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CPAI-84

A SPECIFICATION FOR FLAME RESISTANT MATERIALS USED IN CAMPING TENTAGE

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INDUSTRIAL FABRICS ASSOCIATION INTERNATIONAL

Camping Products Manufacturers' Division
Industrial Fabrics Association International
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St. Paul, MN   USA 55101
1981
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This Standard represents the judgement of the members of the Camping Products Manufacturers' Division of the Industrial Fabrics Association International as to the basic performance requirements for products to be certified under this Standard. Inasmuch as the Industrial Fabrics Association International does not inspect, approve, or certify any procedures, equipment, materials, or products nor does it approve or evaluate actual testing, it assumes no liability or responsibility for the affect of observance or non-observance of any or all of the Standards set forth herein.

CPAI-84, 1980

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1. Scope

1.1 Scope . This standard provides performance requirements and te... for evaluating the flame resistance of fabric and other pliable mater... used in camping tentage. It also provides for certification of materi... suppliers and for labeling programs to caution the user against action... mental to flame retardant finishes, as well as to facilitate the ident... of tentage as being constructed of flame resistant materials and to ... the manufacturer.

2. Definitions

2.1 Camping Tentage: Any portable temporary shelter or structure desig... protect persons from the elements, all or a portion of the covering of wh... is made of fabric or other pliable materials. This includes, though not ... clusively, the following: camping tents; play tents; recreational vehicle ... awnings; dining flies and canopies; fabric screen houses; add-a-rooms; ice ... fishing tents .

2.2 Material Classifications. All materials covered in this standard fall ... one of the following definitions;

2.2.1 Flooring Material: Any pliable material used for flooring in camping ... tentage but excluding such things as rugs or carpets placed in the tent which ... are not an integral part of the item.

2.2.2 Wall and Top Material: Any pliable material used in camping tentage ... for other than flooring including walls, roofs, tops, doors, windows, screens ... awnings, flies and canopies.

2.3 Sample Unit. A sample unit shall consist of the following:

2.3.1 Flooring Material: Four individual specimens, no two specimens containing the same warp or fill yarns or filaments.

2.3.2 Wall and Top Material: Eight individual specimens, four taken from the warp and four from the fill direction of the test material. No two warp specimens shall contain the same warp yarns or filaments and no two fill specimens shall contain the same fill yarns or filaments.

3. Performance Requirements

3.1 Flooring Material. When subjected to the test described in Section 6, no specimen from a sample unit of flooring material shall be damaged within 1.0 inch of the edge of the hole in the flattening frame.

3.2 Wall and Top Material When subjected to the test described in Section 7, no specimen from a sample unit of wall and top material shall have an after-flame time (length of time a specimen continues to flame after removal of the test flame source) of more than 4.0 seconds; the average after-flame time for all specimens in a sample unit shall not exceed 2.0 seconds. The damaged length (distance from the bottom of the specimen to a point above which all material is sound) for the sample unit and individual specimens shall not exceed the values shown in Section 3.2.1 Portions or residues which break or drip from the test specimens shall not continue to flame after they reach the floor of the test cabinet.

3.2.1 Damaged Length. The maximum permissible damaged length and top material shall be as follows:

Untreated Weight of Material Being Tested - Ounces Per Square Yard	Maximum Average Damaged Length for Sample Unit - Inches	Maximum Damage for an Individual Specimen - In
Over 10	4.5	10.0
Over 8 but not over 10	5.5	10.0
Over 6 but not over 8	6.5	10.0
Over 4 but not over 6	7.5	10.0
Over 1.5 but not over 4	8.5	10.0
Not over 1.5	9.0	10.0

4. Certification and Labeling

4.1 Material Certification. Each lot of flame resistant material supplied to a manufacturer of camping tentage shall be accompanied by a written certification from the supplier stating that it meets the flame retardance requirements of CPAI-84 and giving the lot number and yardage therein.

4.2 Labeling of Camping Tentage. A label or labels shall be permanently affixed to each item of camping tentage containing the following information:

4.2.1 Certification: A statement that the materials used in the manufacture of the item meet the flame resistance requirements of CPAI-84.

4.2.2 Manufacturer Identification: An identification of the manufacturer of the item, unless the item bears a private label, in which case, it shall identify the private labeler and shall also contain a code mark which will permit the seller of the item to identify the manufacturer thereof to the purchaser upon his request.

4.2.3 Code Number: A number enabling the manufacturer to identify from his records the suppliers and suppliers' lot numbers of the certified materials used in the item. The manufacturer shall also maintain records identifying the parties to whom he sold camping tentage. Further, he shall maintain records identifying items manufactured from lots of certified material. Records shall be maintained for 4 years.

4.2.4 Warning Label:

24 pt. type	WARNING
16 pt. type	KEEP ALL FLAME AND HEAT SOURCES AWAY FROM THIS TENT FABRIC
12 pt. type	This tent is made with flame resistant fabric which meets CPAI-84 specifications. It is not fire proof. The fabric will burn if left in continuous contact with any flame source. The application of any foreign substance to the tent fabric may render the flame resistant properties ineffective.

This warning label or its equivalent must be permanently affixed to the tent at one conspicuous location, and must contain block letters on a white background. The first paragraph of the body of the label must be placed in a conspicuous location on each carton containing the tent.

5. Conditioning

5.1 Standard Conditions for Testing. Flame tests shall be performed upon immediate removal from Standard Atmospheric Conditions and on specimens in moisture equilibrium under Standard Atmospheric Conditions.

5.1.1 Standard Atmospheric Conditions. Standard Atmospheric Conditions for testing are 65 percent ± 2 percent relative humidity at a temperature of 70°F. ± 2°F. (21.1°C ± 1.1°C.)

5.1.2 Moisture Equilibrium. Moisture equilibrium is considered to have been reached when, after free exposure of the material to air in motion [illegible] at Standard Atmospheric Conditions as defined above, the change in weight of successive weighings made at intervals of 1 hour is no greater than 0.25 [illegible]

5.1.3 Preconditioning. In the event of dispute concerning the results of tests that may be affected by the moisture content, the material shall be preconditioned by being brought to moisture equilibrium with an atmosphere having a relative humidity of not over 10 percent and a temperature not over 125°F. (52°C.). The material shall then be brought to moisture equilibrium under Standard Atmospheric Conditions as defined above and then tested.

5.2 Leaching. Tests in Sections 6 and 7 shall be performed both before and after leaching.

5.2.1 Test Specimen. Test specimens to be leached shall be of the following dimension:

5.2.1.1 Flooring Material. Each test specimen shall be a 9 inch by 9 inch (± 1/16 inch) section of the flooring material to be tested.

5.2.1.2 Wall and Top Material. Test specimens shall be rectangles of cloth 2 3/4 inches by 12 inches (± 1/16 inch) with the long dimensions parallel to either the warp or filling directions of the material.

5.2.2 Apparatus

5.2.2.1 Water container or tank of such shape and size that the specimen can be submerged therein with all surfaces of the specimen having full access to the water. For cloth specimens the container shall allow not less than 1/2 gallon of water for each square foot of specimen. The water shall be changed by a continuous flow or by emptying and refilling so that there shall be at least six complete changes of water in a 72-hour period.

5.2.2.2 Means of maintaining water at a temperature of 60°F. to 70°F. (15.5°C. to 21.1°C.) and a pH of 6.0 to 8.0 during the test.

5.2.2.3 Means for holding the specimen submerged throughout the leaching period.

5.2.3 Procedure. The specimens shall be immersed in water at a temperature of 60°F. to 70°F. (15.5°C. to 21.1°C.) and a pH of 6.0 to 8.0 for 72 hours. The specimen shall then be removed, air-dried and brought to Standard Atmospheric Conditions prior to further testing.

5.3 Accelerated Weathering. Tests in Sections 6 and 7 shall be performed both before and after accelerated weathering.

5.3.1 Test Specimen. Test specimens to be weathered shall be of the following dimensions:

5.3.1.1 Flooring mater[illegible]
9 inch (± 1/16 inch) section of the [illegible]

5.3.1.2 Wall and Top Material. [illegible]
of cloth 2 3/4 inches by 12 inches (± 1/16 inch) with the long dimension
parallel to either the warp or filling directions of the [illegible]

5.3.2 Apparatus

5.3.2.1 Vertical carbon arc mounted at the center [illegible]
The arc shall be designed to accommodate either two or three [illegible]
shall burn only one pair at a time, automatically transferring from one [illegible]
another as the carbons are consumed. The carbons shall be Sunshine [illegible]
copper-coated, No. 22 for the upper pair and No. 13 for the lower pair [illegible]
shall be operated on 60 amperes and 50 volts across the arc for alternat[illegible]
and on 50 amperes and 60 volts across the arc for direct current.

5.3.2.2 A rotating rack with holder in which the specimens are [illegible]
vertically and normally to radiation from the arc with the center of the [illegible]
the specimen at a radial distance of approximately 18 inches from the arc.

5.3.2.3 Water-spray nozzles shall be mounted horizontally (the [illegible]
spray assembly vertically) in the test chamber inside the specimen rack and [illegible]
placed that the water shall strike the specimens evenly over their entire [illegible]
in the form of a fine spray in sufficient volume to cover specimens immediately
on impact. The apparatus shall be so operated that the specimens are exposed [illegible]
successive cycles of 102 minutes of light without spray and 18 minutes of light
with spray.

5.3.2.4 Means for maintaining the required temperature of water in the
spray.

5.3.2.5 Means for maintaining the required pressure of water entering
the spray.

5.3.2.6 Means for delivering the required quantity of water per spray
nozzle to the specimen.

5.3.2.7 Exhaust fan to ventilate the arc effectively.

5.3.2.8 Black panel thermometer unit for measuring the temperature
within the machine. This unit shall consist of a metal panel to the base of which
is attached the sensitive portion of a bimetallic dial-type thermometer. The
entire base is then coated twice with long lasting baked enamel paint.

5.3.3 Procedure

5.3.3.1 The rack shall rotate about the arc at a uniform speed of one
revolution per minute.

5.3.3.2 The temperature of water in the spray shall be $80^{\circ} \pm 10^{\circ}$F.
($26.7^{\circ} \pm 5.6^{\circ}$C.)

5.3.3.3 The pressure of the water entering the spray shall be 1 - 18
psi inclusive.

5.3.3.4 The quantity of water delivered to the specimen shall be .12
to .25 gallons, inclusive, per hour per spray nozzle.

5.3.3.5 The black panel temperature at the exposure [illegible] specimen rack shall be 155° ± 10°F. (68° ± 3,7°C.) when measured [illegible] manner:

Before reading the temperature the machine shall be full [illegible] and shall be in operation long enough for thermal equilibr[illegible] established. The black panel shall be mounted in the test [illegible] and readings taken at the point where water spray is not str[illegible] panel.

5.3.3.6 The specimen shall be suspended on the rotating rac[illegible] tension and in such a way that the ends or corners cannot curl. The [illegible] of the specimen shall be in the vertical position and shall be indicated [illegible] reverse side of the cloth. No test portion of the specimen shall be cov[illegible] above or below the horizontal plane of the arc.

5.3.3.7 The specimen shall be exposed to normal radiation from the [illegible] for 100 hours.

5.3.3.8 At the end of the exposure period, the specimen shall be removed from the machine, allowed to dry, and brought to Standard Atmospheric Conditions prior to further testing.

6. Test Method, Flooring Material

6.1 Test Specimen. Each test specimen shall be a 9 inch by 9 inch (± 1/16 inch) section of the flooring material to be tested.

6.2 Apparatus

6.2.1 Test Chamber. The test chamber shall consist of an open top hollow cube made of noncombustible material with inside dimensions 12 x 12 x 12 inches and a minimum of 1/4 inch wall thickness. The flat bottom of the box shall be made of the same material as the sides and shall be easily removable. The sides shall be fastened together with screws or brackets and taped to prevent air leakage into the box during use.

6.2.2 Supporting Frame. A steel plate, 9 inches by 9 inches, 1/4 inch thick with an 8 inch diameter hole in its center and a 1 inch by 1 inch by 1/16 inch thick shim affixed to the underside of each corner is required to support the material above the floor of the chamber during the course of the test. The edge of the supporting frame must be kept clean.

6.2.3 Flattening Frame. A steel plate 9 inches by 9 inches, 1/4 inch thick with an 8 inch diameter hole in its center is required to hold the flooring material flat during the course of the test.

6.2.4 Punch . A punch capable of making a 1/4 inch diameter hole in the center of the specimen of flooring material to be tested.

6.2.5 Standard Igniting Source. No. 1588 methenamine timed burning tablet or an equal tablet. These tablets shall be stored in a desiccator over a desiccant for 24 hours prior to use. (Small quantities of sorbed water may cause the tablets to fracture when first ignited. If a major fracture occurs, any results from the test shall be ignored, and it shall be repeated.)

6.2.6 Hood: A hood capable of being closed and having its draft turned off during each test and capable of rapidly removing the products of combustion following each test. The front or sides of the hood should be transparent to permit observation of the tests in progress.

6.2.7 Mirror: A small mirror mounted above [illegible] to permit observation of the specimen [illegible]

6.3 Procedure

6.3.1 Place the test chamber in the draft-protected environment with draft off) with its bottom in place and the supporting frame on the bottom of the chamber, shimmed side down.

6.3.2 Punch a 1/4 inch diameter hole in the center of the specimen flooring material to be tested.

6.3.3 Place the specimen on the supporting frame in the position it will be used, exercising care that the specimen is horizontal and [illegible] the flattening frame on the specimen and position a methenamine tablet on its flat sides with its edge within 1/8 inch of the hole in the center of the specimen.

6.3.4 Ignite the tablet by touching a lighted match or an equivalent igniting source carefully to its top.

6.3.5 Continue each test until the last vestige of flame or glow disappears (this is frequently accompanied by a final puff of smoke) or the flaming or smoldering has approached within 1.0 inch of the edge of the hole in the flattening frame at any point. (Any test in which the tablet is extinguished by physical action of the specimen of flooring material shall be disregarded and the test repeated.)

6.3.6 When all combustion has ceased, ventilate the hood and measure the shortest distance between the edge of the hole in the flattening frame and the damaged area. Record the distance measured for each specimen.

6.3.7 Remove the specimen from the chamber and remove any burn residue from the floor of the chamber. Before proceeding to the next test, the floor must be cooled to normal room temperature or replaced with one that is at normal room temperature.

6.4 Report. The number of specimens of the four tested in which the damaged area does not extend to within 1.0 inch of the edge of the hole in the flattening frame shall be reported.

6.5 Notes

6.5.1 The No. 1588 methenamine tablet may be procured from a local pharmacy or from Eli Lilly & Co., 740 S. Alabama, Indianapolis, Indiana 46206.

7. Test Method, Wall and Top Material

7.1 Test Specimen. The test specimens shall be rectangles of cloth 2 3/4 inches by 12 inches (± 1/16 inch) with the long dimensions parallel to either the warp or filling directions of the material.

7.2 Apparatus

7.2.1 Cabinet: A cabinet and accessories, fabricated in accordance with the requirements specified in Figures A, B and C. Galvanized sheet metal or other suitable metal shall be used. The entire inside back wall of the cabinet shall be painted black to facilitate the viewing of the test specimen and pilot flame.

7.2.2 Burner The burner shall [illegible] adjust the flame height, a barrel [illegible] light.

7.2.2.1 The burner may be constructed [illegible] diameter barrel 3 ± 1/4 inches long from a [illegible] a variable orifice burner.

7.2.2.2 The pilot light tube shall have a diameter of approximately 1/16 inch and shall be spaced 1/8 inch away from the burner edge [illegible] flame 1/8 inch long.

7.2.2.3 The necessary gas connections and the applicable [illegible] shall be as specified in Figure D except that a solenoid valve may be [illegible] lieu of the stopcock valve to which the burner is attached. The stopcock or solenoid valve, whichever is used, shall be capable of being fully open [illegible] fully closed in 0.1 second.

7.2.2.4 On the side of the barrel of the burner, opposite the [illegible] light there shall be a metal rod of approximately 1/8 inch diameter spaced [illegible] inch from the barrel and extending above the burner. The rod shall have [illegible] 5/16 inch prongs marking the distances of 3/4 inch and 1 1/2 inches above the top of the burner.

7.2.2.5 The burner shall be fixed in a position so that the center of the barrel of the burner is directly below the center of the specimen.

7.2.3 A control valve system with a delivery rate designed to furnish [illegible] to the burner under a pressure of 2 1/2 ± 1/4 lbs. per square inch at the burner inlet (see 7.3.1). The manufacturer's recommended delivery rate for the valve system shall include the required pressure.

7.2.4 The gas used shall be Matheson Manufactured Gas Type B or the equivalent.

7.2.5 Metal hooks and weights to produce a series of total loads to determine damaged length. The metal hooks shall consist of No. 19 guage steel wire or equivalent and shall be made from 3 inch lengths of the wire and bent 1/2 inch from one end to a 45 degree hook. One end of the hook shall be fastened around the neck of the weight to be used.

7.2.6 Stop watch or other device to measure the burning time to 0.2 second.

7.2.7 Scale, graduated in 0.1 inch to measure the damaged length.

7.2.8 Clamps For holding the specimen to the supporting frame shall be [illegible] Acco #325, Hunt Bulldog Clips No.2, or equivalent. A total of four clamps, two on each side are used. Two clamps 3/4 inch above the bottom edge and two clamps 1 1/2 inch above the first two.

7.3 Procedure

7.3.1 The specimen in its holder shall be suspended vertically in the cabinet in such a manner that the entire length of the specimen is exposed and the lower end is 3/4 inch above the top of the gas burner. The apparatus shall be set [illegible] in a draft free area.

7.3.2 Prior to inserting the specimen, the pilot [illegible] to approximately 1/8 inch in height measured from its lowest point. The burner flame shall be adjusted by means of the needle valve in the burner to give a flame height of 1 1/2 inches (± 1/16 inch) with fully open and the air supply to the burner shut off and taped. The flame height is obtained by adjusting the valve so that the uppermost (tip) of the flame is level with the tip of the metal prong (see Figure specified for adjustment of flame height. It is an important aspect evaluation that the flame height be adjusted with the tip of the flame with the tip of the metal prong. After inserting the specimen, the [illegible] shall be fully opened, and the burner flame applied vertically at the [illegible] of the lower edge of the specimen for 12 seconds (± .2 second) and the burner turned off. The cabinet door shall remain shut during testing.

7.3.3 The after-flame time for each specimen shall be recorded to the nearest 0.2 seconds. After flaming and glowing have ceased, the specimen shall be removed from the cabinet.

7.3.4 After each specimen is removed, the test cabinet shall be cleared of fumes and smoke prior to testing the next specimen.

7.3.5 After both flaming and glowing have ceased, the damaged length shall be measured. The damaged length shall be the distance from the end of the specimen which was exposed to the flame, to the end of a tear (made lengthwise) of the specimen through the center of the damaged area as follows: The specimen shall be folded lengthwise and creased by hand along a line through the highest peaks of the damaged area. The hook shall be inserted in the specimen (or a hole, 1/4 inch diameter or less, punched out for the hook) at one side of the damaged area 1/4 inch from the adjacent outside edge and 1/4 inch in from the lower end. A weight of sufficient size such that the weight and hook together shall equal the total tearing load required in 7.3.6.1 shall be attached to the specimen.

7.3.6 A tearing force shall be applied gently to the specimen by grasping the corner of the cloth at the opposite edge of the char from the load and raising the specimen and weight clear of the supporting surface. The end of the tear shall be marked off on the edge and the damaged length measurement made along the undamaged edge.

7.3.6.1 Loads for Determing Damaged Length. The specific load applicable to the weight of the test material shall be as follows:

Untreated Weight of Material Being Tested - Ounces per Square Yard	Total Tear Weight for Determing the Damaged Length - Pounds
Not exceeding 3.0	0.125
Over 3.0 and not exceeding 6.0	0.25
Over 6.0 and not exceeding 10.0	0.50
Over 10.0	0.75

7.3.7 The damaged length for each specimen shall be recorded to the nearest 0.1 inch.

7.4 Report

7.4.1 The after-flame time and damaged length of the sample unit shall be the average of the results obtained from the individual specimens tested. The values obtained from the individual specimens shall be recorded.

7.4.2 The after-flame time shall be reported to the nearest 0.2 second and the damaged length to the nearest 0.1 inch.

7.5 Notes

7.5.1 The gas and the regulator valve system, Models IL-350 and 70 with hose and fittings connected in series may be obtained from Matheson Gas Products, P. O. Box 85, East Rutherford, New Jersey 07073.

7.5.2 The test cabinet of the type described in this test method may be obtained from U. S. Testing Company, 1941 Park Avenue, Hoboken, New Jersey, 07030 or from the Govmark Organization, Inc., P. O. Box 807, Bellmore, New York 11710.

FIGURE A - Vertical flame resistance textile apparatus.

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FIGURE B - Vertical flame resistance textile apparatus door and top view w/baffle

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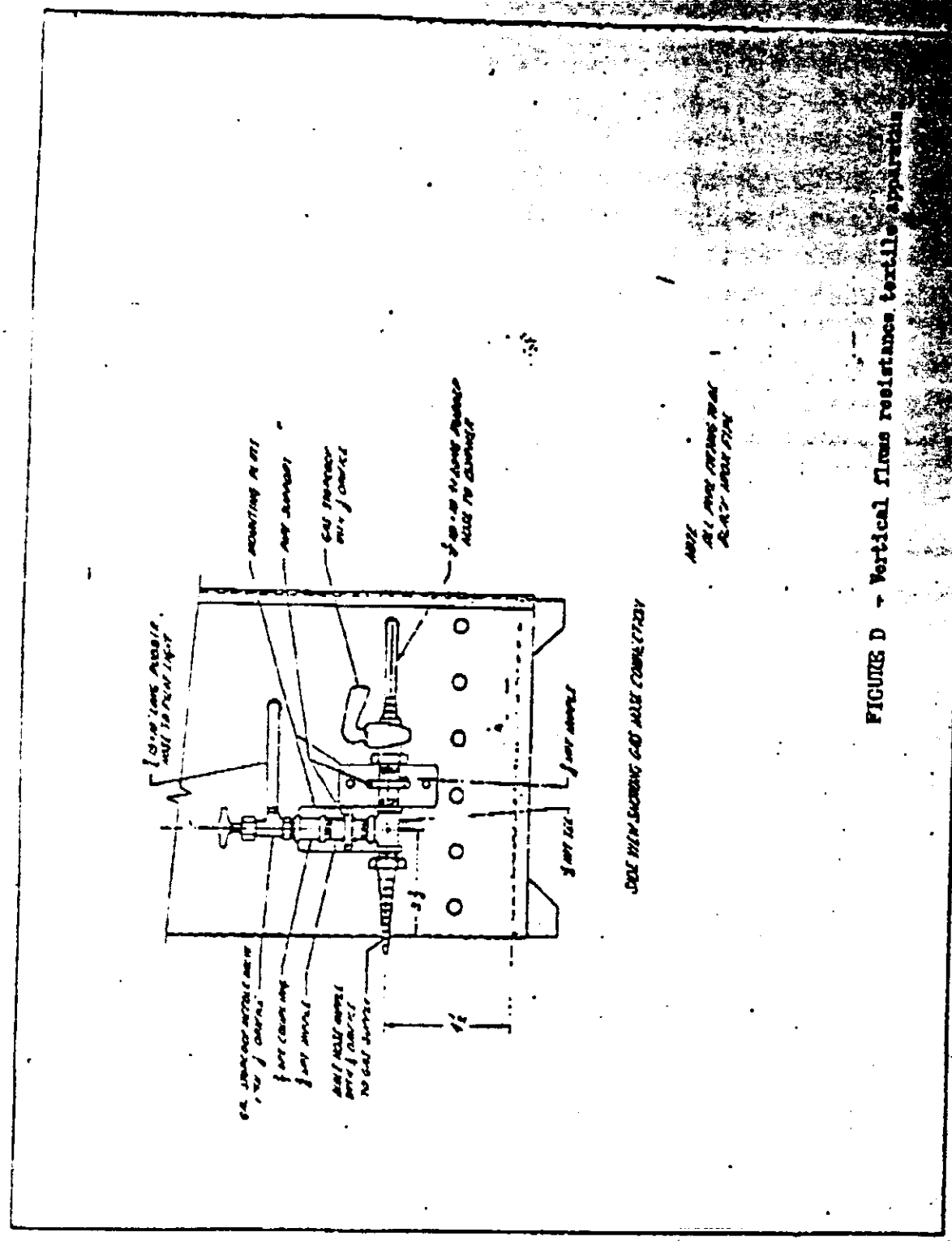

FIGURE D - Vertical flame resistance textile apparatus

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