

flame source. This included any fire occurring in a hotel, motel, dormitory, rooming house, or other conventional residence. The data collection was designed to investigate fires from a reasonably representative sample of upholstered furniture fires reported to U.S. fire departments. It is noted that while the cases investigated were limited in number and were not from a national sample with a known probability of selection, they provided important information about the hazard scenarios associated with small open flame upholstered furniture fires. During the period from November 1997 to February 1999, CPSC also conducted data collection on lighter child play fires. As a result, fire investigations involving lighters may be over-represented in the distribution of small open flame sources.

### **III. Investigation Study Results**

#### **A. Furniture Characteristics**

There were 146 completed in-scope investigations of small open flame ignitions of upholstered furniture. Data on several furniture characteristics were collected including the type of upholstered furniture involved, whether the furniture had been slipcovered and/or reupholstered, and the approximate age of the furniture.

Of the 146 in-scope fires, 117 fires involved sofas/couches and sofasbeds, 28 fires involved upholstered chairs, and 1 fire involved an upholstered ottoman. Some upholstered furniture fires involved sofas having three removable cushions or overstuffed sofas and chairs. One sofa was described as having reclining units on either side of the sofa. Other sofas were described as "love seats" containing only two cushions. Several chairs were described as recliner-type chairs.

Of the 146 in-scope fires, 59 of the investigations reported whether the upholstered furniture was slipcovered. Fifty-one of the investigations reported that the piece of upholstered furniture was not slipcovered and eight were reported as slipcovered. Of the 146 in-scope fires, 42 reported whether the upholstered furniture

was reupholstered. Forty of the investigations reported that the upholstered furniture was not reupholstered, and two reported that the furniture had been reupholstered. Table 1 shows the numbers and percentages of cases with and without the given characteristic among those cases for which the information was known.

Of the 146 in-scope fires, 55 of the investigations reported information on whether the upholstered furniture was new or used; 30 of these reported that the upholstered furniture was either purchased new at furniture stores or received new as a gift and 25 reported the furniture was used when acquired. The used upholstered furniture was said to have been bought at garage sales, received as a gift from others, or was a family heirloom.

**Table 1**  
**Characteristics of Upholstered Furniture Involved in Fires**

Characteristic	Total	Yes		No		Unknown
		Number	Percent	Number	Percent	
Slip-covered	146	8	14%	51	86%	87
Reupholstered	146	2	5%	40	95%	104
Acquired New	146	30	55%	25	45%	91

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.

Of the 146 in-scope fires, 45 of the investigations reported a specific age of the upholstered furniture at the time of the fire and 14 reported that the upholstered furniture was "old" without any reference to a specific age. If it were assumed that the age of all furniture reported as being "old" was over 15 years old, the median age of all furniture involved in these fires was ten years; without this assumption being made, the reported median age was five years. The distribution of the age of the upholstered furniture is shown in Table 2.

**Table 2  
Reported Upholstered Furniture Age**

<b>Furniture Age (In Years)</b>	<b>Frequency</b>	<b>Percent of Known</b>
<b>Total</b>	<b>146</b>	<b>100%</b>
Less than 5	19	32%
5 to 10	11	19%
11 to 15	4	7%
Over 15	11	19%
"Old"	14	24%
Unknown	87	-

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.  
Note: Detail may not add to total due to rounding.

**B. Types of Furniture**

Of the 146 investigations, 33 reported some information about the type of covering or filling material of the upholstered furniture. Most of the investigations contained only sketchy information about the texture and general appearance of the outer fabric covering and filling materials. The distribution of covering materials and fillings involved in these fires could not be determined due to the scant information obtained in this set of investigations.

Regarding the materials covering the upholstered furniture, some investigations included descriptions such as: "light and soft cotton," "a knit fabric with a fuzzy surface," "some type of rayon/nylon synthetic fabric," "corduroy type fabric," "a velvet type of material," a brand-named plastic cover, "a synthetic velour type fabric," and "fabric was a hard fabric, not a textured fabric." Some investigations reported the type of filling material used in the upholstered furniture. These materials were described as "foam cushions and cotton batting stuffing," "cushions made of hard foam," "foam filling material," "cubed foam," and "foam rubber cushions or petroleum-based product." One couch was reported to be covered in leather and labeled as meeting the UFAC requirements. Two investigations reported that the upholstered furniture met the CA

standard for flammability.

### **C. Area of Furniture First Ignited**

Information on the area of the upholstered furniture first ignited was reported in 80 of the 146 fires. Of these, 50 indicated that the ignition occurred somewhere in the seating area consisting of the cushion, the inside of the arm, and the inside back of the sofa/couch or chair. The outer back or outer sides were identified as the portion first ignited in 20 fires, the underside of the upholstered furniture was cited in 7 fires, and the skirt was identified as the portion first ignited in 3 fires. Table 3 presents the locations of the upholstered furniture ignitions by the source of ignition.

Typically, the seating area ignitions involved a child sitting on the sofa or chair and playing with either matches or a lighter. Most of these ignitions started in the cushions of the upholstered furniture. In one case, a child ignited the filling material identified as cotton batting in the cushion of the sofa and the fire report noted that the heaviest fire damage was seen in the center of the sofa.

In the investigations that cited the outer back or side as the portion of the furniture first ignited, it could not be determined whether a skirt was involved. In the seven investigations that reported the underside as the portion first ignited, all fires involved sofas or sofa beds. In the three investigations that reported the skirt as the portion first ignited, two fires involved sofas and one fire involved an upholstered chair. There were 35 deaths associated with fires where the area of the furniture first ignited was known. Most deaths (27 of 35) were associated with fires where the seating area was reported as the area first ignited. There were six deaths where the back (3) or side (3) was reported as the area first ignited and two deaths where the underside was reported as the first area ignited.

**Table 3**  
**Portion of Upholstered Furniture Ignited by the Source of Ignition**  
**in Upholstered Furniture Fires**

Portion of Upholstered Furniture Ignited	Total	Source of Small Open Flame Ignition				
		Cigarette Lighter	Match	Candle	Other	Not Specified
<b>Total</b>	<b>146</b>	<b>95</b>	<b>19</b>	<b>25</b>	<b>3</b>	<b>4</b>
Seating Area	50	29	8	9	2	2
Outer Back / Side	20	14	0	6	0	0
Skirt	3	3	0	0	0	0
Underside	7	6	1	0	0	0
Not Specified	66	43	10	10	1	2

Source: U.S. Consumer Product Safety Commission / EPHA  
 In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.

**D. Small Open Flame Sources**

As shown in Table 3, the source of the small open flame ignition was reported in 142 of the 146 fires. Either a cigarette lighter or a match started the four remaining fires, but the fire department could not determine which. The reported sources of ignition were cigarette lighters (95), matches (19), candles (25), and other ignition sources which included a fireworks sparkler, a flare gun, and a spark from a gas heater. As cited earlier, a concurrent collection of lighter child play fires may have skewed the distribution of small open flame sources.

**E. Child Play**

According to the NFPA, matches and lighters are the leading ignition sources cited when child fire play is reported as the cause of structure fires.<sup>3</sup> Between 1991 and 1995, upholstered furniture ranked third as the first item ignited in residential child play fires, behind mattresses and bedding and clothing.<sup>4</sup> Of the 146 investigations, the probable cause of fire in 120 (82%) of the fires was children playing. The remaining 26 fires were reportedly caused by candles tipping over and falling on the upholstered furniture (22 fires or 15%), careless adult use of lighters (3 fires or 2%), and a

malfunctioning gas heater (1 fire).

The age of the children reported as starting the fires ranged from 2 years of age to 14 years of age. Among the 120 child play fires, 88 fires involved children less than 5 years as the fire-setters and 30 fires involved children between 5 and 14. The ages of two children were unknown. Table 4 shows the distribution of the ages of the children involved in the fires by the type of small open flame ignition source.

**Table 4**  
**Age Distribution of Children Setting Upholstered Furniture Fires**  
**by Small Open Flame Source**

Small Open Flame Source	Total	Age of Child		
		Less than 5 Years	5 - 14 Years	Unknown
<b>Total</b>	<b>120</b>	<b>88</b>	<b>30</b>	<b>2</b>
Lighters	93	76	17	0
Matches	18	4	12	2
Other	9	8	1	0

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.

In 116 of the 120 child play fire incidents, there was an adult in the home, usually a parent (83). Grandparents (11) and other adults over the age of 15 (12) were also reported as supervising the child. In four incidents, a person under the age of 15 supervised the child and in another four incidents the child was left alone in the home. In the remaining six incidents, supervision of the child was unknown. Most of the supervising adults were sleeping when the fire started. Typically, the fires started in the early morning when the child got up before the adult. Other activities of the supervising adults included watching TV, cooking, talking on the phone, attending other children, or engaging in household chores. Although the persons who were supervising the children were in the home when the child started the fire, most did not become aware of the fire until they were alerted by the child's cry for help or by the smell of smoke.

Adults did not witness ignition; therefore, it was generally unknown how long the fire burned before discovery. In these instances, the fire was often said to have progressed to such an extent that it was difficult to extinguish, although many tried to

do so. Sometimes the intensity of the fire or smoke produced made escape difficult.

#### F. Fire Losses

In the 146 fire incidents investigated, there were 79 deaths and 86 injuries for a combined total of 165 fire casualties. Table 5 presents the diagnoses of the victims in the 146 fires investigated. Over 90 percent of the victims suffered from smoke inhalation or thermal burns. Many injured victims had burns to the hands and arms, due to their efforts to extinguish the fires. Sixty-six of the 79 fatalities resulted from smoke inhalation, 11 of the fatalities resulted from thermal burns, and cause of death was unknown for 2 victims. Of the 86 injured victims, 38 suffered from smoke inhalation, 41 suffered from thermal burns, and 2 suffered lacerations. The diagnoses of five injured victims were unknown.

According to NFPA, the leading cause of fire deaths for preschool children was playing with fire.<sup>5</sup> In the upholstered furniture fire study, 46 percent of the deaths (36) and 35 percent (30) of the injuries involved children less than 5 years of age (See Table 6.) Seventy-four of the 146 fires investigated involved either a fatality or an injury. Thirty-one fires involved only one victim, 18 fires involved two victims, 15 fires involved three victims, 3 fires involved four victims, 6 fires involved five victims, and 1 fire involved 10 persons.

**Table 5**  
**Fire Casualties in Upholstered Furniture Fires by Diagnosis**

Fire Casualties	Total	Diagnosis		
		Burns	Smoke Inhalation	Unknown
<b>Total</b>	<b>165</b>	<b>52</b>	<b>104</b>	<b>7</b>
<b>Deaths</b>	<b>79</b>	<b>11</b>	<b>66</b>	<b>2</b>
<b>Injuries</b>	<b>86*</b>	<b>41</b>	<b>38</b>	<b>5</b>

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.

\*Note: Two injured victims suffered lacerations. These two injuries are not shown in the table.

**Table 6  
Fire Casualties in Upholstered Furniture Fires by Age**

Fire Casualties	Total	Age		
		Less than 5 Years	5 Years & Over	Unknown
<b>Total</b>	<b>165</b>	66	85	14
<b>Deaths</b>	<b>79</b>	36	42	1
<b>Injuries</b>	<b>86</b>	30	43	13

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.

In addition to fire casualties, financial loss and physical property damage were described in the fire investigations. These were typically expressed as the extent of fire damage, whether the fire was confined to the object of origin or whether the fire extended beyond the object to the structure, and the dollar amount of property loss. Property loss included the dollar loss of both the structure and the contents.

Fire damage was described for 120 of the 146 fires. (See Table 7.) Fourteen of the fires were confined to the upholstered furniture, an additional 45 fires were confined to the room of origin, an additional 15 fires were confined to the floor of origin, and the remaining 46 fires consumed more than the floor of origin. Two deaths resulted from fires confined to the furniture. Seventeen deaths occurred in fires confined to the room of origin. In one fire where the fire damage was confined to the upholstered furniture, an 8-year-old boy ignited a seat cushion of a sofa while playing with matches. While trying to extinguish the flames in the seat cushion, he accidentally ignited his shirt, resulting in his death. The remaining 60 deaths occurred in fires where more than the room of origin was destroyed (36 deaths) or the amount of property destruction was unknown (24 deaths).

**Table 7**  
**Extent of Fire Damage for Upholstered Furniture Fires**

<b>Fire Damage</b>	<b>Number</b>	<b>Percent of Known</b>
<b>Total</b>	<b>146</b>	<b>100%</b>
Confined to Furniture	14	12%
Confined to Room of Origin	45	38%
Confined to Floor of Origin	15	13%
Consumed more than Floor of Origin	46	38%
Unknown	26	-

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.

The estimated property loss in dollars was reported in 119 of the 146 investigated fires. Table 8 presents the estimated property loss for the investigated fires. About two-thirds of the fires investigated were said to have resulted in less than \$45,000 in property damage. The larger property losses occurred mainly in apartment buildings and other large residential structures.

**Table 8**  
**Estimated Property Loss of Fires Involving Upholstered Furniture**

<b>Estimated Property Loss</b>	<b>Number</b>	<b>Percent of Known</b>
<b>Total</b>	<b>146</b>	<b>100%</b>
Less than \$10,000	32	27%
\$10,000 to \$24,999	24	20%
\$25,000 to \$44,999	25	21%
\$45,000 to \$64,999	13	11%
\$65,000 to \$84,999	10	8%
More than \$85,000	15	13%
Unknown	27	-

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.  
Note: Detail may not add to total due to rounding.

## **G. Household Characteristics**

Information on formal education level of the head of the household was reported in 50 of the investigations. The education levels were distributed as follows: less than

a high school education (11), a high school education (20), and some college education (19). Household income was reported for 51 of the households. Fourteen of the households reported income of less than \$15,000, 24 reported income between \$15,000 and \$34,999, and 13 reported income more than \$35,000. The type of tenure in the residence was reported in 124 of the 146 investigations. It was reported that 79 rented and 45 owned the residence.

#### H. Smoke Detectors Present

Of the 146 investigations, 85 reported that there was a smoke detector present in the dwelling, 36 reported that no smoke detector was present, 1 reported that a sprinkler was present, and 24 reported that it was unknown whether a smoke detector was present or not. (See Table 9.) In this study, the death rate for the nondetector-equipped households (22 deaths out of 36 fires) was higher than the death rate for those households (47 deaths out of 85 fires) that had a smoke detector. These results, while based on a relatively small number of fires, are consistent with the national fire experience where most fatalities occurred in households without smoke detectors<sup>6</sup>. *Forty-six of the 85 smoke detectors in use alarmed and notified the victims of the fire and 27 of the smoke detectors did not alarm. Reasons given for why smoke detectors did not alarm were no batteries, dead batteries, and insufficient smoke.*

**Table 9**  
**Frequency of Fires, Deaths, and Injuries by**  
**Smoke Detector Presence in Upholstered Furniture Fires**

Frequency	Total	Smoke Detector Present		
		Yes	No	Unknown
Fires	146	85	36	25
Deaths	79	47	22	10
Injuries	86	43	26	17

Source: U.S. Consumer Product Safety Commission / EPHA  
In-depth Investigation File, Upholstered Furniture Data Collection, October 1994 - July 1999.  
Note: One fire investigation reported that a sprinkler system helped to extinguish the fire.

#### **IV. Discussion**

The data collected in the 1994 - 1999 investigation study provided useful information on upholstered furniture fires involving small open flames, the areas of the upholstered furniture ignited, and the fire scenarios. Although these upholstered furniture fires were not from a random sample, the information contained in these investigations allows some observations to be made concerning small open flame upholstered furniture fires.

The most common scenario reported in the investigations involved preschool children playing with cigarette lighters and igniting the seating area of the upholstered furniture. The investigations reveal some information about the characteristics of upholstered furniture involved in small open flame ignited fires. Most products involved were sofas and chairs, including some motion products (e.g., recliners) and several slipcovered items. Additionally, the investigations show that seating areas, the outer back or sides, and the undersides of upholstered furniture were first ignited by small open flames, and suggest that protective measures for these areas would help reduce fire losses.

With 82 percent of the fires investigated resulting from children playing with cigarette lighters and matches, parents of small children should be made more aware of the dangers of upholstered furniture small open flame ignition fires. In one investigation, a parent was aware that the child was playing with a lighter and did not attempt to stop or discourage the child.

As may have been expected, the death rate per fire investigated was higher for fires where the household was not equipped with a smoke detector. According to the NFPA, most nondetector-households tend to be low-income and have a greater risk for fires.<sup>7</sup> Also, children less than 5 years of age accounted for a large portion of the deaths in the fires investigated for this study. These findings are consistent with the national fire experience that suggests that children less than 5 years of age and low-income households may have a higher risk of death in upholstered furniture fires.

## Endnotes

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1. Harwood, Beatrice and Kale, Deborah. (1980). Fires in Upholstered Furniture. Washington, DC: U.S. Consumer Product Safety Commission.
  2. Kelly, Sheila. (1994). Upholstered Furniture Fabric Flammability. Washington, DC: U.S. Consumer Product Safety Commission.
  3. Hall, John (1997). Children Playing with Fire: U.S. Fire Experience 1980 - 1995. Quincy, MA: National Fire Protection Association.
  4. Ibid.
  5. Ibid.
  6. Ahrens, Marty. (1998). U.S. Fire Experience with Smoke Detectors and Other Fire Detectors. Quincy, MA: National Fire Protection Association.
  7. Ibid.



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Memorandum

Date: November 15, 2000

TO : Dale Ray, Project Manager, Upholstered Furniture  
Directorate for Economic Analysis

THROUGH: Sue Ahmed, Ph.D., Associate Executive Director *sa*  
Directorate for Epidemiology

Russ Roegner, Ph.D., Director *RR*  
Division of Hazard Analysis

FROM : Mark S. Levenson, Ph.D. *ML*  
Division of Hazard Analysis

SUBJECT : Comparison of Upholstered Furniture Fire Deaths in California  
and the U.S.

In 1993, the National Association of State Fire Marshals (NASFM) petitioned the U.S. Consumer Product Safety Commission (CPSC) to adopt nationwide flammability standards for upholstered furniture. NASFM suggested the adoption of the California standards detailed in California Bulletins 116, 117, and 133. The standards address ignitions from cigarettes, small open flames, and large open flames. Presently, based on a commission vote, CPSC is considering a standard for small open flames.

To support their petition, NASFM compared trends in deaths and injuries from upholstered furniture fires in California and the rest of the nation. The difference between California and the rest of the nation was dramatic. In 1980, there were 1.14 deaths per million people from upholstered furniture ignition by cigarettes in California versus 4.97 in the rest of the U.S. In 1989, the California rate had dropped to 0.41, representing a decrease of 64 %. The U.S. rate, excluding California, had dropped to 3.04, representing a 39 % decrease.

CPSC performed its own analysis of upholstered furniture-related fire deaths and generally confirmed the NASFM estimates.<sup>1</sup> The attached figure displays the CPSC estimates from that analysis for cigarette ignitions and for all sources of ignitions. The estimates are generally higher than the NASFM estimates, because adjustments based on independent estimates of fire deaths were used to account for non-reporting in the *California Fire Incident Reporting System* and the *National Fire Incident Reporting System*.<sup>2</sup>

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<sup>1</sup> Sheila Kelly, Upholstered Furniture Fabric Flammability Petition, FP 93-1, U.S. Consumer Product Safety Commission, March 31, 1994.

<sup>2</sup> The independent estimates are based on information from the National Fire Protection Association estimates of home fire deaths and the National Center for Health Statistics mortality data.

In order to test some key hypotheses concerning the death rates in California versus the rest of the U.S., the previous CPSC estimates were reanalyzed using an exponential decay model.<sup>3</sup> The exponential decay model is more appropriate than a simple linear model when the estimates are approaching zero. Also, it allows for comparisons in trends to be made on a percentage basis. The fitted model predictions are shown in the figure and appear to fit the data well. In both the cigarette ignition and the all ignition cases, a statistical test concluded that the death rates in 1980 were significantly different in California versus the rest of the U.S. Similarly, a statistical test concluded that the death rate decrease—in percentage terms—during the time period was significantly different in California versus the rest of the U.S.

Bea Harwood used the CPSC estimates and concluded that if the U.S. as a whole had rates of deaths similar to California, there would be around 500 fewer deaths annually. It is clear that the U.S. cannot achieve the death rate of California by the adoption of the California standards alone. In 1980, California had a death rate about half that of the rest of the U.S. This difference cannot be overly attributed to the California standards, which took effect in 1975. Factors other than the standards such as smoking behavior, demographics, housing, and education, likely explain the large difference in the 1980 rates. Likewise, these factors may explain some of the difference in the death rate decreases between California and the rest of the U.S. Consider smoking prevalence rates. In 1980, the smoking prevalence rate in California was 32.9 % versus 33.6 % for the whole U.S.<sup>4</sup> In 1990, the California prevalence rate had dropped to 22.4 %, whereas the U.S. prevalence rate had dropped only to 27.4 %. Smoking impacts ignitions from cigarettes and from small open flames such as lighters and matches.

To better understand the effect of the California standards and other standards, CPSC conducted flammability experiments.<sup>5</sup> Upholstered chairs intended for sale in California and chairs intended for sale in the U.S. outside of California were tested. The California chairs did not perform better than those intended for sale in the U.S. outside California. In both cases, the fabric and the filling of the chairs ignited. Additionally, the test methods used in the California standard did not always predict these ignitions.

Due to differences between California and the rest of the nation, it is not possible to establish a cause-and-effect relationship between the California standards and the lower death rates from upholstered furniture-related fires in California. Furthermore, laboratory experimentation did not demonstrate the merit of the standards.

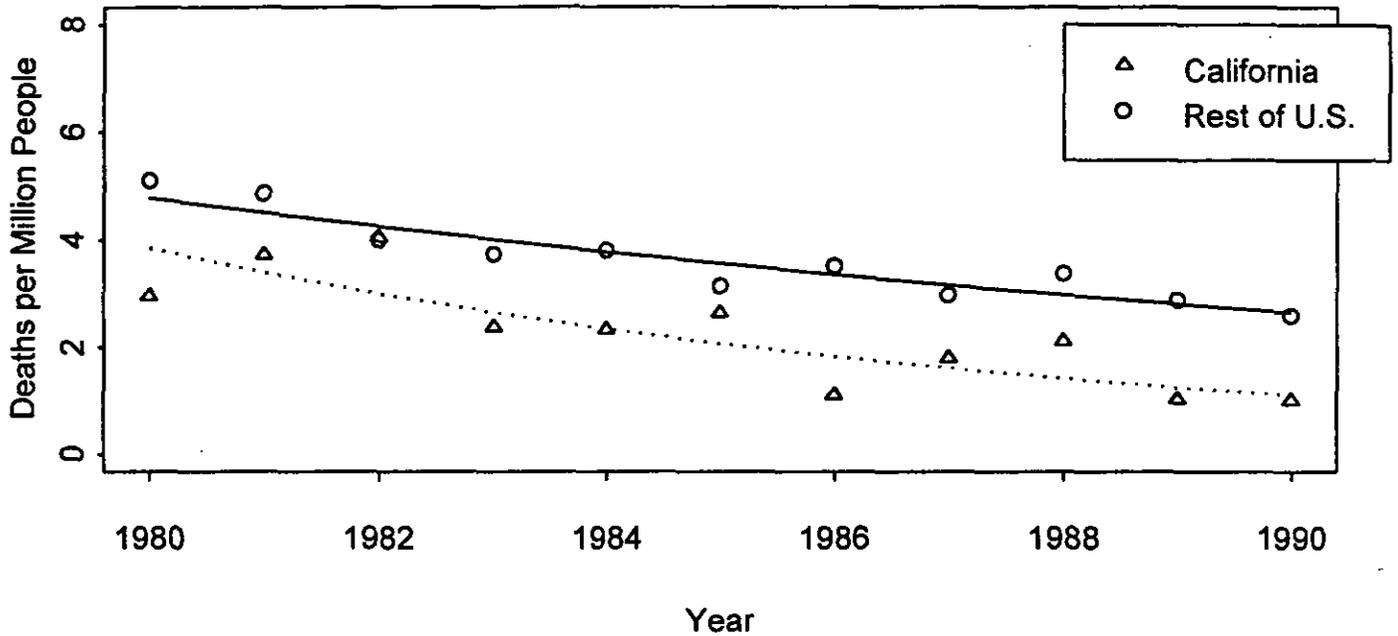
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<sup>3</sup> The hypothesis testing used a significance level of 0.05.

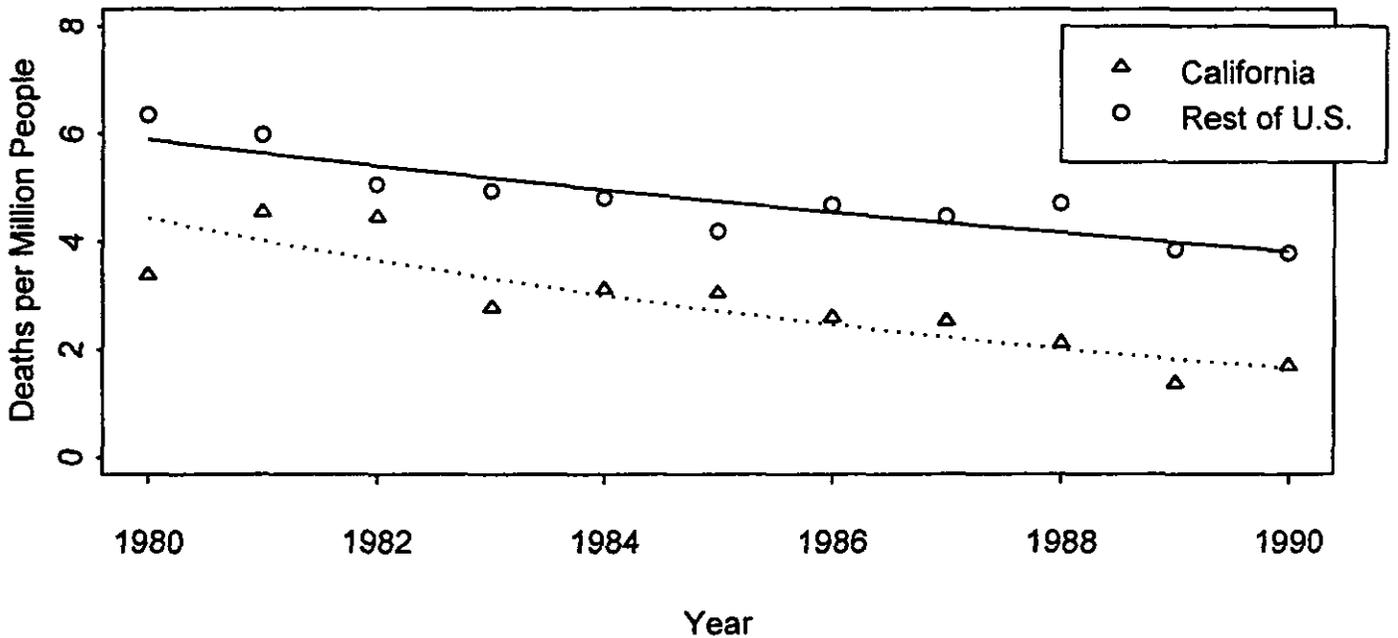
<sup>4</sup> Adult Smoking Trends in California Fact Sheet, California Department of Health Services, 1998.

<sup>5</sup> Upholstered Furniture Flammability Testing: Full Scale Open Flame Data Analysis, U.S. Consumer Product Safety Commission, February 26, 1996.

### Upholstered Furniture-Related Death Rate Cigarette Ignitions Only



### Upholstered Furniture-Related Death Rate All Ignition Sources



**TAB C**

**CPSC STAFF  
DRAFT STANDARD FOR UPHOLSTERED FURNITURE**

**Standard for Small Open Flame Ignition Resistance of Upholstered Furniture**

**Subpart A - The Standard**

Section:

1	Purpose, Scope and Applicability
2	Referenced Documents
3	Definitions
4	General Requirements
5	Atmospheres for Testing and Conditioning
6	Butane Gas Flame and Wood Crib Ignition Sources
7	Test Method
8	Apparatus
9	Test Specimens
10	Test Sample Preparation
11	Seating Area Test Procedure
12	Dust Cover Test Procedure
13	Alternate Barrier Test Procedure
14	Final Examination
15	Sampling Plan
16	Recordkeeping

Appendix	A Figures
Figure 1	Alternate Barrier Test Wood Crib Ignition Source
Figure 2a	Seating Area Test Rig
Figure 2b	Barrier Test Rig
Figure 3	Seating Area/Barrier Test Rigs
Figure 4	Dust Cover Test Rig
Figure 5a	Seating Area Test Fixture
Figure 5b	Dust Cover Test Fixture
Figure 6a	Cover Fabric Cut-outs
Figure 6b	Barrier Cut-outs
Figure 7	Standard Foam Filling
Figure 8	Seating Area/Barrier Test Samples
Figure 9	Dust Cover Samples
Figure 10	Seating Area Test Flame Position
Figure 11	Dust Cover Test Flame Position

## § 1 Purpose, Scope and Applicability

*1.1 Purpose.* This draft standard prescribes requirements for testing small open flame ignition resistance of upholstered furniture before the sale in commerce or the introduction in commerce of any upholstered furniture that is subject to the standard. The standard prescribes test methods to determine the ignition resistance of the upholstered furniture when exposed to a small open flame. The Seating Area Test in § 8 addresses ignitions that may occur near the vertical/horizontal junctions typically found in upholstered furniture. The Dust Cover Test in § 12 addresses the exposed area underneath the seat that is vulnerable to ignition from the floor level.

Manufacturers may conduct the Alternate Barrier Test (barrier test) in § 13 in lieu of the Seating Area Test. The barrier test uses a larger ignition source. Its purpose is to provide an alternate performance test method for manufacturers and to ensure limited fire growth of furniture assemblies. Articles of upholstered furniture must meet either the Alternate Barrier Test or the Seating Area Test.

*1.2 Scope.* All upholstered furniture, as defined in § 3, that is manufactured or imported after the effective date of this standard are subject to the requirements of the standard. Mattresses and futons regulated under 16 CFR 1632 are not subject to this standard.

*1.3 Applicability.* The requirements for testing prescribed by the standard are applicable to each "manufacturer" as that term is defined in § 3 of upholstered furniture manufactured for sale in commerce for residential use. Manufacturers may rely on tests performed by suppliers of component materials (cover fabrics, barriers or dust covers) to establish compliance.

## § 2 Referenced Documents

- 2.1 Methods of test for Assessment of the Ignitability of Upholstered Seating by Smoldering  
- BS 5852: 1990
- 2.2 Industry

## § 3 Definitions

In additions to the definitions given in Section 2 of the Flammable Fabrics Act as amended (15 U.S.C. 1191), the following definitions apply for the purposes of this standard.

*3.1 Afterflame* - The time for which a material continues to produce a visible flame after the ignition source has been removed.

**3.2 Afterglow** - The time for which a material continues to glow after the removal of an external ignition source and after the cessation of flaming of the material.

**3.3 Barrier** – An interior fabric or interlining material between the cover fabric and resilient filling materials of an article of upholstered furniture, that is intended to reduce the fire growth of upholstery.

**3.4 Combustion** - An exothermic, self-sustaining reaction involving an oxidizer and solid or liquid, and or gas phase fuel that may occur in the form of flaming, glowing or smoldering.

**3.5 Cover fabric** - The outermost layer of fabric or material used to enclose the main support system and upholstery filling used in the furniture item.

**3.6 Dust cover** - The outermost layer of non-structural material on the underside of the finished item of upholstered furniture.

**3.7 Fabric Piece (Piece)** means a continuous, unseamed length, one or more of which make up a unit.

**3.8 Fabric Production Unit (Unit)** means any quantity of finished fabric at least 50 and up to 1,000 linear yards for initial sampling or up to 5,000 linear yards for normal sampling, or up to 10,000 linear yards for reduced sampling which has a specific identity that remains unchanged throughout the Unit except for color or print pattern. Non-identical fabrics with equivalent flammability characteristics may also comprise a Fabric Production Unit. For purposes of this definition, finished fabric means fabric in its final form after completing its last processing steps as a fabric except for slitting.

**3.9 Flaming** – Combustion in the gaseous phase with the emission of light.

**3.10 Glowing** - Combustion characterized by incandescence, without visible flame.

**3.11 Ignition** - Initiation of combustion, by the presence of any visible flaming, glowing, or smoldering after removal of the test flame.

**3.12 Manufacturer** – A company engaged in producing, importing, or private labeling of upholstered furniture.

**3.13 Progressive smoldering** – Smoldering that is self-propagated, i.e. independent of the ignition source.

**3.14 Sample** – Consists of four test specimens.

**3.15 Seating area** - The interior intersection of the vertical back or side surface and a contiguous horizontal seating surface on an article of upholstered furniture.

**3.16 Self-extinguishment** - The termination of any combustion within 15 minutes of the test flame removal before the specimen is consumed.

**3.17 Small open-flame** - A flaming ignition source that simulates the heat output of a match, candle, or cigarette lighter.

**3.18 Smoldering** - Combustion characterized by smoke production, without visible flame or glowing.

**3.19 Specimen** - A specific portion of a material or a laboratory sample upon which a test is performed.

**3.20 Upholstered furniture** - A unit of interior furnishing that is constructed with a seating area of fabric or other material covering resilient filling material, and is intended for use or may be expected to be used in homes, and is intended or promoted for sitting or reclining upon. Upholstered products subject to this standard include, but are not limited to chairs, sofas, love seats, settees, and benches. Products without contiguous seats and backs or sides as described in § 3.15 are not subject to the Seating Area Test requirements of § 11 or § 13; products without dust covers as defined in § 3.6 are not subject to the Dust Cover Test requirements in § 12.

## § 4 General Requirements

**4.1 Summary.** Upholstered furniture meeting this standard must resist ignition when subjected to a small open-flame source (simulating a match, candle, or cigarette lighter). The surfaces to be tested are the seat/back or side intersection of the seating area and the dust cover, if it exists. Specimens tested in accordance with the procedures in § 11, 12, or 13 must not exhibit progressive smoldering or flaming ignition described in § 4.2. The seating area of upholstered furniture is evaluated by constructing a small-scale mock-up consisting of the cover fabric and standard polyurethane foam. Manufacturers may opt to conduct the Seating Area Test with actual filling and/or barrier materials used in the finished upholstered item instead of the standard polyurethane foam. Further, manufacturers may opt to conduct the Alternate Barrier Test in lieu of the Seating Area Test.

**4.2 Criteria for ignition.** Complying upholstered furniture must not exhibit progressive smoldering or flaming ignition when tested in accordance with the applicable test methods in this standard.

### 4.2.1 Progressive smoldering ignition

For the purposes of this standard, all of the following types of behavior are considered to be progressive smoldering ignition:

- (a) Any test specimen that displays escalating smoldering combustion behavior so that it is unsafe to continue the test and manual extinguishment is required;
- (b) Any test specimen that smolders to the edge of the specimen (to either side or the full thickness of the specimen) within the duration of the test;
- (c) Any test specimen that produces externally detectable amounts of smoke or glowing 15 minutes after removal of the burner tube (for Seating Area Test and Dust Cover Test);
- (d) Any test specimen that produces externally detectable amounts of smoke, flaming or glowing 60 minutes after ignition of the crib (for Alternate Barrier Test);
- (e) Any test specimen, on final examination, shows evidence of charring within the filling (other than discoloration) more than 100 mm in any direction, from the nearest part of the original position (apart from upwards) of the ignition source (for Alternate Barrier Test).

### 4.2.2 Flaming Ignition

For the purposes of this standard, the following types of behavior are considered to be flaming ignition:

- (a) Any test specimen that displays escalating flaming combustion behavior so that it is unsafe to continue the test and manual extinguishment is required;

- (b) Any test specimen that burns until it is consumed within the test duration;
- (c) Any test specimen on which any flame front reaches the edges of the specimen or passes through the full thickness of the specimen within the duration of the test (for Seating Area Test and Dust Cover Test);
- (d) Any test specimen that continues to flame more than 2 minutes after removal of the burner tube (for Seating Area Test and Dust Cover Test);
- (e) Any test specimen that continues to flame more than 10 minutes after ignition of the crib (for Alternate Barrier Test);
- (f) Any test specimen from which debris causes an isolated floor fire not meeting the requirements of items (d) or (e).

## § 5 Atmosphere for Conditioning and Testing

### 5.1 Conditioning

The specimens to be tested shall be conditioned for at least 24 hours immediately before the tests in the following atmosphere:

- Temperature:  $25 \pm 4^\circ \text{C}$
- Relative Humidity: 40 - 55 %

### 5.2 Water soak procedure<sup>1</sup>

- 5.2.1 Place seating area cover fabric specimen in a container sufficient to completely submerge the sample.
- 5.2.2 Submerge seating area cover fabric specimen in 4 liters of tap water at  $25 \pm 4^\circ \text{C}$  for 24 hours.
- 5.2.3 After the immersion period, the sample is to be thoroughly air dried and conditioned per § 5.1

### 5.3 Test enclosure

The test enclosure shall consist of either a room with a volume greater than  $20 \text{ m}^3$  (which contains adequate air for testing), or a smaller enclosure with adequate airflow. Inlet and extraction systems shall provide an airflow rate of less than  $0.2 \text{ m/s}$  in the proximity of the test specimen to provide adequate air without disturbing burning behavior.

### 5.4 Test Initiation

The test shall be performed in an atmosphere having a temperature between  $10^\circ - 30^\circ \text{C}$  and a relative humidity between 20% to 70%. If the test room does not meet the conditions of § 5.1, then testing shall be initiated within **10 minutes** after the specimens are removed from the conditioning room.

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<sup>1</sup> This procedure shall only be performed on specimens that contain surface applied flame retardant treatments prior to conducting the Seating Area Test. The purpose of the Water Soak Procedure is to remove any non-durable fire retardant finishes used in cover fabric samples.

## § 6 Butane Gas Flame and Wood Crib Ignition Sources

### 6.1 General

The butane gas flame used in the seating area test and dust cover test simulates a small open-flame ignition source similar to the heat output of a match or cigarette lighter. The wood crib ignition source used in the Barrier Test represents a larger ignition source that is used to evaluate the performance of furniture composites that use fire barriers as an approach for limiting fire growth.

### 6.2 Butane gas flame

#### 6.2.1 Burner and controls

Two burner tubes consisting of a length of stainless steel tube,  $8.0 \pm 0.1$  mm outside diameter;  $6.5 \pm 0.1$  mm internal diameter and  $200 \pm 5$  mm and  $600 \pm 10$  mm are required.

**Burner Tube Dimensions**

Test Location	Inside Diameter	Outside Diameter	Length
Dust Cover	$6.5 \pm 5$ mm	$8.0 \pm 0.1$ mm	$200 \pm 5$ mm
Seating Area	$6.5 \pm 5$ mm	$8.0 \pm 0.1$ mm	$600 \pm 10$ mm

The burner tubes are connected by flexible tubing via a flowmeter, fine control valve, on-off valve (optional) and cylinder regulator providing a nominal outlet pressure of 2.75 kPa. The flowmeter shall be calibrated to supply butane gas at a rate of  $45 \pm 2$  ml/min at 25° C. Under the above conditions, the burner should produce a flame approximately 35 mm in height.

#### 6.2.2 Gas flow control

It is essential that the rate of supply of butane to the burner tube complies with the flow rate specified. If the butane cylinder has been stored in an environment cooler than the defined test conditions and/or some distance from the test rig, it is important there is sufficient length of tubing inside the controlled environment ( $23 \pm 7$  ° C) to ensure that the butane equilibrates to this temperature range before flow measurement. One way to assist this is to pass the butane, before flow measurement, through a metal tube immersed in water maintained at a temperature such that flow corrections for temperature variations are avoided.

Great care must be exercised with the measurement and setting of the flow rate of the butane. Direct reading flowmeters, even those obtained with direct butane calibration, need to be checked when initially installed and also at intervals by a method capable of measuring accurately the absolute butane flow at the burner tube. One way of doing this is to connect the

burner tube with a short length of tubing, of approximate internal diameter of 7 mm, to a soap bubble flowmeter, such that the upward passage of a soap film meniscus in a glass tube of calibrated volume (e.g., a burette) over a known period of time gives an absolute measurement of flow. Fine control valves which can each be preset to the desired butane flow rate may also be used.

### 6.3 Wood crib ignition source

#### 6.3.1 Materials and construction

The following are required for the construction of the wood crib:

- (a) dry planks of the softwood *Pinus silvestris* (Scots pine), which have been stored in warm dry conditions for a minimum of 1 week;
- (b) BPC grade absorbent surgical lint, approximately  $200 \text{ g/m}^2$ , which is cut into nominal squares 40 mm x 40 mm (each square having a mass of approximately 0.3 g);
- (c) Polyvinyl acetate (PVA) or other wood adhesive for gluing together sticks and lint.

#### 6.3.2 Assembly of the Wood Crib

The crib parameters are given in the table below. The crib is illustrated in **Figure 1**. A suggested method of construction is in § 6.3.3.

The required number and sizes of sticks, conditioned in accordance with § 6.4 are selected to provide the total mass and is assembled into a crib with the square of lint incorporated, fluffy side uppermost when the crib is standing on the base. The sticks in each layer are parallel to one another and at right angles to the sticks in the adjacent layer. The sticks in each layer are placed as far away from each other as possible, but without undue overhang at their ends, to form a square-sectioned crib. The sticks are glued together and the lint secured with small amounts of adhesive.

**Parameters of Wood Crib**

Stick length	$40 \pm 2 \text{ mm}$
Stick square section	$6.5 \pm 0.5 \text{ mm}$
Number of sticks	20
Total mass of sticks	$17 \pm 1 \text{ g}$
Number of layers each of two sticks	10
Approximate dimensions	40 x 40 mm

### 6.3.3 Suggested methods of construction

Glue together 18 sticks to form the main crib body. Place one square of lint across the crib square section and then glue on the remaining two sticks to form the base.

### 6.4 Conditioning

The sticks and cribs shall be conditioned immediately before the test 72 hours in indoor ambient conditions and then for at least 16 hours at  $20 \pm 5^\circ \text{C}$  and 40 - 55 % relative humidity.

## § 7 Test Method

### 7.1 General.

The Seating Area or Barrier test specimen consists of vertically and horizontally oriented components that comprise a single combination of covering fabric, barrier (if used), and standard polyurethane foam filling material. The Dust Cover test specimen is positioned in a horizontal orientation.

Materials forming the test specimen are assembled together on the appropriate test rig as described in § 8. This apparatus incorporates features designed to model the aspects of upholstered seating critical to ignition and to provide a means of measuring the potential ignitability of the composite.

## § 8 Apparatus

*8.1 Seating area and barrier test rigs*, consisting of two rectangular frames hinged together and capable of being locked at right angles to each other. The seating area test rig illustrated in **Figures 2a and 3** shall be used in the seating area test. The barrier test rig illustrated in **Figures 2b and 3** shall be used in the barrier test. The frames shall securely hold the expanded steel platforms and a standard edging section may be used around the expanded steel to give protection and greater rigidity.

The hinge rod shall be continuous across the back of the rig.

The frames shall be lockable at right angles through each of the pairs of members forming the back legs.

*8.2 Dust cover specimen holder*, consisting of a metal frame and clips is used to secure the dust cover test specimen. The dust cover specimen holder is illustrated in **Figure 4**.

*8.3 Seating area flammability test fixture and dust cover flammability test fixture* fabricated in accordance with the requirements of Appendix A shall be used to deliver the test flame to the samples. These fixtures are illustrated in **Figures 5a and 5b**.

8.4 *Stop clock*, accurate to 1 second and capable of measuring at least 1 hour.

8.5 *Ignition sources*, as described in § 6.

8.6 *Propan-2-ol*, to ignite wood crib (Barrier Test Only)

8.7 *Graduated glass syringe or other suitable measuring instrument*, capable of measuring  $1.4 \pm 0.1$  mL of propan-2-ol.

## § 9 Test specimens

### 9.1 General

The test specimens shall be a structure comprising vertical and horizontal parts of the specimen of upholstery materials submitted for testing.

The cover fabric, dust cover, or barrier materials shall be representative of the components to be used in the finished article of upholstered furniture.

### 9.2 Cover fabric and barrier fabric (if used)

Test specimens used in the seating area test rig described in § 8 shall be as shown in **Figures 6a**.

The test specimens used in the barrier test rig described in § 8 shall be as shown in **Figure 6b**.

The cover fabric test specimens shall be positioned on the Seating Area test rigs in the same orientation as on the finished article of upholstered furniture.

The cut-outs shall be positioned such that when assembled on the test rig the lie of any pile is down the vertical assembly and from the hinge to the front of the horizontal assembly. Where any other material is used, it is cut to the same dimensions and in the same orientation as the cover fabric, for fitting to the test rig under the cover.

The cover fabric size needed for the seating area test is  $800 \pm 10$  mm x  $650 \pm 10$  mm. The specimens shall have triangular cut-outs  $475 \pm 5$  mm from one end on both sides. The size of these cut-outs shall be approximately 50 mm x 110 mm high.

The barrier fabric needed for the barrier test is  $1100 \pm 10$  mm x  $650 \pm 10$  mm. The specimens shall have triangular cut-outs  $475 \pm 5$  mm from one end on both sides. The size of these cut-outs shall be approximately 50 mm x 110 mm high.

### *9.3 Dust cover fabric*

The dust cover fabric specimen shall be cut in a  $300 \times 300 \pm 5$  mm square.

### *9.4 Standard foam filling*

The seating area test requires two pieces of foam filling, one  $450 \pm 5$  mm x  $300 \pm 5$  mm x  $75 \pm 2$  mm) thick and the other  $450 \pm 5$  mm x  $150 \pm 5$  mm  $75 \pm 2$  mm thick. The foam shall be non-FR polyurethane with a density of 24 to 29 Kg/m<sup>3</sup> and an indentation deflection force (IFD) of 25-30. See **Figure 7**.

The barrier test requires two pieces of foam filling, one  $450 \pm 5$  mm x  $450 \pm 5$  mm x  $75 \pm 2$  mm) thick and the other  $450 \pm 5$  mm x  $300 \pm 5$  mm  $75 \pm 2$  mm thick. The foam shall be non-FR polyurethane with a density of 24 to 29 Kg/m<sup>3</sup> and an indentation deflection (IFD) force of 25-30. See **Figure 7**.

## § 10 Test Sample Preparation

*10.1 Seating area and barrier samples:* The sample materials should be removed from any packaging prior to conditioning. The test materials shall be the cover fabric or barrier fabric and standard polyurethane foam as the filling material. The assembly of the seating area and barrier mock-up is described below.

- 10.1.1 Position seat mock-up in the upright position. Insert end of fabric or barrier such that the larger dimension of the material is placed on the vertical portion of the seat mock-up.
- 10.1.2 Next, insert the smaller dimension of the fabric or barrier from behind around the hinged bar. Both ends shall be pulled taut and laid across the horizontal seating surface.
- 10.1.3 Place larger foam against crevice and on top of horizontally placed fabric or barrier and the vertical back of the seat mock-up.
- 10.1.3 Wrap the larger dimension fabric or barrier around the foam to the back of the seat mock-up and fasten with metal clips.
- 10.1.4 Position the smaller dimension of fabric and place smaller foam flush on front edge of seat frame with 75 mm vertical dimension. Wrap both pieces of fabric or barrier around entire contour of seat foam. Insert larger foam between the wrapped fabric or barrier and the vertical back of the seat mock-up.
- 10.1.5 Fasten all fabric or barrier edges to the top, bottom, and sides of each frame using metal clips. Ensure that the fabric or barrier is secured and under even tension. Pull taut to eliminate air pockets between fabric or barrier and foam, but do not create a gap larger than 1/8" along the crevice. See **Figure 8**.

*10.2 Dust cover samples:* The dust cover materials should be removed from any packaging prior to conditioning. The assembly of the dust cover mock-up is described below.

- 10.2.1 Secure dust cover sample with metal clips in the specimen holder to avoid wrinkles in the fabric. Pull sample taut around the edges to avoid any dipping or sagging. See **Figure 9**.

## § 11 Seating Area Test Procedure

- 11.1 Install the seat mock-up seating area flammability test fixture, align and adjust such that the horizontal burner tube rests evenly along the vertical and horizontal intersection of the crevice. See **Figure 10**.
- 11.2 Light the gas emerging from the burner tube, adjust the gas flow rate specified in § 6 and allow the flame to stabilize for at least 2 minutes. Ensure the flame height is approximately 35 mm.
- 11.3 Actuate the furniture test fixture to apply the lit burner flame for **20 seconds** and simultaneously start the clock.
- 11.4 Observe for evidence of ignition in the interior or cover of the mockup.

- 11.5 If flaming or progressive smoldering of the mockup is observed, extinguish the test specimen and record ignition for the seating area test.
- 11.6 If flaming or progressive smoldering is not observed, non-ignition for the seating area test unless the test specimen fails the final examination specified in § 14. In this case, extinguish the test specimen and record ignition.

### § 12 Dust Cover Test Procedure

- 12.1 Place the specimen horizontally in its holder in the dust cover flammability test fixture and adjust the burner tube by placing the 35 mm flame gage on the tube, until the tip of the gage touches the center of the dust cover specimen. See **Figure 11**.
- 12.2 Light the gas emerging from the longer 11 in (279 mm) burner tube, adjust the gas flow rate (specified in § 6) and allow the flame to stabilize for at least 2 minutes. Ensure the flame height is approximately 35 mm.
- 12.3 Actuate the furniture test fixture to apply the lit burner flame at the bottom center of the specimen for **20 seconds**.
- 12.4 Observe for ignition of the dust cover fabric.
- 12.5 If flaming or progressive smoldering of the dust cover specimen is observed, extinguish the test specimen and record ignition for the dust cover test.
- 12.6 If flaming or progressive smoldering is not observed, record non-ignition for the dust cover test, unless the test specimen fails the final examination specified in § 14. In this case, extinguish the test specimen and record ignition.

### § 13 Barrier Test Procedure

- 13.1 After assembly and conditioning of the wooden crib, slowly add  $1.4 \pm 0.1$  mL of propan-2-ol to the center of the lint using the measuring instrument (see § 8.7). Place the crib on the horizontal part in contact with the vertical part of the test specimen, centrally between the sides of the test rig. The base sticks of the crib shall be parallel to the vertical surface of the test specimen.
- 13.2 Within 2 minutes of adding the propan-2-ol to the lint, ignite the alcohol from the front and above the lint, using a match, small gas flame, or hot wire ignition, and simultaneously start the clock. If the crib collapses causing embers to be scattered greater than 100 mm measured from the edge of the crib, repeat the test with a new crib place in position on a new test specimen.
- 13.3 Observe for evidence of ignition (see § 4) in the interior of the mockup or the barrier fabric.
- 13.4 If flaming or progressive smoldering of the barrier fabric/foam mockup is observed (see §4), extinguish the test specimen and record ignition for the barrier test.

- 13.5 If flaming or progressive smoldering is not observed (see § 4), record non-ignition for the barrier test, unless the test specimen fails the final examination specified in 14. In this case, extinguish the test specimen and record ignition for the barrier test.

#### **§ 14 Final Examination**

As cases of progressive smoldering can be undetectable from the outside of test specimens, immediately after completion of the test procedure, dismantle and examine the filling of the test specimen for progressive smoldering. If this is present, extinguish the test specimen and record ignition for the relevant test procedure. Use safety precautions when dismantling test specimens, and the potential for rapid flaming can ensue when foam is exposed.

#### **§ 15 Sampling Plan**

15.1 The Test Criteria of Section 4 shall be used in conjunction with the following fabric sampling plan or any other plan approved by the Consumer Product Safety Commission that provides at least the equivalent level of fire safety to the consumer.

15.2 Different colors or different print patterns of the same fabric, or different fabrics with equivalent flammability characteristics, may be included in a single Fabric Production Unit, provided that they demonstrate equivalent test results of at least three samples from each fabric included in the Unit.

#### **15.3 Fabric Sampling.**

- (a) Specimens and Sampling – Fabric Sampling. A Fabric Production Unit (Unit) is either accepted or rejected in accordance with the following plan:
- (1) Initial Sampling. Select one Sample from the beginning of the Fabric Piece (Piece) in the Unit, one from Sample from the middle Piece in the Unit, and one Sample from the end of the last Piece in the Unit. Test the three selected Samples. If all three Samples meet all the Test Criteria of Section 4, accept the Unit. If any of the Samples fail any of the Test Criteria, reject the Unit. If only one individual specimen from the 12 selected specimens fail any Test Criteria, select four additional specimens from the same end of the Piece in which the failure occurred. If this additional Sample passes all the Test Criteria, accept the Unit. If this additional fails any part of the Test Criteria, reject the Unit.
  - (2) Normal Sampling. (I) The level of sampling required for fabric acceptance may be reduced provided the preceding 5 Units of the fabric have all been accepted using the Normal Sampling plan.
    - (i) The Normal Sampling plan shall be the same as for Initial Sampling except that the quantity of fabric in the Unit may be increased to 5,000 linear yards.

- (ii) Select at least two Samples from a fabric Piece, one from the beginning and one from the end of the Piece. Accept or reject the Unit on the same basis as the Normal Sampling Plan.
  - (iii) Normal Sampling shall be discontinued and Initial Sampling resumed if a Unit is rejected.
- (3) **Reduced Sampling.** The level of sampling required for acceptance can be decreased when 5 Units pass under Normal Sampling. Reduced Sampling shall be the same as Normal Sampling except a production unit may represent up to 10,000 linear yards. Reduced Sampling shall be discontinued and Initial Sampling resumed if a Unit is rejected.

## § 16 Recordkeeping

16.1 *General Requirements.* Every manufacturer initially introducing into commerce items subject to this standard irrespective of whether guaranties are issued under paragraph 4, shall maintain written and physical records as specified. The records must establish a line of continuity from fabric manufacturers through processing to the furniture manufacturer and from the specific finished item to the manufacturing records. Such records shall show:

- (a) Details, description, and identification of any and all sampling plans engaged in pursuant to the requirements of this standard. The records must be sufficient to demonstrate compliance with such sampling plan(s) and must relate the sampling plan(s) to the actual items being produced. The total quantity of fabric in each lot must be recorded.
- (b) Fabric Production Units used in the finished articles of upholstered furniture.
- (c) Test results and details of all tests performed for each production unit, details of the sampling procedure employed, name and signature of the persons conducting tests, date of tests, and all other records necessary to demonstrate compliance with the test procedures specified by this standard or authorized alternate sampling plan.
- (d) Disposition of all failing or rejected items. Such records must demonstrate that the items were retested or reworked and retested items comply with this standard, or otherwise show the disposition of such items.
- (e) Fiber content and manufacturing specifications relating testing to the applicable Fabric Production Unit.
- (f) Data and test results that support a basis for inclusion of different colors or different print patterns of the same fabric, or fabrics with equivalent performance, as a single Fabric Production Unit.
- (g) Identification, composition, and details of application of any flame retardant treatments applied.
- (h) Date and quantity of each sale or delivery of items subject to this standard (except date of sale to an ultimate consumer) and the name and address of the purchaser or recipient (except an ultimate consumer). The items involved in each sale or delivery shall be identified by production unit; such identification must remain with the Fabric Production Unit.

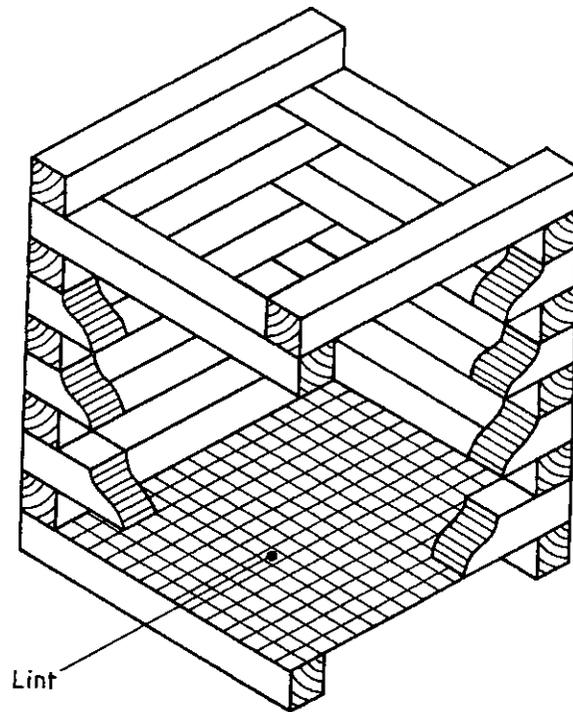
16.2 In addition to the information specified in 16.1, the written and physical records maintained with respect to each Fabric Production Unit shall include:

- (a) Finished fabric samples sufficient to repeat the fabric sampling procedure required by § 15 for each production unit.
- (b) Remains of all physical specimens in accordance with this standard.
- (c) Records that relate the samples to the actual Fabric Production Unit. Upon request of any duly authorized employee or agent of the Commission, samples sufficient for the sampling and testing of any production unit in accordance with § 15 shall be furnished from these records within the time specified in the written request.

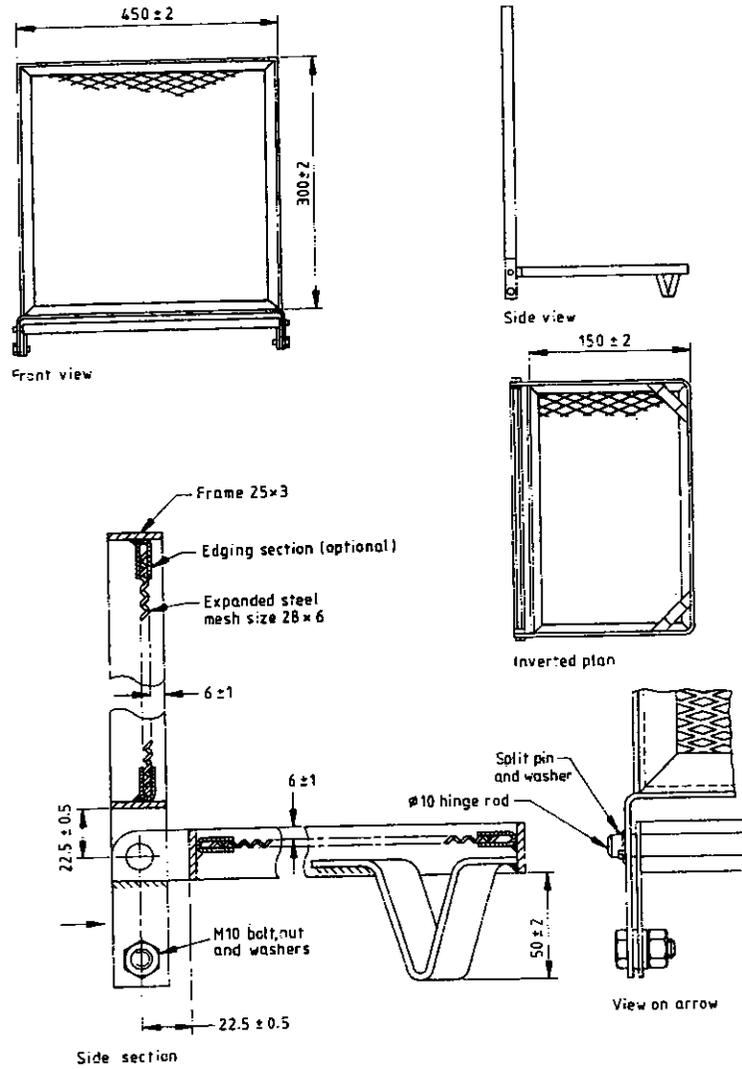
16.3 *Record Retention Requirements.* The records and physical samples required by this section shall be maintained for as long as the Fabric Production Unit is in production or as long as they are relied upon as demonstrating compliance with the testing requirements of this standard, and for three years thereafter.

16.4 *Tests for Guaranty Purposes.* Reasonable and representative tests for the purpose of issuing a guaranty under section 8 of the Flammable Fabrics Act (15 U.S.C. 1197) for items subject to this standard shall be those tests performed pursuant to any sampling plan or authorized alternative sampling plan engaged in pursuant to the requirements of this standard.

**APPENDIX A Figures**



**Figure 1 – Alternate Barrier Test Wood Crib Ignition Source**



All parts are of steel. All dimensions are in millimetres and have a tolerance of 2.5 %, unless otherwise shown.

Figure 2a Seating Area Test Rig

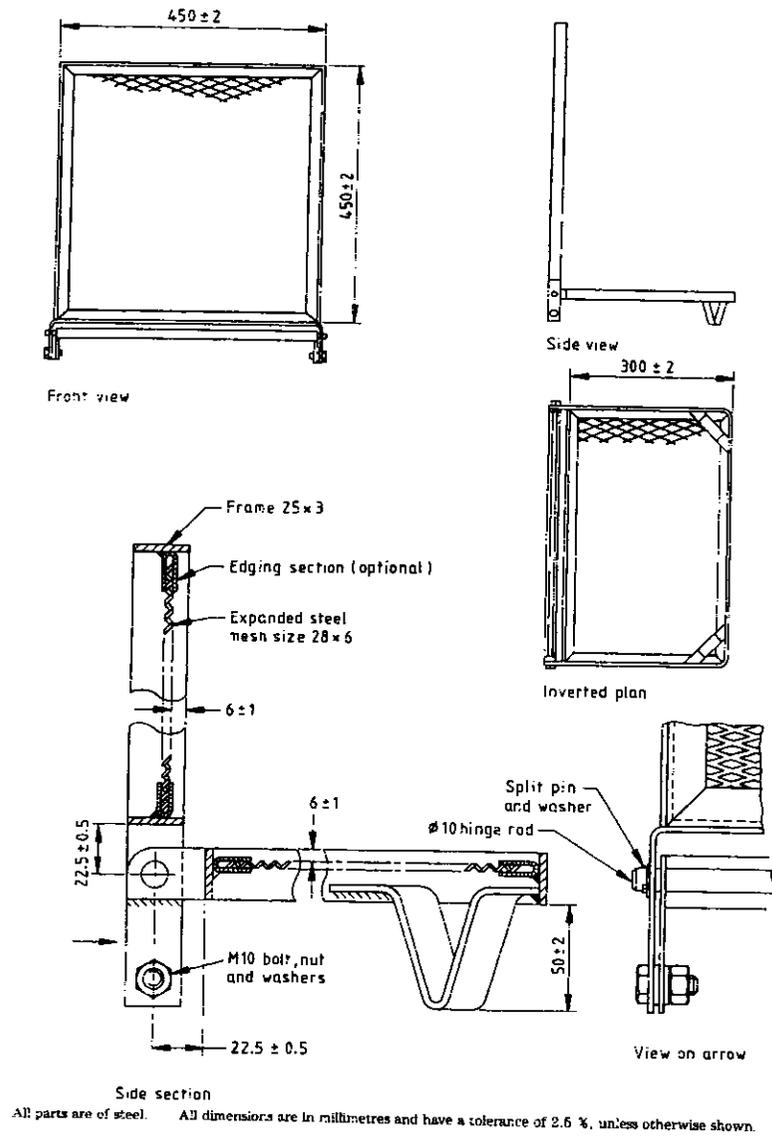
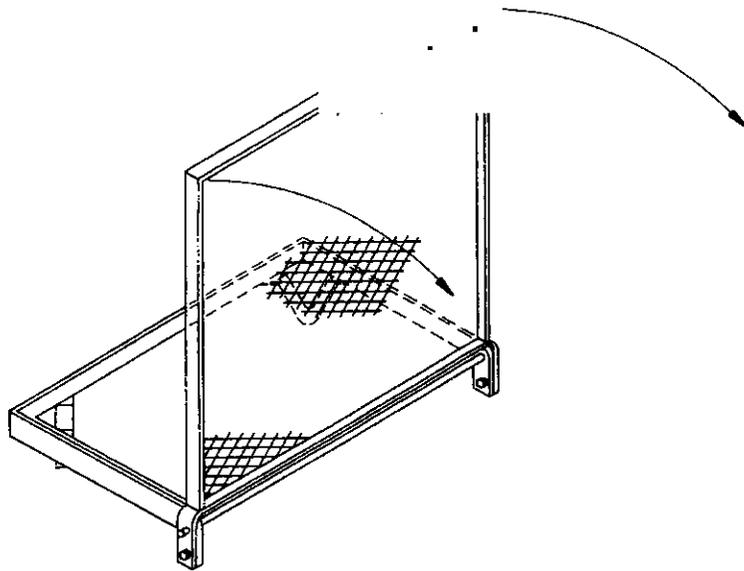
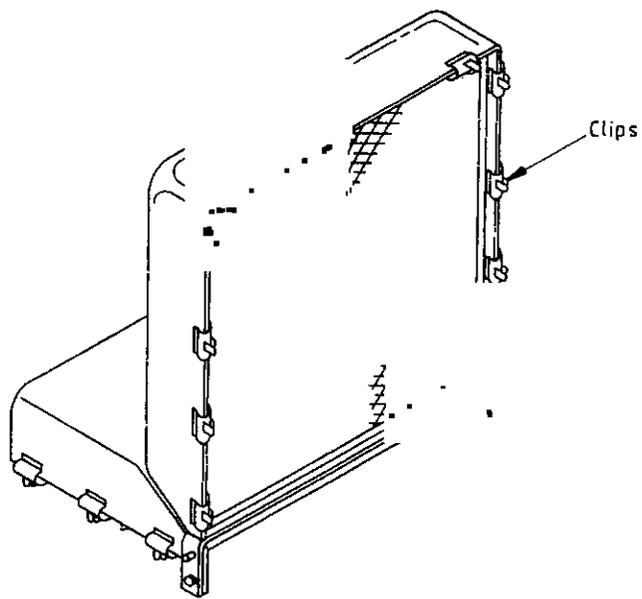


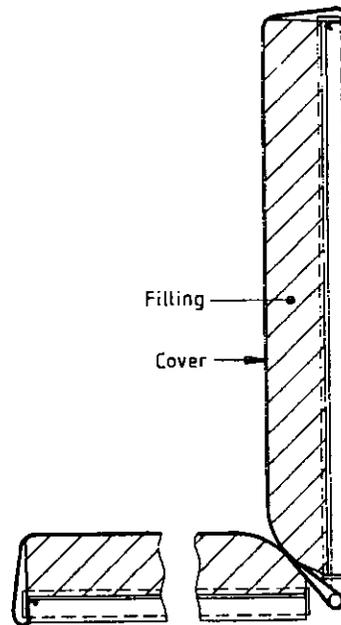
Figure 2b Barrier Test Rig



(a) Test rig



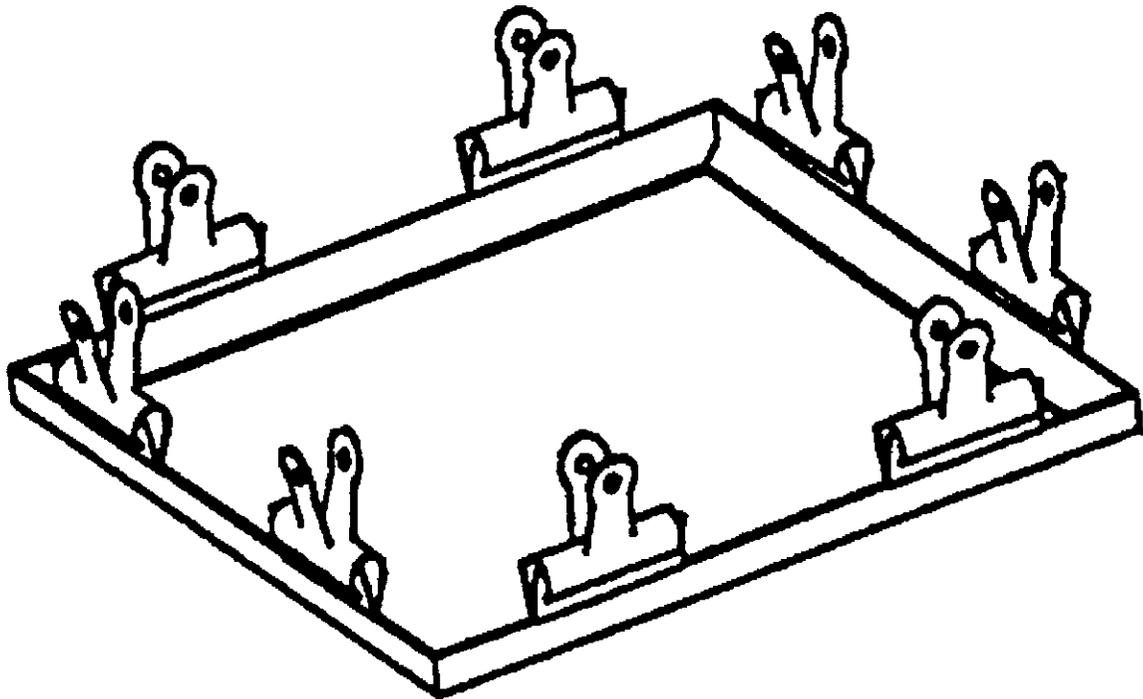
(b) Test rig with cover and fillings



Vertical section

**Figure 3 – Seating Area/Barrier Test Rigs**

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**Figure 4 – Dust Cover Test Rig**

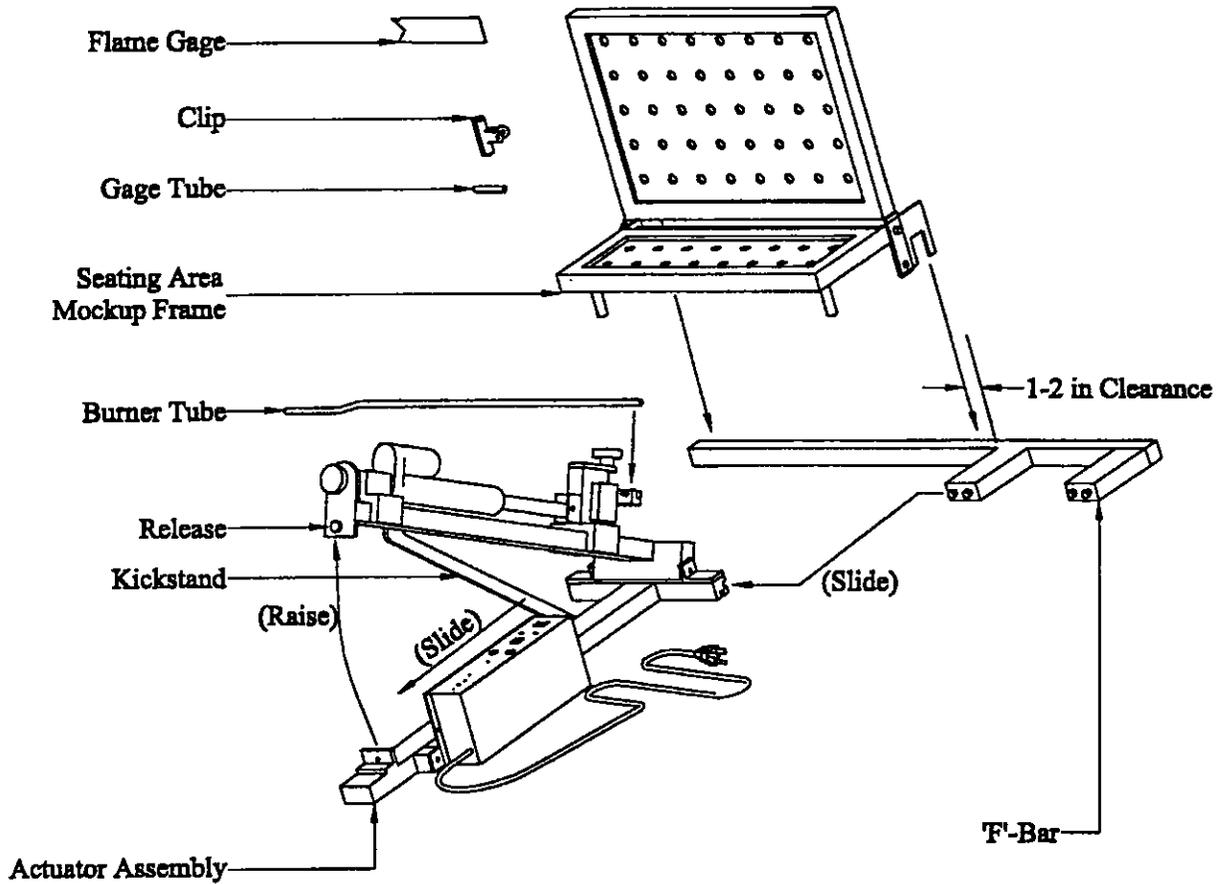


Figure 5a – Seating Area Test Fixture

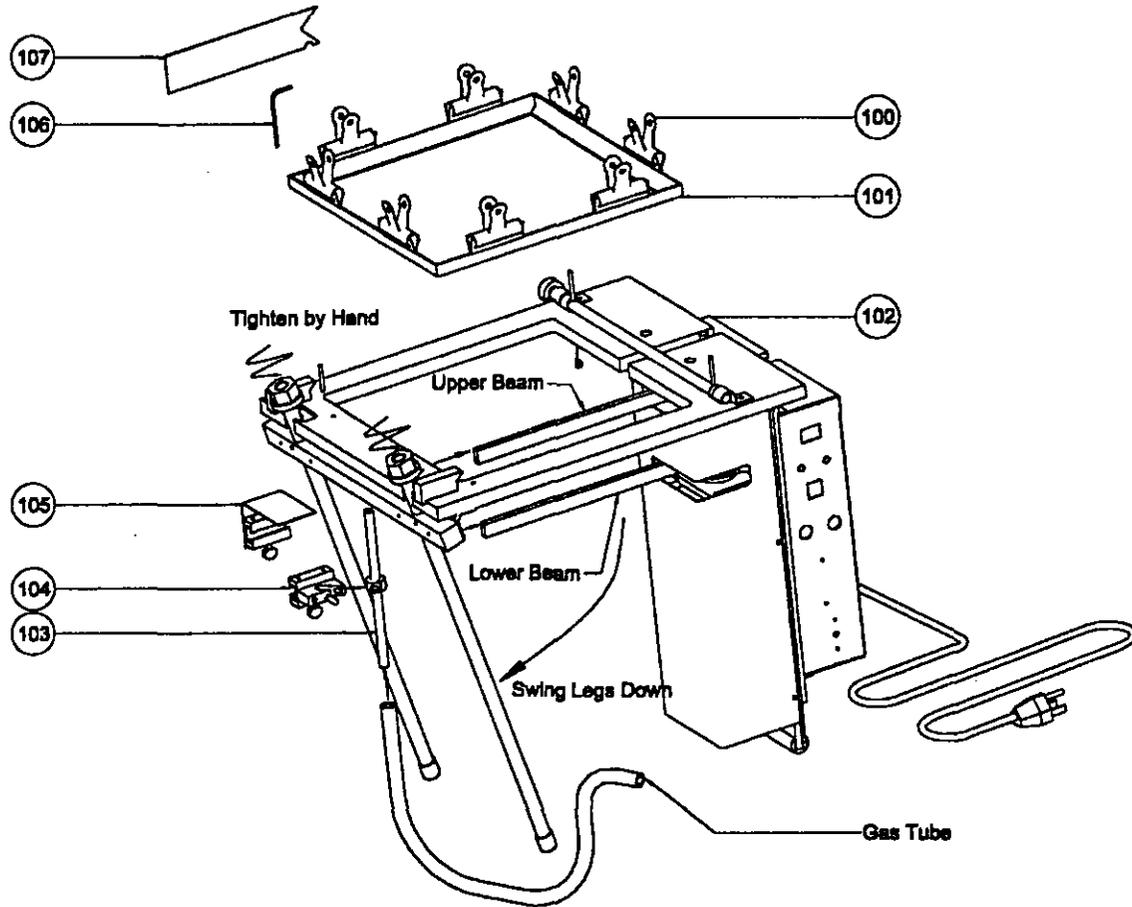
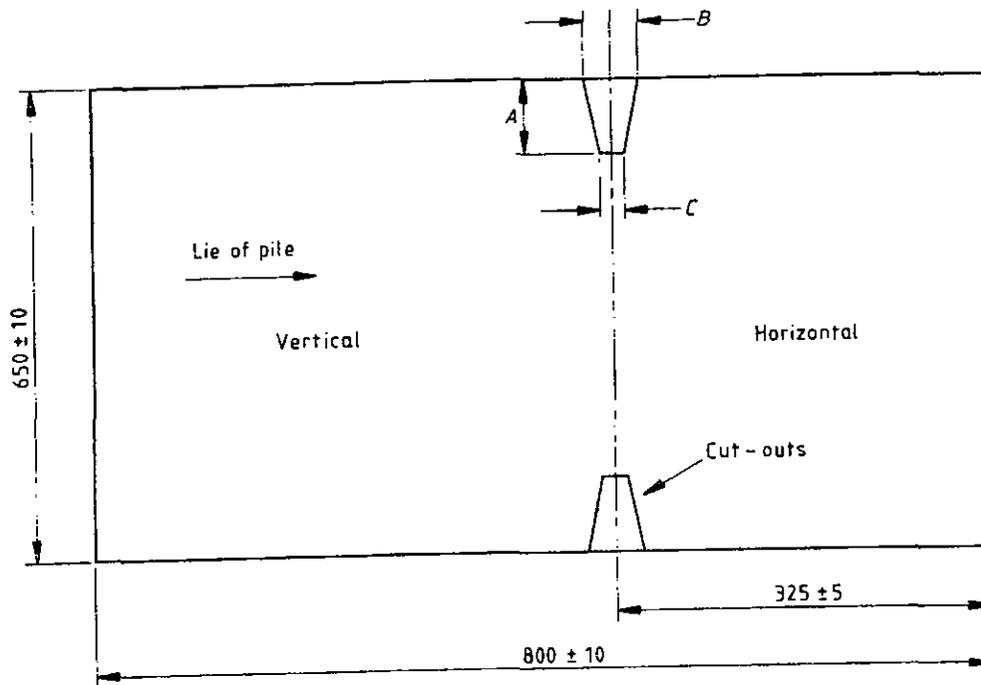


Figure 5b - Dust Cover Test Fixture



Approximate cut-out dimensions

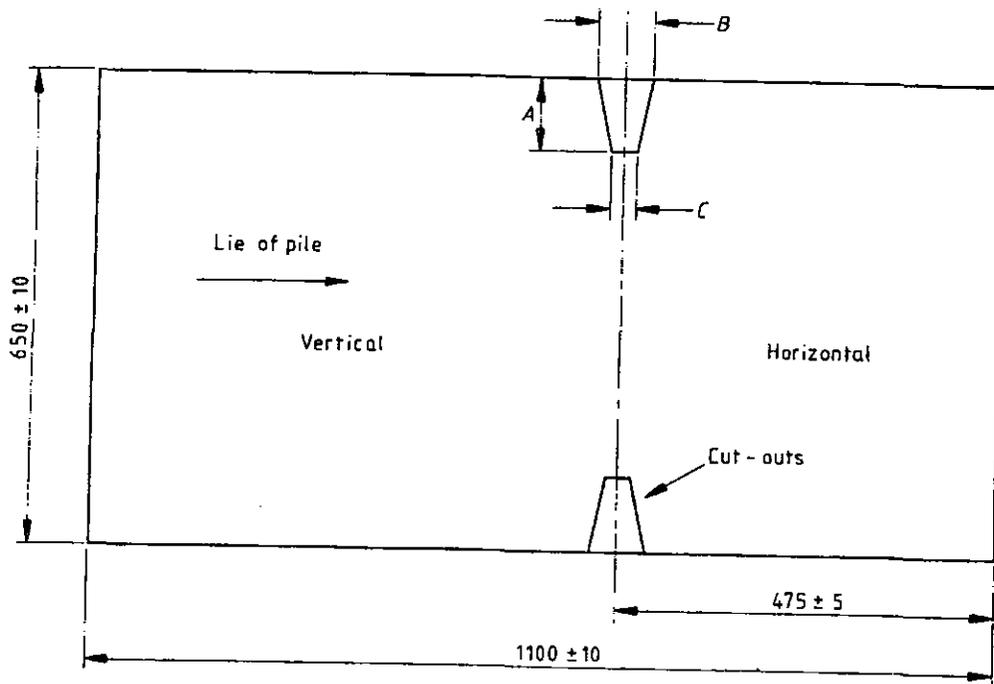
A : 110

B : 50

C : 25

All dimensions are in millimetres.

Figure 6a – Cover Fabric Cut-outs



Approximate cut-out dimensions

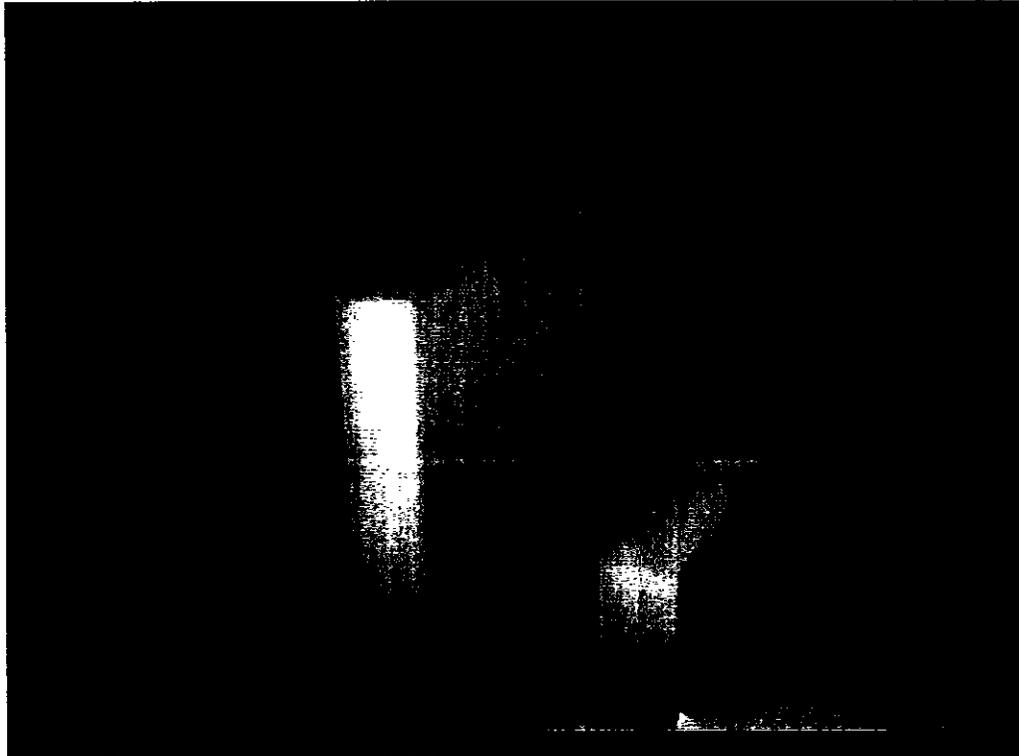
A : 110

B : 50

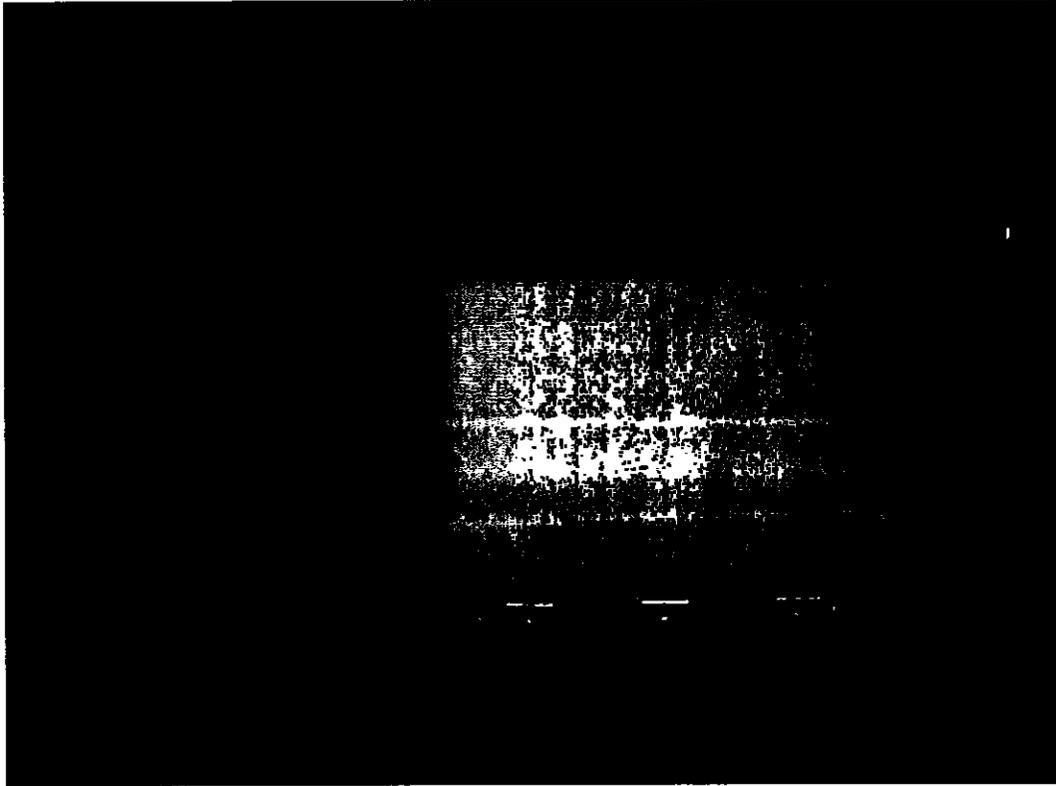
C : 25

All dimensions are in millimetres.

**Figure 6a – Barrier Cut-outs**



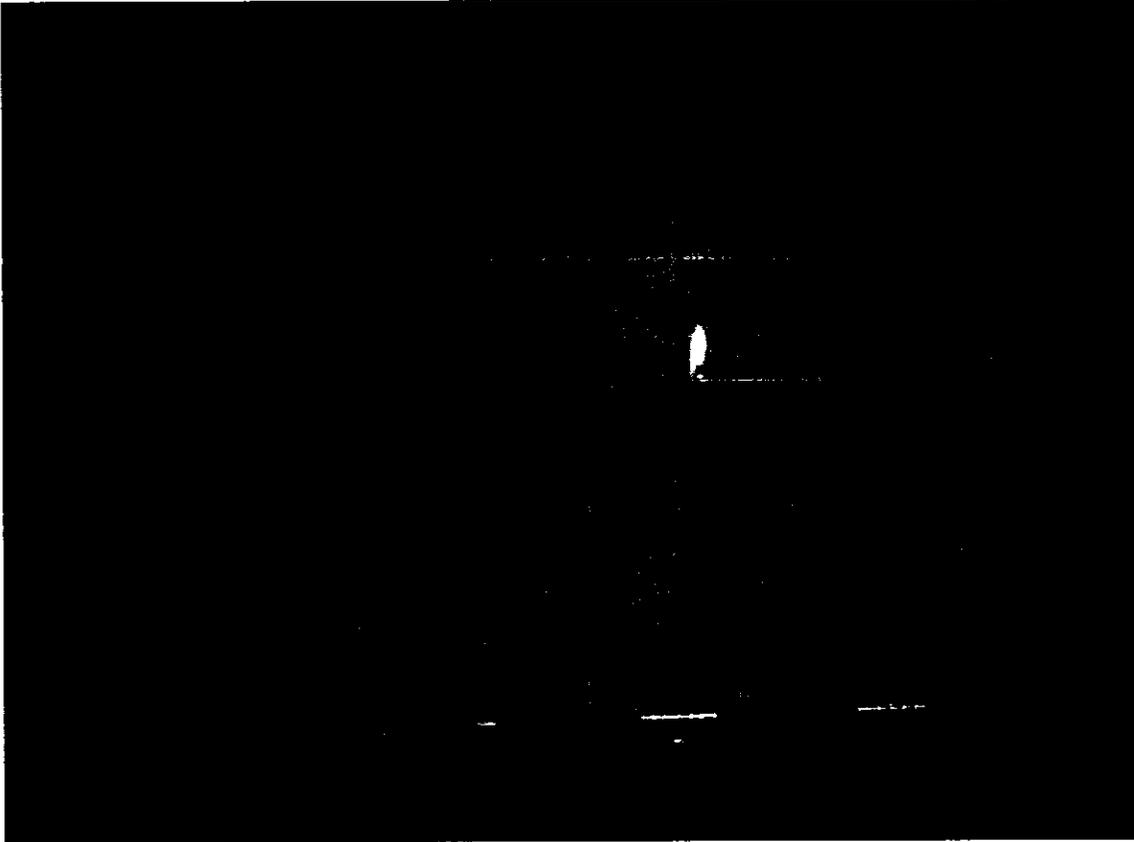
**Figure 7 – Standard Foam Filling**



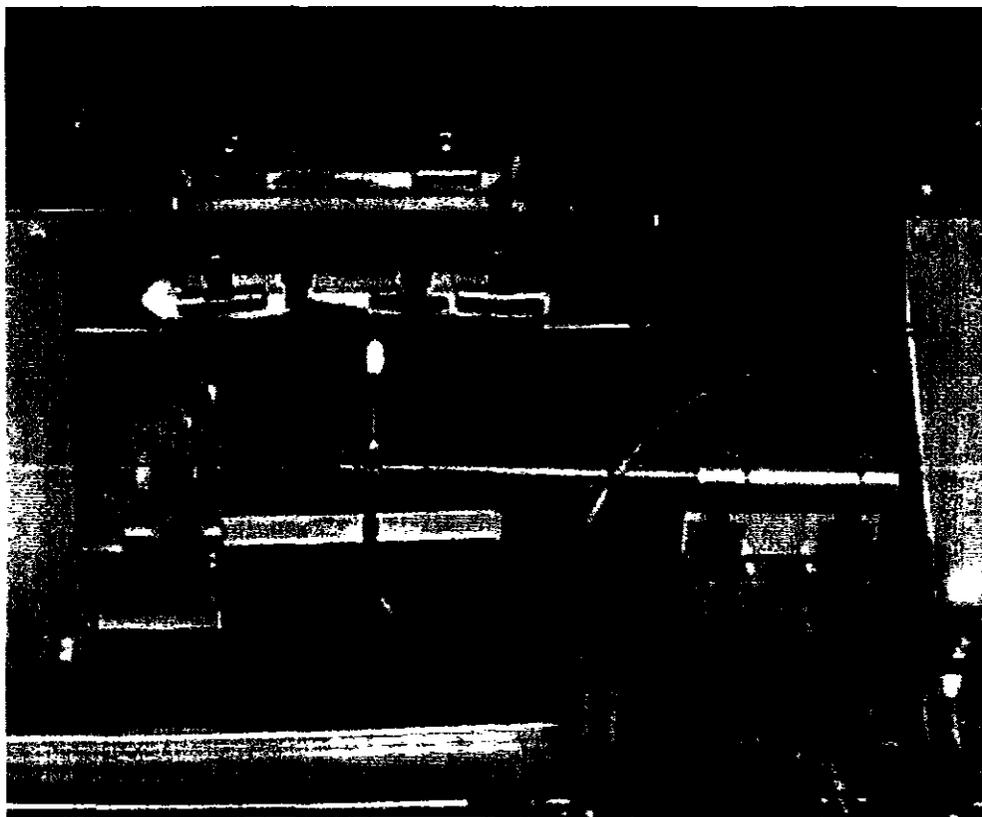
**Figure 8 Seating Area/Barrier Test Samples**



**Figure 9 - Dust Cover Specimen in Holder**



**Figure 10 Seating Area Test Flame Position**



**Figure 11 - Dust Cover Test Flame Position**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: April 14, 2000

TO : Dale Ray, Project Manager, Upholstered Furniture

THROUGH: Andrew G. Stadnik, Acting AED, Laboratory Sciences *ASD*  
James Hyatt, Director, Division of Mechanical Engineering *JH*

FROM : Mark Eilbert, <sup>mgf</sup>Division of Mechanical Engineering

SUBJECT : Transmittal of Documents: Operations Manuals for Upholstered Furniture Test Fixtures

This memorandum forwards the subject documents for the Upholstered Furniture Project.

**Attachments(s)**

Operations Manual: Dust Cover Fabric Flammability Test Fixture, April 13, 2000  
Operations Manual: Seating Area Fabric Flammability Test Fixture, April 14, 2000

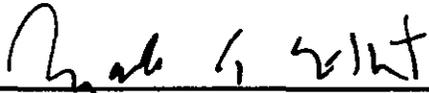
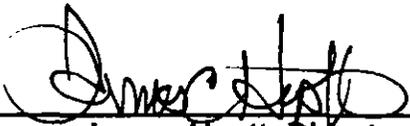
**OPERATIONS MANUAL**  
**Seating Area Fabric Flammability Test Fixture**

April 14, 2000

Version 1

Fixture Developed by  
**Engineering Laboratory**  
**U.S. Consumer Product Safety Commission**

**APPROVAL RECORD**

<u>4/09/01</u> DATE	 Mark G. Eilbert, Mechanical Engineer
<u>4/09/01</u> DATE	 James Hyatt, Director, Division of Mechanical Engineering

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<b>4) SPECIFICATIONS</b>	<b>12</b>
<b>5) TECHNICAL ASSISTANCE</b>	<b>12</b>

## **Acknowledgements**

The following people were principally involved in design, fabrication, and testing during development and production of five Seating Area Fixtures during summer, 1999.

<b>Design:</b>	Mark Eilbert, Mechanical Engineer Nelson Caballero, Electrical Engineer Perry Sharpless, Mechanical Engineer
<b>Fabrication:</b>	Perry Sharpless, Mechanical Engineer Richard Schenck, Electrical Technician Nelson Caballero, Electrical Engineer
<b>Testing:</b>	Nelson Caballero, Electrical Engineer

## 1) Getting Started

This is the Operation Manual for the Seating Area Flammability Test Fixture. The fixture was developed to support an ANPR<sup>1</sup> for the Draft Standard For Upholstered Furniture<sup>2</sup>. This fixture is designed to hold and test seating area fabric assemblies intended for upholstered furniture. The seating area consists of a seat and a back overlaid with padding and coverings, including the outer fabric.

### Important!

Before attempting to use this fixture, it is important to read and understand the instructions in this Manual. Following these instructions will ensure that the fixture operates as intended or, if there should be a problem, that CPSC Technical Staff can determine its nature. Follow the appropriate test protocol in the draft standard for the Seating Area test, which includes requirements for the preparation of test specimens and for a regulated gas supply.

### Basic Operation

The seating area test is used to determine if a material specimen sustains combustion once the flame is removed. This is further defined in the test protocol of the draft standard. This fixture moves a flame source to a material specimen that covers a framework resembling a seating area. A horizontal burner tube carries the flame source into the crevice between the seat and back of this "mockup" in a controlled way and for a set time period. In the two extremes of movement, the burner tube will move between a position in front and outside the mockup to a position adjacent to the crevice. These positions correspond to the setup and test positions, respectively.

### Safety

**Moving Parts:** Avoid accidents and anticipate the moving parts of this test fixture. In automatic operational mode, the burner tube will move according to a timed sequence. Become familiar with the operation of this fixture in both manual and automatic modes by following the checkout procedure in the Operation section.

**Fire Suppression:** Extinguish the test sample soon after each test using the appropriate fire extinguisher and following the requirements for observations and data collection detailed in the draft standard.

---

<sup>1</sup> ANPR: Advanced Notice for Proposed Rulemaking

<sup>2</sup> Draft Standard For Upholstered Furniture, Standard for Small Open Flame Ignition Resistance of Upholstered Furniture. See Endnote.

## **General Care**

This fixture is designed for laboratory use.

The fixture should be:

1. placed on a level, stable surface.
2. operated with a nominal 90-130 VAC, 50/60 Hz power source.
3. handled with care, avoiding sudden shocks.
4. transported in the shipping container or similarly padded container or be hand-carried.

The fixture should not be:

5. exposed to water, including fire suppression.
6. *subject to unintended use or abuse.*
7. placed where anything can obstruct the moving parts.
8. modified in any way without prior approval.

### Packing/Unpacking

Unpack the fixture carefully and save all packing materials. Note that the fixture may be in split shipments. Refer to the Parts Checklist.

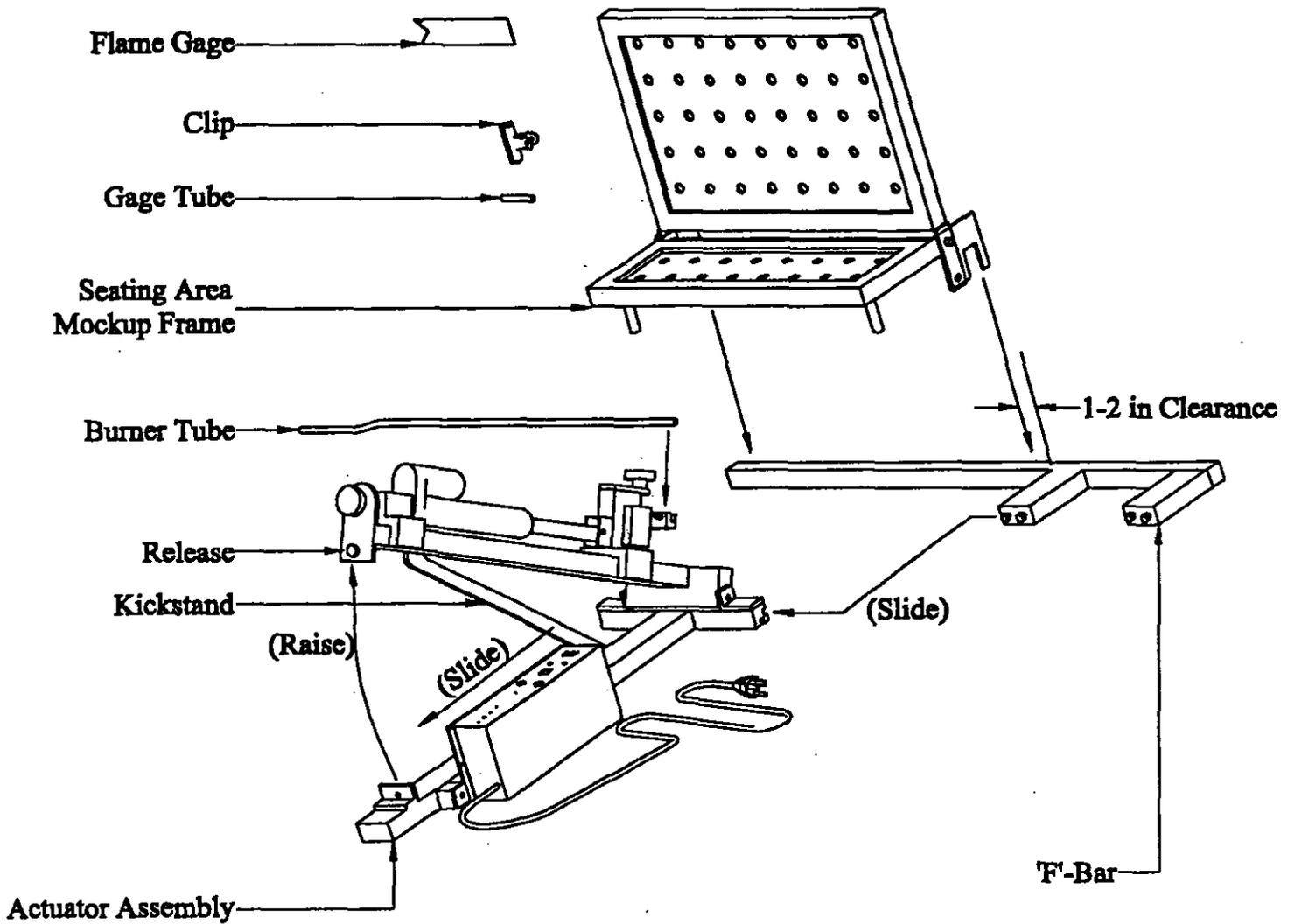
### Parts Checklist

Referring to Figure 1, check that all the parts listed in Table 1 are present. Refer to the Technical Assistance section for help if any parts are missing. [Some extra Frame Clips have been supplied: generally 24 are required for 2 specimens.].

**Table 1**  
Parts Checklist

Description	Quantity	
Actuator Assembly	1	
Burner Tube, 24-inch	1	
Cross Bar ('F'-Bar)	1	
Seating Area "Mockup" Frame	2	
Clips	30	
Flame Gage	1	
Gage Tube, 2-inch	1	

# Figure 1 Fixture Assembly



## **Assembly**

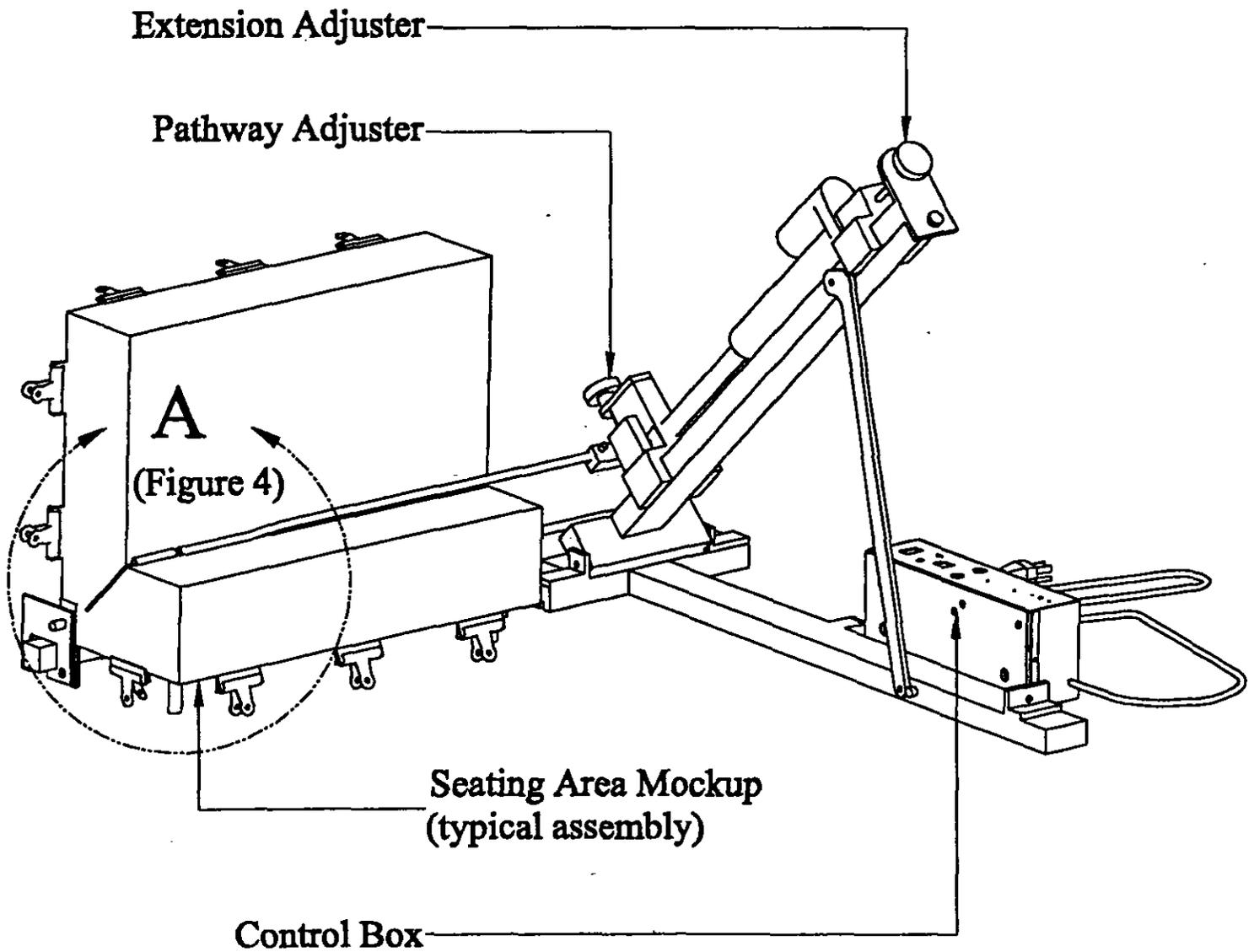
Referring to the Parts List and Figure 1, assemble the Fixture as follows. Refer to the Technical Assistance section for help with any questions.

1. Place the Actuator Assembly on a level surface.
2. Erect the Actuator Assembly:
  - a) Pull the Release handle.
  - b) Raise the upper portion.
  - c) Slide the bottom of the Kickstand to the stop.
3. Attach the 'F'-bar:
  - a) Align the screws on the bar "legs" with the slot in the Actuator Assembly.
  - b) Be sure that the two "feet", positioned at the extremes of the 'F'-bar, are facing down.
  - c) Slide the 'F'-bar in the slot until it stops.
4. Install the Seating Area Mockup Frame:
  - a) Choose a location on the 'F'-bar such that the Mockup is about 1-2 inches from the "leg" of the 'F'-bar.
  - b) Set the 'U'-shaped feet over the 'F'-bar and firmly press downwards until seated.
5. Install the Burner Tube:
  - a) Hold the straight end (without the double bend).
  - b) Using both hands, press the tube down into the receiver on top of the Actuator Assembly. Draw the tube in using the thumbs on top and the fingers beneath the receiver.
  - c) Rotate the tube until the bent end drops such that it most nearly approaches a 45-degree angle directed towards the crevice of the Mockup.
  - d) To position the end of the tube along the crevice, slide it within the receiver. Positioning is specified in the draft standard<sup>1</sup>.
6. Assembly is complete. The assembled fixture should look like that depicted in Figure 2.

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<sup>1</sup> Refer to the CPSC draft standard. See Endnote.

**Figure 2**  
**Fixture in Test Position**



## **2) Operation**

This section describes the operation of the Fixture in manual mode (for setting up) and in automatic mode (for running tests). An initial checkout procedure will incorporate descriptions of these modes. Also, adjustment procedures will be described. Before operating, ensure that the Fixture has been assembled properly and is placed on a secure level surface without obstructions near the Fixture. Begin with the Checkout.

### **Checkout**

Determine proper functioning of the fixture by performing the following (9) steps of the operational checkout. Refer to Figure 3, Control Panel.

1. Switch power off (the power switch LED light will be up).
2. Switch Manual/Automatic to Manual.
3. Plug into a nominal 120 Volt A/C power source.
4. Switch power on (LED will light).

### **Manual Mode Checkout**

The purpose of manual mode is to check the test setup while maintaining control of movement. Perform Steps 5 and 6 several times in forward and reverse sequences to check the motor and drive system. In manual mode, avoid moving the Burner Tube into contact with obstructions, including the Seating Area Mockup. If contact is anticipated, adjust the Burner Tube before continuing with this checkout. Refer to the Adjustments section.

5. Depress the In/Out switch towards the "In" position and hold – the Burner Tube will move towards the Seating Area Mockup and stop. This will be the approximate test position for the burner tube.
6. Depress the In/Out switch towards the "Out" position and hold– the Burner Tube will move away from the Seating Area Mockup and stop. This is the setup position for the burner.

Figure 3  
Control Panel

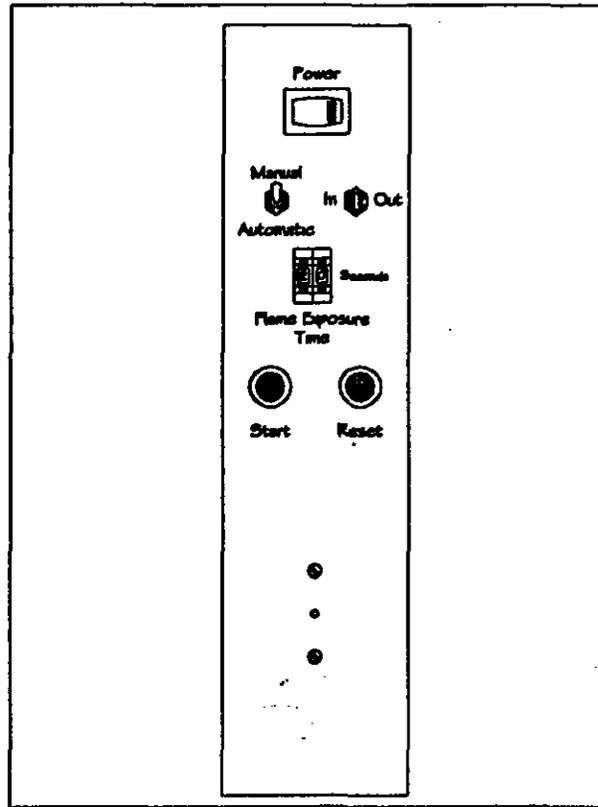
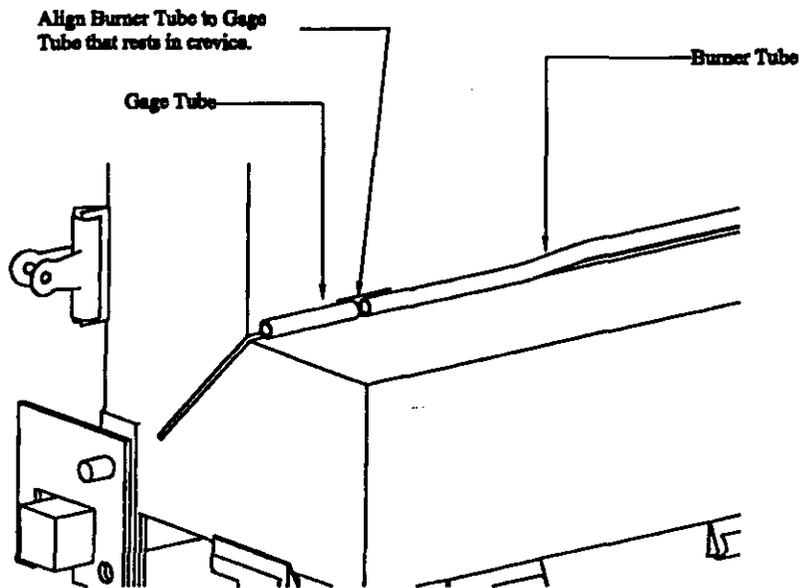


Figure 4  
Checking Burner Position



VIEW A  
(Figure 2)

## Automatic Mode Checkout

Automatic mode is used to perform actual tests. The extents of movement of the Burner Tube are set during a manual mode setup. Always begin each test setup in manual mode to avoid uncontrolled contact of the Burner Tube with the Seating Area Mockup. For each new test, REMOVE THE BURNER TUBE before performing this automatic mode checkout. Refer to the Assembly section.

**Warning:** Whenever "Auto" is selected, the motor will automatically move the Burner Tube.

7. Flip the Manual/Automatic switch to automatic mode. When automatic is selected, a long tone will sound. Immediately following, the motor will move the Burner Tube to the setup position, as described in step 6. At this position, four short tones will sound, indicating that the fixture is ready to run a test. (There are no tones in manual mode.)
8. Press the Start button. The following automatic sequence will occur:
  - a. The Burner Tube will advance to the test position and stop.
  - b. A 20-sec flame-exposure<sup>1</sup> begins.
  - c. After the timed exposure, the Burner Tube will return to the setup position and stop. A four-tone signal will indicate readiness for more testing.
9. Abort button. The resetting feature allows the Burner Tube to be called back in automatic mode. Test this feature by pressing the Abort button while a (mock) test is in progress (i.e. during the Step 8 sequence).

## Adjustments

### Timer.

The time period of the flame exposure is fixed at 20 seconds<sup>1</sup> for tests that require a single time period. In this case, the 2-digit thumbwheel timer on the control panel is not active. This timer/display has a 1 to 99 sec range when active. Refer to the Technical Assistance section for more information.

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<sup>1</sup> Refer to the CPSC draft standard. See Endnote.

### **Burner Offset.**

For tests, the end of the Burner Tube must "rest" in the crevice of the Seating Area Mockup. To achieve this condition, the position of the Burner Tube is adjusted to the end of the Gage Tube as it rests in the crevice. A properly positioned Burner Tube is depicted in Figures 2 and 4.

- 1) Compare the position of the Burner Tube to that of the Gage Tube as follows.
  - a) Rest the Gage Tube in the crevice with one end near the intended site of the Burner Tube. Refer to Figure 4.
  - b) Note the alignment of the circular ends of the two tubes.
- 2) Adjust the Burner Tube until the Gage and Burner Tubes are concentric<sup>1</sup> using the Extension and Pathway adjustments. Locate these adjustment knobs in Figure 2.
  - a) To extend or retract the Burner Tube into or from the crevice, adjust the Extension knob. Extension/retraction adjustments are directed at a 45-degree incline into the crevice. **NOTE: IF THE EXTENSION KNOB LOCKS WHEN TURNED CLOCKWISE, BACK OFF ¼ TURN. LOCKING THE KNOB WILL ADVERSELY AFFECT THE DRIVE SYSTEM AND IS TO BE AVOIDED.**
  - b) To change the path of descent of the Burner Tube, adjust the Pathway knob. Pathway adjustments are perpendicular to the Extension adjustments and are at a 45-degree incline across the crevice.

### **Burner Position along Crevice.**

To position the Burner Tube along the crevice, slide it within the Tube Receiver. Spring force within the Tube Receiver will hold the new position. The position along the crevice is specified in the draft standard<sup>1</sup>.

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<sup>1</sup> Refer to the CPSC draft standard. See End Note.

## Conducting a Test

Refer to the previous sections for details on operations and adjustments. At this point, a fabric mockup and a suitable gas with calibrated gas flow should be on hand<sup>1</sup>. Generally, the procedure to conduct a test is to setup the test without a flame, light the flame, and let the fixture automate the test. Figure 2 depicts the fixture in the test position with a typical mockup.

1. Install a Mockup on the 'F'-bar (Assembly, page 6).
2. Move the unlit Burner Tube to the test position using the manual mode controls and the adjustment knobs (Operation, page 7).
3. Check the burner offset in the crevice using the Gage Tube. Make adjustments using the Extension and Pathway knobs (Adjustments, page 9).
4. Return to the setup position (Operation, page 8).
5. Light the burner gas and let the flame stabilize<sup>1</sup>.
6. Select automatic mode and press Abort. Pressing Abort ensures that the test sequence is initialized.
7. Press Start.
8. At the conclusion of the automatic sequence, perform observations and then apply fire suppression<sup>1</sup> if necessary.

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<sup>1</sup> Refer to the CPSC draft standard. See End Note

### **3) Maintenance and Troubleshooting**

#### **Maintenance**

1. Clear burn residue from the Burner Tube, especially near or in the opening.
2. Periodically clean the Mockup frame with a wire brush. Remove fabric and foam debris that blocks the screens.

#### **Troubleshooting**

1. Problem: The motor seems to drag or the motor does not reverse after reaching the test position. Solution: Check the Extension knob and ensure that it is not locked clockwise. If locked, back off  $\frac{1}{4}$  turn.
2. Problem: Any other instance in which the motor does not operate appropriately. Solution: Refer to the Technical Assistance section.

## 4) Specifications

### Basic physical and environmental specifications/requirements:

Fixture Mass:	6.3 kg (14 lb)
Fixture Size: (erected)	584 mm (23 in) X 787 mm (31 in) X 838 mm (33 in) [heightXwidthXdepth]
Mockup Size:	381 mm (15 in) X 482 mm (19 in) X 203 mm (8 in) [heightXwidthXdepth]
Clip:	No.2 Bulldog clips, 57 mm (2.25 in) width.
Timer:	Set for 20-sec. Optional adjustment range 1-99 sec.
Power Requirement:	Nominal (90-130 VAC 50/60 Hz)
Environmental:	Indoor use only. Refer to the draft standard for additional requirements <sup>1</sup> .

## 5) Technical Assistance

Please refer technical questions to the following individuals.

Perry Sharpless, Mechanical Engineer    Mechanical Help: (301) 413-0181  
Nelson Caballero, Electrical Engineer    Electrical/Controls Help: (301) 413-0183

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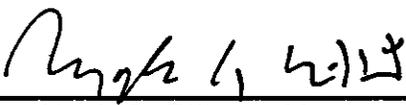
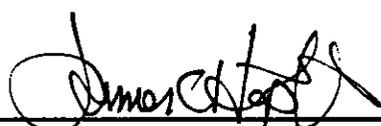
<sup>1</sup> Draft Standard For Upholstered Furniture, Standard for Small Open Flame Ignition Resistance of Upholstered Furniture, U.S. Consumer Product Safety Commission, October 1997. Refer to the CPSC draft standard for guidance and requirements for Seating Area tests including: mockup assembly, flame exposure times, flame stabilization, fire suppression, gas supply, test environment, and data collection.

**OPERATIONS MANUAL**  
**Dust Cover Fabric Flammability Test Fixture**

April 13, 2000  
Version 1

Fixture Developed by  
**Engineering Laboratory**  
**U.S. Consumer Product Safety Commission**

**APPROVAL RECORD**

<u>4/09/01</u> DATE	 Mark G. Eilbert, Mechanical Engineer
<u>4/09/01</u> DATE	 James Hyatt, Director, Division of Mechanical Engineering

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## **Acknowledgements**

The following people were principally involved in design, fabrication, and testing during development and production of five Dust Cover Fixtures during summer, 1999.

<b>Design:</b>	Mark Eilbert, Mechanical Engineer Nelson Caballero, Electrical Engineer
<b>Fabrication:</b>	Mark Eilbert, Mechanical Engineer Richard Schenck, Electrical Technician Richard McCallion, Mechanical Engineer Perry Sharpless, Mechanical Engineer Nelson Caballero, Electrical Engineer
<b>Testing:</b>	Nelson Caballero, Electrical Engineer

## 1) Getting Started

This is the Operation Manual for the Dust Cover Flammability Test Fixture. The fixture was developed to support an ANPR<sup>1</sup> for the Draft Standard For Upholstered Furniture<sup>2</sup>. This fixture is designed to hold and test dust cover fabric specimens intended for upholstered furniture. A dust cover is a horizontal covering placed beneath upholstered furniture.

### Important!

Before attempting to use this fixture, it is important to read and understand the instructions in this Manual. Following these instructions will ensure that the fixture operates as intended or, if there should be a problem, that CPSC Technical Staff can determine its nature. Follow the appropriate test protocol in the draft standard for the Dust Cover test, which includes requirements for the preparation of test specimens and for a regulated gas supply.

### Basic Operation

The fabric specimen test is used to determine if a material specimen sustains combustion once the flame is removed. This is further defined in the test protocol of the draft standard. This fixture moves a flame source beneath the center of a horizontally oriented fabric specimen. A shield that covers the flame exposes the fabric to the flame in a controlled way. When uncovered, the flame impinges on the underside of the fabric for a set time period. Under both manual and automatic operational modes, the shield and the burner tube will move sometimes in tandem; sometimes separately. In the two extremes of movement, these parts will move between a position under the fabric specimen to one outside the fixture body. These positions correspond to the test and setup positions, respectively.

### Safety

**Moving Parts:** Avoid accidents and anticipate the moving parts of this test fixture. In automatic operational mode, the shield and the burner tube will move according to a timed sequence. Become familiar with the operation of this fixture in both manual and automatic modes by following the checkout procedure in the Operation section.

**Fire Suppression:** Extinguish the test sample soon after each test using the appropriate fire extinguisher and following the requirements for observations and data collection detailed in the draft standard.

---

<sup>1</sup> ANPR: Advanced Notice for Proposed Rulemaking

<sup>2</sup> Draft Standard For Upholstered Furniture, Standard for Small Open Flame Ignition Resistance of Upholstered Furniture. See Endnote.

## **General Care**

This fixture is designed for laboratory use.

The fixture should be:

- 1) placed on a level, stable surface.
- 2) operated with a nominal 90-130 VAC, 50/60 Hz power source.
- 3) handled with care, avoiding sudden shocks.
- 4) transported in the shipping container or similarly padded container or be hand-carried.

The fixture should not be:

- 5) exposed to water, including fire suppression.
- 6) subject to unintended use or abuse.
- 7) placed where anything can obstruct the moving parts.
- 8) modified in any way without prior approval.

## Packing/Unpacking

Unpack the fixture carefully and save all packing materials. Note that the fixture may be in split shipments. Refer to the Parts Checklist.

### Parts Checklist

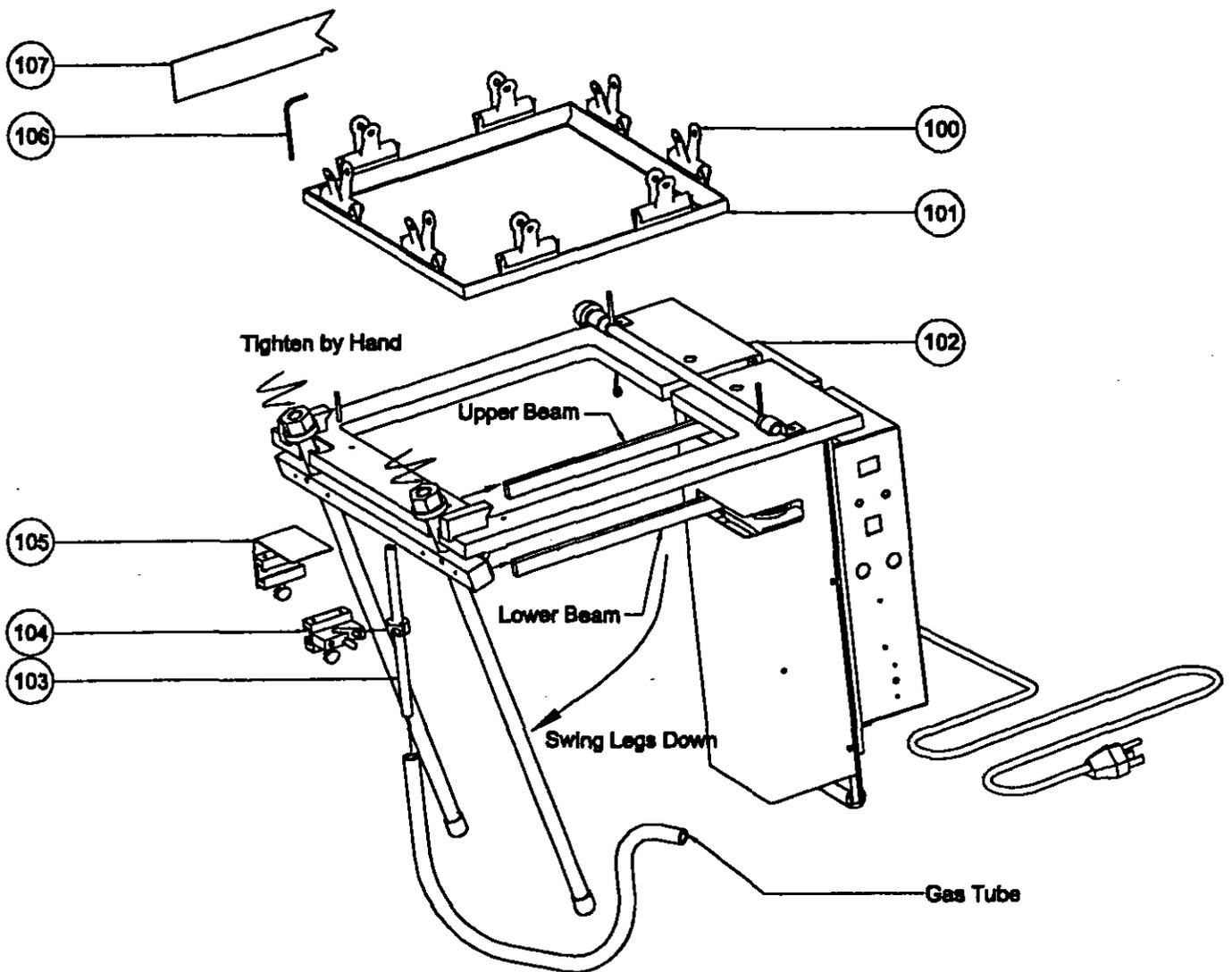
Referring to Figure 1, check that all the parts listed in Table 1 are present. Refer to the Technical Assistance section for help if any parts are missing. [Some extra Frame Clips have been supplied: generally 16 are required for 2 specimens].

Table 1  
Parts Checklist

Figure 1 Reference	Description	Quantity	
100	Frame Clips	20	
101	Dust Cover Specimen Frame ("Mockup" frame)	2	
102	Main Assembly	1	
103	Burner Tube, 6-inch	1	
104	Burner Assembly	1	
105	Shield Assembly	1	
106	Collar Wrench, 3/32" hex	1	
107	Offset/Flame Gage	1	
	Gas Supply Tube (not supplied)		

# Figure 1

## Dust Cover Fixture Assembly



## Assembly

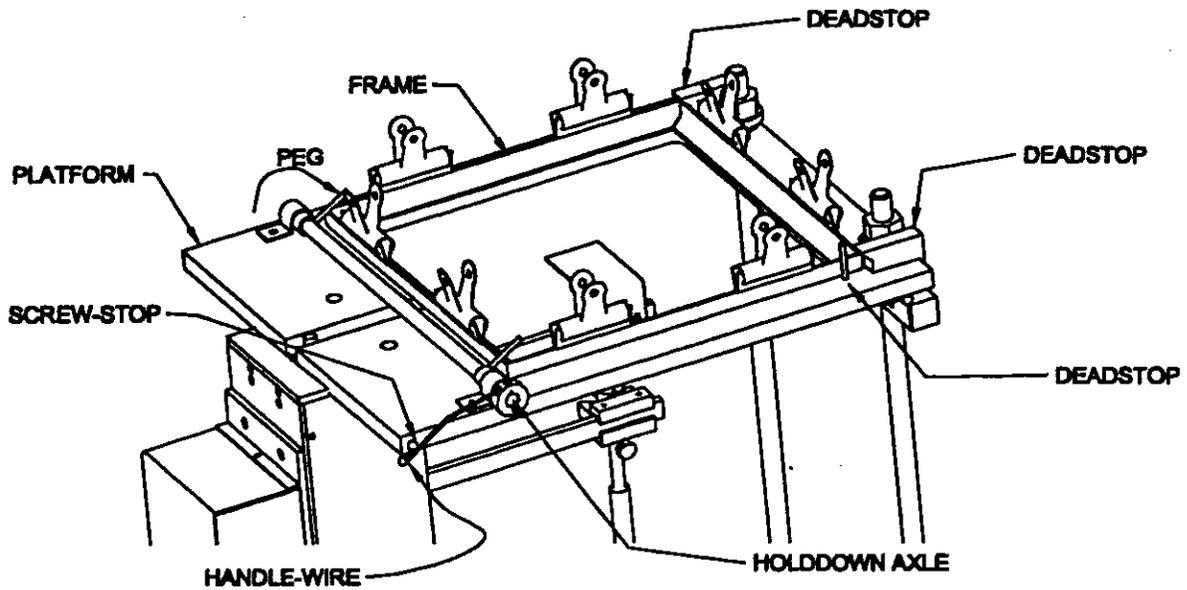
Referring to the Parts List and Figure 1, assemble the Fixture as follows. Refer to the Technical Assistance section for help with any questions.

1. Unfold the legs of the Main Assembly (102) until perpendicular to the top and secure in place with the hand-nuts—USE HAND FORCE ONLY, NO TOOLS.
2. Place the Main Assembly (102) on a level surface and orient the control panel to the front.
3. Slide the Burner Assembly (104) onto the lower of the two beams with the angular slot facing front.
4. Find the alignment mark near the end of the lower beam. Align the outer face of the Burner Assembly (104) with this mark. Apply light hand force to the spade-shaped thumbscrew—DO NOT USE TOOLS.
5. Place one end of the Burner Tube into a flexible gas supply tube. This tube is not supplied with the test fixture. Consult the draft standard<sup>1</sup>.
6. Place the Burner Tube (103) into the slot of the Burner Assembly (104) by resting it on the attached collar. Apply hand force to the knurled thumbscrew—DO NOT USE TOOLS.
7. Slide the Shield Assembly (105) onto the upper of the two beams with the shield overhanging and approximately centered above the Burner Tube (103). Apply light hand force to the spade-shaped thumbscrew—DO NOT USE TOOLS.
8. Using a rectangular Dust Cover Frame (101) and the Clips (100), prepare a Dust Cover specimen -a “mockup”<sup>1</sup>. In general, a mockup is assembled by wrapping the specimen fabric from the bottom to the sides of all sides of the Dust Cover Frame and securing it with clips.
9. Install the mockup. Refer to Figures 1 and 2.
  - a) Turn the holddown axle (refer to Figure 2) of the Main Assembly (102) so that the pegs point as depicted in Figure 1: upward.
  - b) Place the mockup onto the platform of the Main Assembly and push it into the three deadstops (Figure 2).
  - c) Use the handle-wire to turn the holddown axle so that the pegs contact the Frame. Continue to bend the handle-wire and rest it on top of the screw-stop.
10. Assembly is complete.

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<sup>1</sup> Refer to the CPSC draft standard. See Endnote.

# Figure 2 Installation of Dust Cover Frame



# Figure 3 Control Panel

