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TECHNICAL BULLETIN 117

Requirements, Test Procedure and Apparatus for  
Testing the Flame Retardance of Resilient Filling Materials  
Used in Upholstered Furniture

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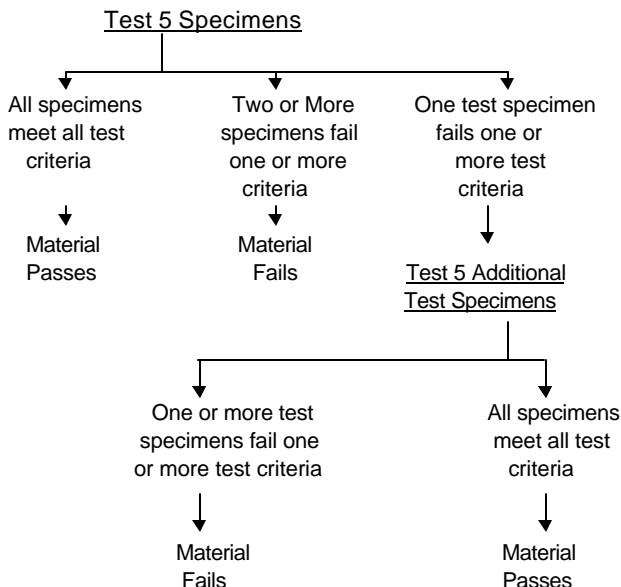
TECHNICAL BULLETIN 117

Requirements, Test Procedure and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used In Upholstered Furniture

SECTION A - Part I  
Resilient Cellular Materials

I. Requirement

1. The average char length of all specimens shall not exceed 6 inches.
2. The maximum char length of any individual specimen shall not exceed 8 inches.
3. The average afterflame, including afterflame of molten material or other fragments dropping from specimens, shall not exceed 5 seconds.
4. The maximum afterflame of any individual specimen, including afterflame of molten material or other fragments dropping from the specimen, shall not exceed 10 seconds.
5. The average afterglow, including afterglow of molten material or other fragments dropping from the specimen, shall not exceed 15 seconds.
6. Resilient cellular materials shall meet the above requirements both before and after aging for 24 hours in a forced air circulating oven at 220°F (104°C).
7. A minimum of 10 test specimens shall be tested; 5 specimens before aging and 5 specimens after aging.
8. Test requirements for resilient cellular materials shall be evaluated according to the following sampling procedure both before and after aging.



II. Test Procedure

1. Scope  
This procedure is intended for use in determining the resistance of resilient cellular materials to flame and glow propagation and tendency to char.
2. Test specimen  
Test specimens shall be rectangles of cellular materials 12 x 3 x 1/2 inches.
3. Apparatus
  - 3.1. Cabinet - A test cabinet fabricated in accordance with the requirements of Federal Test Method Standard No. 191 Method 5903.2 or FF 3-71 shall be used.
  - 3.2. Burner - The burner shall be in accordance with the requirements of Federal Test Method Standard No. 191 Method 5903.2 or FF 3-71.
  - 3.3. Gas - The test gas shall be Matheson Gas B.
  - 3.4. Specimen Holder - A stainless steel specimen holder fabricated in accordance with the requirements specified in Figure 117-A shall be used.
4. Procedure
  - 4.1. All specimens shall be tested, and conditioned for a minimum of 24 hours, at 70 ± 5°F and less than 55% relative humidity.
  - 4.2. The specimen in its holder shall be suspended vertically in the cabinet in such a manner that the lower end of the specimen is 0.75 inches above the top of the burner.
  - 4.3. The burner flame shall be adjusted by means of a needle valve in the base of the burner to give a flame height of 1.5 inches with air supply to the burner permanently shut off.
  - 4.4. After inserting the specimen, the burner flame shall be applied vertically at the middle of the lower edge of the specimens for 12 seconds.
  - 4.5. The cabinet door shall remain shut during testing.

III. Definitions

1. Afterflame  
The afterflame time shall be the time the specimen continues to flame after the burner flame is extinguished, and shall include afterflame of molten drops of material.
2. Afterglow  
The afterglow time shall be the time the specimen continues to glow after it has ceased to flame, and shall include afterglow of molten drops of material.
3. Char length  
The char length shall be the distance from the end of the specimen which was exposed to the flame, to

the upper edge of the void area. In the measurement of char length all readily removable portions of carbonaceous char shall be removed prior to measurement.

IV. Test Results

1. The char length of each specimen shall be recorded to the nearest 0.1 inches and the afterflame time and afterglow time to the nearest 0.1 seconds.
2. Maximum and average char length, afterglow and afterflame, shall be determined for each resilient cellular material.

SECTION A - PART II

Shredded Resilient Cellular Materials

(e.g., shredded polyurethane foams)

Shredded resilient cellular materials shall meet the following requirements.

1. The resilient cellular material used for shredding shall meet the requirements of Section A and D of this Technical Bulletin prior to shredding, or a post flame treated shredded foam may be used.
2. All resilient cellular material shall be encased in a fabric/ticking, and the requirements of the following test procedure shall be met.
3. A 13 x 13 inch (finished size) pillow/cushion fabricated from the fabric/ticking and filled with flame retardant foam, shall be used for testing.
4. The packing density of the shredded foam shall approximate that of intended use.
5. The pillow/cushion shall not lose more than 5% in weight when subjected to a 1.5 inch flame from a Bunsen Burner for 12 seconds.
6. The burner shall be positioned 0.75 inches below the center of the bottom lateral surface of the horizontally positioned pillow/cushion.
7. The pillow/cushion shall be supported in such a manner that a minimum 10 inch diameter circular portion of the lower fabric surface be directly exposed to the burner flame.
8. The pillow/cushion shall meet the test requirements both before and after aging for 24 hours at 220°F (104°C).
9. The test gas shall be Matheson Gas B, and all pillow/cushions shall be conditioned for a minimum of 24 hours at 70 ± 5°F and less than 55% relative humidity.
10. The burner flame shall be adjusted by means of a needle valve in the base of the burner to give a flame height of 1.5 inches with air supply to the burner permanently shut off.
11. The fabric/ticking used to encase the shredded resilient cellular material shall meet the requirements of Technical Bulletin No. 117, Section A, Requirements 1, 2, 3, 4 and 5, when tested in accordance with Federal Test Method Standard No. 191 Method 5903.2. The burner flame shall be applied vertically at the middle of the lower edge of the specimens for both 3 seconds and 12 seconds.

12. A total of 20 fabric specimens shall be tested as follows:

<u>Test Flame</u>	<u>Yarns Vertical</u>	<u>Specimens</u>
3 sec.	Warp	5
3 sec.	Fill	5
12 sec.	Warp	5
12 sec.	Fill	5

SECTION A - PART III

Expanded Polystyrene Beads

I. Requirements

1. Weight loss shall not exceed 5% in any of five consecutive tests.
2. Materials shall meet the above requirement after aging for 48 hours in an air circulating mechanical convection oven at 150 ± 5°F.

II. Apparatus

1. Oven - A mechanical convection air circulating oven capable of maintaining 150 ± 5°F.
2. Laboratory Hood - The test shall be conducted in a laboratory fume hood.
3. Test Basket - 3-inch deep, 8-inch square, wire mesh basket. (U.S. mesh No. 12 or finer)
4. Aluminum Foil - To catch molten material.
5. Methenamine reagent tablets - Eli Lilly No. 1588.
6. Tongs.
7. Matches.
8. Balance - Capable of measuring to the nearest 0.1 gram.

III. Test Procedure

1. All test material shall be aged for a minimum of 48 hours at 150 ± 5°F, and conditioned for a minimum of 24 hours at 70 ± 5°F and less than 55% relative humidity before testing.
2. A pre-weighed wire basket shall be filled to the 3-inch level with the aged material, and the weight of the test material determined.
3. Place the test basket on a sheet of aluminum foil in a fume hood. The hood fan should remain off during the test.
4. Hold a methenamine tablet with tongs and ignite with a match.
5. Place the burning tablet gently on the top center of the test material.
6. Continue the test until all flames are completely extinguished.
7. After cooling, re-weigh the basket and record percentage weight loss. Molten material which remains in the basket or on the aluminum foil is not considered as weight loss.

8. A total of five test samples of each material shall be evaluated.

SECTION B - PART I  
Non-Man-Made Filling Materials

- I. Non-man-made filling materials shall meet all the requirements under Section A of this technical bulletin with the following modifications:
  1. Specimens shall not be mounted in a specimen holder, but shall be vertically suspended into the flame. The upper 1/2 inch of the specimen may be used for suspension.
  2. Specimens size shall be 12 x 3 inches and in the thickness in which the batting is to be used up to 1 inch. If the filler is to be used in thicknesses of greater than one inch, specimens shall be cut to one inch thickness prior to testing.
  3. Non-man-made products shall not be aged for 24 hours at 220°F (104°C).
  4. The afterglow test requirement as stated in Section A, Part I is not applicable for non-man-made filling materials.

SECTION B - PART II  
Shredded and Loose Fill Materials/Feathers and Down

Feathers and down may be used in articles of upholstered furniture provided that the following requirements are met:

1. The feathers and down shall be encased in a flame retardant fabric/ticking.
2. The fabric/ticking shall meet the requirements of Technical Bulletin 117, Section A, Requirements 1, 2, 3, 4 and 5, when tested in accordance with Federal Test Method Standard No. 191 Method 5903.2.
3. The burner flame shall be applied vertically at the middle of the lower edge of the specimens for both 3 seconds and 12 seconds.
4. Specimen size shall be 12 x 2-3/4 inches.
5. Twenty specimens shall be tested as follows:

<u>Test Flame</u>	<u>Yarns Vertical</u>	<u>Specimens</u>
3 sec.	Warp	5
3 sec.	Fill	5
12 sec.	Warp	5
12 sec.	Fill	5

SECTION C  
Man-Made Fiber Filling Materials

I. Requirements

1. The average flame spread of all specimens shall not be less than 10 seconds.
2. The minimum flame spread of any individual specimens shall not be less than 7 seconds.
3. Man-made fiber fillers shall meet these requirements when tested both with and without any attached woven or non-woven materials such as scrims, cheese cloth, etc.
4. Man-made fiber fillers shall meet these requirements when tested in both machine (or linear) and transverse directions.

II. Test Procedure

1. Scope

This procedure is intended for use in determining the resistance of resilient man-made fiber filling materials to flame spread, when tested using a modified version of Commercial Standard 191-53.

2. Test Specimen

Test specimens shall be rectangles of fillers 6 x 3 inches and in the thickness in which the fillers are to be used. A minimum of 5 specimens shall be tested.

3. Apparatus

3.1. Cabinet - A test cabinet fabricated in accordance with the requirements of Commercial Standard 191-53 shall be used.

3.2. Burner and Gas - The burner and gas specified in Commercial Standard 191-53 shall be used.

3.3. Specimen Holder - A modified stainless steel specimen holder fabricated in accordance with the requirements of Figure 117-B shall be used.

4. Summary of Method

4.1. All specimens shall be tested, and conditioned for a minimum of 24 hours, at 70 ± 5°F and less than 55% relative humidity.

4.2. The specimen in its holder shall be supported at an angle of 45°.

4.3. The burner flame, adjusted to a length of 5/8 inches, shall be applied to the specimen near the lower edge for 5 seconds.

4.4. The time required for the flame to proceed up the batting a distance of 5 inches shall be recorded.

4.5. The cabinet door shall remain shut during testing.

III. Definitions

1. Flame Spread - The time in seconds from application of the burner until the specified burn end point is reached.
2. Self-Extinguishing Time - The time in seconds from application of the burner until the specimen flame extinguishes, provided the flame front has not reached the specified burn end point.

IV. Test Results

1. The time of flame spread of individual specimens shall be noted. Average flame spread shall be determined.
2. If a specimen burn does not reach the specified end point, the self-extinguishing time shall be noted.

V. NOTE: Mixed Fiber Fillers

1. Fillers consisting of 60% or greater of non-man-made fibers (e.g., cottons, kapok, hair, etc.) must meet the requirements of Section B, Part I.
2. Fillers consisting of 60% or greater of man-made fibers must meet the requirements of Section C.
3. Fillers not classified in V.1. and V.2. above must meet the requirements of both Section B, Part I and Section C.

FLAMMABILITY TEST FRAME - FLEXIBLE FOAMS

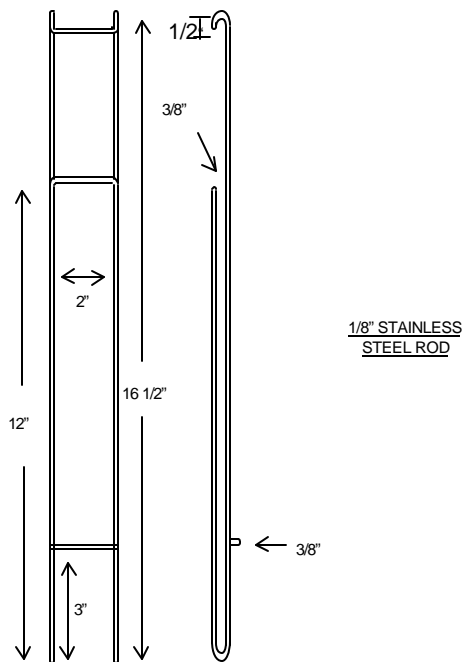


Figure A      Figure B

Figure 117 - A

FLAMMABILITY TEST FRAME - MODIFIED CS 191-53

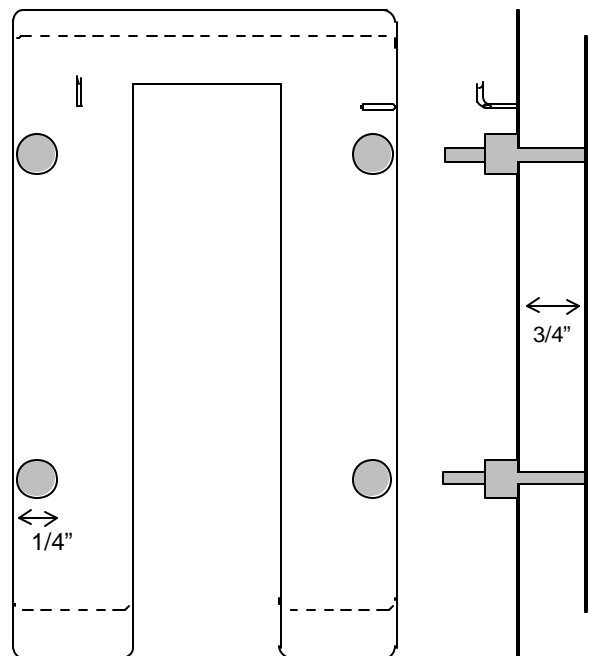


Figure 117 - B

## SECTION D - PART I

### Resilient Filling Materials - Cigarette Resistance

#### I. Requirements

1. All resilient filling materials other than cellular materials (such as foams), shall meet the requirements of this procedure.
2. The maximum char length of any specimen shall not exceed 2 inches in any direction from the cigarette.
3. Resilient cellular materials shall meet the requirements of Section D, Part II.

#### II. Test Procedure

1. Specimens no less than 12 x 12 inches and in the thickness of intended use shall be tested.
2. Cigarettes, meeting the cigarette specification of DOC FF 4-72, shall be burned on the surface, at the center of the specimen.
3. Specimens shall be tested with cigarettes both uncovered, and covered with one layer of sheeting material.
4. Sheeting materials shall meet the sheet specifications of Section D, Part II, 2.2.4.
5. A minimum of 3 specimens both covered and uncovered shall be tested.
6. All test materials shall be conditioned for at least 24 hours prior to testing at  $70 \pm 5^\circ\text{F}$  and less than 55% relative humidity.

#### III. Test Results

1. The char dimensions of each specimen shall be measured to the nearest 0.1 inches.

## SECTION D - PART II

### Resilient Cellular Materials - Smoldering Screening Test

#### 1. Apparatus

1.1. Test Stand - A test stand constructed as shown in Figure 1 shall be used in all tests. Construction material shall be 3/4 inch plywood.

1.2. Test Enclosure - To prevent extreme changes in surface ventilation rate, tests should be performed inside an enclosure measuring 48 inches long, 21 inches deep and 18 inches high, with an integral bottom, but without top. The enclosure is designed such that three individual test stands may be positioned simultaneously. Individual test stands should be at least six (6) inches apart. The enclosure construction material may be wood, transite, sheet metal, PMMA or other similar materials. It is desirable that the enclosure contain an observation window so that tests may be visually monitored.

1.3. Test Hood - The test enclosure shall be placed under a canopy type hood or in a conventional laboratory hood for all testing. Ventilation shall be controlled such

that air flow for the particular hood shall be just sufficient to remove products of combustion. Extreme or excessive air flow is not desirable and may affect test results.

1.4. Caution - Products of combustion can be irritating and dangerous to test personnel. Test personnel must avoid exposure to smoke and gases produced during testing as much as possible. Flaming combustion is a possibility in tests such as these, therefore, tests should not be left unattended. If flaming combustion should occur, the test should be immediately terminated. The availability of a functioning fire extinguisher is advisable.

#### 2. Test Materials

2.1. Ignition Source - Shall be cigarettes without filter tips made from natural tobacco  $85 \pm 2$  mm long with a packing density of  $0.27 \pm 0.02$  gms/cm<sup>3</sup>, and a total weight of  $1.1 \pm 0.1$  gms.

2.2. Test Foams - Shall be 7.25 x 8 x 2 inches for vertical panels, and 8 x 4 x 2 inches for horizontal panels.

2.3. Standard Test Fabric - (see Note 6.6.2) The standard test fabric shall be 15 x 8 inches for vertical panels, and 11 x 8 inches for horizontal panels.

2.4. Cover Sheeting Material - Cotton or cotton/polyester blend bed sheeting material  $3.7 \pm 0.8$  oz/yd<sup>2</sup>, white in color, and not treated with flame retardants shall be used to cover test cigarettes. The sheeting shall be laundered and dried at least once before use. 6 x 6 inch pieces of sheeting shall be used for test.

#### 3. Procedure

3.1. Weigh foam test panels correct to the nearest 0.1 gms.

3.2. Assemble the foam test panels, standard fabric, cigarette and cover fabric as shown in Figure 2. Straight pins may be used to support the cover fabric. The cigarette shall be placed at the crevice created by the abutment of the vertical and horizontal panels, such that the cigarette contacts both horizontal and vertical panels, and shall be equal distance from the edges of the test panels.

3.3. Light the cigarette (but no more than 4 mm burn), attach cover sheeting material and cover cigarette. (Note: A finger shall be run along the length of the covered cigarette to ensure good cover fabric-to-cigarette contact.)

3.4. Continue test until all evidence of combustion has ceased for at least 5 minutes. If a test is inadvertently interrupted it must be repeated from the beginning.

3.5. After all combustion has ceased remove cover fabric and remains of standard test fabric. Carefully remove foam test panels, clean all carbonaceous char from panels by scraping with a spatula and weigh the non-burned portions of the test panels to the nearest 0.1 gms.

4. Test Measurements

4.1. The following weight measurements of the foam test panels shall be made:

- (a) Pre-test weight = A
- (b) Post test weight of non-smoldered foam = B

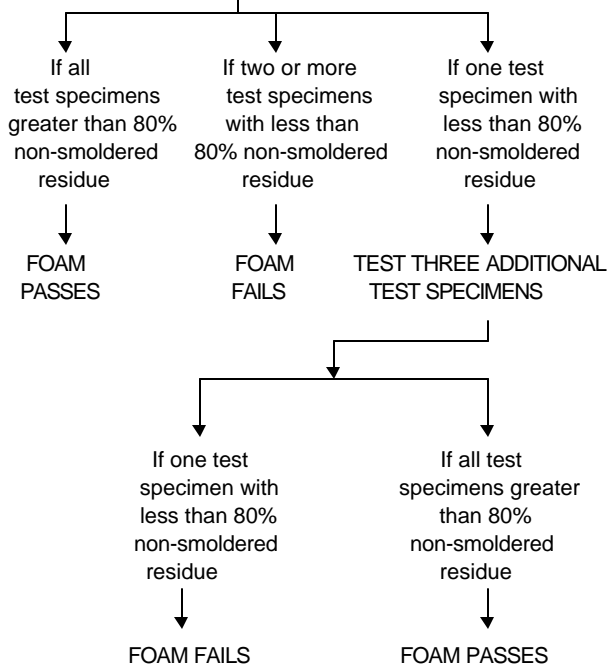
4.2. Calculate the percent non-smoldered foam.

$$\frac{100B}{A}$$

4.3. Tests on each foam formulation shall be conducted in triplicate.

5. Test Criteria

TEST THREE SPECIMENS OF EACH FOAM



6. Notes

6.1. Conditioning - All test foams, standard fabric, cover sheeting and cigarettes shall be maintained at 70°F ± 5°F (21.1°C ± 2.8°C) and less than 55% relative humidity for at least 24 hours prior to test.

6.2. Standard Fabric - The standard upholstery test fabric shall have the following specifications:

FABRIC	:	Pattern 8500
COLOR	:	Beige
FIBER CONTENT	:	100% Cotton Velvet
WEIGHT/LINEAL YD.	:	14.5 oz.
(54 inches)		
BACKCOATING	:	None
MANUFACTURER	:	J.B. Martin
AVAILABLE FROM	:	VAN WATERS & ROGERS
		16300 Shoemaker Avenue
		Cerritos, CA 90701
		(213) 926-0441

NOTE: This fabric was changed pursuant to a note to interested parties dated December 2, 1982. The change was caused by unavailability of previous fabric.

SECTION E - PART I  
Upholstery Fabrics

1. Fabrics which do not meet the Class 1 requirements of U.S. Department of Commerce Commercial Standard 191-53 shall not be used on articles of upholstered furniture.
2. Both surfaces of the fabric shall be tested to determine conformance with C.S. 191-53.
3. Specimens shall not be laundered or dry cleaned prior to testing.
4. Test a minimum of 5 specimens with the warp yarns in the long direction of test and 5 specimens with the fill yarns in the long direction of test.

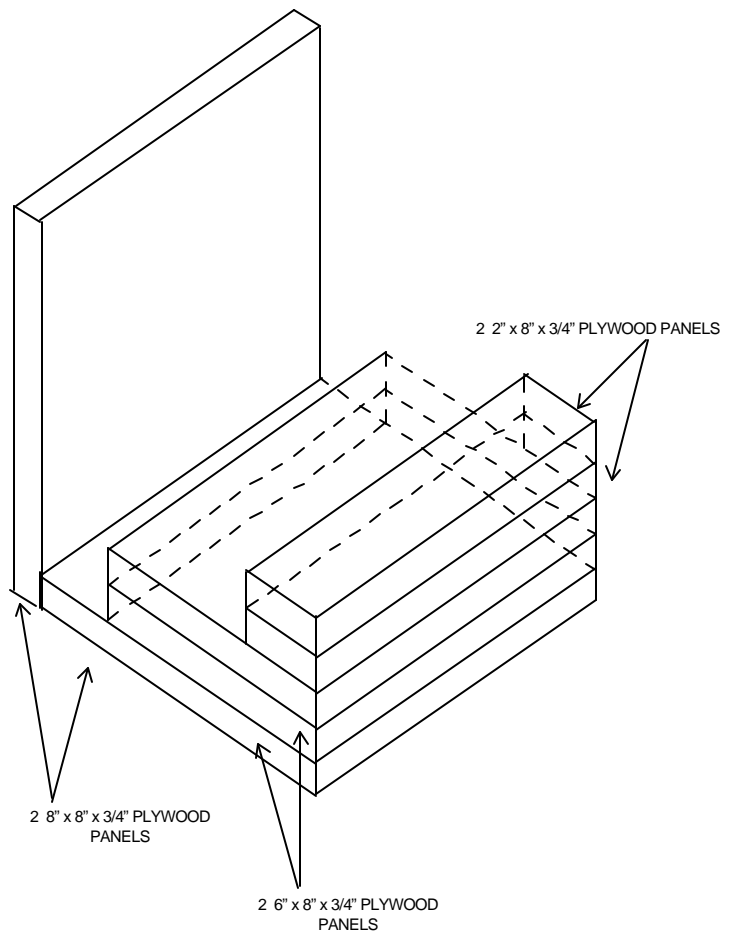


Figure 1

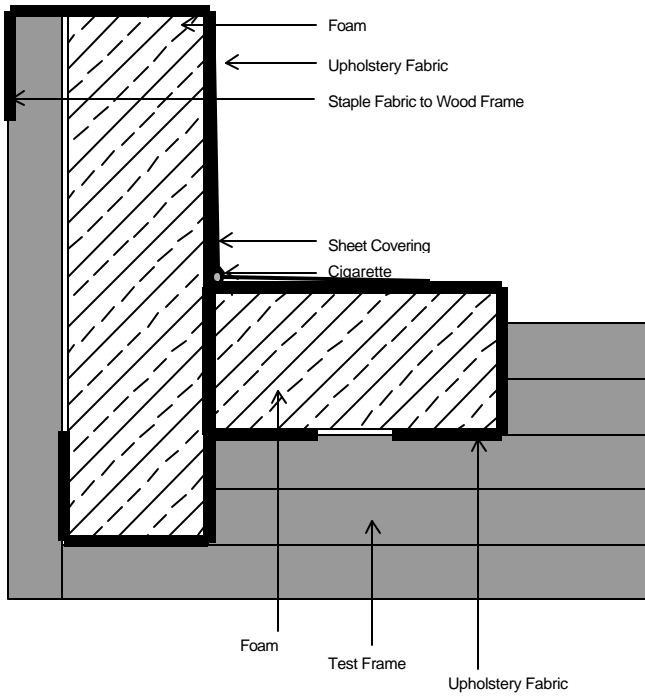


Figure 2