

Test Manual

May 1981

# Compliance Testing of General Wearing Apparel

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ENGINEERING LABORATORY

U.S. CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, D.C.

**ENGINEERING TEST MANUAL**  
**REQUIREMENTS FOR COMPLIANCE TESTING**  
**OF GENERAL WEARING APPAREL**

**May, 1981**

**The Engineering Laboratory Division**  
**The Directorate for Engineering Sciences**  
**The Consumer Product Safety Commission**

COMPLIANCE TESTING MANUAL APPROVAL RECORD

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## I. BACKGROUND

Effective on May 14, 1973, Section 30(b) of the Consumer Product Safety Act, Public Law 92-573, 86 Stat 1231; 15 USC 2079(b) transferred functions under the Flammable Fabrics Act and related functions under the Federal Trade Commission Act to the Consumer Product Safety Commission. At the direction of the Commission, all standards, regulations, policies, and interpretations administered by the Commission under the FFA were published together and included in the code of Federal Regulations (40 FR 59884, 12/30/75; 16 CFR 1602-1632 including the Commercial Standard for the Flammability of Clothing Textiles, which was codified 16 CFR 1610).

The Standard for Flammability of Clothing Textiles, 16 CFR 1610, provides general methods of testing and establishes three classes of flammability for clothing and textiles intended to be used for clothing. To supplement and provide specific details of how each type of test is to be conducted and reported within CPSC, this Engineering Test Manual has been developed.

## II. SCOPE

This test manual for 16 CFR 1610 sets forth general procedures on sample handling and conditioning along with detailed testing procedures, testing equipment, testing flow, and report format that are utilized by the Commission's Engineering Laboratory in conducting compliance testing under the Standard for the Flammability of Clothing Textiles, hereinafter referred to as 16 CFR 1610.

### III. APPLICABLE DOCUMENTS

- A. Current copy, 16 CFR 1610 and 16 CFR 1609.
- B. Sketches of test equipment.\*
- C. Memo concerning additional washing of raised fiber surface textiles.\*
- D. AATCC Test Method 124-1969.\*
- E. Pertinent advisory opinions.
- F. Test Report and Data Sheets and Flow Chart.\*

\*Note - A copy of these documents are attached at Appendices.



#### IV. GENERAL PROCEDURES

##### SAFETY PRECAUTIONS

1. The laboratory supervisor shall be responsible for the safety, competence, and training of all testing personnel. All tests shall be conducted in such a manner as to provide the maximum protection to those individuals conducting the test.
2. All burnings shall be conducted under hoods to remove noxious gases.
3. All gas cylinders shall be secured at all times.
4. When perchlorethylene is used or stored in other than a sealed container, it shall be kept under a hood with the fan turned on. All personnel must wear chemical resistant gloves during the dry cleaning process.
5. Insulated gloves will be worn when removing samples from the ovens.

##### EQUIPMENT ACCURACY

The selection, calibration, and cleaning of all equipment to be used for each phase of the test shall be the responsibility of the textile technologist. In all cases the equipment utilized will provide the accuracy and precision necessary to withstand the scrutiny of any possible legal actions.

## EQUIPMENT

The following lists describe the General Equipment to be used in the performance of the test as well as Specified Equipment in the standard.

### General Equipment

- a. scissors
- b. 6" x 2" marking guide
- c. holding rack which can hold a maximum of 6 specimen holders, Figure 2A.
- d. timer\*, accurate to  $\pm 2$  minutes within one hour
- e. gloves, rubber and asbestos free, insulated
- f. scale\*, accurate within  $\pm .1$  gram
- g. bucket, 10 liters
- h. 1000 ml graduated cylinder
- i. clothes drying rack
- j. thermometer 0-50°C (50-115°F), readable to 1°C
- k. marking pens
- l. exhaust hoods
- m. magnifying glass
- n. toweling and absorbent paper
- o. tape
- p. stop cock grease to insure air tight seal\* between dessicator lid and base.

\*Normally calibrated or checked every six months or at the discretion of the laboratory supervisor based upon the frequency of use.

## Specified Equipment

All specified equipment will be checked periodically to comply with performance specifications required by CFR 1610, and as indicated below.

- a. vented ovens capable of maintaining  $105 \pm 2^{\circ}\text{C}$
- b. dessicator, Scientific Product #D1398 and Precision Scientific 68356, 10 1/2" high, 8" in depth with a shelf 2 inches from the bottom.
- c. dessicant\*, silica gel, (6-16 mesh) white with a sparse layer of blue indicator used for a visual moisture absorbency check of the silica gel. When the blue indicator turns from light blue to pink, the dessicant is reconditioned in an oven at  $190^{\circ}\text{C}$  for 4 hours.
- d. specimen holders\* with angle thread guides and clips purchased from U.S. Testing Co.
- e. brush and brushing unit\* manufactured by U.S. Testing Co., 1415 Park Avenue, Hoboken, NJ 07030, Figure 1.
- f. mounting carriage with 1/8" metal template, U.S. Testing Co., Figure 1.
- g. soap, neutral chip, Ivory Snow
- h. drycleaning machine, U.S. Testing Co., Model 6523, 110 volt single phase, Figure 4.
- i. fuel control valve, a manual needle valve ending in a 1/2" male connection to control the flow of butane gas, Matheson Gas 50R with 510 connection.
- j. flammability tester with a mechanical timer\*, supplied by U.S. Testing Co., New Jersey, Model 7633, please refer to standard CFR 1610.4(b) for description, Figure 3.
- k. weight\* to hold stop cord, 33 grams ( $\pm 0.5$  grams).
- l. butane, #4 cylinder, 2 lbs, commercial purity

\*Normally calibrated or checked every six months or at the discretion of the laboratory supervisor based upon the frequency of use.

m. stop cord thread, white, spool size 50, all cotton mercerized

n. stop watch\* supplied with machine with readable increments of at least .2 sec and accurate to at least .2 sec to be read by tester with a magnifying glass.

o. worsted test fabric (moth test cloth) obtained from Test Fabrics, Inc., 55 Van Dorn St., New York 13, NY

p. perchlorethylene, commercial grade

q. drycleaning soap, CFR 1610, 4d.2.

r. flame measuring device, Figure 2B.

#### PERSONNEL AND TEST REPORT CERTIFICATION

All reports shall be prepared on the form specified herein and shall be certified as to the accuracy and conformance to all the requirements of this test manual by the Textile Technologist. The Textile Technologist shall insure that all test operators are familiar with the procedure of this manual especially the safety precautions. All samples will be reviewed by the Branch Head and Textile Technologist prior to testing. This review will determine which test procedures in Chapter VI are appropriate for that sample. Questions concerning the testing procedures during a test will be answered by the Textile Technologist. A Textile Technologist shall sign the test report and is responsible for all textile samples being tested in the flammability and textile branch.

#### CALIBRATION

All equipment used in the performance of these tests shall be maintained in conformance with the specification required by 16 CFR 1610. In all cases the equipment utilized will provide the accuracy and precision necessary to withstand the scrutiny of possible legal action.

\*Normally calibrated or checked every six months or at the discretion of the laboratory supervisor based upon the frequency of use.

## V. TEST SEQUENCE

Once the seals are broken, all samples will be kept in an area where integrity of each sample can be assured prior to, during, and after testing.

Seals shall be broken by laboratory personnel and signed prior to logging in each sample as received.

The sample number is placed on the sample and each paper associated with that sample. A Flammable Fabrics test form and Data Sheet are prepared for each sample.

Samples that are ready for testing shall be stored in the test cutting area.

As testing is completed, all results are recorded on the Data Sheet. Each sample is classified Class 1, 2, or 3 and the results typed onto a Flammable Fabrics test form. The original is sent to the home field office. Copies of all test forms for each sample will be sent to CERM and the submitting regional office. All samples are sent to the warehouse and stored by Sample Number only.

## VI. TEST PROCEDURES

### TYPES OF TESTS

#### Screening

A sample can be evaluated visually by the Textile Technologist as passing and thus not subjected to the test procedures specified in 16 CFR 1610. This decision is based on fiber content of sample and previous testing experience.

#### Complete Testing of Original State and After Drycleaning and Washing

These tests show classified results when all procedures of Chapter VI of this manual are followed for normal compliance samples.

#### Original State Only

This is a new garment that does not provide sufficient material to do the complete test as mentioned above in "Complete Testing of Original State and After Drycleaning and Washing". Results will be stated as "indicates" Class 1, 2, or 3, but additional samples are required for a complete test.

#### As Received

This deals with samples that may have been worn and/or laundered prior to receipt for testing. Some of these garments are burn injury related samples that have burned areas and

were possibly cut off the victim. "As received" implies possible contamination of the garment by outside sources.

#### CUTTING OF SAMPLES

The required specimen size is 2" x 6". If a 2" x 6" test specimen cannot be cut due to the nature of the item, i.e. hula skirts, ribbons, lei, fringe, loose feathers, wigs, etc., do not attempt to conduct a test.

Ten specimens are cut from the most flammable area of the garment. This is found either by preliminary cutting and testing of different areas in the fabric or by the judgement of the Textile Technologist. Prepare 10 specimens, cut, mount, brush (raised fiber only), and condition in original state. Test 5 of the 10 specimens and determine the average burn time for those 5 specimens. If the average burn time for the 5 specimens is under 3.5 seconds (plain surface) or 4.0 seconds with at least one base burn (raised fiber surface), test the other 5 specimens and obtain an average of all 10 to make a class determination. Do not test an additional 5 specimens if none of the first 5 burn.

A judgement is made by the Textile Technologist as to which procedures will be used for the sample Plain Surface or Raised Fiber.

#### Plain Surface Fabrics

Two specimens are cut so that the long dimension of one specimen is in the horizontal direction of the fabric (-) (filling threads) and one is in the vertical (|) (warp threads) direction and marked accordingly (-, |). These preliminary specimens are then tested according to stated test procedures in Chapter VI to determine if there is a difference in the burning characteristic with respect to the direction of the fabric. Ten additional specimens are cut in the same direction as the fastest burning of the two preliminary specimens. If no difference occurs, then the 10 additional specimens are cut with the long dimension in the vertical direction of the garment.

#### Raised Fiber Surface (Napped)

The direction of the lay of the surface fibers shall be parallel with the long dimension of the specimen. Ten specimens are taken from that part of the raised fiber surface

which appears to have the fastest burn time. This is determined by a preliminary, visual observation of the sample for the fuzziest area. Past experience has shown this to be the most flammable area of raised fiber textiles.

### Specialty Samples

Prior to cutting, a visual observation is made by the Textile Technologist to determine the most flammable area. Samples are cut from these areas for testing as stated below.

a. Woven flocked fabrics are treated as raised surface fabrics.

b. "Metallic" thread fabrics (mainly shimmery rayon thread scarves) are considered plain surface fabrics and are tested accordingly. The specimens are cut so the metallic thread is parallel to the 6" direction with the metallic threads arranged so the impingement flame will ignite a metallic thread.

c. Linings of brushed and unquilted flannel, as in nylon windbreakers with exposed areas, such as found in front-zippered jackets will be tested according to the raised surface test requirements.

d. Sweatshirts with exposed raised fiber surface inside or capable of being worn napped side out are tested on the napped side according to the raised surface test requirements.

e. Embroidery on netting material shall be tested with two sets of preliminary specimens to determine the most flammable area (whichever offers the greatest amount of netting or embroidery in the 6" dimension). One set of netting only shall be tested horizontally, vertically and/or on the diagonal. The other set shall consist mainly of embroidery which shall be tested horizontally, vertically, and/or on the diagonal. Test according to the plain surface requirements in the most flammable direction.

f. Burnt out designs of rayon on nylon or polyester are considered plain surface fabrics. The specimens are cut so that the flame impinges on the rayon design.

### MOUNTING OF THE SPECIMENS

The specimens are mounted individually. The specimen holders consist of two metal plates which support the specimen and



are held together by means of clamps, Figure 1. During the mounting procedure, the plates are placed on a carriage, Figure 1, equipped with a metal template and the specimen is mounted between the specimen holder plates. Where clamps will not hold thin samples securely in the holder, tape is used on all four corners of the specimen. The tape secures the fabric to the base plate of the specimen holder without covering the exposed area of fabric to be tested. The specimen holders shall be cleaned with a wet sponge when needed to remove burn residue and allowed to dry before reusing.

### Plain Surface

These specimens are mounted on the carriage with a 1/8" fabric overhang in the lengthwise direction beyond the bottom of the holder base plate. Each specimen is mounted, clamped, and then placed horizontally in a holding rack, Figure 2A.

### Raised Surface

Prior to mounting the specimen, run a fingernail along the 6" edge of the fabric not more than 1/4" in from the side to determine the lay of the nap. The specimens are mounted so that the brushing procedure raises the nap, i.e. the specimens are brushed against the nap, Figure 1. The sample is mounted with the lay of the nap going away from the closed end of the horseshoe shaped holder.

All specimens are mounted so approximately 1/4" of fabric extends beyond the bottom edge of the specimen holder base plate. This reduces the possibility of an edge ignition occurring during the initial surface burning.

When timed edge ignition<sup>1</sup> occurs on a raised surface sample<sup>2</sup> during testing, extra precaution must be taken during mounting of the retested samples. Mount these specimens with a 1/2" overhang at the open end of the horse shoe holder and tape this overhang to the bottom base of the holder plate. This prevents curling and possible shrinkage of the specimen after it is removed from the oven.

<sup>1</sup>Timed edge ignition is caused by the ignition flame burning down and edge igniting the fabric which starts the burning that breaks the timing thread.

<sup>2</sup>Edge ignition of any sample causes a retest of that sample. Edge ignition times are not counted as base burn.

## BRUSHING OF ALL RAISED FIBER SAMPLES

All specimens are mounted on a carriage that rides on a brushing mechanism, Figure 1. The specimens are mounted, brushed once, and placed horizontally in a holding rack, Figure 2A.

The specimen is mounted between the two metal plates of the specimen holder and clamped; the carriage is pushed to the rear of the device and the brush arm lowered. Firmly press the specimen holder while holding the lower 1/8" edge of specimen and pull the carriage toward the front. This causes the bristles to brush the surface of the specimen without pulling the fabric out of holder. The brush arm is lifted and stored in the vertical position to avoid flattening the bristles. The specimen is removed and placed into a holding rack, Figure 2A.

## SPECIMEN LABELING

After cutting and mounting, each sample holder is labeled with the sample number and the direction in which the specimen was cut (|) vertical , (-) horizontal, (/) diagonal.

Holding racks containing the same sample need only have the top specimen holder labeled with the sample number.

## CONDITIONING

Place the holding rack in a preheated drying oven regulated to  $105^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Permit free circulation of air around them. Holding racks containing the specimens are placed on the wire shelves with not more than 8 racks in one oven. Close oven door. When the temperature returns to  $105^{\circ}\text{C}$ , time to dry for  $30 \pm 2$  minutes.

Remove specimens from the oven and place each rack in a separate dessicator to cool until the metal holder may be comfortably picked up with an ungloved hand. A visual check of the Blue indicator dessicant is made to assure proper moisture absorbency. If the Blue indicator is pale blue or pink do not use. Recondition the dessicant.

The following times shall be observed according to the number of specimens in each dessicator:

1. One or two specimens, a conditioning time of at least 15 minutes is allowed.

2. Three to six specimens, a conditioning time of at least 55 minutes not to exceed 3 hours. No more than 6 specimens are placed in each dessicator.

## TIMED BURNING OF SPECIMENS

### Adjustments Prior to Testing

Open the control valve in the fuel supply. Allow 5 minutes for the air to be drawn from the fuel line, ignite the gas. Adjust the flame length to 5/8", measured from its blue tip to the opening in the gas nozzle. The measurement of the flame is checked by a flame measuring device, Figure 2B, throughout testing and adjusted accordingly.

The test is conducted with the sliding glass door of the test chamber shut. The test chamber is located under a hood with the fan off. The fan is turned on after recording the time burn data on each specimen. The test chamber, Figure 3, contains a specimen rack which allows the specimen to be held at a 45° angle.

Adjustments are made on the specimen rack so that the tip of the indicator finger touches the face of the specimen. The specimen rack inside the tester has two guide pins projecting downward from the center of the base. The rack travels in slots provided in the floor of the chamber so that adjustment can be made for the thickness of the specimen in relation to the flame front. A stop is provided in the base of the chamber to assist in adjusting the position of the rack. Tests will be done at room temperature in a draft-free area.

### Start of Test

Set the stop watch, which is part of the impingement mechanism, at 0. The specimens are removed from the dessicator one at a time and placed in the test chamber specimen rack. If needed, the rack is adjusted as mentioned above.

The thread is strung through the sky hook, the two right angle guides on the specimen holder, the one thread guide on the rear wall and the final guide on the left wall of the chamber. A 33 gram weight is applied to the cord directly below the final thread guide. The door of the test chamber is closed and the test begun.

The starting lever will be activated within 45 seconds of the time the specimen is removed from the dessicator.

The starting lever is activated which simultaneously impinges the flame for one second  $\pm .1$  and starts the stop watch.

If the specimen ignites, then the flame burns up the 45° angle and severs the cord directly above the specimen. This releases the weight, which in turn stops the watch that gives a numerical reading in 0.0 seconds.

The numerical burn time is recorded along with any visual observation as stated in the following section. The fan is turned on to remove the smoke. Periodically check to see that the test chamber is at room temperature (cool to the touch) and the bottom cleaned of any burned debris.

#### EXPLANATION OF ABBREVIATIONS USED IN RECORDING DATA ON THE TEST REPORT FORM

##### Plain surfaces

IBE	Ignited but extinguished.
*IBE	Ignited, but extinguished, the asterisk (*) denotes a burn that goes under the cord without breaking the cord.
DNI	Did not ignite.
0.0 seconds	Actual time of burn from ignition until the flame severs the cord directly above the specimen, thereby releasing the weight which in turn stops the watch that gives a numerical time in 0.0 seconds.

##### Raised fiber surfaces

SF uc	Surface flash, under the cord, but does not break the cord.
SF pw	Surface flash, part way. No time shown because the surface flash did not reach the cord.
SF poi	Surface flash, at point of impingement only (equivalent to "did not ignite" for plain surfaces).

- 0.0 seconds Actual time of burn from ignition until the flame severs the cord directly above the specimen, thereby releasing the weight which in turn stops the watch that gives a numerical time in 0.0 seconds.
- 0.0 SF only Time in seconds, surface flash only. No damage to the base fabric.
- 0.0 SFBB Time in seconds, surface flash base burn. Base starts burning at points other than the point of impingement.
- 0.0 SFBB poi Time in seconds, surface flash base burn starting at the point of impingement.
- \*0.0 SFBB poi Time in seconds, surface flash base burn possibly starting at the point of impingement. The asterisk is accompanied by the following: "Unable to make absolute determination as to source of base burns." This note is added to the result of any specimen if there is a question as to origin of the base burning. It does not qualify as a base burn under the current interpretation of CFR 1610.

#### TEST CRITERIA (SEE FLOW CHART)

The average burn times are computed after testing the first five specimens. Five more specimens are tested with plain surface fabrics when the average of all burn times are under 3.5 for the first five specimens. An average requires at least 2 burn times.

Five more specimens are tested with raised fiber surface only when the average of all burn times are under 4.0 with one or more Base Burns in the first five specimens. Base Burns are those base burns that occur on the specimen in places other than the point of impingement, from now on referred to as "Base Burns". The final determination of a failure is made on an average burn time of 10 specimens.

If none of the first 5 specimens burn, do not test an additional 5. Proceed to launder sample.

## CLASSIFICATION

A class determination is made on tested samples in original state and/or after drycleaning and laundering. The final result shall be the average burn time before or after dry cleaning and washing whichever is lower; and based on this result, the textile shall be placed in the proper classification as given below per CFR 1610.3.

### Plain Surface Textiles:

Class 1: "Normal flammability" are (1) those samples whose average burn time is 3.5 seconds or greater, (2) samples that ignited but extinguished, (3) samples that did not ignite.

Class 2: Not applicable.

Class 3: "Rapid and intense burning" are those fabrics whose average burn time of 10 specimens is less than 3.5 seconds.

### Raised Fiber Surface:

Class 1: "Normal flammability" are those fabrics whose (1) average burn time is 0-7.0 seconds with less than two specimens out of the 10 having a base burn, (2) whose average burn time of 5 or 10 specimens is greater than 7.0 seconds disregarding the number of base burns, (3) whose specimens have no base burns disregarding the average burn time of 5 specimens.

Class 2: A class designated for raised fiber surface textiles only. It includes those fabrics whose average burn time based on 5 or 10 specimens is 4.0 seconds to 7.0 seconds with two or more base burns.

Class 3: "Rapid and intense burning"; a sample whose average burn time of 10 specimens is less than 4.0 seconds with two or more base burns.

## DRY CLEANING PROCEDURE

Those garments that are for screening only, those tested as received, and those with a Class 3 in original state will not be drycleaned and washed. All other Class 1 or 2 garments will be drycleaned, washed, and retested.

1. Cut a specimen swatch approximately 15" x 15" from the sample. A single swatch is preferred, but two swatches of a smaller size may be used if the garment design requires it. Label specimen swatch with the sample number by needle and thread or a ball point pen. This specimen swatch with attached permanent sample number will then be weighed. Additional material is added to form a one pound load. The one pound load shall be made up of other samples to be drycleaned and/or worsted fabric.

2. Place this 1 lb load into the specified dry cleaning apparatus. Fill the cylinder approximately 1/3 full with fresh perchlorethylene then add 270 ml of dry cleaning soap. The soap shall be made by dissolving 56 grams of caustic potash (KOH) in 100 ml of water. The potassium hydroxide solution shall be poured slowly with constant stirring into a mixture of 340 grams of oleic acid, 400 ml of Stoddard solvent (Commercial Standard CS3-40 grade) and 100 ml of tertiary butyl alcohol or an equal quantity of butyl cellosolve.

3. The dry cleaning apparatus, Figure 4, is loaded with soap, specimen swatches, perchlorethylene, and operated for 25+0-5 minutes. The machine is turned off and the solution drained out and discarded.

First Rinse: refill apparatus to approximately 1/3 full with fresh perchlorethylene only. The machine is turned on for an additional five minutes.

At the end of the first rinse, the worsted test fabric is removed, the perchlorethylene is drained out and discarded and the rinse cycle is repeated two more times using fresh perchlorethylene (no soap added). The perchlorethylene from the last two rinses can be saved if not discolored and used in the wash of the next load.

4. The specimen swatches are then removed from the machine, and the excess solvent is removed from the swatches by any convenient method or patted with clean cotton toweling. The swatches are air dried at room temperature under a hood.

## WASHING PROCEDURE

After the dry cleaning procedure is completed, the specimen swatches shall be weighed along with other samples to be washed. Use the following formula to calculate the amount of water and soap according to the weight of the samples to be washed.

1. The volume of water in the bath in ml shall be 30 times the weight of the swatches in grams. The water temperature shall be between 95° and 100°F (35°-37°C).
2. The soap weight in grams is 0.5 percent of the volume in ml of the water bath. The swatches shall be immersed and worked gently with gloved hands for five minutes in a bath of soft water in which 0.5 percent neutral soap chip has been dissolved. The swatches are then rinsed twice in water at 80°±5°F (26.7°C), extracted, and dried.
3. Extracting and drip dry methods - Pat the fabrics on layers of cotton towels and/or hanging them up to dry over a drying rack while smoothing the specimens by hand to insure no wrinkles occur while drying. After dry-cleaning and washing, the specimens are cut, mounted, etc. as stated in Chapter VI.

## SPECIAL WASHING OF ALL RAISED FIBER SURFACE SAMPLES

An additional 15" x 15" swatch is cut from all raised fiber surface samples. This swatch will be washed once along with other raised fiber surface swatches, using the laundry equipment and procedure specified in CFR 1615 and CFR 1616, Standards for the Flammability of Children's Sleepwear, (sizes 0-14), i.e. AATCC Test Method 124-1975, washing procedure 6.21(iii) with a water temperature of 60 $\pm$ 2.8°C (140 $\pm$ 5°F), and drying procedure 6.3.2(B) shall be used. A copy of this test method is attached. After machine washing and "tumble drying", the samples are then retested as stated in Chapter VI.

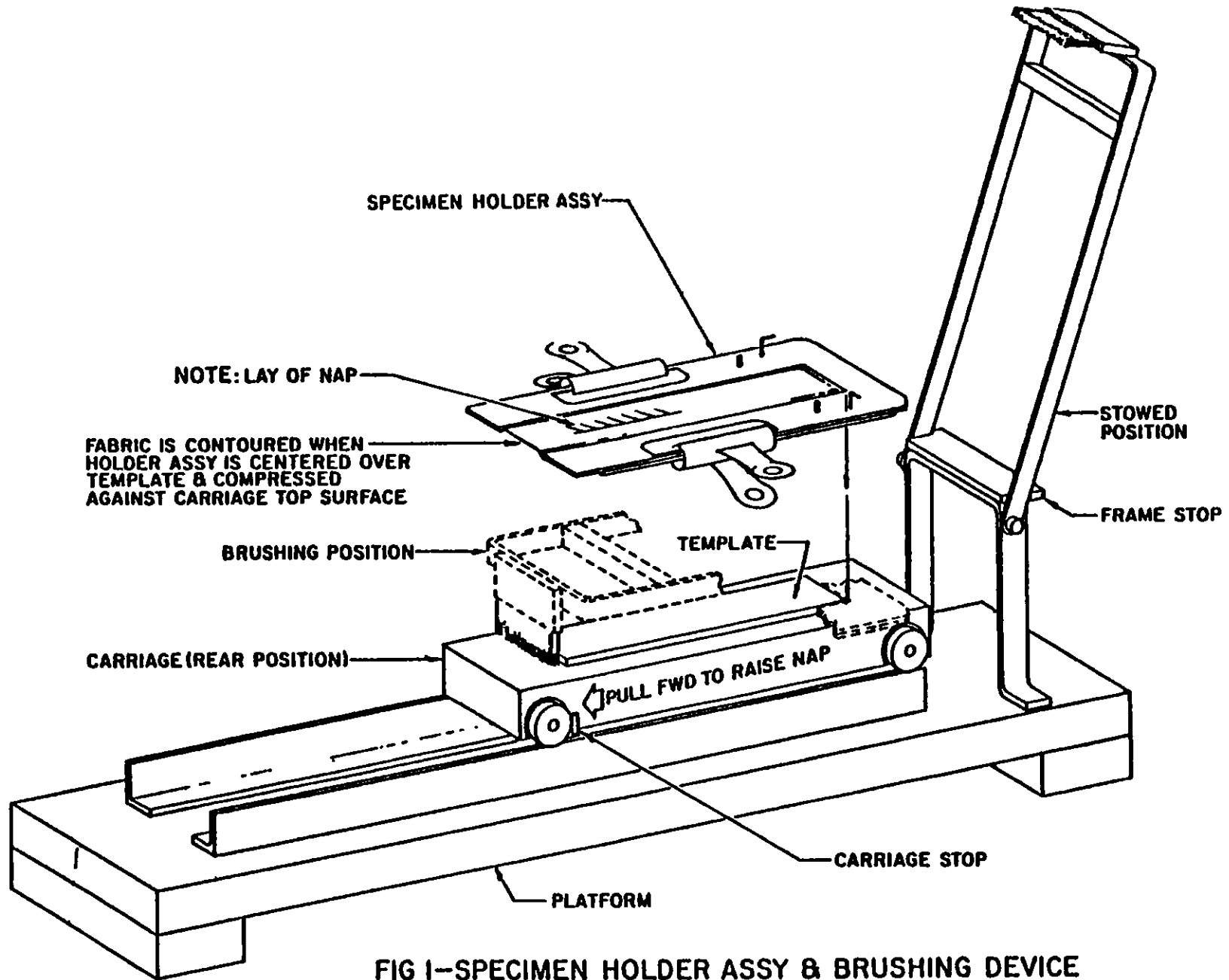
The average burn time is computed and a classification is given. This classification does not alter any classification given as stated in the classification section of Chapter VI. A Class 3 test result after "tumble drying" cannot be used as the basis for a violation of the standard but can be used (1) to provide data which may encourage a recall if the fabric was determined to be a Class 3 fabric under test procedures specified in CFR 1610, or (2) to provide test data for use in considering whether or not the product creates a substantial product hazard even if the fabric was determined not to be a Class 3 under the test procedure specified in CFR 1610.



## VII. SAMPLE DISPOSITION

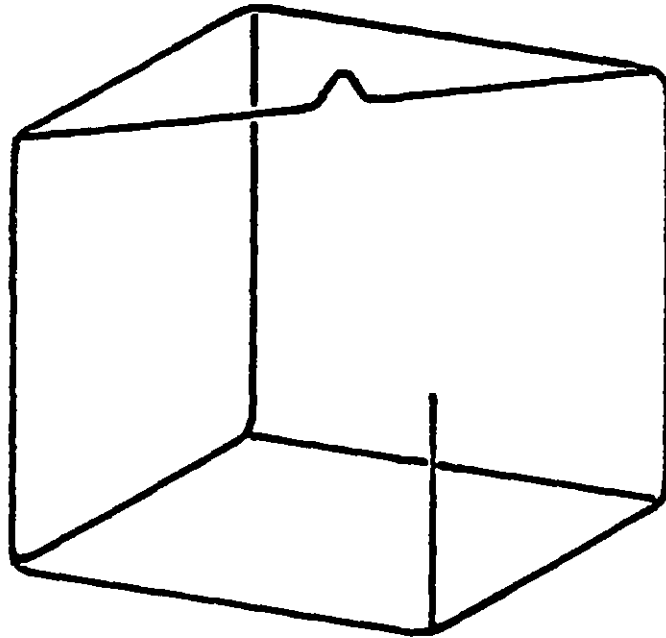
After testing is completed, the remains of each cut sample are sealed and returned to the Sample Custodian separately under the given sample number.

APPENDIX A  
SKETCHES OF EQUIPMENT

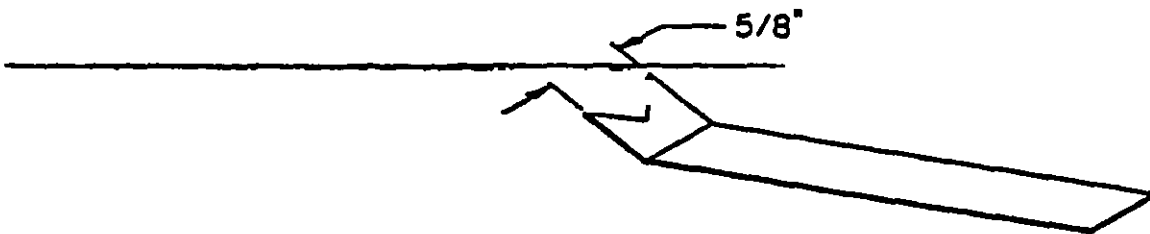


**FIG 1--SPECIMEN HOLDER ASSY & BRUSHING DEVICE**

Modified 4 1/2" CUBIC, BRAZED FRAME  
Matl: 1/8" DIA Brass ROD



(a)



(b)

FIG 2-HOLDING RACK (a) &  
FLAME GAGE (b)

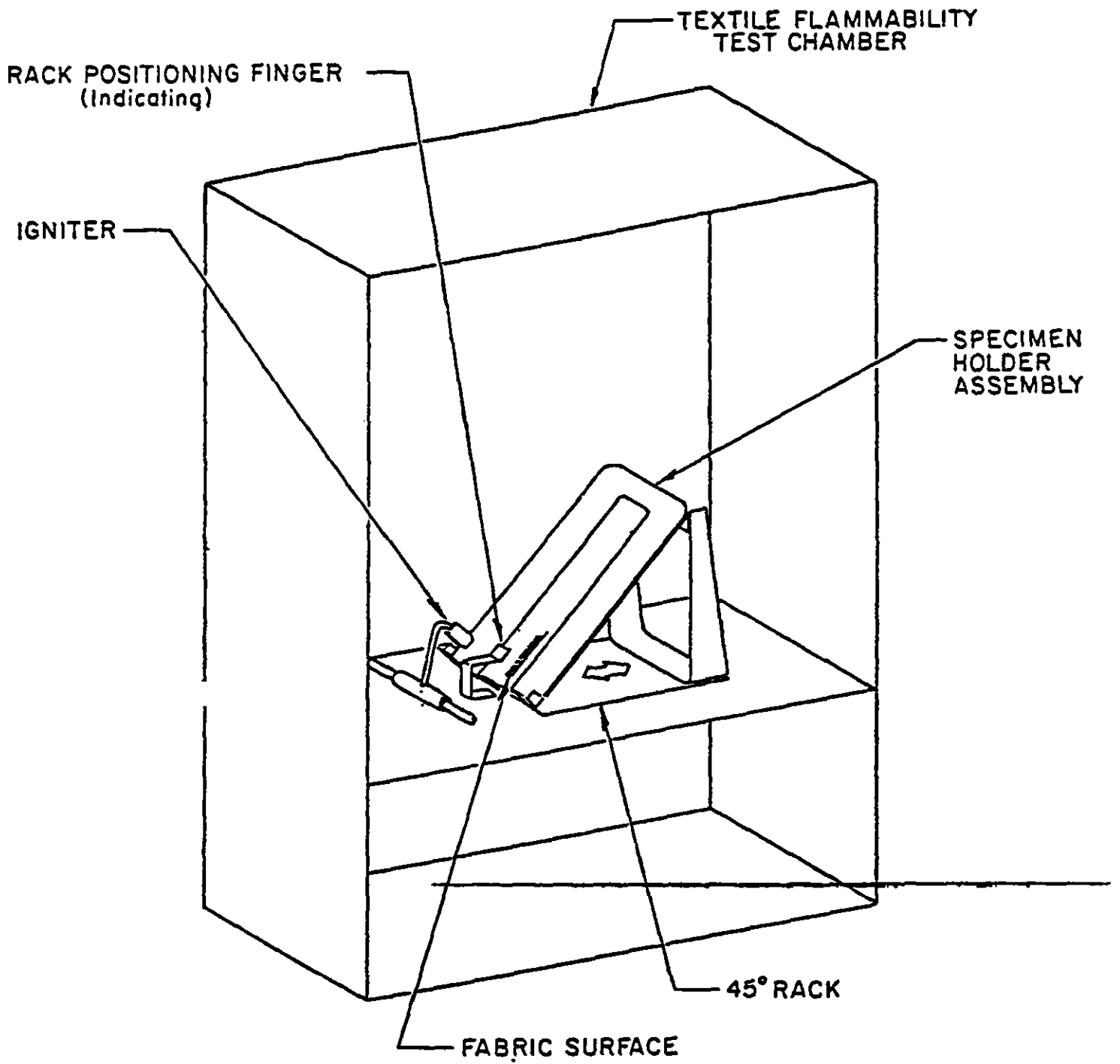


FIG 3—POSITIONING OF 45° RACK

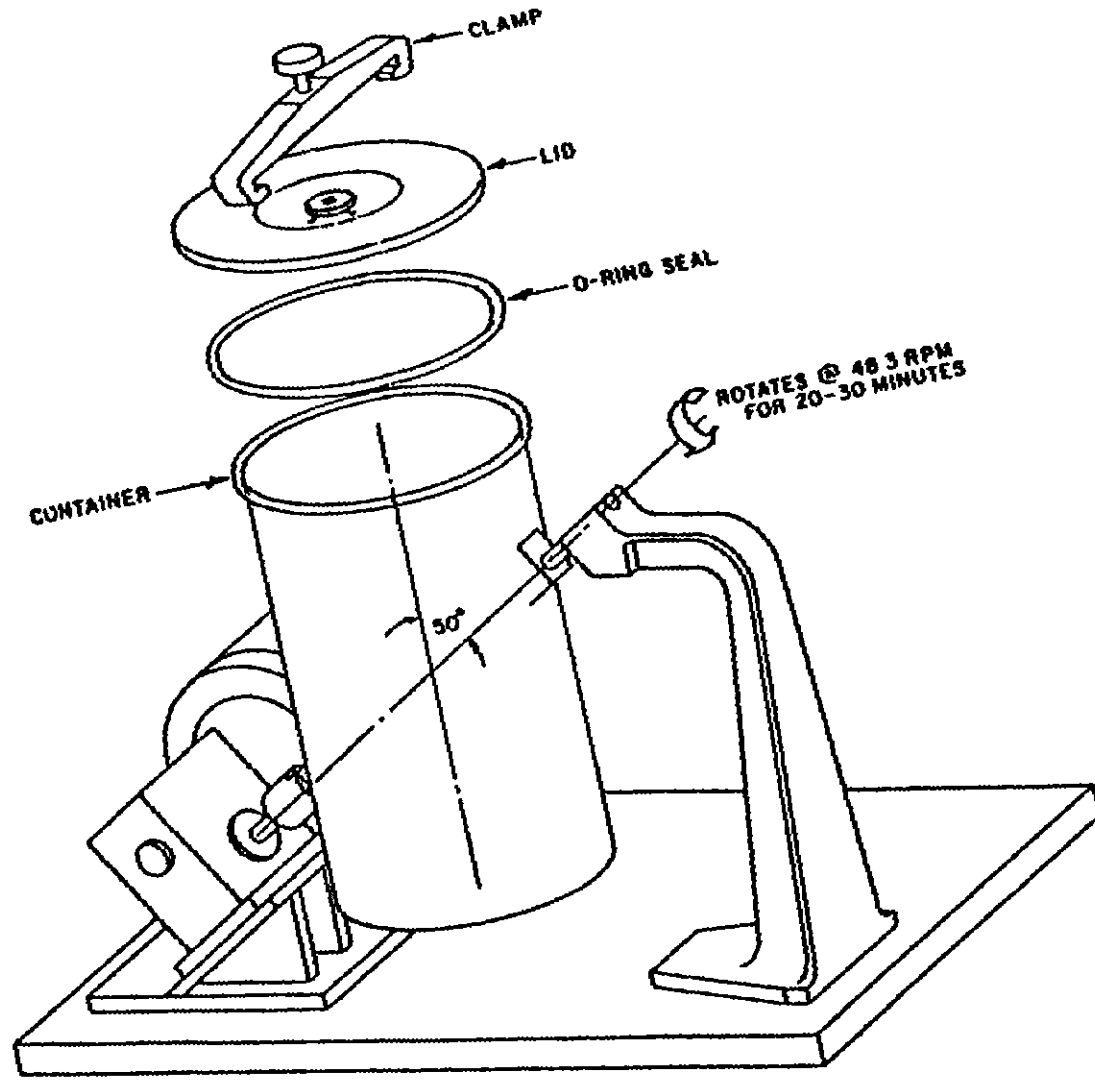


FIG 4-DRY CLEANING MACHINE

**APPENDIX B**  
**TEST REPORT DATA SHEETS AND FLOW CHART**

CPSC REPORT FOR FLAMMABLE FABRICS

DATE RECEIVED: \_\_\_\_\_ TEST: 16 CFR 1610

SAMPLE NO: \_\_\_\_\_

MANUFACTURER: \_\_\_\_\_

SUBMITTING AREA OFFICE: \_\_\_\_\_

LAB INSTRUCTION: \_\_\_\_\_

REPRESENTED AS BEING: \_\_\_\_\_

VISUAL OBSERVATION AND COMMENTS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

SEAL BROKEN BY: \_\_\_\_\_  
(Initial) (Date)

\_\_\_\_\_  
TEST ANALYST DATE

\_\_\_\_\_  
TEXTILE TECHNOLOGIST DATE

\_\_\_\_\_  
REVIEWER DATE



CPSC DATA SHEET

FLAMMABLE FABRICS 16 CFR 1610

SAMPLE NUMBER: \_\_\_\_\_

MANUFACTURER: \_\_\_\_\_

Laboratory Test Results:

Original State:

- |          |           |
|----------|-----------|
| 1. _____ | 6. _____  |
| 2. _____ | 7. _____  |
| 3. _____ | 8. _____  |
| 4. _____ | 9. _____  |
| 5. _____ | 10. _____ |

_____	seconds average	_____
		(tester's initials & date)

Comments: \_\_\_\_\_  
\_\_\_\_\_

After Drycleaning and Washing:

- |          |           |
|----------|-----------|
| 1. _____ | 6. _____  |
| 2. _____ | 7. _____  |
| 3. _____ | 8. _____  |
| 4. _____ | 9. _____  |
| 5. _____ | 10. _____ |

_____	seconds average	_____
		(tester's initials & date)

Comments: \_\_\_\_\_  
\_\_\_\_\_

Class - 1      Class - 2      Class - 3

\_\_\_\_\_  
Reviewer

CPSC DATA SHEET  
SPECIAL WASHING OF RAISED  
RIBER SURFACE 16 CFR 1610

SAMPLE NUMBER: \_\_\_\_\_

MANUFACTURER: \_\_\_\_\_

Laboratory Test Results:

After 1 laundering and 1 tumble dry

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_
- 6. \_\_\_\_\_
- 7. \_\_\_\_\_
- 8. \_\_\_\_\_
- 9. \_\_\_\_\_
- 10. \_\_\_\_\_

seconds			
average		Tester's Initial	Date

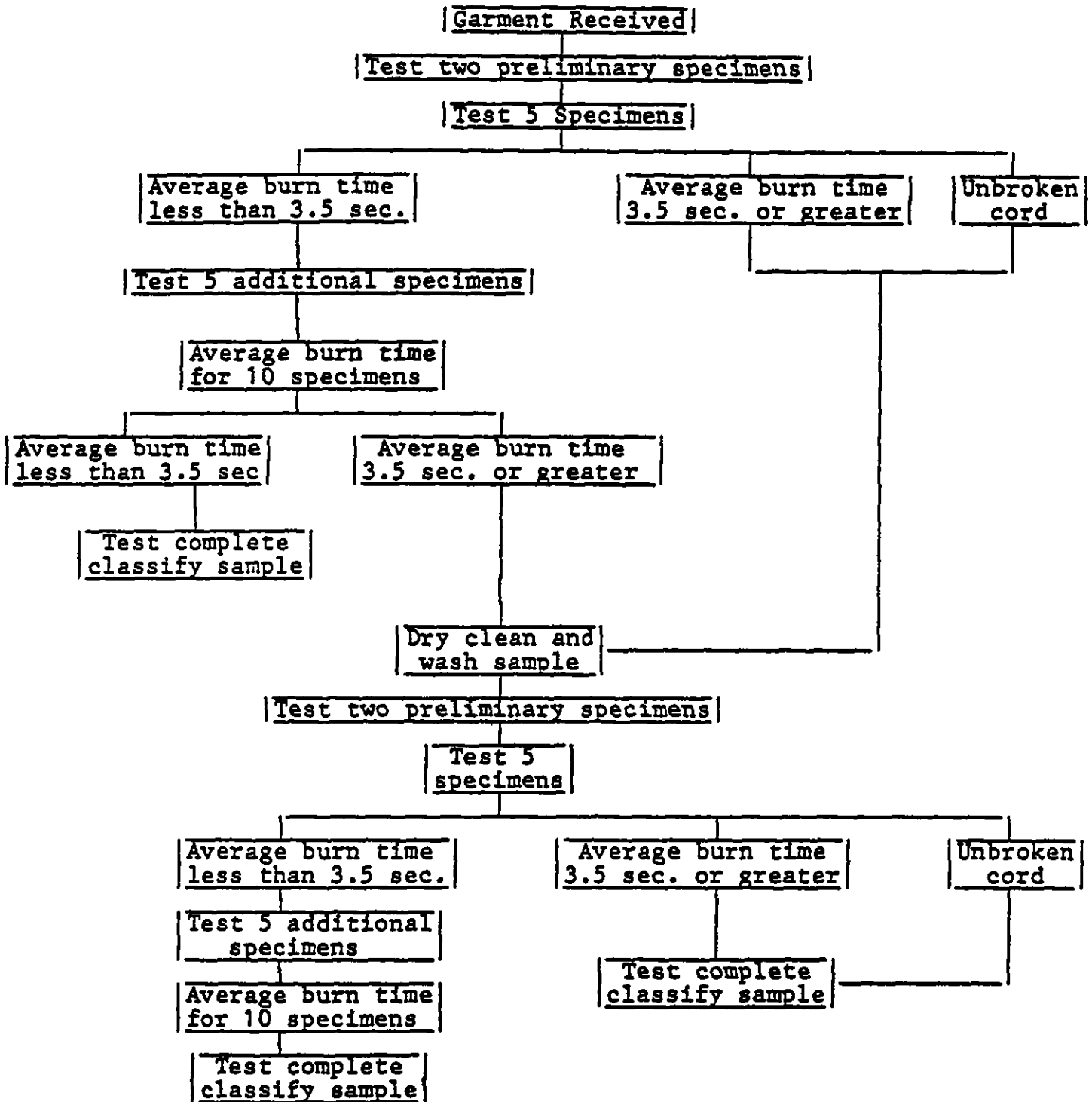
Comments: \_\_\_\_\_

\_\_\_\_\_

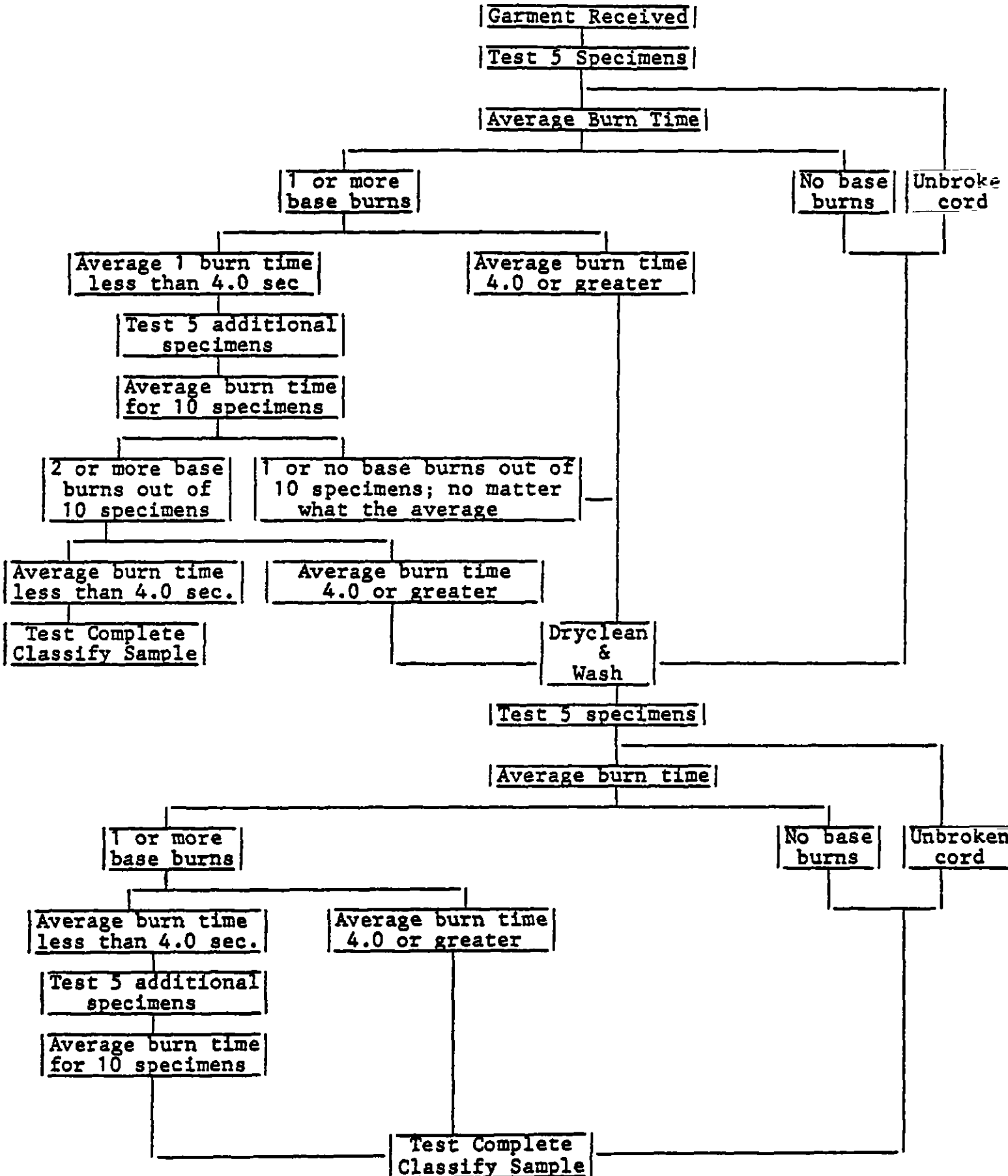
Class - 1      Class - 2      Class - 3

\_\_\_\_\_  
Reviewer

PLAIN SURFACE FABRICS



RAISED FIBER SURFACE FABRICS



**APPENDIX C**

**MEMO CONCERNING ADDITIONAL WASHING OF RAISED FIBER  
SURFACE TEXTILES AND AATCC TEST METHOD 124-1969**

3A5

541710

UNITED STATES GOVERNMENT

U.S. CONSUMER PRODUCT SAFETY COMMISSION

Memorandum 79 OCT 22 A 9: 47

TO : Al Castle, ESEP

DATE OCT 19 1979

FROM : Through, Director, CERM *Rob*

Liz Jones, CERM *lej*

SUBJECT Request for Additional Testing of All Raised-Fiber Surface Fabrics Subject to the Standard for the Flammability of Clothing Textiles

As you know the Standard for the Flammability of Clothing Textiles (CS-191-53) specifies that a fabric is to be tested before and after dry cleaning and washing. The fabric is then classified as provided by the standard based upon the lowest average test result. As established by the FTC and continued by CPSC, fabrics that are classified as Class 3 in the original state (before drycleaning and washing) are not routinely tested under the standard after drycleaning and washing. The subject request does not alter this procedure.

The drycleaning procedure specified by the standard is described at 1610.4(d) and the washing procedure at 1610.4(e). The latter section also specifies that the fabric is to be dried. The established procedure involves placing the fabric on a clothesline or rack and allowing it to "air dry".

*2*  
*discovery?*

We are not suggesting a change in these procedures. However, in view of the extensive use of electric or gas "tumble driers" by the consumer and the fact that such driers tend to make a raised-fiber surface fabric softer and/or fluffier than "air drying", we believe the additional test of a raised-fiber surface fabric after washing and "tumble drying" will provide a better assessment of the potential hazard a consumer may be exposed to after home laundering. A Class 3 test result after "tumble drying" cannot be used as the basis for a violation of the standard, but can be used (1) to encourage a recall if the fabric was determined to be a Class 3 under the test procedures specified in the standard or (2) to provide test data for use in considering whether or not the product creates a substantial product hazard even if the fabric was determined not to be a Class 3 under the test procedures specified in the standard.

Page 2

Please test all raised fiber surface fabrics after one washing and drying using the laundry equipment specified in the children's sleepwear standard and currently available in the laboratory. Report the results of this additional test with the results currently being provided for a CS 191-53 test; however, do not consider the test results when determining the proper classification of the fabric as provided by the standard.

# Appearance of Durable Press Fabrics after Repeated Home Launderings

Developed in 1967 by AATCC Committee RA61; revised 1969. Editorially revised 1974; reaffirmed 1973; revised 1975.

## 1. Purpose and Scope

1.1 This method is to be used to evaluate smoothness appearance after repeated home launderings of those fabrics primarily intended for use in durable press products (sometimes referred to as permanent press). The method is not necessarily limited to durable press fabrics.

## 2. Uses and Limitations

2.1 The test procedure is designed to reflect the minimum capabilities of home laundry equipment which is currently used by consumers. The specified machine settings in this procedure for washing and drying are not designed to reflect advances in cycle design or special features of washers and dryers which enhance the performance of durable press fabrics.

2.2 It is recognized that prints and patterns will mask the mussiness present in durable press fabrics. However, this does not detract from the durable press concept which seeks to provide the consumer with fabrics which require no ironing.

## 3. Principle

3.1 Fabric specimens are subjected to procedures simulating home laundering practices. A choice is provided of three alternative washing temperatures, and two alternative drying procedures.

## 4. Apparatus and Materials

4.1 Automatic washing machine (see 9.1).

4.2 Automatic tumble dryer (see 9.2).

4.3 A lighting and evaluation area in a darkened room using overhead lighting arrangement shown in Fig. 1 (see 9.3).

4.4 Line drying facilities.

4.5 AATCC Standard Detergent 124 (see 9.4).

4.6 AATCC Three-Dimensional Durable Press Replicas, set of six (see Fig. 2 and 9.4).

4.7 Dummy load of 92 x 92 cm (36 x 36 in.) hemmed pieces of type

Table I  
Summary of Washing and Drying Procedures

Machine	Wash Conditions	Drying Procedure
I	Mach Wash (41 ± 3C) 105 ± 5F	A Line
II	Mach Wash (49 ± 3C) 120 ± 5F	B Tumble
III	Mach Wash (60 ± 3C) 140 ± 5F	

128 cotton sheeting or type 128 50% polyester/50% cotton bleached and mercerized muslin sheeting (see note 9.5) which, when added to test specimens, will make a 1.8 kg (4 lb) load.

4.7.1 Dummy load

Type 1—100% cotton

4.7.2 Dummy load

Type 2—50% polyester/  
50% cotton

## 5. Test Specimens

5.1 Prepare three test specimens each 38 x 38 cm (15 x 15 in.), cut parallel to the warp and filling, pinked to prevent fraying and marked to indicate the direction of the warp.

## 6. Test Procedures

6.1 Table I summarizes the machine washing conditions and drying procedures available.

## 6.2 Washing.

6.2.1 Use the full water level of the washer and the selected water temperature for the washing cycle; rinse at 41 ± 3C (105 ± 5F), for all washing procedures.

6.2.2 Add the three test specimens and enough dummy pieces to make a 1.8 kg (4 lb) load using no fewer than 10 dummy pieces. Add 90 grams AATCC Standard Detergent 124.

6.2.3 Set washer for a 12-minute washing cycle on the *Normal* setting. Allow washing to proceed automatically through the final spin cycle. Remove the test specimens immediately and dry by one of the methods indicated in Table I.

## 6.3 Drying.

6.3.1 (A) Line Dry. Remove the test specimens from the automatic washer immediately after the final spin cycle taking care to minimize distortion. Hang each specimen by two corners with the warp in the vertical direction. Allow the test specimens to remain in still air at room temperature until dry.

6.3.2 (B) Tumble Dry. Remove the test specimens from the automatic washer immediately after the final spin cycle, separate tangled pieces and

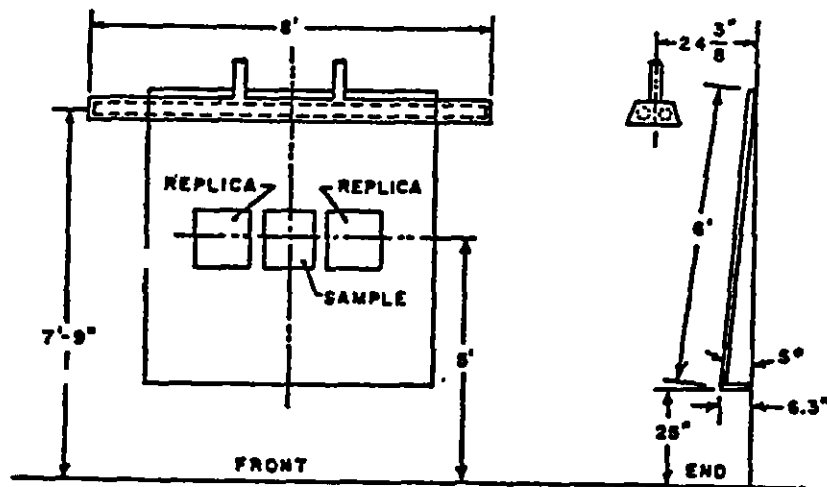


Fig. 1—Lighting Equipment for Viewing Test Specimens.

### Materials List

- 2—8' Type F96 CW (Cool-White) Preheat Rapid Start Fluorescent Lamp (without baffle or glass).
- 1—White enamel reflector (without baffle or glass).
- 1—General-type swatch mount, spring-loaded. Fabricate using light sheet metal (22 ga).
- 1— $\frac{1}{4}$ " Plywood mounting board; OD 6' x 4'. Paint gray to match No. 2 rating on International Gray Scale for Staining.



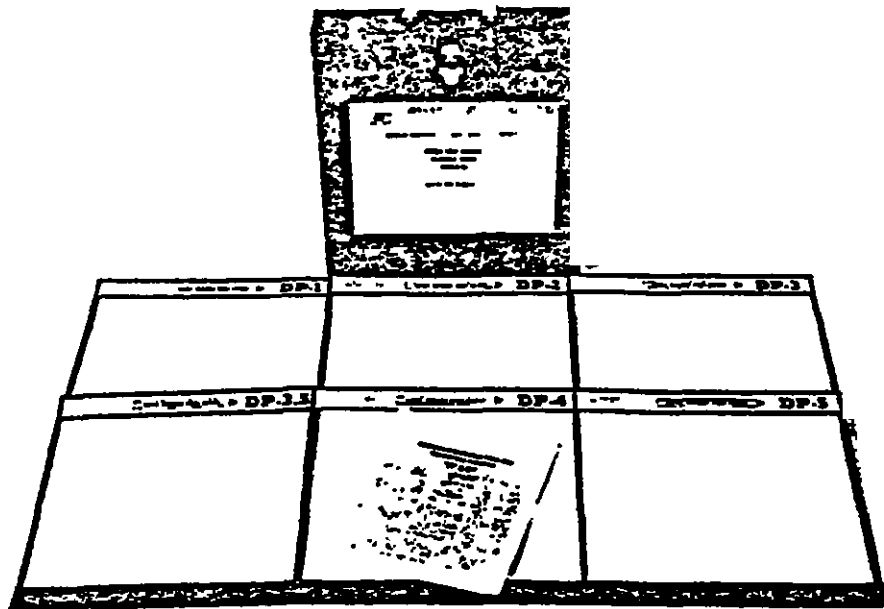


Fig. 2—AATCC 3-D Durable Press Replicas.

place the washed load (test specimens and dummy pieces) in the tumble dryer set at the *Normal* cycle and dry at the setting which generates exhaust temperatures that cycle from 60 to 71C (140 to 160F). Operate dryer until total load is dry. Continue tumbling five minutes with the heat turned off (cool-down cycle). Remove the load immediately after machine stops.

6.4 Repeat the selected washing and drying cycles four more times. Condition the test specimens for 2 hours at  $21 \pm 1C$  ( $70 \pm 2F$ ) and  $65 \pm 2\%$  RH, hanging each specimen in open condition with warp in vertical direction to avoid distortion.

#### 7. Evaluation

7.1 Three trained observers should rate each test specimen independently.

7.2 Mount the test specimen on the viewing board as illustrated in Figure 1, with the warp in vertical direction. Place three-dimensional plastic replicas on each side of the test specimen to facilitate comparative rating.

7.2.1 The overhead fluorescent light should be the only light source for the viewing board, and all other lights in the room should be turned off.

7.2.2 It has been the experience of many observers that light reflected from the side walls near the viewing board can interfere with the rating results. It is recommended that the side walls be painted black or that

blackout curtains be mounted on either side of the viewing board to eliminate the reflective interference.

7.3 The observer is to stand directly in front of the specimen four feet away from the board. It has been found that normal variations in the height of the observer above and below the arbitrary five-foot eye level have no significant effect on the rating given.

7.4 Assign the number of the replica which most nearly matches the appearance of the test specimens.

7.4.1 A DP-5 rating is equivalent to the DP-5 Replica and represents the smoothest appearance, while a DP-1 rating is equivalent to the DP-1 Replica and represents the poorest appearance.

7.5 Similarly, the observer independently rates each of the other two test specimens. The other two observers proceed in the same manner assigning ratings independently.

Table II

#### Fabric smoothness ratings

DP-5	—an appearance equivalent to the DP-5 Replica.
DP-4	—an appearance equivalent to the DP-4 Replica.
DP-3.5	—an appearance equivalent to the DP-3.5 Replica.
DP-3	—an appearance equivalent to the DP-3 Replica.
DP-2	—an appearance equivalent to the DP-2 Replica.
DP-1	—an appearance equivalent to or worse than the DP-1 Replica.

## 8. Calculating and Reporting Results

8.1 Average the nine observations made on each test fabric (three judgments on each of three specimens). Report the average to the nearest tenth of a rating and state the test procedure used by giving the roman numeral defining the washing temperature, the capital letter defining the drying procedure and the arabic number defining the type of dummy load used; e.g., fabric smoothness rating DP-3.8 (II-B-1) denotes an value of 3.8 for samples washed at 49C (120F) and tumble dried using a dummy load of pieces of cotton sheeting.

## 9. Notes

9.1 Kenmore Automatic Washer Model 600 has been accepted as the standard machine. Source: Sears Roebuck and Co.—for address of nearest Commercial Sales Dept. write to AATCC, P. O. Box 12215, Research Triangle Park, N. C. 27709. Any other washer which is known to give comparable results may be used.

Washing machine conditions for "Normal Setting"

- a) Normal agitator speed:  $70 \pm 5$  cycles/min
- b) Normal washing time: Set at 12 minutes
- c) Spin speed: 500-510 rpm
- d) Final spin cycle: 4 minutes
- e) Rinse temperature:  $41 \pm 3C$  ( $105 \pm 5F$ )

These conditions represent the actual speeds and time available in the Kenmore Model 600. Other equipment will no doubt vary in one or more of these settings.

9.2 Kenmore Automatic Electric Dryer Model 600 has been accepted as the standard. Source: Sears Roebuck & Co.—for address of nearest Commercial Sales Dept. write to AATCC, P. O. Box 12215, Research Triangle Park, N. C. 27709. Any other dryer known to give comparable results may be used.

#### Dryer Conditions

- a) Controlled exhaust temperature which cycles from 60 to 71C (140 to 160F).
- b) A cooling period while tumbling 5 minutes at the end of the drying cycle.

9.3 The use of 8-foot fixtures for viewing washed specimens is specified in this method. It is recognized, however, that physical limitations in certain laboratories will prevent the use of 8-foot fixtures. In those situations 4-foot lights may be used but replicas identified as DP-4, DP-3 and DP-1 should always be placed on the left side of the viewing board as the board is viewed from the front. Replicas identified as DP-5, DP-3.5 and DP-2 should always be placed on the viewing board to the right side as the board is viewed from the front.

9.4 Source: AATCC Technical Center, P. O. Box 12215, Research Triangle Park, N. C. 27709.

9.5 Source: Testfabrics Inc., P. O. Drawer O, Middlesex, N. J. 08846.