INCH-POUND
PPP-C-1120D
15 October 2012
SUPERSEDING
PPP-C-1120C
20 July 1993

FEDERAL SPECIFICATION

CUSHIONING MATERIAL, UNCOMPRESSED BOUND FIBER FOR PACKAGING

Reactivated after 15 October 2012 and may be used for new and existing designs and acquisitions.

This General Services Administration has authorized the use of this federal specification by all federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers uncompressed, water resistant, fibrous cushioning materials in rolls, flat sheets, and molded forms for packaging applications.

1.2 Classification. The cushioning material in roll and flat sheet form is furnished in the following types (see 6.2):

Type II - Soft
Type III - Medium
Type IV - Firm

2. APPLICABLE DOCUMENTS

2.1 Government publications. The following documents are the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

FEDERAL STANDARD

FED-STD-595 - Colors Used in Government Procurement/ Color Numbers 23655, 22510, 21105.

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 4L8000B120-3, Highway 547, Lakehurst, NJ 08733-5100 or emailed to michael.sikora@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

FSC 8135

(Activities outside the Federal Government may obtain copies of federal specifications, standards, and commercial item descriptions as specified in the General Information section of the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index is for sale on a subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

(Single copies of this specification, and other federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes, are available without charge from General Services Administration, Federal Supply Service, Specification Section, Suite 8100, 470 L'Enfant Plaza, S.W., Washington, DC 20407.)

(Federal Government activities may obtain copies of federal standardization documents and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-129 - Marking for Shipment and Storage.
MIL-STD-3010 - Test Procedures for Packaging Materials.

(Copies of these documents are available online at http://assist.dla.mil/quicksearch/ or https://assist.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal should apply.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ-Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD adopted)

(Copies of this document are available from www.asq.org or the American Society for Quality, 600 Plankinton Avenue, Milwaukee, WI 53203.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exception has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), samples shall be subjected to first article inspection in accordance with 4.2.

3.2 Material (see 6.4).

3.2.1 Cushioning material. The cushioning material shall consist of a fibrous filler and a binding material which shall bind the fiber into a coherent resilient form.

3.2.2 Filler material. The filler material shall consist of vegetable fiber or synthetic fiber and shall be clean and free of foreign matter. There is no exclusion to the use of recovered materials provided the finished product meets the requirements of this specification (see 6.4).

3.2.3 Binding material. With the exception of natural latex rubber, the binding material shall not contain protein or starch. The supplier shall certify the absence of protein or starch.

3.3 Form. The cushioning material shall be furnished uncompressed in flat sheets, rolls, or molded forms (see 6.2).

3.3.1 Molded forms. Special dynamic compression resistance requirements and detailed dimensions for molded forms shall be as specified in procurement documents. In addition, all relevant requirements of this specification apply to molded forms.

3.3.2 Sheet and roll dimensions. The width, length, and thickness of flat sheets or rolls shall be as specified in 6.2.

3.3.2.1 Dimensional tolerances.

3.3.2.1.1 Width. The width of sheets and rolls shall be within 3 percent or ¼ inch, whichever is larger, of the specified width.

3.3.2.1.2 Length. The length of sheets shall be within 5 percent or ½ inch, whichever is larger, of the specified length. The length of any individual roll shall be not less than 95 percent of the specified length, and the average length of all rolls in any lot shall be not less than the specified length.

3.3.2.1.3 Thickness. For sheet or roll, the thickness shall be within plus or minus 15 percent of the specified thickness when measured under a static load of 0.025 psi.

3.4 Physical properties. When tested as specified in 4.5, the material shall comply with the physical property requirements listed in table I.

3.5 Color coding. The material in roll or sheet form shall be identified according to type by color coding. Either uniform dispersion of color in the binding material or color stripes shall be

used to color code. The color stripes shall be applied in 2 ±¼-inch widths with stripe centers spaced 6 ±¼ inches apart. Coding colors shall correspond to material type and color numbers of FED-STD-595 as follows:

Type			Color		
II	-	Soft	Yellow	-	No. 23655
III	-	Medium	Orange	-	No. 22510
IV	-	Firm	Red	-	No. 21105

TABLE I. Physical properties.

Property	Requirement	Paragraph reference
Compression set (average)	Less than 10.0%	4.5.1
Dynamic compression resistance (peak acceleration) Type — Static Bearing Stress II — .063 psi II — .098 psi III — .063 psi III — .113 psi IV — .113 psi IV — .176 psi	 15.0 – 23.0 G's 24.0 – 36.0 G's 17.0 – 25.0 G's 20.0 – 30.0 G's 14.0 – 22.0 G's 19.0 – 29.0 G's	4.5.2
Water resistance	No decomposition	4.5.3
Water absorption	200% (max)	4.5.3
Tensile strength	No total separation	4.5.4
Dustiness (weight loss)	0.75% (max)	4.5.5
Hydrogen ion concentration (pH)	6.0 to 8.0	4.5.6
Contact corrosivity	No induced corrosion in the contact area	4.5.7

3.6 Identification of material. Each roll or package of flat sheets or molded forms shall include a tag, label or sheet containing the following information: this specification number, type (or part number for molded forms), manufacturer's name, manufacturer's designation, month and year of manufacture, and lot number. Letters and figures shall be clear, legible and a minimum of ¼-inch high.

3.7 Workmanship. The cushioning shall be manufactured in a manner that will produce the high quality material necessary to meet the requirements of this specification. The finished product shall be uniform and free from defects that could adversely affect its intended use.

4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall consist of examinations and tests specified in this specification, and shall be performed on samples from the same production lot, when specified (see 6.2).

4.3 Conformance inspection. Conformance inspections shall consist of examinations listed in 4.3.2 and the tests listed in 4.3.3.

4.3.1 Sampling for conformance inspection. Unless otherwise specified, sampling for conformance inspection shall be performed in accordance with the provisions of ASQ-Z1.4 (see 6.4).

4.3.2 Examination of the end item. For the purpose of determining the sample size in accordance with ASQ-Z1.4, the lot size shall be expressed in units of rolls, sheets or forms for examinations specified in 4.3.2.1.

4.3.2.1 Examination of the end item for form, color coding, identification of material and workmanship. The sample unit for the end item shall be one roll, sheet or form. The sample unit shall be visually inspected and measured to ensure it meets the requirements specified in 3.3, 3.5, 3.6, and 3.7.

4.3.3 Conformance testing. Conformance tests shall as specified in table II.

TABLE II. Conformance tests.

Tests	Reference paragraph
Compression set	4.5.1
Dynamic compression resistance	4.5.2
Dustiness	4.5.5
Hydrogen ion concentration	4.5.6

4.4 Test conditions. Unless otherwise specified, tests shall be conducted in an atmosphere having a relative humidity (RH) of 50 percent ±5 percent and a temperature of 70° to 76° F. Material shall be considered in equilibrium after exposure to these conditions for a minimum of 24 hours.

4.5 Tests.

4.5.1 Compression set. The test specimens shall be 6 ±⅛-inch square with a minimum thickness of two inches. If the specimen is less than 2 inches thick, multiple layers shall be used. The thickness of each specimen shall be measured prior to preworking. Preworking shall consist of compressing the specimen between parallel rigid plates to 65 percent of its thickness. Compress a total of 10 times at a rate of approximately three times per minute. The specimens shall be allowed to recover a minimum of 4 hours after the final compression. The specimen shall then be loaded as follows: 20 pounds for type II, 30 pounds for type III, 55 pounds for type IV. The load shall be applied to the specimen evenly and gently. Three minutes after application, the load shall be removed. One minute after the load has been removed, the thickness of the specimen shall be redetermined. Specimen compression set is the difference between the preworked and final thickness expressed as a percent and calculated as follows:

$$\text{Percentage compression set} = (t_P - t_{f)} \times 100/t_p)$$

Where: t_p = preworked thickness
t_f = final thickness

Five specimens shall be tested and the average compression set determined.

4.5.2 Dynamic compression resistance. A dynamic compression resistance test machine shall be used. The test machine shall consist of an instrumented, weighted drop platen and an impact base with dimensions which are at least 1 inch larger than the corresponding specimen dimensions. The weighted drop platen shall fall freely upon release onto the specimen which is supported by the impact base. The impact base shall be rigidly supported by a massive unyielding foundation. The drop platen, impact base, and supporting foundation shall be free of disturbing mechanical resonances over the frequency range 0-500 Hz. The test machine and instrumentation shall be capable of measuring the drop platen acceleration pulse generated by the cushioning specimen with an accuracy of ±5 percent. The test specimen shall be an 8 by 8 inch rectangular solid, 4 inches thick, made from plies of one sample unit, if necessary. The drop platen loaded to the specified static bearing stress shall be dropped from a height of 24 inches. At impact, drop platen, impact base, and specimen bearing surfaces shall be centered and parallel. Five drops with a 1 to 2 minute recovery interval between drops shall be made on each specimen at the static bearing stress specified in table I. Testing shall proceed in the order of increasing static bearing stress until either the test is completed or until 10 percent compression set is incurred by the specimen. When 10 percent compression set is incurred by a specimen, it shall be replaced by an untested specimen made from the same sample unit as the replaced specimen. For each static bearing stress, the five peak accelerations shall be averaged and reported as the specimen peak acceleration. The above series of tests shall be conducted on five test specimens. The second through fifth specimen peak accelerations shall be averaged for each specified static bearing stress. Average peak accelerations exceeding the limits specified in table I shall be cause for rejection of the lot.

4.5.3 Water resistance and water absorption. Five test specimens, 4 to 6 inches square and containing not less than 20 cubic inches of material shall be weighed to the nearest 0.1 gram. Submerge the specimen for 24 hours in potable water at 75 ±5° F. The specimens shall be submerged a minimum of 1 inch and oriented in a manner so that a minimum of air is entrapped. After 24 hours, remove and let drain on a wire screen for 1 minute and examine the specimens for decomposition. If the specimens are still acceptable then transfer them to a weighing dish and individually weigh to the nearest .1 gram. Specimen percent water absorbed is the difference between the final weight and the initial weight multiplied by 100 and divided by the initial weight. The percent water absorption for each of the five specimens shall be averaged to determine the sample water absorption value.

4.5.4 Tensile strength. Five test specimens shall be tested. Each specimen shall be 8 inches long and 3 inches wide and of nominal sample thickness. The two opposite ends of the specimen shall be securely clamped with a horizontal distance of 6 inches separating the clamps. A dead weight tensile load of 1.5 psi shall be applied to the specimen midway between the clamps. Total separation of any one of the specimens within 10 minutes shall constitute failure of the lot.

4.5.5 Dusting. Five 2-inch square specimens shall be cut from each sample unit, cleaned with a brush and then weighed to the nearest 0.001 gram. A 0.75 ±0.01 pound cylindrical weight, having a flat face of 1.5 ±0.01 square inches in area shall be dropped squarely upon each specimen from a height of 10 inches above the specimen. After a total of 10 such impacts, each sample shall be cleaned with a brush and weighed to the nearest 0.001 gram. Specimen weight loss is the difference between the initial and final weighings and shall be expressed in percent of initial specimen weight. The weight losses of the five specimens shall be averaged and the average shall be reported as the sample dusting weight loss.

4.5.6 Hydrogen ion concentration (pH). Place 5 grams of air-dried cushioning material in a 500 mL heat resistant Pyrex Erlenmeyer (or equivalent) flask and add 250 mL of boiling distilled or deionized water free of CO_2 and having a pH between 6.7 and 7.1. To avoid the tendency of the material to float on the surface, the flask shall be well shaken. Attach a water-cooled condenser and reflux gently for one hour with occasional shaking to ensure that all of the material is immersed in the water. Stopper the flask, cool the solution to room conditions and determine the pH of the extract electrometrically, using a glass or quinhydrone electrode and calomel cell, or colorimetrically, using isohydric indicators. The average of three separate tests shall be determined. Electrometric determination of pH is preferred for control testing.

4.5.7 Contact corrosivity. Contact corrosivity testing shall be conducted in accordance with MIL-STD-3010, Test Method 3005 using steel panels only.

PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD, or in-house contractor, personnel, these personnel need to contact the responsible packaging

activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

INFORMATION FOR GUIDANCE ONLY. This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.

6.1 Intended use. This cushioning material is intended to protect against vibration and impact shock where a resilient cushion is required. This material is intended for general cushioning applications and is cut to size or molded as required. The molded forms are intended for specific articles and are molded to fit the contours of the article.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Type of material (see 1.2).

c. Form (flat sheets, rolls, or molded forms) (see 3.3).

d. Dimensions of sheets or rolls (length, width, and thickness) (see 3.3.2).

e. If first article inspection is required (see 4.2).

f. Packaging requirements (see 5.1).

6.3 First article inspection. When specified, first article inspection should be conducted by the contractor in the presence of a Government representative designated by the contracting officer. The first article inspection should consist of examination and tests for all of the requirements of this specification. When the acquiring activity or contract administration activity has data or other evidence to indicate that prior successful first article inspection has been conducted, first article inspection may be waived.

6.3.1 First article samples. When specified by the contracting officer (see 6.2), the contractor should submit a first article sample of sufficient material to conduct all tests required by this specification. The sample should be produced by the contractor using the same production processes, procedures, and equipment used in fulfilling the contract. Prior to submission the contractor should inspect the sample to ensure that it conforms to the requirements of the contract and should submit a record of this inspection. A first article sample should be submitted, as directed by the contracting officer, whenever a change occurs in the manufacturing process or material used such as to significantly affect product uniformity or

performance as determined by the Government. Failure of the first article sample to meet all the requirements of the specification should be cause for rejection.

6.3 Conformance inspection lot. For purposes of sampling, an inspection lot for examinations and tests should consist of all material made by the same process from the same components by one manufacturer and submitted for delivery at one time (see 4.3.1).

6.4 Recovered material. The contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR) (see 3.2).

6.5 Cross reference. The following cross references the types of cushioning material contained in PPP-1120D with the previous revision.

PPP-C-1120C	PPP-C-1120D
Type I soft	Not covered
Type II medium soft	Type II soft
Type III medium firm	Type III medium
Type IV firm	Type IV firm
Type V extra firm	Not covered
Class A	All types are Class A only
Class B	Not covered
Grade I	Not covered
Grade II	Not covered
Grade III	Not covered

6.6 Subject term (key word) listing.

Packaging
Protection
Shock
Vibration

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:
Army - GL
Navy - AS
Air Force - 69
Other - DS

Review activities:
Army - AR, AV, CR4, EA, MD, SM
Navy - MC, MS, SH

Preparing activity:
Navy - AS
(Project 8135-2012-004)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.