

INCH-POUND

MIL-A-2334J

15 March 1991

SUPERSEDING

MIL-A-2334H

15 January 1988

MILITARY SPECIFICATION

APRON, TOXICOLOGICAL AGENTS PROTECTIVE, M-2

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

1. SCOPE

1.1 Scope. This specification covers a one-piece impermeable apron used for protection against toxicological warfare agents.

1.2 Classification. The apron shall be of one type in the following sizes, as specified (see 6.2):

X-Small
Small
Medium
Large
X-Large

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5019 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

FEDERAL

- A-A-50083 - Bag, Plastic, Folded Garment
- V-T-285 - Thread, Polyester
- DDD-L-20 - Label: For Clothing, Equipage, and Tentage,
(General Use)
- PPP-B-566 - Boxes, Folding, Paperboard
- PPP-B-636 - Boxes, Shipping, Fiberboard
- PPP-B-676 - Boxes, Setup
- PPP-T-45 - Tape, Gummed, Paper, Reinforced and Plain, for
Sealing and Securing

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- MIL-W-530 - Webbing, Textile, Cotton, General Purpose, Natural
or in Colors
- MIL-B-543 - Buckles, Tongueless and Web Strap
- MIL-C-12189 - Cloth, Coated: Butyl Coated, Toxicological Agents
Protective
- MIL-L-35078 - Loads, Unit: Preparation of Semiperishable
Subsistence Items; Clothing, Personal Equipment and
Equipage; General Specification For

STANDARDS

FEDERAL

- FED-STD-191 - Textile Test Methods
- FED-STD-751 - Stitches, Seams and Stitchings
- FED-STD-595 - Colors Used in Government Procurement

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection
by Attributes
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-147 - Palletized Unit Loads
- MIL-STD-731 - Quality of Wood Members for Containers and
Pallets

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

U.S. ARMY NATICK RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER

5-10-47 - Fastener, 1-Inch

(Copies of drawings are available from the U.S. Army Natick Research, Development, and Engineering Center, ATTN: STRNC-UXT, Natick, MA 01760-5017.)

2.2 Non-Government 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 are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 618 - Conditioning Plastics and Electrical Insulating
Materials for Testing

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.)

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

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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Guide sample. Samples, when furnished, are solely for guidance and information to the contractor (see 6.4). Variation from this specification may appear in the sample, in which case this specification shall govern.

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3.3 Materials. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.3.1 Basic material. The basic material shall be a butyl coated cloth conforming to MIL-C-12189.

3.3.2 Strapping. The strapping used to seal the seams shall be made of the coated cloth specified in 3.3.1, straight or bias cut. The strapping shall be $1 \pm 1/16$ inch wide.

3.3.3 Adhesive. The adhesive used to pre-cement the seams and to adhere the strapping to the seams shall be of the self-curing neoprene or butyl-base type. The adhesive, when applied and tested as specified in 4.4.1, shall not crack or flake when subjected to the cold crack test. The hydrostatic resistance of the adhesive coated cloth shall be not less than 90 percent of the actual hydrostatic resistance of the butyl coated cloth prior to applying adhesive. Sample strapped seams, prepared with the adhesive as specified in table IV, shall have a minimum adhesion of 2.0 pounds per inch of width after water immersion and after aging.

3.3.4 Thread. The thread for all seams and stitching shall be polyester thread conforming to type I or type II, class 1, subclass A, sizes E and B of V-T-285. The thread shall be Camouflage Green 483 approximating color chip 34094 of FED-STD-595.

3.3.5 Webbing. The webbing used in the apron shall be 5/8 inch wide for the wrist adjustment straps, 3/8 to 5/8 inch wide for the wrist adjustment strap loops and 1 inch wide for the tie tapes and shall conform to type IIa, class 7 of MIL-W-530. The color of the webbing shall be Olive Drab 7.

3.3.6 Buckles.

3.3.6.1 Wrist straps. The buckles for the wrist straps shall conform to type II, style 4, class 3, size 5/8 inch of MIL-B-543.

3.3.6.2 Tie tapes. The buckles for the tie tapes shall conform to Drawing 5-10-47.

3.3.7 Label. The label shall conform to type IV or V, class 12 of DDD-L-20, except that the legend for the type IV label (when used) shall be printed with 14-point characters.

3.3.7.3 Tackiness of labels. Both the cloth label and the stamped label shall be legible and shall not become tacky after testing as specified in 4.4.1.

3.3.8 Dusting powder. The dusting powder for application to the apron shall be whiting less than 1.0 percent silica (nonfibrous), or other finely divided low toxicity material which does not support mildew growth.

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3.4 Design. The design shall be as shown on figure 1. The apron shall have a front, two side panels and raglan sleeves. The back shall be secured by tie tapes and each sleeve shall have a wrist adjustment strap.

3.5 Patterns. Standard patterns, which provide proper allowance for all seams will be furnished by the Government. The standard patterns shall not be altered in any way and are to be used only as a guide for cutting the contractors working patterns. The working patterns shall not be altered in any way.

3.5.1 List of pattern parts. The components of the pattern for the apron shall be cut from material as specified and according to the number of each part required as indicated in table I.

TABLE I. Pattern parts

Material	Item	Nomenclature	Cut parts
Cloth, coated, butyl coated, toxicological agents protective	1	Side panel	2
	2	Sleeve	2
	3	Front	1

3.5.2 Assembly of apron. The apron shall be constructed and assembled with the heavily coated side of the fabric on the outside of the apron.

3.6 Construction.

3.6.1 Stitches, seams, and stitching. All stitches, seams, and stitching shall conform to FED-STD-751. The type of seam, stitching, and stitches per inch shall be as specified in table II. Seam allowances shall be maintained so that no raw edges, run-offs, pleats, or open seams occur. Where two or more methods for seams or stitch types are given for the same part of the operation, any one of them may be used. When stitch type 401 is used, the looper (underthread) shall be on the inside of the apron. In order to minimize the size of the hole in the fabric, the needle used shall be the smallest size that will accommodate the specified thread.

3.6.1.1 Type 301 stitching. Ends of 301 stitching shall be backstitched or overstitched 1/2 inch minimum, except where ends are turned under in a hem or held down by other stitching. Thread tension shall be maintained so there will be no loose stitching resulting in a loose bobbin or top thread or no excessively tight stitching resulting in puckering of the materials sewn. The lock shall be embedded in the materials sewn.

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3.6.1.1.1 Repairs of type 301 stitching. Repairs of type 301 stitching shall be as follows:

a. When thread breaks, skipped stitches, run-offs or bobbin run-outs occur during sewing, the stitching shall be repaired by restarting the stitching a minimum of 1/2 inch back of the end of the stitching. 1/

b. Thread breaks or two or more consecutive skipped or run-off stitches noted during inspection of the item (in-process or end item) shall be repaired by over stitching. The stitching shall start a minimum of 1/2 inch back of the defective area, continue over the defective area, and continue a minimum of 1/2 inch beyond the defective area onto the existing stitching. Loose or excessively tight stitching shall be repaired by removing the defective stitching without damaging the material and restitching in the required manner. 1/

1/ When making the above repairs, the ends of stitching are not required to be backstitched.

3.6.1.2 Type 401 stitching. Thread tension shall be maintained so that there will be no loose stitching. Both ends of all seams or stitching produced with 401 stitch type, when not turned under in a hem or held down by other stitching, shall have a 1/2 to 3/4 inch chain extending beyond each end. All repairs shall be in accordance with 3.6.1.1.1a and 3.6.1.1.1b.

3.6.1.3 Pre-cementing. All major joining seams shall be overlapped $1/2 \pm 1/16$ inch and cemented before stitching.

3.6.1.4 Bartacks. Bartacks shall be free from thread breaks and loose or excessively tight stitching.

3.6.2 Seam strapping.

3.6.2.1 Preparation of seam area for strapping. Prior to application of the adhesive, the seam and area along the seam where the strapping makes contact, and the surface of the strapping to be adhered, shall be thoroughly cleaned with rubber makers' naptha or other suitable cleaning agent which is not a solvent for the butyl coating compound.

3.6.2.2 Application of seam strapping. Strapping shall be applied to both inside and outside of those seams required to be strapped (with the lightly coated side of the strapping contacting the seam) using the adhesive specified in 3.3.3. Each individual seam shall be strapped with a single piece of strapping. Where ends of strapping meet, a $1 \pm 1/4$ inch overlap shall be made. Wherever strappings intersect, they shall be overlapped. When the strapping is centered over the seam and pressed into position, the adhesive line shall not extend more than 3/4 inch on either side of the strapping. The center of the strapping shall be no more than 1/8 inch off center. The finished strapping width shall be $1 \pm 1/16$ inch.

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3.7 Figures. Figure 1 is furnished for information only. If there are inconsistencies between the written specification and the figure, the written specification shall control.

3.8 Manufacturing operations requirements. The apron shall be manufactured in accordance with operations specified in table II. The contractor is not required to follow the exact sequence of operations. Any additional basting or holding stitching to facilitate manufacture is permissible, provided the thread is removed or does not show in the finished apron.

3.9 Use of automated apparel equipment. Automated apparel equipment may be used to perform any of the operations specified in table II, providing that the seam and stitch type are as specified and the finished component conforms to the required configuration. When a government furnished shaper pattern is forwarded, the component shall conform to that pattern.

NO.	TABLE II. MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	T H R E A D	
					NEEDLE	BOBBIN/ LOOPER COVER
1.	<p><u>Cutting.</u></p> <p>The apron shall be cut in accordance with patterns furnished which show size, marks, and notches for proper assembling of all parts. The use of drill holes is prohibited. All component parts shall be matched to approximate a uniform shade throughout the apron. No pin tickets shall be used. A tolerance of 1 inch maximum from the directional line on the pattern is acceptable.</p>					
2.	<p><u>Marking.</u></p> <p>a. Mark, ticket or bundle all component parts of the apron to insure correct size, proper assembly and uniform shade throughout the apron.</p> <p>b. Any method of marking may be used except:</p> <ul style="list-style-type: none"> (1) Metal fastening devices (2) Sew-on tickets (3) Adhesive type tickets which leave traces of adhesive on the material after removal of the tickets 					
3.	<p><u>Replacement of defective components.</u></p> <p>During the spreading, cutting and manufacturing process, components having material defects or damages that are classified as defects in 4.4.3 shall be removed from production and replaced with non-defective and properly matched components.</p>					

NO.	TABLE II. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	T H R E A D		
					NEEDLE	DOBBIN/ LOOPER	COVER
4.	<p><u>Cut wrist adjustment straps.</u></p> <p>Cut two wrist adjustment straps from 5/8 inch webbing (see 3.3.5) each $18 \pm 1/2$ inches long. The length and width shall be the same for all sizes.</p> <p><u>Cut tie tapes.</u></p> <p>Cut four tie tapes (see 3.3.5) from 1 inch tape. Two of the tie tapes shall be $5 \pm 1/8$ inches long and two shall be $12 \pm 1/8$ inches long.</p> <p><u>Cut reinforcement patches.</u></p> <p>Cut four reinforcement patches from basic material (see 3.3.1) $1-3/4$ by $3 \pm 1/4$ inches or $1-3/4 \pm 1/4$ inches by $6 \pm 1/2$ inches and six patches $1-3/4$ by $2-1/2 \pm 1/4$ inches. Patches may be cut from ends, but each patch shall be one piece with no seams. The corners of the patches may be rounded.</p> <p><u>Cut wrist adjustment strap loops.</u></p> <p>Cut four wrist adjustment strap loops from basic material $1-1/4$ by $2-1/2 \pm 1/4$ inches.</p> <p style="text-align: center;">or</p> <p>Cut four wrist adjustment strap loops from 3/8 to 5/8 inch wide webbing (see 3.3.5) $2-1/2 \pm 1/4$ inches long.</p>						
5.							
6.							
7.							

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NO.	TABLE II. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	T H R E A D		
					NEEDLE	BOBBIN/ LOOPER	COVER
8.	<p>Make four wrist adjustment strap loops.</p> <p>When loops are made of basic material, the material shall be folded under and sewn to form a finished piece measuring 3/8 inch wide and 2-1/2 inches long.</p>	301	EFb-1	8-10	B	B	
9.	<p>Make two wrist adjustment straps.</p> <p>Insert one end of 5/8 inch webbing over the center bar of the 5/8 inch buckle, turn in the raw edge and securely boxstitch with a 3/8 inch boxstitch.</p>	301		8-10	B	B	
10.	<p>Make sleeves.</p> <p>a. Hem sleeves as indicated by notches on the pattern and stitch 1/8 to 3/16 inch from edge; hem shall finish 1/2 ± 1/8 inch wide.</p> <p>b. Sew two wrist adjustment strap loops on each sleeve as indicated by marks on pattern. Each end of the loop shall be turned under and securely bartacked or box-stitched through sleeve with a 1/4 to 3/8 inch box stitch. The loop opening shall finish 1-3/8 ± 1/8 inches long.</p> <p>c. A patch of basic material 2-1/2 by 1-3/4 ± 1/4 inches shall be cemented inside of the sleeve to cover the loop stitching.</p>	301 or bartack	EFa-1	8-10	B	B	
11.	<p>Join side panels to front.</p> <p>A raw edge seam shall be used. Lap one ply of pre-cemented material over the other 1/2 ± 1/16 inch and seam with a single row of stitching.</p>	301 or 401	LSa-1 LSa-1	8-10 8-10	E E	E B	

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NO.	TABLE II. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD		
					NEEDLE	BOBBIN/LOOPER	COVER
12.	<p>Close <u>sleeve inseam</u>.</p> <p>A raw edge seam shall be used. Lap one ply of precemented material over the other $1/2 \pm 1/16$ inch and seam with a single row of stitching.</p> <p>NOTE: Alternatively, the closing of the sleeve and body side may be performed as one operation.</p>	301 or 401	LSa-1 LSa-1	8-10 8-10	E E	E B	
13.	<p>Set <u>sleeves</u>.</p> <p>a. A raw edge seam shall be used. Lap one ply of precemented material over the other $1/2 \pm 1/16$ inch and seam with a single row of stitching.</p> <p>b. Strap the seams inside and outside with strapping well centered over the seam. The outside strapping shall turn over $1 + 1/16$ inch at the neck.</p>	301 or 401	LSa-1 LSa-1	8-10 8-10	E E	E B	
14.	<p><u>Strap apron side and sleeve inseams</u>.</p> <p>Strap the sleeve inseam and apron side seam, inside and outside, as one continuous operation with the strapping well centered over the seam. The outside strapping shall turn over $1 + 1/16$ inch at the neck and $1 + 1/16$ inch at the bottom of the apron.</p>						
15.	<p><u>Hem edges of apron</u>.</p> <p>Turn up the edges of the apron in accordance with the pattern and single stitch through the apron $1/8$ to $3/16$ inch from edge. All hems shall finish $1/4 + 1/16$ inch wide.</p>	301	EFa-1	8-10	B	B	

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NO.	MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	T H R E A D		
					NEEDLE	DOBBIN/ LOOPER	COVER
16.	<p><u>Attach wrist adjustment strap.</u></p> <p>a. Insert wrist adjustment strap through loops and tack or bartack full width of the strap to the in seam of the sleeve. The strap shall be tacked $5 \pm 1/2$ inches from the buckle end of the strap and $1-5/8 \pm 1/8$ inches from the bottom edge of the sleeve. The buckle shall fall to the back of the sleeve. A patch of basic material $2-1/2$ by $1-3/4 \pm 1/4$ inches shall be cemented inside the sleeve to cover the tack stitching.</p> <p>b. Thread free end of webbing through buckle, turn under the free end of webbing and stitch $1/8$ to $3/16$ inch from edge. The turn-under shall be $5/8 \pm 1/8$ inch with the raw edges turned in.</p> <p style="text-align: center;">or</p> <p>c. Thread free end of webbing through buckle, turn under the free end $5/8 \pm 1/8$ inch with the raw edge turned in and securely bartack the full width of the webbing.</p> <p><u>Attach tie tapes.</u></p> <p>a. A patch 3 by $1-3/4$ inches shall be stitched on four sides or cemented to the underside of apron as indicated by marks on pattern, to serve as a reinforcement for the tie tapes. Alternatively, a piece of the coated cloth folded once to the above dimensions and with the open ends caught in the hem may be used as reinforcement.</p>	301 or bartack	OSa-1	8-10 21 per bartack	E B	E B	
17.		Bartack	EFb-1	8-10	B	B	
		301	SSa-1	8-10	E	E	

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NO.	TABLE II. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD	
					NEEDLE	DOBBIN/ LOOPER COVER
17.	<p><u>Attach tie tapes.</u> (cont'd)</p> <p>b. Thread one end of the $5 + 1/8$ inch tie tape through the female portion of the buckle, with the manufacturer's identification facing towards the apron. Turn under the raw edge of one end of tie tape $1/4 + 1/16$ inch and then turn the same end in $3/4 + 1/16$ inch more. Tuck the other raw edge under the turn in. Stitch the tape to the right side of the apron back, as indicated on pattern, with a $3/4$ inch boxstitch $1/16$ to $1/8$ inch from the edge. Repeat procedure for the other tie tape. The finished length of the tie tapes shall be $2 + 1/8$ inches.</p> <p>c. Thread one end of the $12 + 1/8$ inch tie tape through the male portion of the buckle. Turn under the raw edge of one end of tie tape $1/4 + 1/16$ inch and then turn in the same end $3/4 + 1/16$ inch more. Stitch the tie tape to the left side of apron back, as indicated on pattern, with a $3/4$ inch boxstitch $1/16$ to $1/8$ inch from the edge.</p> <p>d. Turn the other raw edge under $1/4 + 1/16$ inch and then turn in the same end $3/4 + 1/16$ inch more and stitch with a $3/4$ inch boxstitch $1/16$ to $1/8$ inch from the edge. The finished length of the tie tapes shall be $9-1/2$ inches. The teeth on the male portion of the buckle shall finish towards the apron.</p>	301		10-12	E	E
		301		10-12	E	E
		301		10-12	E	E
18.	<p><u>Label.</u></p> <p>a. Identification label shall be positioned inside, on the right side of the back opening $4 + 1/8$ inches above the lower tape and seamed on four sides $1/8$ to $3/16$ inch from edge with ends securely tacked.</p>	301	SSa-1	8-10	B	B

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NO.	TABLE II. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	T H R E A D		
					NEEDLE	BOBBIN/ LOOPER	COVER
18.	<p><u>Label.</u> (cont'd)</p> <p>or</p> <p>b. Identification label may be stamped directly on the fabric in the same position referenced above.</p>						
19.	<p><u>Preparation for packaging.</u></p> <p>A light application of dusting powder shall be applied to the finished apron (see 3.3.8). The apron must be fully cured prior to packaging.</p>						

NATICK Form 903
1 Dec 76 EDITION OF 1 OCT 76 WILL BE USED UNTIL EXHAUSTED.

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3.10 Finished measurements. The apron shall conform to the finished measurements shown in table III.

TABLE III. Finished measurements (inches)

Measurements	X-Small	Small	Medium	Large	X-Large
Length <u>1/</u>	43	45-1/2	48	50-1/2	53
Chest measurement <u>2/</u>	41	45	49	53	57
Sleeve <u>3/</u>	17-1/2	18	18-1/2	18-7/8	18-7/8
Sweep <u>4/</u>	53-1/2	57-3/4	62-1/2	67	71-1/2

NOTE: Tolerance for length, chest, and sweep shall be ± 1 inch.
Tolerance for sleeve shall be $\pm 1/2$ inch.

- 1/ Length - Measure from top to bottom of apron at front center.
- 2/ Chest measurement - Measure the apron from side to side at the inseam of sleeve under armhole seam and double the measurement.
- 3/ Sleeve inseam - Measure from the base of armhole along the inseam of sleeve to the bottom of sleeve.
- 4/ Bottom sweep - Fold apron in half with the back edges meeting and measure from side to side, double the measurement.

3.11 Performance.

3.11.1 Adhesion of strapping. After application of the strapping as specified in 3.6.2, the strapping shall have a minimum initial adhesion of 3.0 pounds per inch of width when tested as specified in 4.5.1.1. After water immersion and heat aging, the strapping shall have a minimum adhesion of 2.0 pounds per inch of width when tested as specified in 4.5.1.2 and 4.5.1.3, respectively.

3.12 Repairs in coating on finished apron. Areas containing coating defects may be repaired by application of two round, superimposed $1-1/2 \pm 1/4$ inches diameter patches with one patch on the inside of the apron and the other on the outside of the apron. The patches shall be made of the coated cloth specified in 3.3.1 and shall be cemented with the adhesive specified in 3.3.3. The lightly coated side of the patch shall be cemented to the apron

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and the patch shall extend a minimum of 1/2 inch beyond all edges of the damaged area. The patch shall be smoothly and evenly adhered over its entire area and shall be well adhered to the coated cloth so that, when subjected to flexing action between the hands, it will show no lifting of the edge and no cracking, flaking, or removal of the adhesive or patch. The repaired area shall show no stiffening or tackiness that would affect the serviceability of the apron. Repairing of fabric coating defects by methods other than patching are not authorized.

3.12.1 Location and number of repairs. Repairs not exceeding ten in number may be made to each apron, provided not more than five repairs are made on any one of the five major pattern parts of the apron. Repair to seam strapping is not authorized.

3.13 Workmanship. The end item shall conform to the quality of product established by this specification. All cemented areas shall be fully cured prior to packaging. The occurrence of defects shall not exceed the applicable acceptable quality levels.

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 (examinations and tests) 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 specification where such inspections are deemed necessary to ensure 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring 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 ensure compliance with all dimensional requirements.

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

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection. When a first article is required (see 6.2), it shall be examined for the defects specified in 4.4.3 and 4.4.4 and tested for the characteristics specified in 4.4.5. The presence of any defect or failure of any test shall be cause for rejection of the first article.

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

4.4.1 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 specification or applicable purchase document. In addition to the quality assurance provisions of applicable referenced documents, testing shall be performed on components and materials listed in table IV for the characteristics shown. The sample unit shall be a one pint composite for adhesive testing. The sample size for adhesive shall be one sample unit. The lot shall be unacceptable if any unit fails to meet any requirements specified. The physical values specified apply to the average of the determinations made of a sample unit for test purposes as specified in the applicable test methods. All test reports shall contain the individual values utilized in expressing the final result.

TABLE IV. Component tests

Component and lot size expressed in terms of	Characteristic	Paragraph reference		Number determinations per sample unit	Results reported as	
		Require-ment	Test method		Pass or fail	Numerically to nearest
Adhesive (manufacturer's batch)	Cold crack of adhesive film	3.3.3	4.5.2 1/	1	X	---

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TABLE IV. Component tests (cont'd)

Component and lot size expressed in terms of	Characteristic	Paragraph reference		Number determinations per sample unit	Results reported as	
		Require-ment	Test method		Pass or fail	Numerically to nearest
Adhesive (manufacturer's batch) (cont'd)	Hydrostatic resistance	3.3.3	4.5.3	2		0.5 psi
	Adhesive: After water immersion	3.11.1	4.5.1.3 <u>2/</u>	2		0.1 lb
	Adhesive: After heat aging	3.11.1	4.5.1.4 <u>2/</u>	2		0.1 lb

1/ Unless otherwise specified, a certificate of compliance shall be submitted and will be acceptable for the stated requirement.

2/ Two panels, specially prepared by the contractor, each consisting of two 4 inch wide by 1 yard long pieces of the coated fabric specified in 3.3.1, shall be joined using the seam and stitch type specified in table II. The seamed samples shall than be strapped on one side only, with 1 inch wide strip of strapping material specified in 3.3.2 utilizing the adhesive specified in 3.3.3.

4.4.2 In-process inspection. Examination shall be made of pre-cementing, seaming, and stitching to establish conformance to specified requirements. Whenever nonconformance is noted, correction shall be made to the items affected, the lot in progress, and to the operation. Parts which cannot be corrected shall be removed from production. This examination shall be made on unstrapped component parts or unstrapped aprons, as applicable.

4.4.3 End item visual examination. The end items shall be examined for the defects listed in table V. The lot size shall be expressed in units of aprons. The sample unit shall be one apron. The inspection level shall be II and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0 for major defects and 10.0 for total (major and minor combined) defects. Any critical defect found during the sampling inspection will be cause for rejection of the lot represented by the sample.

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TABLE V. End item visual defects

Examine	Defect	Classification		
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>
Finish				
Color (applicable to all components)	Not color specified or definite variation in color			201
Cleanliness	Spot, stain, or streak more than 1 inch in combined directions, which cannot be readily removed with naptha or water			202
	Adhesive line extends more than 3/4 inch on either side of the strapping on major portion of seam			203
Dusting	Apron not dusted or not dusted as specified with dusting powder			204
Design	Characteristic not in accordance with specified requirements (unless otherwise indicated herein)		101	
Material, general	Component not fabricated of the specified material	1		
Coated fabric <u>1/</u>	Cut, hole, or tear:			
	-on back of apron (except sleeves) <u>2/</u>			205
	-on one ply at hems			206
	-on strapping on front of apron		102	
	-on all other areas (sleeves and front)	2		
	Uncoated area, pit, or any abrasion mark or scratch that results in a thinning of the butyl coating:			
	-on back of apron (except sleeves)			207
	-on hems			208

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TABLE V. End item visual defects (cont'd)

Examine	Defect	Classification		
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>
Coated fabric <u>1/</u> (cont'd)	-on strapping on front of apron and sleeves		103	
	-on all other areas (sleeves and front)	3		
	Blister or delamination of coating:			
	-on back of apron (except sleeves)			209
	-on hems			210
	-on strapping on front of apron and sleeves		104	
	-on all other areas (sleeves and fronts)	4		
	Lump or embedded foreign matter not readily removed or abraded:			
	-on back of apron (except sleeves)			211
	-on hems			212
	-on strapping on front of apron and sleeve		105	
	-on all other areas (sleeves and front)	5		
	Crease or wrinkle resulting in adhesion of surface or delamination of coating when crease or wrinkle is pulled out by manual pressure:			
	-on back of apron (except sleeves)			213
	-on hems			214
-on strapping on front of apron and sleeves		106		
-on all other areas (sleeves and front)	6			
Heavily coated side of material on inside of apron	7			

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TABLE V. End item visual defects (cont'd)

Examine	Defect	Classification		
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>
Coated fabric <u>1/</u> (cont'd)	Any pick-off or cavity of any size resembling a pick-off in the coating: <u>3/</u>			
	- on back of apron (except sleeves)			215
	- on hems			216
	- on strapping on front of apron and sleeves		107	
	- on all other areas (sleeves and front)	8		
	Any impression in the coating from splicing threads	9		
Cutting	Parts not cut in accordance with the directional line indicated on pattern or document		108	
Construction and workmanship	Any component omitted, damaged, not as specified, not firmly affixed, or misplaced to such a degree that:			
	-injury to wearer may result	10		
	-serviceability is seriously affected		109	
	-serviceability is affected but not seriously			217
	Any cemented area not fully cured		110	
	Excessive cement which causes garment to stick to itself when folded or any change in color where cement is applied detectable when examined at a distance of three feet		111	
Repairs	Patch diameter less than 1-1/4 inches		112	
	Patch diameter greater than 1-3/4 inches			218
	More than ten patches per apron		113	

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TABLE V. End item visual defects (cont'd)

Examine	Defect	Classification			
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>	
Repairs (cont'd)	More than five patches per pattern part			219	
	Damaged area patched on one side only		114		
	Heavily coated side of patch cemented to the apron			220	
	Patch extends less than 1/2 inch beyond all edges of the damaged area		115		
	Patches not superimposed by more than 1/4 inch			221	
	Edge lifting of patch, cracking, flaking, or removal of the adhesive or patch when hands are flexed as specified in 3.12		116		
	Patch not smoothly and evenly adhered		117		
	Patch area excessively stiff or tacky affecting serviceability		118		
	Seam and stitching	Not seam type specified			222
		Not stitch type specified			223
Stitching omitted where required			119		
One or two stitches per inch less than the minimum specified				224	
Three or more stitches per inch less than the minimum specified			120		
More than the maximum number of stitches per inch but not damaging the fabric				225	
More than the maximum number of stitches per inch damaging fabric			121		

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TABLE V. End item visual defects (cont'd)

Examine	Defect	Classification		
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>
Seams and stitching (cont'd)	One or more rows of stitching forming boxstitching omitted or insecure to a degree where assembly may become detached		122	
	One or more rows of stitching forming boxstitching loosely accomplished but assembly is not expected to become detached			226
	Ends of seam or stitching (stitch type 301) when not caught in other seams or stitching, backstitched or overstitched less than 1/2 inch			227
	Ends of seam produced with 401 stitch type when not caught in other seam or stitching, having chain extend less than 1/2 inch or more than 3/4 inch beyond each end			228
	Ends of seam produced with 401 stitch type when not caught in other seam or stitching, not having chain extend beyond each end		123	
	Repair of seam not as specified			229
	Any open seam more than 1/4 inch (applicable to seams not required to be strapped)		124	

NOTE: A seam shall be classified as open when one or more stitches joining a seam are broken or when two or more skipped or run-off stitches occur.

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TABLE V. End item visual defects (cont'd)

Examine	Defect	Classification		
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>
Strapped seams	Any open seam completely through apron	11		
	Any seam strapped on only one side	12		
	Strapping on both sides in the same area of seam not securely affixed (i.e., strapping not properly cemented so that it can be readily pulled off seam with little resistance)	13		
	Strapping on only one side of seam not securely affixed		125	
	Heavily coated side of strapping not on outside			230
	Any blister or delamination in central area of strapping but edges are securely affixed and the bonded portion of strapping is securely cemented to fabric			231
	Strapping on one side does not completely cover stitching on seam		126	
	Strapping on both sides in the same area of seam does not cover stitching on seam	14		
	Strapping off center by more than 1/8 inch but covers seams and stitching			232
	Opening at edge of strapping more than 1/16 inch in depth but does not extend to the stitching $\frac{4}{16}$			233
	Any opening 1/32 inch or more in width extending to the stitching in the following areas			
	-any seam		127	
	-any opening less than 1/32 inch in width and extending to the stitching			234

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TABLE V. End item visual defects (cont'd)

Examine	Defect	Classification		
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>
Strapped seams (cont'd)	Any individual seam not having a continuous length of strapping		128	
	Any ends of strapping that meet, not overlapped $1 \pm 1/4$ inch		129	
	Any intersection of strapping not overlapped		130	
	Strapping not smoothly and evenly adhered		131	
	Any strapping less than $3/4$ inch finished width			235
Buckles	One or more missing, broken, bent, cracked, or otherwise defective seriously affecting serviceability		132	
	One or more damaged but not to the extent that serviceability will be seriously affected			236
Armhole	Top of sleeve or body badly puckered or pleated in armhole			237
Sleeves	Reversed (i.e., left sleeve in right armhole)		133	
	Badly twisted affecting appearance			238
Wrist strap adjustment loop	One or more missing		134	
	Ends not securely tacked			239
	Stitched ends not sealed by patch on the inside			240
Wrist adjustment strap	Not threaded through loops or buckle in specified manner seriously affecting functioning of strap		135	
	Not threaded through loops or buckle in specified manner affecting functioning of strap but not seriously			241

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TABLE V. End item visual defects (cont'd)

Examine	Defect	Classification		
		<u>Critical</u>	<u>Major</u>	<u>Minor</u>
Wrist adjustment strap (cont'd)	Set so that buckle is finished in direction opposite to that specified		136	
Tie tapes	One or more omitted		137	
	One or more not securely attached		138	
Reinforcement patches	Not securely attached			242
	Omitted		139	
Hems	Badly twisted or turned up; irregular in width causing visible unevenness of edges			243
Identification label	Missing, incomplete, incorrect, illegible, not specified type or size, not in proper location or not accomplished in the specified manner			244

- 1/ Clearly visible at normal inspection distance (approximately 3 feet). A pick glass may be used for defect identification once the defective condition is sighted during normal inspection.
- 2/ The front and back shall be those areas shown on figure 1, except the sleeves.
- 3/ A cavity is defined as an irregularly-shaped depression in the coating that may be formed if loose lumps, specks, undispersed coating compound ingredients, or foreign matter have been partly or entirely dislodged from the coating.
- 4/ Extent of opening (or tunnel) may be determined by insertion of any blunt end instrument suitable for this purpose. A suggested standard probing tool is a commercial paper clip 1/64 inch thick. Penetration of the instrument shall cease immediately if resistance is met.

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4.4.4 End item dimensional examination. The end items shall be examined for conformance to the dimensions specified in table III. Any dimension not within the specified tolerance shall be classified as a defect. The lot size shall be expressed in units of aprons. The sample unit shall be one apron. The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

4.4.5 End item testing. The end items shall be tested as specified in 4.5.1 for conformance to the strapping adhesion requirements in 3.11.1. The lot size shall be expressed in units of aprons. The sample unit shall be one apron. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

4.4.6 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. 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 (exterior and interior)	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application
Materials	Any component missing, damaged, or not as specified
Workmanship	Inadequate application of components, such as incomplete sealing or closure of flap, improper taping, loose strapping, or inadequate stapling Bulged or distorted container
Content	Number of unit packs per container is more or less than required

4.4.7 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
Palletization	Pallet pattern not as specified Load not bonded as specified

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<u>Examine</u>	<u>Defect</u>
Weight	Exceeds maximum load limits
Marking	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application

4.5 Methods of inspection. Results of physical tests obtained under test conditions defined in FED-STD-191 or ASTM D 618, shall be acceptable except in case of dispute; in dispute cases, tests shall be conducted with both the specimen and test apparatus under standard conditions as defined in FED-STD-191.

4.5.1 Strapping adhesion.

4.5.1.1 Adhesive cure test. Dampen a clean swab with a 75/25 Freon/Toluene blend. Using a circular motion, lightly rub excess adhesive in the vicinity of the back shoulder seam strapping for 30 seconds. With the back of a finger, touch the area rubbed. There should be no tackiness.

4.5.1.2 Adhesion test. After the seam strapping assembly has aged for 48 hours, determine the adhesion of strapping to the seams as specified in Method 5962 of FED-STD-191 except as follows: The adhesion shall be the lowest individual load resistance registered in pounds per inch of strapping width on the autographic chart for 3 inches of seam strapping separation in lieu of the average of the five highest peak loads of resistance registered for 3 inches of separation of strapping. Make five determinations per sample unit and report the results numerically to the nearest 0.1 pound per inch of width. Each of the five test specimens shall be taken from a different part of the item. Testing shall be done on the heavily coated side of the garment. Any separation of the coating in lieu of strapping adhesion will be considered an invalid test and a new specimen will have to be tested.

4.5.1.3 Adhesion after immersion test. Immerse the seams for 2 hours in boiling water, remove, immerse for 15 minutes in water at $75^{\circ} \pm 5^{\circ}\text{F}$, remove from the water and, while still dripping wet, test for strapping adhesion as specified in 4.5.1.2.

4.5.1.4 Adhesion after heat aging test. Expose the seam samples for 7 days in a circulating air oven at $158^{\circ} \pm 2^{\circ}\text{F}$, remove from the oven, and bring to equilibrium under standard conditions, then test for strapping adhesion as specified in 4.5.1.2.

4.5.2 Cold crack test. Clean test specimens of the coated fabric specified in 3.3.1, measuring 8 inches by 8 inches minimum, on the lightly coated side only by wiping with rubber makers' naphtha or other suitable cleaning agent that is not a solvent for butyl coating. Coat the cleaned area with two

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layers of the adhesive specified in 3.3.3. Condition the test specimens for 4 hours at room temperature and dust until tack free. Test the specimens as specified in Method 5874 of FED-STD-191 except that testing temperature shall be minus 20°F. Expose the specimens to this temperature for not less than 4 hours before testing. When performing tests, the adhesive side shall be considered the heavily coated side.

4.5.3 Hydrostatic resistance test. Randomly select ten 8 inch by 8 inch specimens from a 1 yard piece of the coated cloth specified in 3.3.1. Test five specimens for hydrostatic resistance as specified in Method 5512 of FED-STD-191. Adhesive coat the remaining five specimens as specified in 4.5.2 and test for hydrostatic resistance in accordance with Method 5512. Expose the side without the adhesive coating to the water.

4.5.4 Resistance of labels to tackiness.

4.5.4.1 Boiling water test. Completely submerge one label in boiling water for a period of 1 hour. Remove and examine for conformance with requirements specified in 3.3.7.3.

4.5.4.2 Acid test. Completely submerge one label in 10 percent (by volume) acetic acid solution at 75° to 80°F for 1 hour. Remove and examine for conformance with requirements specified in 3.3.7.3.

5. PACKAGING

5.1 Preservation. Preservation shall be level A or Commercial, as specified (see 6.2).

5.1.1 Level A preservation. Each apron shall be laid out flat, front down. The sleeves shall be folded at right angles across the back one on top of the other. The apron edges shall be adjusted by overlapping as necessary in order to attain the desired width dimension of 25 inches. The apron shall be folded to one third the length to measure 14 inches. Prior to folding the apron in thirds, the hem shall be turned over sufficiently so that the specified dimension is accomplished. The completely folded apron shall measure approximately 25 inches by 14 inches. Each folded apron shall be inserted in a snug-fitting flat or square style clear polyethylene film bag conforming to A-A-50083. Prior to or during the heat sealing operation, excess air shall be expelled to the extent necessary to ensure that the bagged apron will fit into the paperboard box. One bagged apron shall be unit packed in a folding paperboard box conforming to variety 1, style III, type G, class i, group I of PPP-B-566; or setup paperboard box conforming to type I, variety 1, class A, style 4 of PPP-B-676. Inside dimensions of each paperboard box shall be 25 inches in length, 14 inches in width, and 1 1/4 inches in depth. Box closure shall be secured with 2-inch minimum width gummed paper tape conforming to type III, grade B of PPP-T-45. As an alternative, the unit pack container may be style OPF, type CF or SF, class domestic, grade 125 of PPP-B-636 with the same dimensions established for the setup type container. Method of closure shall be in accordance with the appendix of PPP-B-636.

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5.1.2 Commercial preservation. Aprons shall be preserved in accordance with ASTM D 3951.

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

5.2.1 Level A packing. Ten aprons of one size only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC, grade V2s of PPP-B-636. Level A unit packs shall be packed flat ten in depth within the shipping container. Inside dimensions of each shipping container shall be approximately 25-3/4 inches in length, 14-3/4 inches in width, and 13-3/4 inches in depth. Approximate dimensions are furnished as a guide only. Each shipping container shall be closed in accordance with method III, waterproofed in accordance with method V, and reinforced as specified in the appendix of PPP-B-636, except that the inspection shall be in accordance with 4.4.6. Shipping containers shall be arranged in unit loads in accordance with MIL-L-35078 for the type and class of load specified (see 6.2). Strapping shall be limited to nonmetallic strapping, except for type II, class F loads.

5.2.2 Level B packing. Ten aprons of one size only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC, type CF (variety SW) or SF, class domestic, grade 275 of PPP-B-636. Level A unit packs shall be packed flat ten in depth within the shipping container. Inside dimensions of each shipping container shall be approximately 25-3/4 inches in length, 14-3/4 inches in width, and 13-3/4 inches in depth. Approximate dimensions are furnished as a guide only. Each shipping container shall be closed in accordance with method II as specified in the appendix of PPP-B-636, except that the inspection shall be in accordance with 4.4.6.

5.2.2.1 Weather-resistant fiberboard container. When specified (see 6.2), the shipping container shall be a grade V3c, V3s, or V4s fiberboard box fabricated in accordance with PPP-B-636 and closed in accordance with method III as specified in the appendix of PPP-B-636, except that the inspection shall be in accordance with 4.4.6.

5.2.3 Commercial packing. Aprons, preserved as specified in 5.1, shall be packed in accordance with ASTM D 3951.

5.3 Palletization. When specified (see 6.2), aprons, packed as specified in 5.2.2 or 5.2.3, shall be palletized on a 4-way entry pallet in accordance with load type Ia of MIL-STD-147. Pallet type shall be type I (4-way entry), type IV, or type V in accordance with MIL-STD-147. Pallets shall be fabricated from wood groups I, II, III, or IV of MIL-STD-731. Each prepared load shall be bonded with primary and secondary straps in accordance with bonding means C and D or film bonding means F or G. Pallet pattern shall be number 6 in accordance with the appendix of MIL-STD-147.

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5.4 Marking. In addition to any special marking required by the contract or purchase order, unit packs, shipping containers, and palletized unit loads shall be marked in accordance with MIL-STD-129 or ASTM D 3951, as applicable.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The apron is for use in the Kit, Gas Casualty Treatment, M-2, and related assemblies.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Size required (see 1.2).
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1. and 2.2).
- d. When a first article is required (see 3.1, 4.3 and 6.3).
- e. Availability of sample apron and patterns (see 3.2 and 3.5.1).
- f. Levels of preservation and packing (see 5.1 and 5.2).
- g. Type and class of unit load required (see 5.2.1).
- h. When weather-resistant grade fiberboard shipping containers are required for level B packing (see 5.2.2.1).
- i. When palletization is required (see 5.3).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should include specific instructions in all acquisition instruments regarding arrangements for selection, inspection, and approval of the first article.

6.4 Guide sample. For access to samples, address the contracting activity issuing the invitation for bids.

6.5 Subject term (key word) listing.

Gas casualty treatment
Protection

6.6 Changes from previous issue. Marginal notations 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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Custodians:

Army - GL
Navy - NU
Air Force - 11

Preparing activity:

Army - GL
(Project 8415-0759)

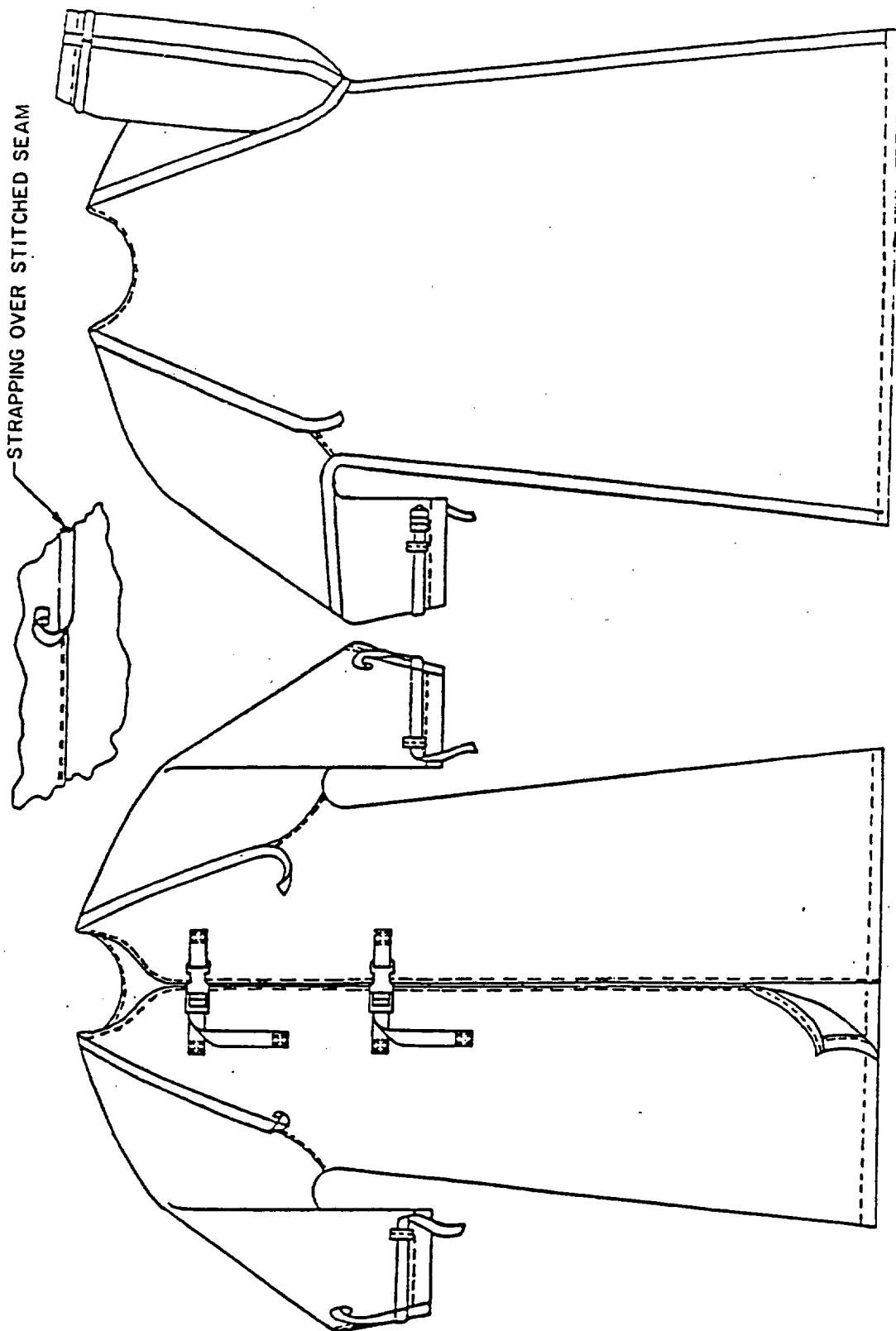
Review activities:

Army - MD
Air Force - 82, 99
DLA - CT

User activities:

Navy - MC, AS
Air Force - 45

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FRONT

BACK

FIGURE 1. APRON, TOXICOLOGICAL AGENTS, PROTECTIVE, M-2