80	12	-	15.00	-		10	11.3	20		Severe melting and flaming droplets.
4	0.18	1.22	12	-	15.00	6		4	7.9	6		
Avg.	0.18	2.38	13	-	15.00	-	52	9	9.4	16	43	
5 F2	0.07	1.93	13	-	15.00	-		75	35.4	464		Heavy smoke.
5	0.09	1.78	X	-	2.90	-		55	29.4	283		Very severe flashing over complete length of sample.
5	0.09	1.87	X	-	2.80	-		47	20.6	170		
Avg.	0.08	1.86	X	-	6.90	-	297	59	28.5	306	37	
6 F2	0.05	2.15	13	-	15.00	-		69	20.4	247		Heavy smoke.
6	0.08	1.13	X	-	1.20	-		63	30.2	333		Some flashing (6 inches max).
6	0.08	1.22	X	-	1.30	-		56	28.0	275		Some glow after flame-out.
Avg.	0.07	1.50	X	-	5.80	-	284	63	26.2	285	12	
7 R2	0.09	2.58	X	-	2.70	15-17		183	12.3	395		Heavy black smoke.
7	0.10	4.19	X	-	4.30	15-17		147	10.2	267		Very high flames.
7	0.11	4.72	X	-	4.80	15-17		121	10.4	219		Flaming droplets from molten pad.
Avg.	0.10	3.83	X	-	3.90	15-17	1011	150	11.0	294	25	Some flashing.

Notes:

- (1) X - Burns completely.
(2) NR - No complete data for first 14 materials.

Abbreviations:

- F1, F2 - Uncoated and coated fabrics.
R1, R2 - Unpadded and padded rugs.
S1, S2, S3 - Flexible, semi-rigid and rigid sheet.
L1, L2, L3 - Flexible, semi-rigid and rigid laminate.
A - Assembly

TABLE III (Continued)

FLAMMABILITY DATA BY NES RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flashing Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Is Flame-Spread Index	Coefficient of Variation (%)	General Remarks
8 R1	0.25	2.35	X	-	2.60	15-17	562	127	11.8	261		Heavy smoke. High flames. Some flashing.
9 S1	0.10	4.00	12	-	15.00	NR	51	51	15.9	142		Heavy white smoke.
9	0.20	1.76	12	-	15.00	-	96	37	7.0	96		High flames above burner.
9	0.11	4.42	13	-	15.00	-	47	47	11.4	94		Some flashing.
Avg.	0.14	3.39	12	-	15.00	-	45	45	11.4	113	42	
10 S2	0.15	4.85	X	-	5.00	15-17	111	111	8.1	156		Very heavy black unbearable sooty smoke
10	0.10	2.10	X	-	2.20	15-17	85	85	15.1	225		High flames.
10	0.09	1.82	X	-	1.90	15-17	91	91	15.8	252		Melts and drips flaming droplets.
Avg.	0.11	2.92	X	-	3.00	15-17	96	96	13.0	211	19	Continues to burn on floor.
11 S3	0.28	1.33	X	-	1.60	15-17	66	66	19.8	229		Extremely heavy black unbearable sooty smoke. High flames.
11	0.17	3.73	X	-	3.90	15-17	183	183	11.7	374		Melts and drips flaming droplets.
11	0.24	3.33	X	-	3.60	15-17	189	189	10.1	334		Continues to burn on floor.
Avg.	0.23	2.80	X	-	3.00	15-17	166	166	13.9	312	20	
12 S3	0.14	11.90	9	-	15.00	NR	25	25	2.3	10		Light white, very acrid and overpowering smoke. Some flashing (6 inches max).
12	0.14	13.40	12	-	15.00	-	33	33	3.5	20		Some glow after flame-out.
12	0.10	11.90	12	-	15.00	-	45	45	2.4	19		
Avg.	0.13	12.40	11	-	15.00	-	55	55	2.7	16	28	
14 S2	0.08	-	0	-	15.00	-	1	1	4.5	1		Light white smoke.
14	0.09	1.68	6	-	15.00	-	1	1	3.7	1		Flaming erratic and difficult to observe.
14	0.08	1.80	6	-	15.00	-	1	1	3.6	1		
Avg.	0.08	1.74	6	-	15.00	-	1	1	3.9	1	0	
17 R2	0.02	7.53	13	7.4	15.00	15-17	58	58	16.6	139		Light white gray acrid smoke.
17	0.02	4.96	X	0.0	5.00	15-17	71	71	20.1	206		
17	0.02	7.18	13	7.7	15.00	15-17	61	61	6.5	57		
Avg.	0.02	6.56	13	5.0	11.70	15-17	942	63	14.4	134	46	
18 R1	0.02	4.63	X	0.0	4.70	15-17	96	96	20.1	277		Heavy black acrid sooty smoke.
18	0.02	3.52	X	0.0	3.60	15-17	97	97	11.9	166		High flames.
Avg.	0.02	4.08	X	0.0	4.20	15-17	97	97	16.0	222	25	
19 S1	0.03	2.12	X	0.0	2.20	15-17	47	47	27.9	188		Light white smoke with sweet odor.
19	0.02	1.28	10	0.0	15.00	10	191	191	29.5	191		Flashes.
19	0.02	1.58	X	0.0	1.60	15-17	69	69	36.2	360		
Avg.	0.02	1.66	X	0.0	6.30	15-17	142	54	31.2	246	33	

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 001366 (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	F _s Flame-Spread Factor	I _s Flame-Spread Index	Coefficient of Variation (%)	General Remarks
20 L3	0.20	2.62	10	0.0	15.00	10	77	19	4.8	13		Heavy black acrid sooty smoke.
21 L3	0.12	2.03	11	0.0	8.00	15-17	253	25	9.4	34		Heavy white acrid smoke. Gases snuff-out burner flame twice. Coating peels off metal.
22 L1	0.07	1.13	9	0.0	15.00	12		7	9.8	10		Light white smoke with very slight odor.
22	0.10	1.06	9	0.0	15.00	12		13	10.0	19		
22	0.09	1.01	9	0.0	15.00	12		6	10.1	9		
22	0.09	1.07	9	0.0	15.00	12	57	9	10.0	13	34	
Avg.												
25 L3	0.10	4.60	10	0.0	15.00	13		88	11.0	140		Moderate white smoke.
25	0.09	3.36	11	0.0	8.00	15-17		72	10.9	113		Incandescent particles ejected from sample.
25	0.08	5.27	11	0.0	11.00	15-17		85	16.1	172		
25	0.09	4.41	11	0.0	11.00	13-17	323	82	12.0	142	17	
Avg.												
26 L3	0.05	4.35	8	0.0	15.00	9		56	5.4	44		Moderate white smoke.
26	0.04	5.56	9	0.0	15.00	10		61	5.3	46		Burns with crackling noises.
26	0.04	5.46	13	0.0	8.00	15-17		57	7.2	59		
26	0.04	5.12	10	0.0	12.70	9-17	175	58	6.0	50	13	
Avg.												
28 F1	0.02	-	0	0.0	4.40	15-17		6	1.0	1		Heavy white acrid smoke.
28	0.02	-	0	0.0	4.70	15-17		7	1.0	1		No visible flaming.
28	0.02	-	0	0.0	5.40	15-17		8	1.0	1		Shrinks and chars rapidly.
28	0.02	-	0	0.0	4.80	15-17	26	7	1.0	1	0	
Avg.												
29 F1	0.02	-	0	0.0	5.60	15-17		9	1.0	1		Heavy white acrid smoke.
29	0.02	0.38	3	0.0	6.30	15-17		12	6.2	11		Flaming erratic and brief.
29	0.02	0.46	3	0.0	5.50	15-17		11	4.8	8		Shrinks and chars rapidly.
29	0.02	0.28	2	0.0	5.80	15-17	116	11	4.0	7	61	
Avg.												
30 A	0.03	3.97	7	0.0	15.00	14		54	5.4	42		Heavy white, very acrid smoke.
30	0.03	2.97	7	0.0	15.00	14		40	5.7	33		Flaming extends around sides and back of sample. Honeycomb core completely destroyed.
30	0.02	2.48	7	0.0	15.00	14		39	5.2	29		
30	0.03	3.14	7	0.0	15.00	14	735	44	5.4	35	16	
Avg.												
31 S1	0.03	0.67	8	9.0	15.00	10		4	12.4	7		Moderate gray acrid smoke.
31	0.02	1.36	12	8.0	15.00	14		5	17.7	13		Melts and disintegrates.
31	0.02	1.13	10	4.0	15.00	14		5	18.1	13		
31	0.02	1.05	10	7.0	15.00	13	245	5	16.0	11	26	
Avg.												

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00156b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	F _a - Spread Factor	I _s Flame-Spread Index	Coefficient of Variation (%)	General Remarks
32 L3	0.06	2.04	10	0.0	15.00	14	134	9	6.9	9		Light white acrid smoke. Flashes.
33 S3	0.02	9.48	10	0.0	11.00	15-17		62	5.1	46		Heavy black, very acrid sooty smoke. Unbearable after four minutes. High flames.
33	0.02	12.68	10	0.0	13.00	15-17		55	5.3	42		
33	0.02	7.98	13	0.0	10.00	15-17		51	5.1	38		
Avg.	0.02	10.05	11	0.0	11.00	15-17	614	56	5.2	42	8	
34 F2	0.02	0.53	9	0.0	15.00	15		32	40.8	188		Light white smoke with very slight odor.
34	0.02	0.43	8	0.0	15.00	15		28	29.3	118		
Avg.	0.02	0.48	9	0.0	15.00	15	39	30	35.0	153	23	
35 S3	0.02	13.63	11	0.0	15.00	15		70	5.2	53		Very heavy black acrid smoke with heavy soot.
35	0.02	10.68	11	0.0	15.00	15		59	4.5	38		
35	0.02	9.48	12	0.0	15.00	15		64	6.8	63		
Avg.	0.02	11.26	11	0.0	15.00	15	619	64	5.5	41	20	
38 S3	0.07	3.83	X	0.0	3.90	15-17		221	10.4	330		Light white smoke with sweet odor. Very high flames. Severe melting. Flaming droplets continue to burn on floor.
38	0.07	4.18	X	0.0	4.30	15-17		280	9.7	390		
Avg.	0.07	4.00	X	0.0	4.10	15-17	1251	250	10.0	360	8	
39 S3	0.02	4.83	10	10.0	15.00	11	477	53	5.4	41		Very heavy black acrid smoke with heavy soot. Continuous glow after flame-out.
40 S1	0.03	0.07	3	0.0	4.80	15-17		5	11.0	8		Very light smoke. Shrinks from burner flame and disintegrates.
40	0.02	0.05	2	0.0	4.50	15-17		5	1.0	1		
Avg.	0.03	0.06	3	0.0	4.70	15-17	3	5	6.0	4	86	
41 A	0.04	1.00	X	0.0	1.04	15-17		99	28.0	399		Heavy black acrid smoke. Drips but does not burn on floor.
41	0.03	1.75	X	0.0	1.78	15-17		99	18.1	259		
Avg.	0.04	1.38	X	0.0	1.61	15-17	459	99	23.0	329	21	
42 A	0.15	-	0	12.0	15.00	14	30	5	1.0	1		Very light acrid smoke. Flaming only detected as burner flame enlargement.
43 A	0.15	-	0	12.0	15.00	14	52	9	1.0	1		Very light acrid smoke. Flaming only detected as burner flame enlargement.

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Is Flame-Spread Index	Coefficient of Variation (%)	General Remarks
44	0.03	2.72	11	0.0	10.00	15-17		46	14.8	98		Heavy black/white acrid smoke. White smoke develops before flame propagation.
44	0.02	3.18	11	0.0	7.00	15-17		55	20.7	164		
44	0.02	3.28	11	0.0	7.00	15-17		33	9.9	47		
Avg.	0.02	3.06	11	0.0	8.00	15-17	310	45	15.1	83	62	
45	0.02	4.78	10	0.0	15.00	11		50	7.4	53		Very heavy black acrid smoke with heavy soot. High flames.
45	0.02	4.68	9	0.0	15.00	11		37	6.9	36		
45	0.02	5.10	10	0.0	15.00	11		41	6.4	38		
Avg.	0.02	4.85	10	0.0	15.00	11	330	43	6.9	42	18	
46	0.03	7.37	5	0.0	15.00	12		30	1.4	6		Moderate gray acrid smoke. Gases snuff-out pilot flames four to five times.
46	0.04	9.61	11	0.0	15.00	13		34	3.3	16		
46	0.03	2.47	7	0.0	15.00	12		22	3.5	11		
Avg.	0.03	6.48	8	0.0	15.00	12	624	28	2.7	11	37	
47	0.04	-	0	0.0	15.00	15-17		7	1.0	1		Very light smoke with no odor. No visible flaming.
47	0.02	-	0	0.0	15.00	15-17		5	1.0	1		
47	0.02	-	0	0.0	15.00	15-17		7	1.0	1		
Avg.	0.03	-	0	0.0	15.00	15-17	155	6	1.0	1	0	
48	0.02	5.28	12	0.0	10.00	15-17		77	7.0	77		Very heavy black acrid smoke with heavy soot. High flames.
49	0.03	8.22	12	0.0	10.00	15-17		69	13.9	138		
49	0.09	7.47	13	0.0	12.00	15-17		94	4.7	64		Very heavy black acrid smoke with heavy soot. High flames.
Avg.	0.06	7.85	13	0.0	11.00	15-17	722	82	9.3	101	37	
51	0.01	4.99	11	0.0	15.00	14		84	7.4	90		Heavy gray acrid smoke with light soot.
51	0.01	13.40	12	0.0	15.00	14		94	9.7	131		
Avg.	0.01	9.19	12	0.0	15.00	14	1535	89	8.6	111	18	
52	0.01	0.42	X	0.0	0.43	15-17		56	104.6	844		Very light acrid smoke. Extensive melting. Flaming droplets burn on floor.
52	0.01	0.40	X	0.0	0.41	15-17		75	115.8	1250		
52	0.01	0.41	X	0.0	0.42	15-17		66	110.2	1047		
Avg.	0.01	0.41	X	0.0	0.42	15-17	194	66	110.2	1047	19	
53	0.01	0.54	2	12.0	15.00	15-17		5	1.0	1		Heavy white acrid smoke. Pilot snuffed out. Nylon cover burns completely.

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Is Index	Coefficient of Variation (%)	General Remarks
54 A	0.01	0.39	2	12.0	15.00	15-17	100	5	1.0	1		Heavy white acrid smoke. Pilot snuffed out. Nylon cover burns completely.
55 F2	0.02	0.54	5	2.0	15.00	14	130	6	4.1	4		Moderate white acrid smoke. Covering of No. 53 only.
56 F2	0.02	0.44	5	1.0	2.10	15-17		9	5.4	7		Light white acrid smoke. Covering of No. 54 only.
57 F2	0.01	0.07	3	0.0	15.00	1		7	21.0	21		Light white acrid smoke. Flashes.
57	0.01	0.09	9	0.0	15.00	1		2	104.0	30		
57	0.01	0.24	6	0.0	15.00	1		7	26.0	26		
AVG.	0.01	0.13	6	0.0	15.00	1	245	5	50.3	26	14	
58 F1	0.04	1.38	10	12.0	15.00	15-17		21	17.2	52		Moderate white acrid smoke. High flames. Softens and boils.
58	0.04	1.20	11	7.0	10.00	15-17		27	16.1	70		
58	0.05	1.06	10	5.0	8.00	15-17		25	31.7	114		
AVG.	0.04	1.21	10	8.0	11.00	15-17	297	24	22.3	79	33	
59 S1	0.02	0.93	3	5.0	10.00	15-17		11	1.6	3		Light white acrid smoke. Swells and blisters.
59	0.02	1.48	3	4.0	10.00	15-17		13	2.3	4		
59	0.02	0.96	3	9.0	15.00	15-17		12	2.3	4		
AVG.	0.02	1.12	3	6.0	12.00	15-17	200	12	2.1	4	14	
60 S3	0.02	6.68	7	0.0	8.00	15-17	560	45	6.1	39		Heavy grey, very acrid smoke with heavy soot. Flashes.
61 S3	0.02	10.60	14	0.0	12.00	15-17		55	3.6	28		Heavy white acrid smoke with heavy soot.
61	0.02	8.78	12	0.0	12.00	15-17		46	3.2	21		
AVG.	0.02	9.69	13	0.0	12.00	15-17	340	51	3.4	25	11	
62 S3	0.02	9.68	8	0.0	15.00	15-17	680	21	1.8	6		Heavy white acrid smoke with heavy soot.
63 F1	0.02	0.00	0	0.0	5.00	15-17		2	1.0	<1		Heavy white acrid smoke. No visible flaming.
63	0.02	0.00	0	0.0	5.00	15-17		9	1.0	1		
63	0.02	0.00	0	0.0	5.00	15-17		1	1.0	<1		Shrinks and chars rapidly.
AVG.	0.02	0.00	0	0.0	5.00	15-17	130	4	1.0	1	0	

TABLE III (Continued)
 FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
 FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	F _s Flame-Spread Factor	I _s Flame-Spread Index	Coefficient of Variation (%)	General Remarks
64 R1	0.02	3.98	X	0.0	4.00	15-17	520	76	10.4	114		Moderate gray smoke. High flames.
65 R1	0.02	2.49	X	0.0	2.50	15-17		166	13.0	310		Heavy black acrid smoke.
65 Avg.	0.02	2.35	X	0.0	2.40	15-17		134	13.3	256		High flames.
66 S1	0.02	2.42	X	0.0	2.50	15-17	810	150	13.2	283	9	Flaming droplets burn on floor.
66 S1	0.02	2.02	X	0.0	2.04	15-17		45	16.6	107		Moderate gray acrid smoke.
66 S1	0.02	2.03	X	0.0	2.05	15-17		51	21.6	159		Flashes.
66 S1	0.02	1.72	X	0.0	1.74	15-17	230	36	20.9	108		
66 S1	0.02	1.92	X	0.0	1.94	15-17		44	19.7	125	19	
67 L2	0.02	1.74	11	0.0	15.00	1		5	14.5	10		Moderate gray acrid smoke.
67 L2	0.02	1.88	11	0.0	15.00	1		9	11.5	15		Minor flashing.
67 L2	0.02	1.68	9	0.0	15.00	1	65	9	12.5	16		
67 L2	0.02	1.77	10	0.0	15.00	1		8	12.8	14		
68 L2	0.02	8.43	11	0.0	10.00	15-17		33	15.4	73		Heavy gray very acrid smoke.
68 L2	0.02	4.93	11	0.0	10.00	15-17		31	8.0	36		Gases snuff-out burner flames four to five times.
68 L2	0.02	6.68	11	0.0	10.00	15-17	270	32	11.7	55	34	
69 L2	0.02	1.88	10	0.0	10.00	15-17	108	20	9.5	27		Heavy gray very acrid smoke. Gases snuff-out burner flames four to five times.
70 L2	0.02	7.28	14	0.0	10.00	15-17		35	11.8	60		Heavy black, very acrid smoke with heavy soot.
70 L2	0.02	5.58	X	0.0	5.60	15-17		31	13.6	100		High flames.
70 L2	0.02	6.43	X	0.0	7.80	15-17	39	43	12.7	80	25	
71 L2	0.02	3.73	11	0.0	7.00	15-17		5	4.6	3		Moderate gray, very acrid smoke.
71 L2	0.02	2.18	7	0.0	7.00	15-17		6	7.3	6		Gases snuff-out burner flames two to three times.
71 L2	0.02	2.96	9	0.0	7.00	15-17	65	6	6.0	5	35	
72 L3	0.03	9.87	X	0.0	12.10	15-17		43	4.3	27		Heavy black, very acrid smoke with heavy soot.
72 L3	0.03	12.17	13	0.0	15.00	15-17		36	3.6	19		
72 L3	0.03	7.97	11	0.0	15.00	15-17		32	3.2	15		
72 L3	0.03	10.00	X	0.0	14.00	15-17	540	37	3.7	20	22	

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Flame-Spread Index	Coefficient of Variation	General Remarks
73 S3	0.03	10.97	13	0.0	15.00	14		80	3.9	45		Heavy black acrid smoke with heavy soot.
73	0.02	5.03	10	0.0	15.00	14		64	4.7	44		Gases snuff-out burner flames four to five times.
73	0.02	13.33	14	0.0	15.00	15		76	4.7	52		
AVG.	0.02	9.78	12	0.0	15.00	14	1340	73	4.4	47	8	
74 S3	0.08	10.25	X	0.0	10.30	15-17	> 2000	369	5.1	272		Light white smoke with sweet odor. Flames and temperature very high.
76 A	0.06	11.44	10	3.0	15.00	11		28	7.1	28		Heavy white acrid smoke.
76	0.06	7.18	12	4.0	15.00	13		36	10.4	54		Flashes.
76	0.02	9.02	10	3.0	15.00	11		48	19.8	136		Intumescent coating swells 3/16 inches Max.
AVG.	0.05	9.21	11	3.3	15.00	12	540	37	12.4	73	63	
101 F1	0.08	-	0	15.0	15.00	6		14	1.0	2		Very light white smoke with no odor.
101	0.06	-	0	15.0	15.00	8		12	1.0	2		No flaming other than brief burner flame enlargement.
101	0.06	-	0	15.0	15.00	5		10	1.0	1		
AVG.	0.07	-	0	15.0	15.00	6	98	12	1.0	2	29	
102 F1	0.05	1.95	6	13.0	15.00	11		10	3.8	6		Light white smoke with no odor.
102	0.04	1.95	8	13.0	15.00	9		15	4.1	9		
102	0.05	1.95	8	13.0	15.00	9		13	4.6	9		
AVG.	0.05	1.95	7	13.0	15.00	10	220	13	4.2	8	18	
103A S3	0.02	-	0	14.0	15.00	15-17		23	1.0	3		Moderate white, very acrid smoke.
103A	0.02	-	0	14.0	15.00	15-17		10	1.0	1		No visible flaming.
103A	0.02	-	0	13.0	15.00	15-17		15	1.0	2		Shrinks and withdraws from burner flames.
AVG.	0.02	-	0	13.7	15.00	15-17	490	16	1.0	2	42	
103B S3	0.02	-	0	13.0	15.00	15-17		21	1.0	3		Thinner than 103A.
103B	0.02	-	0	11.0	15.00	15-17		10	1.0	1		
103B	0.02	-	0	10.0	15.00	15-17		6	1.0	1		
AVG.	0.02	-	0	11.0	15.00	15-17		12	1.0	2	50	Moderate white smoke with slightly acrid odor.
104 A	0.03	0.48	6	0.0	10.00	<1	20	2	18.2	5		
105 F2	-	0.00	0	0.0	15.00	<1	0	0	1.0	<1		No smoke or odor. Non combustible.

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Fs Flame-Spread Factor	Is Flame-Spread Index	Coefficient of Variation (%)	General Remarks
108 F1	0.01	-	0	0.0	4.00	15-17	13	2	1.0	< 1		Heavy white acrid smoke. Chars rapidly. No visible flaming.
109 S3	0.04	11.60	13	10.0	15.00	14	66	66	7.7	73		Heavy black acrid sooty smoke. Flames very high.
109 Avg.	0.04	14.50	13	10.0	15.00	14	91	74	4.3	56	13	
110 S3	0.04	13.20	13	10.0	15.00	14	830	74	6.0	65		Heavy black acrid smoke with heavy soot. High gas flames above burner but not on sample.
111 S3	0.02	10.60	12	0.0	15.00	14	1570	83	5.6	67		Same observations as above for this sample.
112A S2	0.09	5.91	12	0.0	15.00	15-17	1030	80	6.7	78		Sample 0.060 inches thick. Moderate black slightly acrid smoke. Melts, drips and burns eight to 10 seconds on floor.
112A Avg.	0.05	6.45	12	0.0	15.00	15-17	610	40	4.5	26	11	
112B S2	0.07	4.53	11	0.0	15.00	15-17	610	37	4.1	22		Sample same as above but .020 inches thick. Moderate black slightly acrid smoke.
112B Avg.	0.07	5.63	11	0.0	15.00	15-17	610	39	3.6	20	22	
113 S1	0.04	5.13	12	1.5	7.00	15-17	50	19	4.1	23		No smoke or odor. Non-combustible.
114 F2	0.02	5.93	14	4.0	10.00	15-17	50	25	5.3	14		Light white acrid smoke. No visible flame.
114 Avg.	0.02	4.79	X	0.0	4.80	15-17	50	23	7.3	24		Very light white smoke. No visible flaming. Melts and vaporizes.
115 S1	0.07	5.31	X	1.8	7.30	15-17	50	22	6.1	19		Light white slightly acrid smoke. Blisters and crackles.
116 S2	0.03	2.20	1	10.0	15.00	7	7	7	1.0	1		
116 Avg.	0.02	2.90	2	10.0	15.00	7	11	11	1.0	2		
116 Avg.	0.02	0.68	2	10.0	15.00	8	12	12	1.0	2		
116 Avg.	0.02	1.93	2	10.0	15.00	7	10	10	1.0	2		

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Fs Flame-Spread Factor	Is Flame-Spread Index	Coefficient of Variation (%)	General Remarks
117 S3	0.02	4.60	9	0.0	15.00	14		29	12.3	51		Heavy gray acrid smoke.
117	0.02	4.60	10	0.0	15.00	15		28	7.7	31		Burner flame snuffed-out four to five times.
117 Avg.	0.02	5.70	12	0.0	15.00	14	134	26	15.6	58	24	
117	0.02	4.96	10	0.0	15.00	14		28	11.9	47		
118A S1	0.03	-	0	0.0	15.00	1		11	1.0	2		Only differences between samples A, B, C and D are coating and thickness.
118B S1	0.02	-	0	0.0	15.00	1		7	1.0	1		Very light white smoke.
118C S1	0.02	-	0	0.0	15.00	6	50	3	1.0	<1		No visible flaming.
118D S1	0.02	-	0	0.0	15.00	2		7	1.0	1		No smoke with only trace of odor.
119 F2	0.21	-	0	0.0	15.00	1		6	1.0	1		No visible flaming.
119	0.08	-	0	0.0	15.00	1		7	1.0	1		No smoke with only trace of odor.
119 Avg.	0.20	-	0	0.0	15.00	1	77	7	1.0	1	0	No smoke with only trace of odor.
119	0.16	-	0	0.0	15.00	1		7	1.0	1		No visible flaming.
120 S2	0.03	-	0	0.0	15.00	1		1	1.0	<1		Very light white smoke. Blisters over entire area.
121 S3	0.06	10.00	2	5.0	15.00	9		22	1.0	3		
121	0.08	10.00	2	5.0	15.00	9		14	1.0	2		
121 Avg.	0.07	10.00	2	5.0	15.00	9	230	13	1.0	2	27	
121	0.07	10.00	2	5.0	15.00	9		16	1.0	2		
122 S3	0.02	0.65	2	14.0	15.00	13		27	1.0	4		Light white smoke with very acrid unbearable odor after four minutes.
122	0.02	1.00	2	14.0	15.00	13		27	1.0	4		Burns with pale blue intermittent flame.
122 Avg.	0.02	0.88	2	14.0	15.00	13	580	25	1.0	4	0	
122	0.02	1.00	2	14.0	15.00	13		26	1.0	4		
123 S1	0.01	1.68	X	0.0	2.20	15-17		94	82.7	1120		Very heavy black acrid smoke.
123	0.01	0.71	X	0.0	2.75	15-17		83	98.4	1175	2	High flames.
123 Avg.	0.01	1.21	X	0.0	2.48	15-17		89	90.6	1148		
123X	0.01	3.50	6	11.5	15.00	15-17		72	18.0	187		Same as above but reverse smooth side of pad.
124 F1	0.01	-	0	0.0	2.00	15-17		1	1.0	<1		Very light white smoke with slight odor.
124	0.01	-	0	0.0	2.00	15-17		2	1.0	<1		No visible flaming.
124 Avg.	0.01	-	0	0.0	2.00	15-17	10	2	1.0	<1	0	Very rapid melting.

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Is Index	Coefficient of Variation (%)	General Remarks
125 F2	0.02	-	0	0.0	15.00	1	9	1.0	1	1	0	Very light smoke with sweet odor. No visible flaming.
125	0.03	-	0	0.0	15.00	1	8	1.0	1	1		
125	0.03	-	0	0.0	15.00	1	6	1.0	1	1		
Avg.	0.03	-	0	0.0	15.00	1	8	1.0	1	1	0	
126 F2	0.02	-	0	0.0	15.00	1	6	1.0	1	1	0	No smoke with light sweet odor. No visible flaming.
126	0.02	-	0	0.0	15.00	1	7	1.0	1	1		
126	0.02	-	0	0.0	15.00	1	6	1.0	1	1		
Avg.	0.02	-	0	0.0	15.00	1	6	1.0	1	1	0	
128A S1	0.02	0.88	X	0.0	0.90	15-17	83	53.5	639	4	3	(A) Fire Retardant Foam
128A	0.02	0.78	X	0.0	0.80	15-17	82	50.6	597	4	3	Moderate white smoke with sweet odor. Very high flames. Drips but drops do not burn.
128A	0.01	0.78	X	0.0	0.79	15-17	615	54.0	615	4	3	
Avg.	0.02	0.81	X	0.0	0.83	15-17	81	52.7	617	4	3	
128B S1	0.01	0.39	X	0.0	0.40	15-17	195	21.1	2983	4	19	(B) Regular Foam
128B	0.01	0.41	X	0.0	0.40	15-17	136	19.6	1927	4	19	Light gray sweet smoke. Very high flames. Melts with droplets burning on floor.
128B	0.01	0.39	X	0.0	0.40	15-17	137	19.7	2151	4	19	
Avg.	0.01	0.40	X	0.0	0.40	15-17	156	20.1	2354	4	19	
129 S1	0.12	8.18	4	6.0	15.00	8	21	1.4	4	6	18	Light white acrid smoke. Heavy white acrid smoke. Moderate white acrid smoke. No visible flaming.
130 S1	0.07	4.10	5	10.0	15.00	8	22	1.8	6	3	18	Heavy white acrid smoke. Moderate white acrid smoke. No visible flaming.
131 S1	0.05	-	0	14.0	15.00	12	19	1.0	3	56	15	Heavy white acrid smoke. Flames high. Flashes.
132 F1	0.02	1.03	9	5.0	1.20	15-17	14	27.7	56	282	15	Heavy black acrid smoke. Flames high. Melts but drops do not burn on floor.
132	0.02	0.73	10	1.0	2.00	15-17	15	31.6	68	318	14	
132	0.02	0.72	8	1.0	1.90	15-17	14	23.1	47	216	14	
Avg.	0.02	0.83	9	2.0	1.71	15-17	14	27.5	57	272	14	
133 L1	0.05	2.45	X	0.0	2.50	15-17	58	24.5	205	282	15	Heavy gray acrid smoke. Flames high. Flashes.
134 L1	0.03	1.82	X	0.0	1.85	15-17	63	31.1	282	318	15	Heavy black acrid smoke. Flames high. Melts but drops do not burn on floor.
134	0.02	1.74	X	0.0	1.76	15-17	63	35.0	318	216	15	
134	0.02	2.98	X	0.0	3.00	15-17	59	25.5	216	272	15	
Avg.	0.02	2.18	X	0.0	2.20	15-17	62	29.2	272	360	15	

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Fs Flame-Spread Factor	Is Flame-Spread Index	Coefficient of Variation (%)	General Remarks
135 L2	0.03	2.27	8	11.0	15.00	15 P(3) 9 B(4)		7	5.2	5		Moderate gray smoke with very acrid odor. Small flames.
135	0.03	0.57	5	11.0	15.00	15-17 F 11 B		13	5.0	9		
135	0.03	2.71	7	11.0	15.00	15-17 F 9 B		12	5.7	10		
Avg.	0.03	1.85	7	11.0	15.00	15-17 F 9 B	80	11	5.3	8	27	
136 L3	0.05	5.95	14	5.0	15.00	14 F 8 B		34	7.5	37		Moderate black sooty smoke with very acrid odor. Very high and bright flames
136	0.03	5.71	13	4.0	15.00	13 F 8 B		35	5.3	27		
136	0.03	5.59	13	5.0	15.00	13 F 6 B		37	12.7	68		
Avg.	0.04	5.75	13	4.7	15.00	13 F 7 B	420	35	8.5	44	40	
137 L3	0.02	5.73	7	4.0	10.00	15-17 F 14 B		29	2.6	11		Moderate black, very sooty smoke with very acrid odor. High flames.
137	0.02	4.48	7	5.0	10.00	15-17 F 15-17 B		35	2.9	15		Burner flames snuffed-out four to five times.
137	0.02	4.68	8	5.0	10.00	15-17 F 15-17 B		37	3.5	19		
Avg.	0.02	4.96	7	4.7	10.00	15-17 F 15-17 B	390	34	3.0	15	22	
138 F1	0.05	0.77	13	13.0	15.00	13		3	34.7	1		Light to moderate white smoke with acrid odor. No visible flaming.
138	0.07	-	0	13.0	15.00	10		2	1.0	<1		
138	0.06	-	0	13.0	15.00	10		2	1.0	<1		
Avg.	0.06	0.26	4	13.0	15.00	11	20	2	12.2	<1	0	
140 F1	0.05	-	0	4.0	15.00	15-17		8	1.0	1		Heavy white smoke with pungent odor.
140	0.07	-	0	5.0	15.00	15-17		1	1.0	<1		
140	0.10	-	0	3.0	15.00	15-17		5	1.0	1		
Avg.	0.07	-	0	4.0	15.00	15-17	120	5	1.0	1	0	

Notes:
(3) F - Facing side of test sample.
(4) B - Backing side of test sample.

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 001366 (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flashing Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Is Flame-Spread Index	Coefficient of Variation (%)	General Remarks
141 S2	0.06	4.89	6	2.0	15.00	9		12	2.1	4		
141	0.06	6.84	10	3.0	15.00	11		13	3.2	6		
141	0.06	9.94	12	5.0	15.00	13		20	2.8	8		
AVG.	0.06	7.22	9	3.0	15.00	11	220	15	2.7	6	27	
142 S3	0.02	0.78	13	0.0	15.00	15-17		20	55.7	160		Light black sooty smoke with slight odor.
142	0.02	1.17	13	0.0	15.00	15-17		23	62.2	206		
AVG.	0.02	0.98	13	0.0	15.00	15-17	70	22	58.9	183	13	Moderate white acrid smoke.
143 R1	0.04	3.92	7	11.0	15.00	11		10	2.4	3		
143	0.04	-	0	12.0	15.00	11		4	1.0	1		
143	0.04	-	0	13.0	15.00	11		5	1.0	1		
AVG.	0.04	-	2	12.0	15.00	11	170	6	1.5	2	16	Light white smoke with slight odor. Small flames.
144 F1	0.07	-	0	13.0	15.00	9		8	1.0	1		
144	0.05	-	0	12.0	15.00	9		6	1.0	1		
144	0.05	1.68	7	13.0	15.00	9		11	4.2	7		
AVG.	0.06	-	2	13.0	15.00	9	90	8	2.1	3	94	Moderate white acrid smoke.
145 F2	0.06	-	0	0.0	15.00	1		3	1.0	<1		No smoke or odor. No visible flaming.
145	0.04	-	0	0.0	15.00	1		6	1.0	1		
AVG.	0.05	-	0	0.0	15.00	1		5	1.0	1	0	
146 F1	0.07	0.68	3	13.0	15.00	6		4	2.5	1		Very light acrid smoke. Flashes.
146	0.07	0.53	2	10.5	15.00	12		10	1.0	1		
146	0.06	5.24	13	9.0	15.00	13		7	4.8	5		
AVG.	0.07	2.15	6	10.8	15.00	10	110	7	2.8	2	89	
147 S3	0.09	14.26	X	0.0	14.35	15-17		201	3.7	107		Heavy gray acrid smoke. Very high flames. Snapping and crackling.
147	0.07	14.13	X	0.0	14.20	15-17		221	4.1	129		
AVG.	0.08	14.20	X	0.0	14.28	15-17	4670	211	3.9	118	9	
148 R1	0.02	6.13	14	0.0	10.00	15-17		80	34.6	399		Heavy gray, very acrid sooty smoke. Very high flames. Burner flames snuffed-out four to five times.
148	0.02	7.38	X	0.0	7.40	15-17		79	11.8	144		
148	0.03	5.54	13	0.0	10.00	15-17		76	18.6	203		
AVG.	0.02	6.35	14	0.0	9.10	15-17	630	78	21.7	249(5)	44	

(5) Rug backing responsible for high index. Backing alone - Is 186.

TABLE III (Continued)

FLAMMABILITY DATA BY NES RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	Flame-Spread Factor	Is Index	Coefficient of Variation (%)	General Remarks
149 F1	0.02	-	0	0.0	4.00	15-17		3	1.0	1		Light white acrid smoke.
149	0.01	-	0	0.0	4.00	15-17		3	1.0	1		No visible flames.
149	0.01	-	0	0.0	4.00	15-17		3	1.0	1		Sample shrinks from heat.
Avg.	0.01	-	0	0.0	4.00	15-17		3	1.0	1	0	
150 S1	0.01	0.44	X	0.0	0.45	15-17		69	76.1	756		Heavy white acrid smoke.
150	0.01	0.47	X	0.0	0.48	15-17		67	83.4	805		High flames.
150	0.01	0.49	X	0.0	0.50	15-17		75	77.4	836		Drips and burns on floor.
Avg.	0.01	0.47	X	0.0	0.48	15-17	170	70	78.4	799	4	
151 L3	0.03	5.67	14	0.0	7.00	15-17		36	6.2	32		Heavy black, very acrid, very sooty smoke. Burner flames snuffed-out two to three times. Flashes.
151	0.03	5.79	14	0.0	7.00	15-17		39	6.4	36		
Avg.	0.03	5.73	14	0.0	7.00	15-17	290	38	6.3	34	6	
152 L2	0.02	8.88	12	1.0	10.00	15-17		31	7.6	34		Heavy gray, very acrid smoke.
152	0.02	12.33	13	0.6	13.00	15-17		34	4.2	21		
Avg.	0.02	10.60	13	0.8	12.00	15-17	760	33	5.9	28	23	
153 F1	0.08	0.96	10	0.0	15.00	15-17		13	57.3	107		Moderate to heavy gray smoke. Sample shrinks from heat.
153	0.02	0.64	7	0.0	5.00	15-17		21	22.7	68		
153	0.02	1.16	10	0.0	4.00	15-17		27	57.3	223		
Avg.	0.04	0.92	9	0.0	8.00	15-17	60	20	45.8	133	56	
154 S1	0.07	7.22	13	9.2	15.00	14		39	6.4	35		Heavy white gritty smoke.
154	0.07	7.23	13	9.2	15.00	14		40	6.1	35		
154	0.05	8.07	X	0.0	8.12	15-17		37	5.7	30		
Avg.	0.06	7.51	13	6.1	12.71	15	600	39	6.1	33	7	Sample length nine inches. Moderate gray acrid, very sooty smoke. Drops let's burn on floor.
155 S3	0.10	3.15	9	0.0	4.00	9	100	25	5.0	18		
157 F1	0.01	-	0	0.0	5.00	15-17		8	1.0	1		Light white light acrid smoke.
157	0.01	-	0	0.0	5.00	15-17		10	1.0	1		No visible flames.
157	0.01	-	0	0.0	5.00	15-17		4	1.0	1		
Avg.	0.01	-	0	0.0	5.00	15-17	110	7	1.0	1	0	

TABLE III (Continued)

FLAMMABILITY DATA BY NBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Total (Btu)	Max Temperature Rise (°C)	F _s Spread Factor	Is Flame- Spread Index	Coefficient of Variation (%)	General Remarks
158 S2	0.05	2.45	8	0.0	7.00	15-17		25	13.0	47		Heavy gray, very acrid sooty smoke. High gas flames. Burner flames snuffed-out two to three times.
159 S2	0.03	3.47	11	0.0	5.00	15-17		30	7.0	30		Heavy gray, very acrid sooty smoke. High gas flames. Burner flames snuffed-out two to three times.
160 S3	0.02	4.98	10	0.0	10.00	15-17	460	27	3.4	13		Heavy white acrid smoke. High gas flames. Burner flames snuffed-out two to three times.
161 L3	0.06	1.74	10	3.0	6.00	15-17		10	8.1	12		Moderate white acrid smoke. High gas flames.
161	0.09	1.16	10	3.0	5.00	15-17		8	8.9	10		
161	0.08	1.22	9	3.0	5.00	15-17		11	9.3	15		
Avg.	0.08	1.37	10	3.0	5.00	15-17	110	10	8.8	12	17	
162 F1	-	-	0	0.0	15.00	<1		0	1.0	<1		Trace white smoke with slight odor. Asbestos synthetic blend fabric.
162	-	-	0	0.0	15.00	<1		3	1.0	<1		
Avg.	-	-	0	0.0	15.00	<1		2	1.0	<1	0	
163 L2	0.07	1.23	3	0.0	15.00	15-17		4	2.4	1		Moderate white, very acrid smoke. Minor flashing.
163	0.07	1.23	3	0.0	15.00	15-17		4	2.1	1		
163	0.06	1.14	3	0.0	15.00	15-17		4	2.0	1		Asbestos sheet sub-strate.
Avg.	0.07	1.20	3	0.0	15.00	15-17	20	4	2.2	1	0	
164 S3	0.03	11.37	9	3.0	15.00	15-17	720	40	6.4	37		Heavy black, very acrid sooty smoke. High flames. Burner flames snuffed- out four to five times. Flashes.

TABLE III (Continued)

FLAMMABILITY DATA BY MBS RADIANT PANEL APPARATUS
FEDERAL STANDARD - TEST METHOD NO. 00136b (ASTM E-162)

Material No. Code	Ignition Time (min)	Total Flaming Time (min)	Max Flame Propagation (in.)	Glow Time (min)	Total Burning Time (min)	Char Length (in.)	Heat Contributed Total (Btu)	Max Temperature Rise (°C)	F _s Flame-Spread Factor	I _s Flame-Spread Index	Coefficient of Variation (%)	General Remarks
Comb.(A)(6)	0.05	4.25	X	0.00	10.00	15-17		85	14.5	177		(A) Cover #58 + Liner #47 + Foam pad #128B Heavy white acrid smoke. High flames.
Comb.(B)	0.04	3.16	7	0.00	15.00	15-17		26	8.4	31		(B) Cover #58 + Liner #47 + Foam pad #128A Heavy white acrid smoke. Moderate flames.
Comb.(C)	0.04	2.46	7	0.00	15.00	15-17		25	13.0	47		(C) Cover #58 + Liner #119 + Foam pad #128B Moderate white acrid smoke. High flames.
Comb.(D)	0.02	1.98	7	0.00	15.00	15-17		22	10.1	32		(D) Cover #58 + Liner #119 + Foam pad #128A Heavy white acrid smoke. Moderate flames.
Comb.(E)	0.03	5.57	X	0.00	15.00	15-17		23	11.3	38		(E) Cover #144 + Liner #119 + Foam pad #128B Moderate white acrid smoke. Moderate flames.
Comb.(F)	0.02	4.98	X	0.00	15.00	15-17		23	13.2	44		(F) Cover #144 + Liner #119 + Foam pad #128A Moderate white acrid smoke. Moderate flames.
Comb.(G)	0.03	2.00	4	7.50	15.00	10		21	1.9	3		(G) Cover #144 + Liner #145 + Foam pad #128B Moderate white slightly sweet smoke. Foam pad chars 15 inches.
Comb.(H)(7)	0.02	-	0	0.00	15.00	1		3	1.0	<1		(H) Cover #145 + Foam pad #128B Light white slight sweet smoke. Foam pad chars nine inches. No visible flaming.

(6) Combinations representing various seat pad assemblies.

(7) Material No. 145 is effective in providing vapor barrier against combustion of the foam pad.

<p>Department of Transportation, Federal Aviation Administration, National Aviation Facilities Experimental Center, Atlantic City, N. J.</p> <p>FLAMING AND SELF-EXTINGUISHING CHARACTERISTICS OF AIRCRAFT CABIN INTERIOR MATERIALS by John F. Marcy and Richard Johnson, Final Report, July 1968, 44 pp. incl. illus., plus 1 Appendix. (Project No. 510-001-11X, Report No. NA-68-30) (DS-68-13)</p> <p>Unclassified Report</p> <p>A study was made of the burning characteristics of some 140 different materials for the purpose of obtaining technical data and criteria needed to support current efforts to improve existing Federal Air Regulations governing the use of cabin interior materials in aviation. Comparative tests were conducted on two groups of materials one consisting of materials now in use in air transport, and the second materials proposed for future use with superior fire resistance. Measurements were made of ignition time, burn and char lengths, flame-out time, burn rate, heat of combustion, flame-spread index, etc. Two standard laboratory test methods were employed; namely, (1) Federal Standard CCC-T-191b, Test Method 5902, Vertical Burning Apparatus, and (2) Federal Standard 00136b (ASTM E-162), Radiant Panel Apparatus. Results of the tests were analyzed to indicate (over)</p>	<p>UNCLASSIFIED</p> <p>I. John F. Marcy Richard Johnson Project No. 510-001-11X</p> <p>II. Project No. 510-001-11X</p> <p>III. Report No. NA-68-30 (DS-68-13)</p> <p><u>Descriptors</u></p> <p>Aircraft Fires Test Methods Fire Safety Smoke Toxicity</p> <p>UNCLASSIFIED</p>
<p>Department of Transportation, Federal Aviation Administration, National Aviation Facilities Experimental Center, Atlantic City, N. J.</p> <p>FLAMING AND SELF-EXTINGUISHING CHARACTERISTICS OF AIRCRAFT CABIN INTERIOR MATERIALS by John F. Marcy and Richard Johnson, Final Report, July 1968, 44 pp. incl. illus., plus 1 Appendix. (Project No. 510-001-11X, Report No. NA-68-30) (DS-68-13)</p> <p>Unclassified Report</p> <p>A study was made of the burning characteristics of some 140 different materials for the purpose of obtaining technical data and criteria needed to support current efforts to improve existing Federal Air Regulations governing the use of cabin interior materials in aviation. Comparative tests were conducted on two groups of materials one consisting of materials now in use in air transport, and the second materials proposed for future use with superior fire resistance. Measurements were made of ignition time, burn and char lengths, flame-out time, burn rate, heat of combustion, flame-spread index, etc. Two standard laboratory test methods were employed; namely, (1) Federal Standard CCC-T-191b, Test Method 5902, Vertical Burning Apparatus, and (2) Federal Standard 00136b (ASTM E-162), Radiant Panel Apparatus. Results of the tests were analyzed to indicate (over)</p>	<p>UNCLASSIFIED</p> <p>I. John F. Marcy Richard Johnson Project No. 510-001-11X</p> <p>II. Project No. 510-001-11X</p> <p>III. Report No. NA-68-30 (DS-68-13)</p> <p><u>Descriptors</u></p> <p>Aircraft Fires Test Methods Fire Safety Smoke Toxicity</p> <p>UNCLASSIFIED</p>

major flammability trends for different material classifications. Practical allowable flammability limits based on available materials technology were recommended for increasing the present fire protection requirements of interior materials.

major flammability trends for different material classifications. Practical allowable flammability limits based on available materials technology were recommended for increasing the present fire protection requirements of interior materials.

UNCLASSIFIED

UNCLASSIFIED

1901

1902