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SUPERSEDING
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MILITARY SPECIFICATION

BAGS, SAND, POLYPROPYLENE

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

1. SCOPE

1.1 Scope. This document covers two types of polypropylene fabric sandbags.

1.2 Classification. Sandbags shall be of the following types, as specified (see 6.2):

- Type I - Woven bag
- Type II - Sewn seam bag

2. APPLICABLE DOCUMENTS

2.1 Government documents.

- * 2.1.1 Documents. The following documents form a part of this document 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.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to U.S. Army Natick Research, Development and Engineering Center, Natick, MA 01760-5014, 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

FSC 8105

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SPECIFICATIONS

FEDERAL

- V-T-295 - Thread, Nylon
- FF-N-105 - Nails, Brads, Staples, and Spikes: Wire, Cut and Wrought
- NN-P-71 - Pallets, Material Handling, Wood, Stronger Construction, 2-Way and 4-Way (Partial)
- QQ-S-781 - Strapping, Steel, and Seals
- MMM-A-250 - Adhesive, Water-Resistant, (for Sealing Fiberboard Boxes)
- PPP-B-601 - Boxes, Wood, Cleated-Plywood
- PPP-B-636 - Boxes, Shipping, Fiberboard
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes
- PPP-S-760 - Strapping, Nonmetallic (and Connectors)

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- MIL-P-15011 - Pallets, Material Handling, Wood Post Construction, 4-Way Entry

STANDARDS

FEDERAL

- FED-STD-191 - Textile Test Methods
- FED-STD-595 - Colors
- FED-STD-601 - Rubber: Sampling and Testing
- FED-STD-751 - Stitches, Seams, and Stitchings

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

(Copies of documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

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- * **2.2 Other publications.** The following documents form a part of this document 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 issues of the nongovernment documents which are current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 523 - Specular Gloss

D 3951 - Standard Practice for Commercial Packaging

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

(Technical society and technical association documents are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

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

3. REQUIREMENTS

3.1 Material. Material shall be as specified herein. Material not specified shall be of the quality normally used by the contractor, provided that the completed item complies with all provisions of this document.

3.1.1 Fabric. Fabric used in the manufacture of sandbags shall be woven from yarns made of 0.003-inch thick filaments, ribbons, or combinations thereof specified in 3.1.1.1. The fabric shall conform to the physical requirements in table I.

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TABLE I. Physical requirements of fabric

Characteristic	Requirement
Weight, minimum	3.7 ounces per square yard
Breaking strength, initial, minimum	
Warp direction	100 pounds (minimum)
Filling direction	100 pounds (minimum)
Breaking strength after 400 hours of exposure to accelerated weathering	Not less than 85 percent of its original breaking strength

* 3.1.1.1 Yarn. The yarn shall be crystalline or isotactic polypropylene or copolymers thereof in which the comonomer content does not exceed 10 percent.

* 3.1.1.2 Inhibitor concentration. The polypropylene yarn, ribbon, or filament shall be stabilized by a system containing organo-nickel complex UV-light inhibitor. The yarn, ribbon, or filament shall contain organo-nickel complex at a concentration of not less than 0.1 percent nickel as metal from the inhibitor.

3.1.1.3 Color. The fabric shall be a lusterless olive drab, not lighter than Green 34096 nor darker than Green 34079 of FED-STD-595. The fabric color shall be obtained by solution dyeing (pigmenting during extrusion) of the staple or film from which the yarns are produced, or by the addition of an acrylic coating to the fabric surface. Coated fabrics shall have a basic, uncoated color of lusterless olive drab, as specified herein.

3.1.1.4 Specular gloss. The specular gloss of the fabric shall be not more than 2.0 gloss units. When specified (see 6.2), fabric used for type II sandbags shall be delustered on one side in accordance with 3.1.1.5.

* 3.1.1.5 Coatings. Coatings added to the fabric for types I and II bags to reduce gloss shall be as stable as the fabric to which they have been applied when exposed to accelerated weathering.

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3.1.2 Thread.

3.1.2.1 Polypropylene. Polypropylene thread shall be a black spun staple or a black continuous multifilament thread. The thread may be coated with a silicone treating agent to improve its sewing qualities.

- * 3.1.2.2 Nylon. Nylon thread shall be black conforming to types I, II or III, class A, size F of V-T-295.

3.2 Construction. Bags shall be one-piece construction; splicing of fabric shall not be permitted.

- * 3.2.1 Sandbags, type I. Type I sandbags shall be either a completely woven bag with woven butt seam, or a sewn butt seam conforming to type SSn-1 of FED-STD-751. The seams shall be on the outside of the bag. Tubular woven (sock form) bags that have no side seams, shall have a butt seam conforming to type SSn-1 of FED-STD-751. All bags constructed with heat-sealed fabric edges at butt end of bag shall also have butt seams conforming to type SSn-1, unless the bag design requires inverting of bag prior to filling. A bar tack may be used in lieu of running out the chain stitch off the fabric 1 inch on the side seam at the top of the bag (bar tack to be 3/8 to 3/4 inch long and to be located approximately 3/4 inch from the top edge of bag). In lieu of running out the side seam 1 inch at the bottom, the bottom of side seam may be tacked by making the bottom seam stitchings run all the way across the bottom of the bag and chains extend 1 inch beyond each side of the bag.

- * 3.2.2 Sandbags, type II. Type II sandbags shall have sewn seams. Fastening of the midsection of the tie string within a sewn seam so that the tie ends are positioned inside the bag (bag design requiring inverting of bag prior to filling, see 6.2) or tie ends to project outward (outside seam sandbag) is optional, except that, for tubular woven (sock form) bags that have no side seams and a sewn butt seam, the tie string shall be fastened as specified in 3.2.5.1.

3.2.3 Seams. Seams shall be woven or sewn.

- * 3.2.3.1 Woven seams. The material yarn ends shall be interwoven so as to result in a 1/2 inch wide seam.

3.2.3.2 Sewn seams. Sewn seams shall be stitched with any of the threads specified herein.

3.2.3.3 Seam classes and types. Seam classes and types shall be optional, except when otherwise specified herein. Seams formed at fabric edges which are not selvaged shall have fabric extending beyond the stitching for not less than 3/8 inch.

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3.2.3.4 Stitches. Stitches shall conform to stitch type 401 of FED-STD-751. Ends of stitches shall be secured either by beginning and ending in a chain link of not less than 1 inch in length being off the fabric, or shall be effectively secured in another manner.

3.2.4 Edge finish. The edges of fabric not incorporated in a seam shall be finished by a selvage, by a heat-seal, or by stitchings conforming to class EF, type EFa or EFb of FED-STD-751, using thread specified herein to form the stitchings. Heat-sealed edges of fabric shall be clean, straight, and shall exhibit no evidence of damage to yarns which causes crumbling or breaking of the fabric away from the bag edge. Edges finished by stitchings type EFa shall have not less than 1/4 inch of the fabric extending beyond the stitchings.

3.2.5 Tie strings. Tie strings shall be fabricated of twine composed of interconnected filaments or film of black polypropylene. The tensile breaking strength of the twine shall be not less than 100 pounds. The length of the tie string shall be not less than 24 inches. When the alternate method of attaching the tie string (see 3.2.5.1) is used, the length of the tie string may equal the length of the type I sandbag. The ends of the tie string shall be heat-sealed (see 6.3.1), or knotted to prevent raveling. The tie string shall be located on one side of the bag (at the seam or at the folded bag edge), not less than 4 nor more than 5 inches from the top edge of the bag.

3.2.5.1 Tie string fastening methods.

* 3.2.5.1.1 Method A. Tie strings shall be fastened to the sand bag by sewing the approximate center of the string within a sewn side seam; or, in the absence of sewn side seams (type I sandbags), by knotting (around the bag edge) at the approximate center of the tie string through a heat-sealed hole, not more than 1/4 inch in diameter, in the middle of a woven side seam. For tubular woven sandbags, the tie strings shall be fastened by knotting through a heat-sealed hole not more than 1/4 inch in diameter, or by threading through the fabric without severance of any ribbon, not nearer the side of the bag than 3/4 inch or more than 1 1/4 inches.

* 3.2.5.1.2 Method B. Tie strings shall be fastened to the type I sandbag by weaving it in the approximate center of the woven side seam, in the linear direction of the side seam. The tie string shall be lightly held to the seam by weaving one end into the woven seam at the location specified in 3.2.5 so that it penetrates through the seam under a minimum of six alternate picks on each side, leaving the shorter loose end free on the other side of the side seam, so that a slight pull shall equalize the loose ends. The longer loose end of the tie string shall be lightly held at two additional points of the side seam by weaving through not more than two picks of the woven fabric at each point.

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- * 3.2.5.1.3 Method C. Tie strings shall be fastened to the tubular woven sandbag by either having a type 401 stitch that runs $\frac{3}{8}$ to $\frac{3}{4}$ inch in from the edge of the bag and securing the tie string in the center not less than 4 or more than 5 inches from the top of the bag or the tie string may be $\frac{3}{4}$ inch bartacked in the same location.

3.2.5.2 Extra tie strings. A minimum of five extra tie strings shall be furnished with each 100 bags.

- * 3.3 Dimensions. The finished bag, measured between the top edge and the inside of the bottom seam, shall be 26 inches \pm 1 $\frac{1}{4}$ inches long, and 14 inches \pm $\frac{1}{2}$ inch wide when measured between the inside edges of the two sides.

3.4 Finished product performance requirements.

3.4.1 Drop resistance. The sandbag shall withstand three consecutive free fall drops from a height of 48 inches onto a hard, unyielding surface without sustaining visible damage other than slight seam slippage (see 6.3.2) or yawning (see 6.3.3) in the seams when tested as specified in 4.3.6.

3.4.2 Sift resistance. The sandbag shall lose not more than $\frac{1}{2}$ pound of the sand by sifting during all three free-fall drops when tested as specified in 4.3.6 and 4.3.7.

3.5 Workmanship. The sandbags shall be uniform in size and color, clean, unstained, and free of any extraneous material.

- * 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 this document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this document shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirement in the document 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.

* 4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for assuring that all specified dimensions have been met. When dimensions cannot be examined on the end item, inspection shall be made at any point, or at all points in the manufacturing process necessary to assure compliance with all dimensional requirements.

* 4.1.3 Certificate of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.2 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this document or applicable purchase document.

4.2.2 End item visual examination. The end item shall be examined for the defects listed in table II. The lot size shall be expressed in units of finished bags. The sample unit shall be one finished bag with affixed tie string. The inspection level shall be II and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 2.5 for major defects and 6.5 for total (major and minor combined) defects.

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TABLE II. End item visual defects

Examine	Defect	Classification	
		Major	Minor
Fabric	Not as specified	X	
	Color not as specified		X
Seams and stitching	Stitch not type specified	X	
	Woven seam (see 3.2.3.1) width not as specified		X
	Sewn seams not as specified:		
	- resulting in drop test failure	X	
	- not affecting drop test results		X
Construction	Ends of stitches not in chain link or not effectively secured		X
	Edges not finished as specified		X
Tie strings	Material not as specified	X	
	Length not as specified		X
	Ends not heat-sealed or knotted		X
	Not located or attached as specified		X

4.2.3 End item dimensional examination. The end item shall be examined for conformance to the dimensions specified in 3.3. Any dimension not within the specified tolerance shall be classified as a defect. The lot size shall be expressed in units of finished bags. The sample unit shall be one finished bag with affixed tie string. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

4.2.4 End item testing. The end item shall be tested for the characteristics specified in table IV. The lot size shall be expressed in units of finished bags. The sample unit shall be one finished bag with affixed tie string. Sampling shall be either from table III or in accordance with MIL-STD-105, as specified in table IV. The AQL, expressed in terms of defects per hundred units, shall be 1.5 unless otherwise specified.

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TABLE III. Sampling plan

Lot size (yards or bags)	Sample size (sample unit)
800 or less	2
801 to 22,000	3
22,001 and over	4

TABLE IV. End item testing

Characteristic	Requirement para.	Sampling	Test method and acceptance requirements
Filament or ribbon thickness	3.1.1	Table III	4.3.1
Fabric weight	3.1.1	Table III	4.3.2
Breaking strength, initial	3.1.1	Table III	4.3.3.1, 4.3.3.2
Breaking strength, after accelerated weathering	3.1.1	Table III	4.3.3.1, 4.3.3.3
Inhibitor concentration	3.1.1.2	Table III	4.3.4 <u>1/</u>
Specular gloss	3.1.1.4	Table III	4.3.5
Drop resistance	3.4.1	MIL-STD-105, S-4	4.3.6
Sift resistance	3.4.2	MIL-STD-105, S-4	4.3.7

1/ The sandbag shall be accepted on the basis of a contractor's certification of compliance for the specified requirement.

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- * 4.2.5 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of bundles or boxes (five packages of 100 bags each). The sample unit shall be one unit pack of 100 bags. No more than one unit pack shall be drawn from any bundle or box. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

<u>Examine</u>	<u>Defect</u>
Marking	Omitted; incorrect; illegible; of improper size, location, sequence, method of application
Materials	Not as specified
Assembly	Bags of unlike description unit packed and bundled together Bag unit packs and tie strings incorrectly positioned Extra tie strings missing or less than quantity specified Less than 100 bags per unit pack Number of unit packs per bundle or box not as specified
Dimensions	Not held within specified tolerances (applicable to unit packs and bundles) Not compressed to minimum size before strapping (applicable to bundles)
Box (when specified)	Not as specified in PPP-B-601

4.2.5.1 Alternative method of count. Manually count 10 percent of the unit packs sampled and weigh same to determine an average weight per 100 bags. Remaining 90 percent of samples shall weigh no less than the average weight of those manually counted. Weighings shall be made to nearest ounce.

4.2.6 Palletization examination. The fully packaged and palletized end items shall be examined for the defects listed below. The lot size shall be expressed in units of palletized unit loads. The sample unit shall be one palletized unit load, fully packaged. The inspection level shall be S-1, and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

<u>Examine</u>	<u>Defect</u>
Finished dimensions	Length, width, or height exceeds specified maximum requirement

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<u>Examine</u>	<u>Defect</u>
Palletization	Not as specified on figures Interlocking of loads not as specified Load not bonded with required straps as specified Level A pallet not capped, strapping not zinc coated
Weight	Exceeds maximum load limits
Marking	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application

4.3 Methods of inspection.

* 4.3.1 Ribbon thickness. The polypropylene ribbon, filaments and combinations of filaments and ribbons thickness of the sandbag fabric shall be determined as specified in FED-STD-601, method 2011, except that minimum thickness shall be recorded to the nearest 0.0001 inch. For each sample, five minimum thickness specimens from the warp direction shall be tested for minimum thickness and the results averaged; five minimum ribbon thickness specimens from the filling direction shall be tested for minimum thickness and the results averaged. An average minimum ribbon thickness for either warp or filling direction of less than 0.003 inches shall constitute failure of this test. Failure of any sample unit will constitute failure of the lot.

* 4.3.2 Fabric weight. The polypropylene sandbag fabric weight per square yard shall be determined as specified in FED-STD-191, method 5041. A fabric weight of less than 3.7 ounces per square yard shall constitute failure of this test. Failure of any sample unit will constitute failure of the lot.

4.3.3 Breaking strength.

4.3.3.1 Preparation of specimens. The sample unit will be one finished bag or an equivalent amount of flat goods. Three swatches 4 inches by 12 inches shall be cut from each principal direction (warp and filling) of the fabric. Each swatch shall be cut into two 4 inch by 6 inch test specimens; one specimen is to be used for initial breaking strength (see 4.3.3.2) and the other specimen for breaking strength after accelerated weathering (see 4.3.3.3). The specimens shall be marked to indicate which are cut with the long dimension in the warp direction and which have the long dimension in the filling direction. Failure of any sample unit will constitute failure of the lot.

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4.3.3.2 Initial breaking strength. The marked control specimens shall be conditioned for 24 hours at the standard condition specified in FED-STD-191 and shall be tested for breaking strength in accordance with FED-STD-191, method 5100. The results representing the lot shall be averaged for specimens in warp direction and averaged for specimens in the filling direction, and the averages shall be recorded as the initial breaking strength in warp and filling directions. A lot average in either warp or filling direction of less than 100 pounds shall constitute failure of this test.

4.3.3.3 Breaking strength after accelerated weathering. The rest of the specimens shall be tested in accordance with FED-STD-191, method 5804, for not less than 400 hours, except that the black panel temperature shall be maintained at $155^{\circ}\text{F} \pm 3^{\circ}\text{F}$. The black panel thermometer shall be read during the final 10 minutes of a cycle just before the water spray period starts. At the completion of the 400 hours exposure to accelerated weathering, the specimens shall again be conditioned for 24 hours at the standard conditions specified in FED-STD-191. Any visible evidence of cracking, peeling, or loss of coating on coated specimens shall constitute failure of this test. After conditioning, the exposed specimens shall be tested for breaking strength in accordance with FED-STD-191, method 5100. An average lot breaking strength of less than 85 percent of the initial average breaking strength recorded for its respective warp or filling yarn direction (see 4.3.3.2) shall constitute failure of this test. Failure of any sample unit will constitute failure of the lot.

4.3.4 Inhibitor concentration. Polypropylene ribbon or yarn specimens shall be removed from the filling direction of each sample and tested for ultraviolet inhibitor (UVI) concentration of organo-nickel complex type by following either the gravimetric or atomic absorption method. Polypropylene specimens shall likewise be removed from the warp direction and tested for inhibitor concentration. Nonconformance of either warp or filling of the fabric to 3.1.1.2 shall constitute failure of this test. Failure of any sample unit will constitute failure of the lot.

* 4.3.4.1 Gravimetric method.

4.3.4.1.1 Apparatus.

- a. Analytical balance
- b. Triple beam balance
- c. Muffle furnace
- d. Hot plate
- e. 35-50 mL platinum crucibles
- f. 35-50 mL M fritted crucibles
- g. 600 mL beakers
- h. 50 mL graduated cylinders

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4.3.4.1.2 Reagents.

- a. Dimethylglyoxime (1 percent alcoholic solution)
- b. Hydrochloric acid 1:1
- c. Nitric acid 1:1
- d. Tartaric acid
- e. Ammonium hydroxide (concentrated)
- f. Sodium carbonate (anhydrous)
3. Hydrochloric acid (concentrated)

4.3.4.1.3 Procedure. Cut 7-inch by 7-inch pieces of the test material, fold and tie sample with polypropylene fiber or with approximately 4 inches of scotch tape. Place sample in a weighted platinum crucible and weigh. Place sample in muffle furnace at 225°C for 15 to 30 minutes. Raise temperature of muffle furnace to 700°C; hold at that for another 1/2 hour. Remove the samples and add 6 grams of sodium carbonate anhydrous. Fuse for 15 minutes at 900°C. Cool and place samples in a 600 mL beaker that contains 100 mL of hydrochloric acid (1:1). Add 10 mL of nitric acid (1:1) and boil for a few minutes to remove oxides of nitrogen, then add 7 grams of tartaric acid. When the tartaric acid has dissolved, neutralize with concentrated ammonium hydroxide and add 1 mL in excess. If any insoluble material is visible in the solution, filter it off on paper and wash the residue with hot water. Make the solution slightly acid with concentrated hydrochloric acid, heat to about 70°C, and add 20 mL of 1 percent alcoholic solution of dimethylglyoxime. (Note: Addition of dimethylglyoxime must be adjusted to avoid too large an excess; otherwise it may precipitate, since it is not very soluble in water.) Add concentrated ammonium hydroxide until slightly alkaline or ammoniacal and set the solution aside for 30 to 60 minutes. Filter through a weighed M fritted glass crucible, keeping the crucible filled with liquid. Wash with cold water, and dry at 105° ± 5°C for 1 hour. Repeat the heating to constant weight.

4.3.4.1.4 Calculations.

Percent of nickel in the sample =

$$\frac{\text{Wt of fritted crucible + precipitate} - \text{Wt of fritted crucible}}{\text{Wt of platinum crucible + sample} - \text{Wt of platinum crucible}} \times 20.32$$

Note: If the scotch tape is used, subtract weight from weight of sample.

4.3.4.2 Atomic absorption spectrophotometric method.

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4.3.4.2.1 Apparatus.

- a. Any commercially available atomic absorption spectrophotometer
- b. Nickel hollow cathode lamps
- c. Analytical balance

4.3.4.2.2 Reagents.

- a. Concentrated nitric acid (reagent grade)
- b. Concentrated sulfuric acid (reagent grade)
- c. 10,000 ppm nickel standard solution (commercially available)

4.3.4.2.3 Preparation of specimen solution. Cut ribbons, representing direction (warp or filling threads) being tested, into 1/2- to 1-inch lengths and proceed as follows:

- a. Weigh out approximately 1.0 gram (to 0.1 mg) of the sample into a 125 mL Erlenmeyer flask.
- b. Add 6 mL of concentrated sulfuric acid and 1 mL of concentrated nitric acid and place the flask on a hot plate.
- c. Heat the solution to boiling and continue to heat the solution until the dense white fumes appear.
- d. Remove the solution from the hot plate and let the flask cool. When cool, add 1 mL of nitric acid and repeat step 3.
- e. Repeat steps 3 and 4 until the solution is clear.
- f. Cool the flask and cautiously add about 3 mL of distilled water to the solution.
- g. Cool the sample and quantitatively transfer it to a 100 mL volumetric flask using distilled water. Dilute to the mark with distilled water.

4.3.4.2.4 Preparation of stock solution. Prepare a 100 ppm nickel stock solution by pipetting 5 mL of the 10,000 ppm nickel standard solution into a 500 mL volumetric flask and dilute to the mark with distilled water. This solution should be made up daily.

4.3.4.2.5 Preparation of standard solutions. Prepare the following standard solutions daily from the above 100 ppm stock solution. Pipette the aliquots listed in table V into the given volume, add 6 mL of concentrated sulfuric acid, and dilute to the mark with distilled water.

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TABLE V. Standard solutions

Concentration (ppm)	Aliquot (mL)	Final Volume (mL)
10	10	100
15	15	100
20	20	100

4.3.4.2.6 Operating conditions for the instrument.

- a. Wavelength - 2320A
- b. Slit width - 50 microns
- c. Support gas - air
- d. Fuel - acetylene
- e. Flame - clear, nonluminous

4.3.4.2.7 Nickel content determination. Using atomic absorption spectrophotometric equipment, run the specimen solution versus standards. Determine ppm of nickel in the sample solution through the use of a curve of absorbances versus ppm nickel for the three standard solutions. The percent nickel present in the polypropylene is calculated from ppm nickel detected in solution as follows:

$$\text{Percent Ni in polypropylene} = \frac{C_n \times 100}{C_p}$$

where C_n = ppm Ni in solution and

C_p = ppm polypropylene sample present in solution, determined by multiplying the grams of polypropylene times 10,000.

- * 4.3.5 Specular gloss. The specular gloss of the sandbag fabric shall be determined as specified in ASTM D 523 with an instrument capable of measuring gloss to 0.1 gloss units. Readings shall be taken longitudinally and transversely on both exterior bag faces. The readings obtained shall be averaged. An average gloss reading of more than 2.0 gloss units on any sandbag shall constitute failure of this test. Failure of any sample unit will constitute failure of the lot.

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* 4.3.6 Drop resistance test. Fill the sandbag with 44 pounds \pm 1/2 pound (approximately 760 cubic inches) of clean, dry sand and knot the tie string firmly about the choke. Adjust the contents of the bag to form a shape about 4 inches by 10 inches by 20 inches before each drop. Drop the bag (free fall) from a height of 48 inches on one face, on one side seam or the folded area where a seam would normally be located on a tubular bag, and on the butt onto a hard, unyielding surface such as stone or concrete of sufficient mass to absorb the shock without deflection. Every fourth sandbag tested shall be dropped (free fall) on the tied (choke) end in lieu of the butt drop. After each drop, the sandbag shall be examined for visible evidence of damage such as tears, punctures, broken yarns or thread, or exposure of the contents by any means other than sifting. Slight slippage or yawning in the seams shall not be considered damage. Visible evidence of damage shall constitute failure of this test.

4.3.7 Sift resistance test. The bag and contents shall be weighed both before and after the drop tests on a scale accurate to 0.25 pound. Any loss of weight for the bag and contents exceeding 1/2 pound after the three drops specified in 4.3.6 shall constitute failure of this test.

5. PACKAGING

5.1 Preservation. Preservation shall be level A.

5.1.1 Level A.

5.1.1.1 Type I sandbags. The type I sandbags, with the tie strings positioned towards the center of the flatwise stacked bags, shall be stacked in quantities of 100 with the extra tie strings placed in the top bag of the stack. Each stack shall be compressed to the minimum height forming a flat unit pack and secured while under compression with one girthwise tie located in the center of the unit pack. The tie shall be of the same material as specified for tie strings. Length and width of a unit pack shall be equal to the outside measurements of the flat bag, with a tolerance of plus 1 1/2 inches in length and plus 1 1/2 inches in width. There shall be no parts of the tie string exposed at the sides or ends.

5.1.1.2 Type II sandbags. The type II sandbags, with the seams outside, shall be stacked and secured as specified in 5.1.1.1. If tie strings are on the outside of these sandbags with the seams outside, the tie strings shall be positioned towards the center of the flatwise stacked bag so that there will be no parts of the tie string exposed at the sides or ends of the unit packed sandbags. Type II bags that are delustered on one side of the fabric only shall be stacked with the seams inside and the tie strings outside of the ready-to-use-bag, with the strings positioned towards the center and not exposed from the sides or ends of the unit packed sandbags.

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5.1.1.3 Bundles, type I and type II bags. Five unit packs of sandbags of like description, preserved as specified in 5.1.1.1 or 5.1.1.2 as applicable, shall be closely compressed to form a bundle. The bundle shall be strapped while under compression of a minimum total pressure of 2,000 pounds over the entire area of the bag (5.0 psi). While under pressure, each bundle shall be strapped with two girthwise and one lengthwise straps conforming to QQ-S-781, type I or IV, class B, 3/8 inch by 0.015; or PPP-S-760, type II, with metal sealed joint, 3/8 inch by 0.020. Girthwise straps shall be applied approximately 5 inches from each end of the bundle. Lengthwise strap shall be centered on the bundle. Length and width of the bundle shall equal the outside measurements of the flat bag within a tolerance of plus 1 1/2 inches in length and plus 1 1/2 inches in width (not applicable to sandbags containerized by contractor, provided minimum quantity per box is met).

5.2 Packing. Packing shall be level A, B, or Commercial, as specified.

5.2.1 Level A packing.

- * 5.2.1.1 Palletized sandbags. The bundles of sandbags, preserved as specified in 5.1, shall be palletized and capped in accordance with figures 1 and 2. Steel strapping shall be zinc coated. When specified, overall pallet height shall be reduced to 43 inches.

5.2.1.2 Boxed sandbags. When specified, sandbags shall be preserved as specified in 5.1, and shall be boxed in a cleated-plywood box conforming to PPP-B-601, overseas type, style I. Box shall be a maximum of 88 inches in length, 48 inches in width and 43 inches in height, including skids. The box shall be strapped with two lengthwise straps and five girthwise straps. Skids shall be notched for placement of lengthwise straps. All straps shall be located over flat surfaces or cleats. Center intermediate cleats shall be located off-center so girthwise strap may be centered on cleat and adjacent to skid. Outside girthwise strap shall be located adjacent to skids. Weight limitation of the container is waived. Strapping shall be zinc coated and 3/4 by 0.023 inch in size.

5.2.2 Level B packing. The bundles of sandbags, preserved as specified in 5.1, shall be palletized in accordance with figures 1 and 2, except the V2s cap shall not be used and the strapping shall not be zinc coated. When specified, overall pallet height shall be reduced to 43 inches.

5.2.3 Commercial packing. The sandbags shall be packed in accordance with ASTM D 3951.

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- * 5.3 Marking. Unless otherwise specified in the contract or purchase order, bundles, pallets, and shipping containers shall be marked in accordance with MIL-STD-129 or ASTM D 3951, as applicable. When ASTM D 3951 is used, each shipping container shall be marked with the gross weight and cube.

6. NOTES

6.1 Intended use. Polypropylene sandbags are intended for use in field fortifications, breastworks, revetments, personnel shelters, ammunition bunkers, and gun emplacements, where a high degree of biodeterioration resistance is required. The polypropylene sandbags are not recommended for temporary flood control where easy destruction and rapid deterioration of bag fabrics are desired after flood danger has passed.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this document.
- b. Type of bag required (see 1.2).
- c. When type II bags are to be of the inverted design with the tie ends (see 3.2.2) and the delustered side on the outside of the sandbag (see 3.1.1.4).
- d. Level of packing required (see 5.2).
- e. For level A packing, whether palletized or boxed sandbags are required (see 5.2.1.1 and 5.2.1.2).
- f. When palletized sandbags are to be prepared for Sea Van (containerized) shipments requiring an overall load height of 43 inches, maximum (see 5.2.1.1 and 5.2.2).

6.3 Definitions. For the purpose of this document, the following definitions apply.

- * 6.3.1 Heat-sealed. Heat-sealed is defined as the melting of adjacent yarns of any type in either warp or filling directions, which causes an intimate adherence of one yarn to another so as to prevent raveling or separation of yarns so melted together under the stress of the rough handling test specified herein.

6.3.2 Seam slippage. Seam slippage is defined as openings occurring in the bag fabric immediately adjacent to the seam, which are caused by the bunching of yarns in the seam under the stress of a drop test. Slight slippage results in openings between adjacent yarns not more than 1/8-inch in width and 5/8-inch in length and does not permit the loss of any fill.

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6.3.3 Yawning. Yawning is defined as the spreading apart of the folded fabric edges of a sewn seam under the stress of a drop test. Slight yawning will expose a continuous length of seam thread which is not more than 1/2 inch, and does not permit the loss of any fill.

* 6.4 Subject term (key word) listing.

Bags, sand
Polypropylene bags
Sandbags

6.5 Changes from previous issue. The margins of this document are marked with an asterisk (*) to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only, and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content, as written, irrespective of the marginal notations and relationship to the last previous issue.

Custodian:

Army - GL
Air Force - 99

Review activities:

Army - ME, MD
Air Force - 84
DLA-GS

Preparing activity:

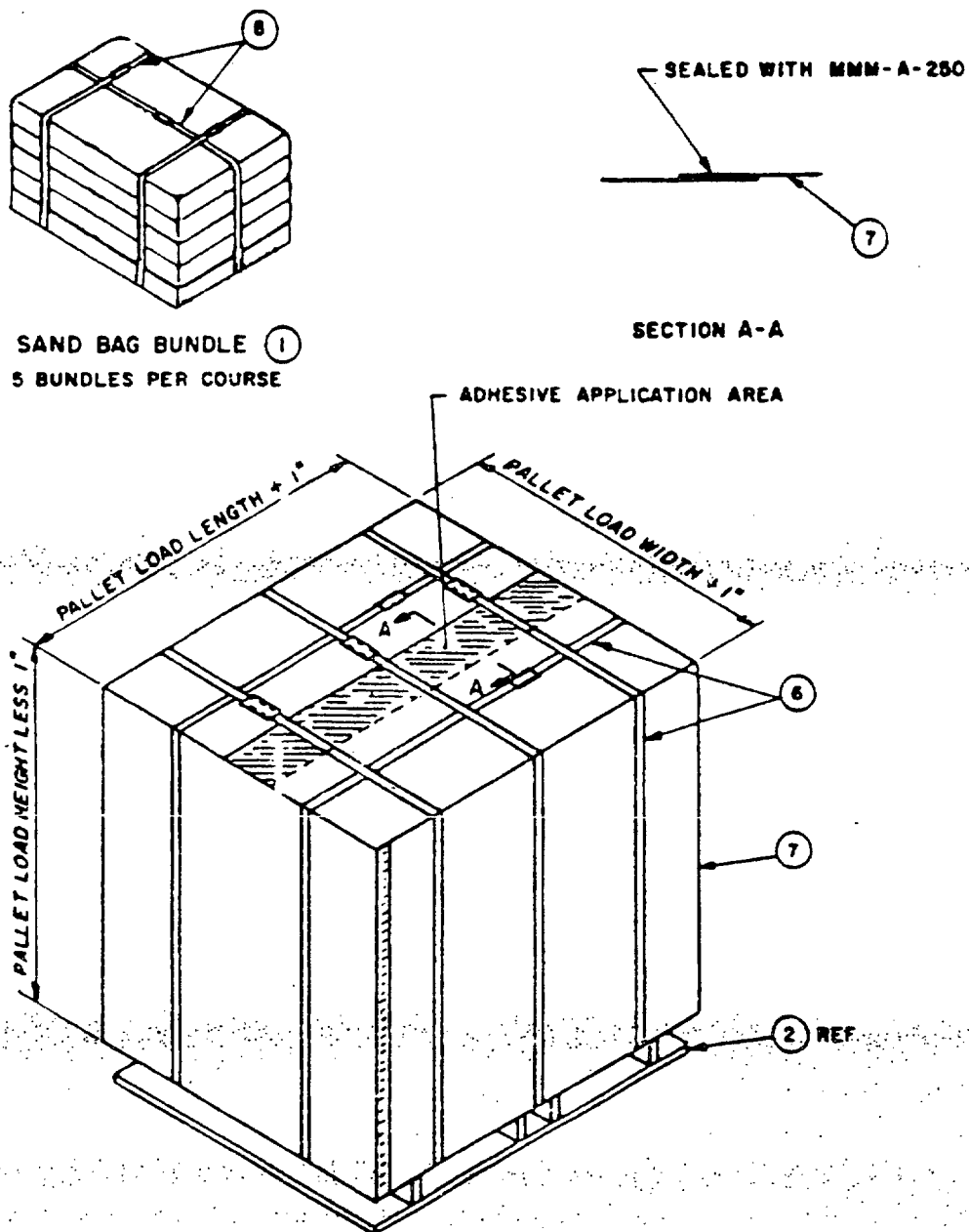
Army - GL

Project No. 8105-A319

User activities:

Army - CE
Navy - MC

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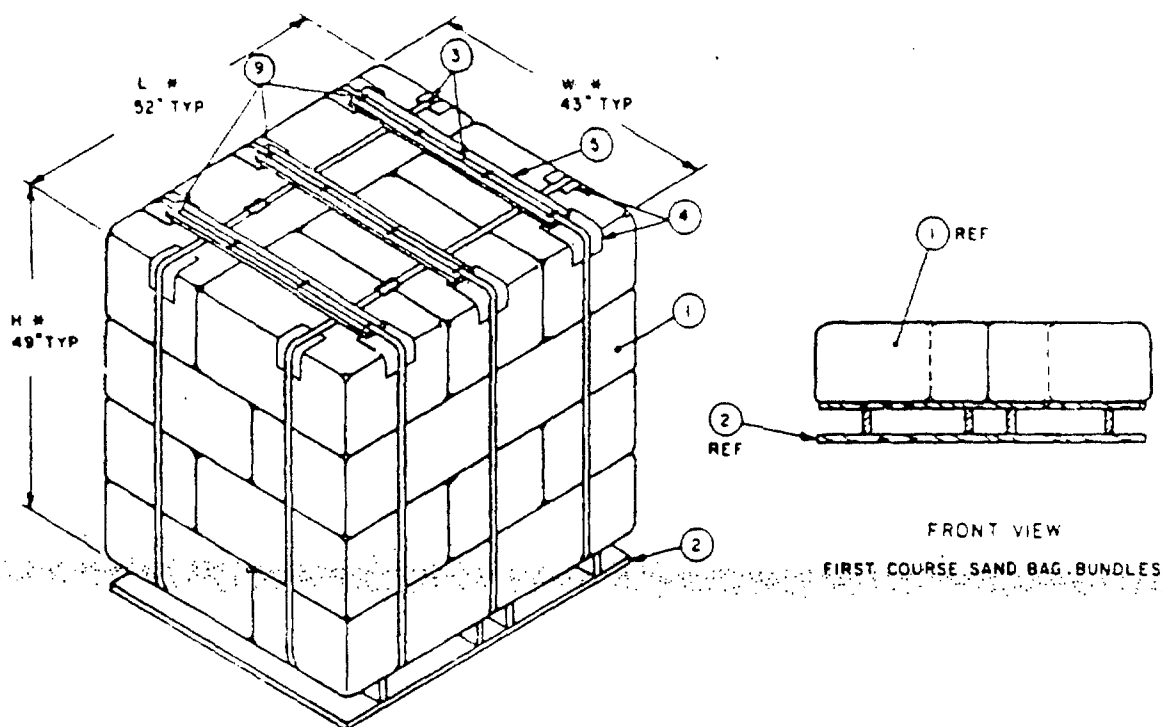


NOTES:

1. HALF SLOTTED CONTAINER WITHOUT BOTTOM WITH 6" OVERLAP OF LENGTHWISE FLAPS OF TOP. TOP FLAPS TO BE SEALED WITH ADHESIVE CONFORMING TO MMM-A-250 PRIOR TO PLACEMENT OF COVER 7 OVER PALLET LOAD. DIMENSIONS VARY WITH PALLET LOAD DIM. SEE NOTE FIG. 2
2. FOR FIND NO. 6 AND NO. 7 SEE FIG. 2

Figure 1. Fiberboard Cap for Palletized Sand Bags.

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* NOTE

LENGTH, WIDTH AND DEPTH SHOWN ARE TYPICAL DIMENSIONS. THE E DIMENSIONS WILL VARY, DEPENDENT UPON FINISHED BAG SIZE FOR LENGTH AND WIDTH OF BUNDLE AND DEPENDENT UPON DEGREE OF COMPRESSION FOR BUNDLE HEIGHT. THIS IN TURN, WILL EFFECT PALLET LOAD DIMENSIONS. PALLET LOAD SHALL BE 3 OR 4 COURSES HIGH, NOT TO EXCEED 50\"

FIND NO	QTY	NOMENCLATURE
1		BUNDLE, SAND BAGS. SEE FIG 1
2	1	PALLET, 40\"
3	5	STRAP OO-S-781, TYPE I OR IV, CLASS 1, 3/4\"
4	10	4\"
5	3	NOM. 1\"
6	5	STRAP OO-S-781, TYPE I OR IV, CLASS 1, 3/4\"
7	1	FIBERBOARD COVER PPP-B-636, V2S - SEE NOTE 1, FIG. 1
8	3	STRAPS OO-S-781, TYPE I OR IV, CLASS 1, 3/8\"
9	12	STAPLE, 14 Ga., CROWN 7/8\", LEG 3/4\", FF-N-105

Figure 2. Sand Bag Palletization.

