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MILITARY SPECIFICATION

CUSHIONING MATERIAL, RESILIENT TYPE, GENERAL

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE.

1.1 Scope. This specification covers resilient materials (see 6.1) used for cushioning applications in the form of rolls, sheets, special diecut pads, or molded forms as specified (see 6.2).

1.2 Classification. The cushioning material shall be classified as to the grade for each class of loading range as follows:

Class 1 - Very light loading range: less than 0.08 psi (551.6 Pa).

Class 2 - Light loading range: (0.08 - 0.2 psi) or (551.6 Pa - 1.38 KPa).

Class 3 - Medium loading range: (0.2 - 0.5 psi) or (1.38 - 3.45 KPa).

Beneficial comments (recommendations, additions, deletions, and any pertinent data) which may be of use in improving this document should be addressed to: The Air Force Packaging Evaluation Activity, HQ AFLC/DSTZ, Wright-Patterson AFB, Ohio 45433-5999 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

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Class 4 - Heavy loading range: (0.5 - 1.0 psi) or (3.45 - 6.9 KPa).

Class 5 - Very heavy loading range: (1.0 - 1.5 psi) or (6.9 - 10.3 KPa).

Class 6 - Extremely heavy loading range: (1.5 - 4.0 psi) or (10.3 - 27.6 KPa).

Class 7 - Ultra heavy loading range: 4.0 - 10.0 psi or (27.6 - 69.0 KPa).

Grade A - Very low peak acceleration (less than 20 Gs)

Grade B - Low peak acceleration (less than 40 Gs)

Grade C - Medium peak acceleration (less than 60 Gs)

Grade D - High peak acceleration (less than 100 Gs)

Grade E - Very high peak acceleration (less than 130 Gs)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-B-601	- Boxes, Wood, Cleated-Plywood
PPP-B-636	- Boxes, Shipping, Fiberboard

STANDARDS

FEDERAL

FED-STD-101	- Test Procedures for Packaging Materials
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MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	- Marking for Shipment and Storage

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(Copies of specifications, standards, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM)

- | | |
|-------|---|
| D1596 | - Shock Absorbing Characteristics of Package Cushioning Materials |
| C421 | - Tumbling Friability of Pre-foamed Block-Type Thermal Insulation |
| D2221 | - Creep Properties of Package Cushioning Materials |

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103).

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

TECHNICAL ASSOCIATION PAPER AND PULP INDUSTRY (TAPPI)

- | | |
|------|---|
| T435 | - Hydrogen Ion Concentration (pH) of Paper Extracts (Hot Extraction Method) |
|------|---|

(Application for copies should be addressed to the Technical Association of the Pulp and Paper Industry, P. O. Box 105113, Atlanta, Georgia 30348).

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification.

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(Applications for copies should be addressed to the Uniform Classification Committee, 222 South Riverside Plaza, Suite 1120, Chicago, Illinois 60606).

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATIONS, INC.

National Motor Freight Classification.

(Applications for copies should be addressed to the American Trucking Association, Inc., 1616 P Street NW, Washington, DC 20036.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS.

3.1 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.4.2 and 6.2).

3.2 Materials. The cushioning material shall be composed of any resilient material (see 6.1) which will provide a product conforming to the requirements specified herein.

3.2.1 Form and construction. The cushioning material shall be furnished noncompressed in rolls, flat sheets, machined or die cut pads, as specified (see 6.2). The cushioning material may be unbacked, backed, or coated with a suitable material, as specified (see 6.2). Artificial cores or columns shall not be used in rolls or sheets.

3.2.2 Dimensions. The length, width, and thickness of rolls, sheets, or die-cut pads determined in accordance with 4.5.3.1-2 shall be as specified by the procuring activity (see 6.2). Rolls and sheets will normally be supplied in 2 or 3 foot (.61 or .91m) widths with rolls in 50 or 100 foot (15.24 or 30.48m) lengths and sheets in 6, 8, 10 or 12 foot (1.83, 2.44, 3.05 or 3.66m) lengths. Special molded or machined shapes shall be of the configuration and dimensions specified by the procuring activity (see 6.2).

3.2.2.1 Dimensional tolerances for length and width.

3.2.2.1.1 Rolls and sheets. The length of rolls or sheets shall be within minus 1 plus 5 percent of the specified length. The width shall be within \pm 1 percent of the specified width (see 6.2).

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3.2.2.1.2 Die cut pads. Unless otherwise specified, the length and width of die cut pads shall be within 0.25 inch (6.35mm) inch of the specified dimensions (see 6.2).

3.2.2.2 Dimensional tolerance for thickness. For a material 1.25 inch (3.18cm) thick or less, the tolerance for the specified thickness shall be minus 10 to plus 20 percent. For a material exceeding 1.25 inch (3.18cm) thickness, the tolerance shall be plus 0.25 inch (6.35mm) to minus 0.125 inch (3.18mm) (see 6.2).

3.2.3 Density. The maximum permissible variation from the density specified by the procuring activity (6.2) shall not exceed \pm 10 percent when tested in accordance with 4.5.3.3.

3.2.4 Hydrogen ion concentration. The hydrogen ion concentration (pH) shall not be less than 5.0 nor more than 10.0 (see 4.5.3.5 and 6.2).

3.2.5 Performance characteristics.

3.2.5.1 Dynamic cushioning. The cushioning material shall be assigned classes and grades as classified in 1.2. The classification shall be determined from a peak acceleration-static stress curve, established for a 24 inch (61cm) drop height (see 4.5.3.11). The grades and classes under which a particular material falls are determined primarily by the manner in which the curve intersects the boundaries for class and grade. To be classified within a particular grade and class, the curve must occur completely below the boundaries for that grade through the entire stress range represented by the class (see 6.2).

3.2.5.2 Hydrolytic stability. After aging, the stress necessary to cause a 50 percent strain on the specimen shall be within 20 percent of the stress necessary to cause the same strain on unaged specimen (see 4.5.3.10 and 6.2).

3.2.5.3 Tensile strength. The cross sectional area of a cushioning material specimen shall sustain the tensile load specified in 6.2 without total separation (see 4.5.3.9).

3.2.5.4 Creep. Unless otherwise specified (see 6.2), the maximum percentage of creep that occurs under a continuous load representing the maximum stress of the loading range for which the material is being qualified shall be ten percent when tested in accordance with 4.5.3.7.

3.2.5.5 Permanent set. Unless otherwise specified (6.2), the permanent set shall be not more than 15 percent of the original thickness (see 4.5.3.8).

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3.2.5.6 Friability. The maximum weight loss of the resilient cushioning material when tested in accordance with 4.5.3.4 shall be specified by the procuring activity (see 6.2).

3.2.5.7 Relative combustibility. There shall be no visual evidence of burning or melting of the specimen at or beyond the 5-inch (12.7 cm) gage mark specified in the test (see 4.5.3.12).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Classification of inspection. The inspections shall be classified as follows:

- a. First Article Inspection (4.4.2).
- b. Quality Conformance Inspection (4.4.3).

4.3 Sampling.

4.3.1 Lot. For purposes of sampling, a lot shall consist of all material produced under like conditions in one unchanged process by one manufacturer and submitted for acceptance at one time.

4.3.2 Sampling for testing. Samples shall be selected as listed below and subjected to the tests described in 4.5. Specimen size and preparation shall be in accordance with 4.5.1.

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a. Rolls: A sample roll shall be selected at random from the lot. Specimens of sufficient size to conduct the tests shall be taken from the sample after two layers or thicknesses of material have been removed from the roll.

b. Sheets: Three bundles shall be selected, the top three sheets of each bundle removed and samples taken at random from the remainder of each bundle.

c. Die-cut pads: Three samples of sufficient size for testing shall be selected from the sheet stock from which the pads are fabricated.

d. Molded shapes: Three rectangular blocks of sufficient size and molded in a similar fashion as the molded shapes shall be used to conduct the specified tests.

e. Machine shapes: Three samples of sufficient size to conduct the specified tests shall be selected and cut from the base stock.

4.4 Inspection and tests.

4.4.1 First article waiver. First article inspection may be waived when the procuring activity or contract administration has data or other evidence to indicate that prior successful first article inspection has been conducted (see 6.2). When the first article has been waived, the contractor shall certify that the material will conform to the requirements of this specification.

4.4.2 First article inspection. First article inspection shall consist of all tests in Table I and shall be performed by the contractor after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units produced using materials, equipment, and procedures which will be used in fulfilling the contract. First article approval is valid only on the contract on which it is granted, unless extended by the Government to other contracts.

TABLE I. First Article Test Requirements and Methods

<u>Property</u>	<u>Requirement</u>	<u>Test Method</u>
Form and Construction	3.2.1	4.4.3.3
Dimensions	3.2.2	4.5.3.1 and 4.5.3.2
- Tolerance for Width and Length	3.2.2.1	4.5.3.1
- Tolerance for Thickness	3.2.2.2	4.5.3.2

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<u>Property</u>	<u>Requirement</u>	<u>Test Method</u>
Density	3.2.3	4.5.3.3
Hydrogen Ion Concentration	3.2.4	4.5.3.5
Dynamic Cushioning	3.2.5.1	4.5.3.11
Hydrolytic Stability	3.2.5.2	4.5.3.10
Tensile Strength	3.2.5.3	4.5.3.9
Creep	3.2.5.4	4.5.3.7
Permanent Set	3.2.5.5	4.5.3.8
Friability	3.2.5.6	4.5.3.4
Combustibility	3.2.5.7	4.5.3.12

4.4.3 Quality conformance inspection.

4.4.3.1 Lot. A lot shall consist of all rolls, sheets, die-cut pads and molded or machined shapes within the same class and grade manufactured from the same material, under essentially the same conditions offered for delivery at one time.

4.4.3.2 Sampling for lot acceptance. A random sample of rolls, sheets, die-cut pads and molded or machined shapes shall be selected from each lot in accordance with MIL-STD-105 at inspection level S-3.

4.4.3.3 Inspection of materials. Materials selected in accordance with 4.4.3.2 shall be examined to verify compliance with this specification. Examination shall be conducted as specified in Table II. The Acceptable Quality Level (AQL) is 6.5 percent for major defects and 10.0 percent for minor defects. Test conditions shall be as specified in 4.5.2.

TABLE II. Material Defects

<u>Categories</u>	<u>Defect</u>
Major	
101	Dimensions of die-cut or molded shapes not within specified tolerance.
102	Non-uniformity in quality and texture.
103	Not within class and grade specified in contract or order.
104	Use of artificial cores or columns to meet specified requirements on rolls or sheets.
105	Materials not as specified (see 6.1).

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<u>Categories</u>	<u>Defect</u>
Minor	
201	Length and width of rolls or sheets not within specified limits.
202	Improper marking of shipping containers.

4.4.3.4 Testing for end item acceptance. Acceptance tests shall consist of all tests in Table III.

TABLE III. Tests for End Item Acceptance

Examination of Dimensions	4.5.3.1
Thickness	4.5.3.2
Density	4.5.3.3
Creep	4.5.3.7
Permanent set	4.5.3.8
Dynamic cushioning	4.5.3.11
Combustibility	4.5.3.12

4.5 Testing. The tests specified in Tables I and III shall be performed to assure compliance with the requirements of Section 3.

4.5.1 First article test sample. Five rolls, sheets, die-cut pads or molded or machined shapes of the same material, manufactured under essentially the same conditions as to be used in production shall be selected for samples. Samples shall be of sufficient size to provide material for all the first article tests. They shall not be subjected to any mechanical or chemical treatment prior to testing except as specifically described herein. The specimens shall be cut so as to avoid rounded or precompressed edges.

4.5.2 Test conditions. Except as specified herein, tests and measurements shall be made at room temperatures, i.e., 70 to 80 degrees F (21.1 - 26.7 degrees C) unless otherwise specified by the procuring activity (see 6.2). In case of dispute and prior to resumption of testing, the specimens shall be conditioned at 73.4 ± 2 degrees F (23 ± 1.1 degree C) and 50 ± 5 percent relative humidity or at the specified temperature and relative humidity (see 6.2) for at least 16 hours or until the difference between two successive weighings conducted at one-hour intervals is less than 1 percent of the average specimen weight.

4.5.3 Test methods.

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4.5.3.1 Examination of dimensions. The length, width and thickness of rolls, sheets, or die cut pads shall be measured to determine conformance to 3.2.2. The dimensions of molded and machined shapes shall be examined for conformance to the requirements specified.

4.5.3.2 Thickness determination.

4.5.3.2.1 Preparation of specimens. Three square specimens shall be prepared from each of the samples. The length and width of the specimens shall be not less than twice its assumed thickness. The length and width of the specimens shall be measured at the center lines to the nearest 0.0625 inch (1.6mm). The specimens for material less than one inch (25.4mm) in thickness shall consist of sufficient stacked pieces to measure at least one inch (25.4mm) in thickness. The specimens shall be cut to avoid rounded or precompressed edges:

4.5.3.2.2 Test procedure. The specimen shall be placed upon a flat surface and loaded with a rigid, flat plate which overhangs by one inch (25.4mm) the width and length of the specimen. The load exerted on the specimen shall be 0.025 ± 0.0003 psi ($0.172 \pm .002$ KPa). Thirty seconds after application of the plate and while still under load, the vertical distance between the base surface and the plate at each of the four corners shall be measured to the nearest 0.0625 (1.6mm) inch: the average of the four measurements shall be recorded as the original thickness. (A dial indicator located at the geometric center of the plate may also be used to measure thickness). The thickness representative of the lot shall be the average of the material thickness of the specimens.

4.5.3.3 Density. Three specimens shall be prepared in accordance with 4.5.1, the thickness of each specimen determined in accordance with 4.5.3.2 and the weight of each specimen determined to the nearest 0.01 gram. The density of each specimen shall be determined in accordance with the following formula:

$$D = \frac{3.81 \times W}{l \times w \times t}$$

where: D = density in pounds per cubic foot
 W = weight of specimen in grams
 l = length of specimen in inches
 w = width of specimen in inches
 t = thickness of specimen in inches

The density of the material in a lot shall be the average of the densities of the three specimens.

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4.5.3.3.1 Rejection of sample. If specimens from the sample block fail to meet the requirements of 3.2.3 the sample block shall be discarded and new specimens from a second sample shall be prepared. If specimens from the second sample block fail to meet the above requirements, the entire lot represented by the sample block shall be rejected.

4.5.3.4 Friability. Twelve samples shall be tested and examined for conformance to 3.2.5.6. Friability shall be determined in accordance with the tumbling technique of ASTM C421-77 with the following modification: the drying temperature of ASTM C421, paragraph 5.3, shall be 220 - 235 degrees F (104.4 - 112.8 degrees C).

4.5.3.5 Hydrogen ion concentration. The hydrogen ion concentration (pH) shall be determined in accordance with TAPPI T435 OM-83, Hydrogen Ion Concentration (pH) of Paper Extracts (Hot Extraction Method) with the following exception: reference the use of resilient cushioning material in place of paper material. This test is not intended to determine the material's corrosivity.

4.5.3.6 Preworking. Unless otherwise specified (see 6.2), three test specimens shall be prepared in accordance with 4.5.3.2.1, conditioned in accordance with 4.5.2 and placed in a compression tester (Instron Compression Tester, or equal). Preworking shall consist of compressing the specimens between parallel rigid plates 65 percent of their original measured thickness. Compress a total of 10 times at a rate of 10 to 20 inches (25.4 cm to 50.8 cm) per minute.

4.5.3.7 Determination of creep. Three test specimens shall be prepared in accordance with 4.5.3.2.1 and 4.5.2, and unless otherwise specified in 6.2 shall be preworked in accordance with 4.5.3.6. Three minutes after the last compression, the thickness of each specimen shall be measured in accordance with 4.5.3.2.2 and recorded as T (original thickness). Creep shall be determined in accordance with ASTM D2221 - Creep Properties of Package Cushioning Materials with the following exceptions: the specimens shall be loaded at the maximum stress of the loading range for which the material is being qualified. The specimens shall remain under constant load and thickness measurements recorded approximately six minutes after initial load application and every 24 hours thereafter for seven days (168 hrs) after loading or until the total variation of four successive measurements does not exceed one percent of the original thickness (T). The percentage of creep shall be calculated in accordance with section 10.4 of ASTM D2221.

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4.5.3.8 Permanent set. Permanent set shall be calculated in accordance with section 10.6 of ASTM D2221 following the creep test specified in 4.5.3.7 using the same specimens. Twenty-four hours after the load is removed, the value for specimen thickness (T) to be used in the calculation shall be measured in accordance with 4.5.3.2.2. The results shall not exceed the requirements of 3.2.5.5.

4.5.3.9 Tensile strength.4.5.3.9.1 Apparatus.

a. The testing machine shall be capable of applying a tensile load at a controllable rate. Machines used for tension testing shall conform to the requirements of ASTM Practices E4, Load Verification of Testing Machines. The loads used in determining tensile strength shall be within the loading range of the testing machine as defined in ASTM E4.

b. The gripping devices shall have flat faces and a width equal to or greater than the width of the specimen being tested. The grips shall be designed to exert uniform pressure on the test specimen.

4.5.3.9.2 Test specimens. Unless otherwise specified (6.2), five test specimens shall be a strip $4 \pm .125$ inches long, $3 \pm .32$ cm). For materials with oriented structure or fibers five specimens shall be cut with the length parallel, and an equal number shall be cut with the length perpendicular, to the direction of orientation. These samples shall be prepared in accordance with 4.5.2. and measured in accordance with 4.5.3.2.2.

4.5.3.9.3 Test procedure. Specimens shall be clamped across the width of the specimen so the clamps are 90 degrees to the specimens longitudinal axis. The distance between the clamps shall be $2 \pm .0625$ inches ($5.08 \pm .16$ cm) apart. The specimens shall be placed in tension as to cause the cross sectional loading specified in 6.2. This load shall be maintained for 10 minutes or until rupture occurs. Samples shall then be examined for conformance to 3.2.5.3.

4.5.3.10 Hydrolytic stability. The test specimens shall be prepared in accordance with 4.5.3.2.1 and then preworked, i.e., subjected to compression cycling in accordance with 4.5.3.6. Three minutes after the last compression, the thickness of each specimen shall be measured with in accordance with 4.5.3.2.2. The test specimens shall then be placed in the compression machine and loaded to 50 percent strain at a rate not greater than 1.0 inch (2.54cm) per minute per inch of thickness. The load causing this strain shall be recorded. The same test specimens shall then be placed for two weeks in a humidity

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cabinet at 120 ± 2 degrees F (49 ± 1.1 degrees C) and 95 ± 5 percent relative humidity. After the two week exposure period, the test specimens shall be subjected for one hour to the test conditions specified in 4.5.2. The test specimens shall again be loaded to 50 percent strain and the loads causing this strain recorded. The average value of the loads before and after aging shall be examined for conformance to 3.2.5.2.

4.5.3.11 Dynamic cushioning properties.

4.5.3.11.1 Peak acceleration versus static-stress-stress data. The data to plot the peak acceleration in multiples of Gs versus static stress in pounds per square inch, for a drop height of 24 inches (61cm) shall be established in accordance with ASTM D1596 with exceptions as specified herein (see 6.3).

4.5.3.11.2 Specimen size. Unless otherwise necessary, each test specimen shall be an 8 inch by 8 inch square. Specimen size may be reduced, to accommodate test equipment operating capacity, only after it has been determined that attainment of the required static stress cannot be accomplished by varying the weight of the dropping head. The least allowable altered specimen size shall be 4 by 4 by 1 inch (10 X 10 X 2.54cm). The thickness of the test specimen shall be specified by the procuring activity (see 6.2).

4.5.3.11.3 Preworking. Unless otherwise specified (see 6.2 and 6.3) each specimen shall be preworked in accordance with 4.5.3.6. Specimen shall be rested for at least 16 but not more than 72 hours before conducting dynamic test procedure.

4.5.3.11.4 Dynamic test procedure. Dynamic impact tests shall be conducted only on certified test equipment (see 6.3). Impact tests shall be so conducted on each specimen that the dropping head compresses the specimen at an initial velocity of $136 \pm$ two inches (345.4 ± 5 cm) per second. The acceleration-time record of the dropping head during compression of the cushion shall be recorded for each drop. With the dropping head at the lowest weight range, five consecutive drops shall be made on each of the specimens comprising the sample of a material. At least one minute shall elapse between drops to permit the specimen to regain its shape. A quantity of weight shall then be added to the dropping head and five consecutive drops again made on each of the specimens. Several more such increments of weight shall be added. After the addition of each weight increment, the dropping procedure shall be repeated. The increments of weight shall be chosen so that the acceleration-static stress curve is clearly defined, usually five to nine points will be required to establish the curve.

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4.5.3.11.5 Computations. The first reading obtained from each set of five drops shall be discarded and the peak acceleration readings of the remaining four shall be averaged. The average values, one for each specimen, shall then be averaged to obtain one value at each weight increment for the sample. The average peak acceleration for each given weight shall be plotted directly against the corresponding static stress.

4.5.3.12 Relative combustibility. The combustibility of the resilient cushioning material shall be determined in accordance with the following subparagraphs. After completion of the test, the samples shall be examined for conformance to 3.2.5.7. A test shall consist of determining the extent of burning of at least five samples. Samples shall be cut from sections at least 1.5 (3.8 cm) inches from exterior surfaces. The length of each sample shall be perpendicular to the direction of rise or fibers.

4.5.3.12.1 Apparatus.

a. Test Chamber - Any enclosure is satisfactory that is large enough to provide quiet draft-free air around the specimen during test, yet will permit normal thermal circulation of air past the specimen during burning. A hood is recommended in order to remove the sometimes noxious products of combustion. If a test chamber is used, it should be of such a design that it can be used in a hood. For referee purposes, test results with the chamber should be the same whether or not the hood exhaust is on. In cases of discrepancy, values obtained with the damper closed or the hood fan off, or both, will be considered valid. The recommended test chamber should be constructed of sheet metal or other fire-resistant material, having inside dimensions 12 inches wide, 24 inches long, 30 inches high (30.5 x 61 x 76.2 cm), open at the top, with a ventilating opening approximately 1 inch (2.54 cm) high around the bottom. A viewing window of heat-resistant glass should be of sufficient size and in such a position that the entire length of the specimen under test may MIL-C-26861C be observed. The chamber should be readily opened and closed to facilitate mounting and ignition of the test specimen.

b. Burner - A standard 0.375 inch (1cm) outside diameter barrel Bunsen or Tirrill burner fitted with a 2 inch (5.1cm) width wing top. The wing top may have to be opened to approximately 0.125 inch (.32cm) to provide the flame required in Figure 2.

c. Fuel Supply - Propane gas of at least 85 percent purity.

d. Specimen Support - Wire cloth (wire screen) 0.25 inch (6.5mm) mesh using 0.0313 inch (0.8mm) diameter steel wire. The wire cloth specimen support 3 x 8 inches (7.6 x 20.3cm) shall have a 0.625 inch (1.6cm) of length bent to form a right angle. This will form the specimen support as shown in Figure 1.

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e. Specimen Support Holder - Any holding device that will clamp the wire cloth specimen support horizontally so that the bottom of the bent-up portion is 0.5 inch (1.3cm) above the top of the burner wing top, as shown in Figure 1. A typical arrangement consists of two laboratory ring stands with two adjustable flat-surface clamps which may be locked in place by set screw and lock nut.

f. Timing Device - Readable to ± 1 second.

4.5.3.12.2 Test specimens.

a. Five specimens 2 ± 0.0625 inches ($5.1 \pm .16$ cm) wide and 6 ± 0.0625 inches ($15.2 \pm .16$ cm) long are needed.

b. Material thickness shall be 0.5 ± 0.0625 inches ($1.3 \pm .16$ cm).

c. Each test specimen shall be marked across its width by one line 5 inches (12.7cm) from one end.

4.5.3.12.3 Conditioning. Specimens shall be conditioned prior to test for a minimum of 24 hours in an atmosphere having a temperature of (73.4 ± 4 degrees F) (23 ± 2 degrees C) and a relative humidity of 50 ± 5 percent. Tests shall be made in this atmosphere or immediately after removal therefrom.

4.5.3.12.4 Procedure. See Figures 4, 5, and 6.

a. Clamp the wire cloth specimen support horizontally so that the bottom of the wire cloth is 0.5 inch (1.3cm) above the top of the burner wing top as shown in Figure 1. Place a layer of aluminum foil on the bottom of the test chamber to catch any dripping or flaming particles. The distance between the wire cloth and the foil shall be between 6 and 8 inches (15.2 and 20.3cm). Change the foil after each test, if there is any debris on the surface from the previous test. Burn off any material remaining on the wire cloth from the previous tests or use a new wire cloth for each test. If a new wire cloth is not used for each test, the wire cloth should be cool to the touch before being used. If dripping or melting material falls into the wing top, clean it before testing the next specimen.

b. Place the specimen on the support with one end touching the 0.625 inch (1.6cm) bent-up portion of the support. The end of the specimen nearest the gage mark should be away from the bent-up end of the specimen support, so that the gage is 5 inches (12.7cm) away from the bent-up end.

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c. Adjust the burner with the wing top to provide a blue flame whose visible portion is 1.5 inches (3.8cm) high with a clearly defined inner cone 0.25 inch (.6cm) high. Place the burner under the upturned end of the specimen support so that one edge of the flame is in line with the upturned end of the wire cloth and the other edge of the flame extends into the front end of the specimen.

d. Start the timing device when the flame is first applied to the specimen. After 60 seconds, remove the burner at least 6 inches (15.2cm) away from the test specimen. If the flame goes out before reaching the gage mark, the extent of burning is equal to 5 inches (12.7cm) minus the distance from the gage mark to the nearest evidence of the flame front, measured to the nearest 0.0625 inch (.16cm). Note burning characteristics such as expansion as a result of heating, melting, or dripping. Also record if the dripping on the foil burns. In some cases, the burning may cease in the first 60 seconds. This is evident by the disappearance of the yellow or characteristic flame.

4.5.3.12.5 Calculations.

a. If the flame front passes the gage mark in any one of the ten specimens, the sample shall be judged as burning. This indicates the failure of the lot.

b. If the flame front does not reach the gage mark for all ten specimens, average the distance burned in inches (or cm) as measured on the top surface.

4.5.3.12.6 Report. The report shall include the following:

a. The description of the material including the proprietary designation and complete description per this specification.

b. A description of samples that burned to gage mark.

EXAMPLES: Six-inch (15.2 cm) sample was consumed completely.

c. Record burning characteristics, such as dripping.

d. For samples that did not burn to the gage mark, report the average extent of burning. (Five inches (12.7 cm) - less the distance between the gage mark and closest evidence of burning).

4.5.3.12.7 Precision. The standard deviation for inter-laboratory reproducibility is 0.375 inch (1 cm).

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4.6 Inspection of packaging. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification shown in section 5 and the marking requirements of MIL-STD-129 (see 6.2).

5. PACKAGING

5.1 Preservation. Not applicable.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A and B. Unless otherwise specified, cushioning material of the same class and grade, in rolls, sheets, pads or molded forms as specified, shall be packed in containers conforming to PPP-B-636, Type CF, Class Weather Resistant, Grade VllC; or, when loads exceed the limited of PPP-B-636, in containers conforming to PPP-B-601, overseas type. Closure and waterproofing shall be in accordance with the appendix to the applicable specification.

5.2.2 Level C. Cushioning material shall be packed to afford adequate protection against damage from the supply source to the first receiving activity for immediate use. Containers and packing shall comply with the Uniform Freight Classification Rules, and National Motor Freight Classification Rules, as applicable.

5.3 Marking. In addition to any special markings required by the contract or order (see 6.2), the exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Composition and intended use. Materials that qualify under this specification are usually composed of either interlocking fibers, bonded fibers or an elastomeric substance and are intended for use within packages to protect equipment from shocks or impacts incurred during shipment and handling. Care should be taken to insure that cushioning materials procured under this specification are not used as dunnage or in other areas where the full value of the cushioning ability is not realized. For the purpose of this specification, a resilient material is defined as that type which will recover 90 percent or more of its original thickness after being compressed 65 percent of the original thickness a total of ten times (see 4.5.3.6) or until the change in thickness between compression cycles does not exceed 2 percent of the original thickness.

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6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Class and Grade (see 1.2 and 3.2.5.1).
- c. Form and construction (see 3.2.1)
- d. Dimensions and thickness (see 3.2.2).
- e. Density (see 3.2.3).
- f. Hydrogen ion concentration, if other than specified. (see 3.2.4).
- g. Hydrolytic stability, if other than specified. (see 3.2.5.2).
- h. Tensile strength in psi (see 3.2.5.3).
- i. Maximum allowable percentage of creep and permanent set, if other than specified (see 3.2.5.4 and 3.2.5.5).
- j. Maximum amount of friability (see 3.2.5.6).
- k. Combustibility (see 3.2.5.7).
- l. Indicate whether first article inspection is required/waivered (see 3.1).
- m. Test conditions, if other than specified (see 4.5.2).
- n. Preworking - state if not required (see 4.5.3.7 and 4.5.3.11.3).
- o. Level of packing (see 5.2.2).
- p. Markings other than specified (see 5.3).

6.3 Certification of test equipment. With respect to certification of test equipment for the peak acceleration versus static stress data of 3.2.5.1, only those laboratories or test facilities which have, prior to the time of first article tests, had their equipment tested and approved for listing on the List of Certified Testing Facilities for MIL-C-26861 shall be acceptable for the performance of the test of 4.5.3.11. The attention of the suppliers is called to this requirement and manufacturers are urged to arrange to have their equipment certified in order that they may be eligible to perform the test for peak acceleration versus static stress data under this specification. The agency responsible for certifying test equipment and maintaining the List of Certified Testing Facilities for MIL-C-26861 is Headquarters, Air Force Logistics Command, Air Force Packaging Evaluation Activity (DSTZ), Wright-Patterson AFB, Ohio 45433-5999, and information pertaining to certification of test equipment may be obtained from that activity.

6.4 First article. When a first article inspection is required, the item(s) should be a first article sample, a first production item, or it may be a standard production item from the contractor's current inventory. The first article should consist of five units. The contracting officer should include specific instructions in acquisition documents regarding arrangement for examinations, approval of first article tests results and disposition of first articles. Invitations for bids

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should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.5 Disposability. One or more of the following methods shall be used to accomplish disposal of (list material): reuse, recycling, baling, sanitary landfill, composting, incinerations, pyrolysis, or sea disposal.

6.6 Subject term (keyword) listing.

Combustibility
Cushioning
Cushioning materials
Packaging
Packaging materials
Ph of cushioning material
Resilient cushioning material (7)

6.7 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

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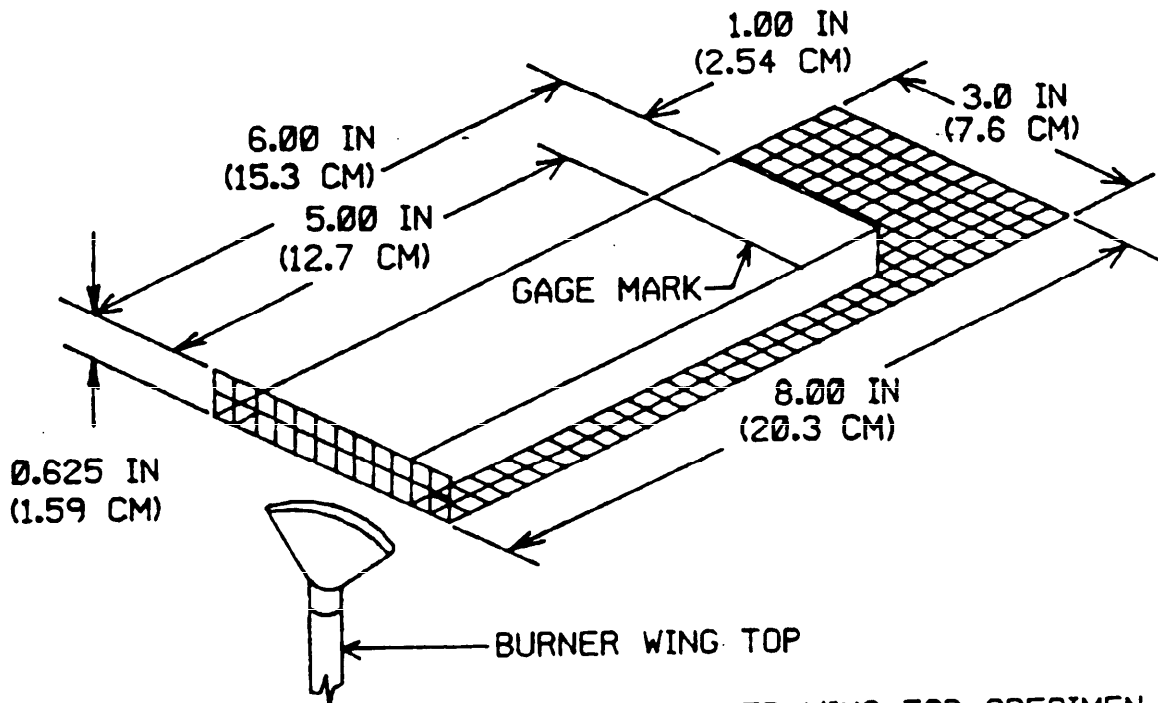


FIGURE 1. RELATIVE POSITIONS OF BURNER WING TOP, SPECIMEN AND SPECIMEN SUPPORT

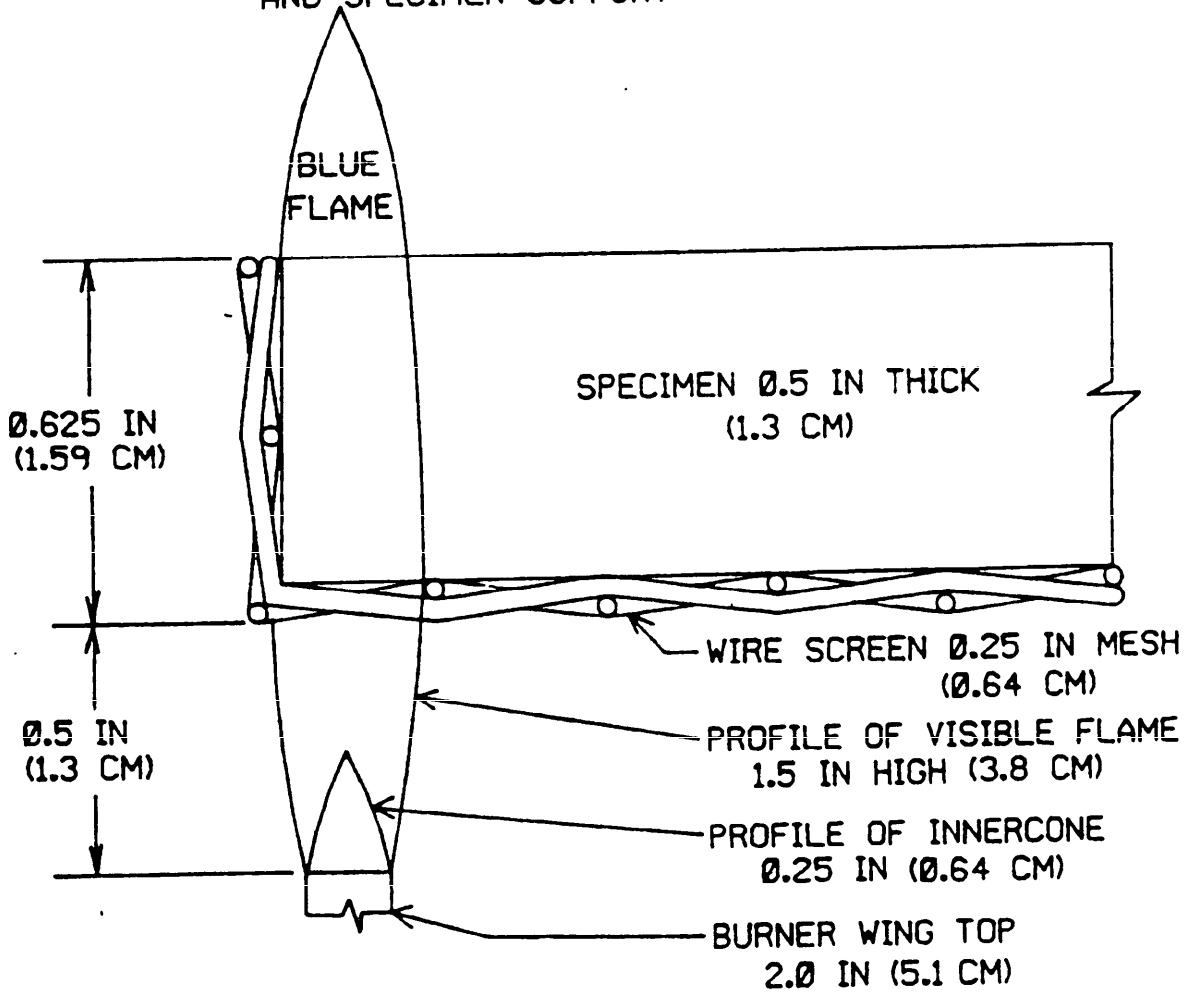


FIGURE 2. RELATIVE POSITIONS OF BURNER WING TOP, FLAME, SPECIMEN AND SPECIMEN SUPPORT.

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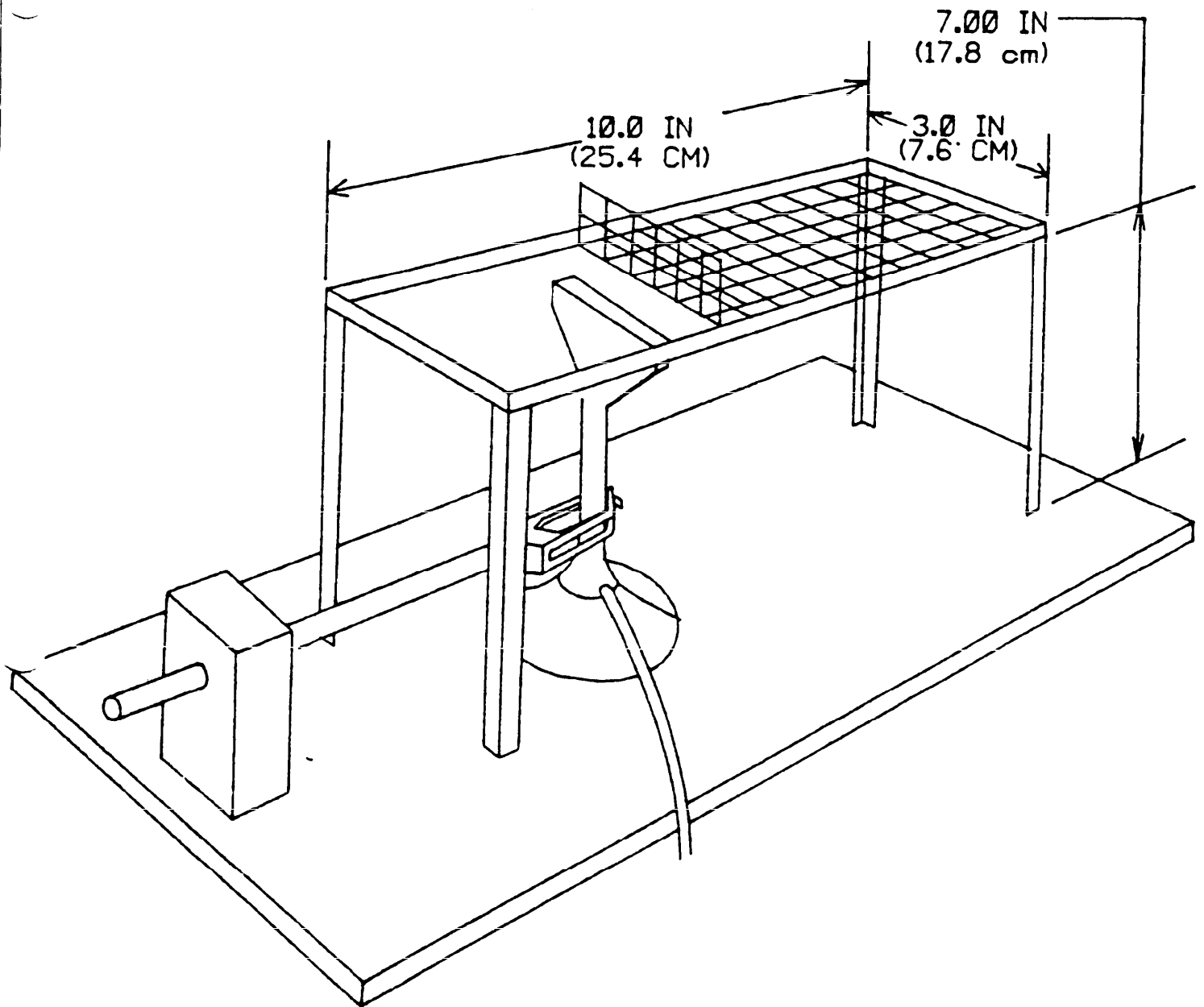


FIGURE 3. APPARATUS FOR SUPPORT OF SPECIMEN.

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Custodians:

Army - GL
Navy - AS
Air Force - 69

Preparing Activity:

Air Force - 69

(PROJECT 8135-0599)

Review Activities:

Army - MD, AT, WC, SM, EA, AR
Navy - OS
Air Force - 99

User Activities:

Navy - MC, SA, YD
Air Force - 15

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