

INCH-POUND

MIL-U-44435 (GL)

16 April 1992

MILITARY SPECIFICATION

UNDERWEAR, CHEMICAL PROTECTIVE, TWO PIECE

(UNDERSHIRT AND DRAWERS)

This specification is approved for use by the Natick Research, Development, and Engineering Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers underwear (undershirt and drawers) for 12 hours of protection against chemical warfare agents for a periods up to 15 days. This is a special purpose Life Support Clothing and Equipment (LSC&E) item. All Government administrative and surveillance procedures applicable to LSC&E items shall be invoked in accordance with the contract or purchase order (see 6.2).

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

<u>Undershirt</u>		<u>Drawers</u>	
<u>Chest size schedule</u>		<u>Waist size schedule</u>	
32	34	26	28
36	38	30	32
40	42	34	36
44	46	38	40
	48		42

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.

AMSC N/A

FSC 8415

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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).

SPECIFICATIONS

FEDERAL

- A-A-50199 - Thread, Polyester Core, Cotton- or Polyester-Covered
- A-A-52095 - Thread, Polyester, Textured
- V-F-106 - Fasteners, Slide, Interlocking
- DDD-L-20 - Label: For Clothing, Equipage, and Tentage, (General Use)
- PPP-B-636 - Boxes, Shipping Fiberboard
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes

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- MIL-D-3464 - Desiccants, Activated, Bagged, Packaging Use and Static Dehumidification
- MIL-T-5038 - Tape, Textile, And Webbing, Textile, Reinforcing, Nylon
- MIL-F-21840 - Fastener Tapes, Hook and Loop, Synthetic
- MIL-L-35078 - Loads, Unit: Preparation of Semiperishable Subsistence Items; Clothing, Personal Equipment, Equipage; General Specification For
- MIL-B-44433 - Bag, Barrier, Multi-layer Film

STANDARDS

FEDERAL

- FED-STD-101 - Test Procedures for Packaging Materials
- FED-STD-191 - Textile Test Methods
- FED-STD-751 - Stitches, Seams, and Stitchings

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

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- MIL-STD-129 - Marking for Shipment and Storage
 MIL-STD-147 - Palletized Unit Loads

(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.)

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)

ASTM D 5035 - Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Force)

ASTM F 88 - Standard Test Method for Seal Strength of Flexible Barrier Material

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

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 Body material. The basic cloth for the underwear shall conform, or equal to DuPont Part No. LANX I.

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3.3.2 Lining fabric (see 6.8). The lining fabric for top collar, front flap, underarm and crotch shall be nylon/lycra tricot fabric. The lining fabric shall be dyed black and shall conform to the requirements in table I when tested as specified in 4.4.1.1.

TABLE I. Lining fabric physical characteristics

Weight	4.2 to 4.6 ounces per square yard
Breaking strength:	
Wale direction	13 pounds, minimum
Course direction	25 pounds, minimum
Breaking elongation	
Wale direction	350 percent minimum
Course direction	150 percent minimum

3.3.3 Thread. The thread for seaming and stitching shall conform to sizes Tex 45-50 (T-50) and size Tex 35 (T-35) of A-A-52095 and to type 1 or 2, size 50/2 and 70/2 of A-A-50199, as specified in table III. The thread shall be dyed black.

3.3.4 Slide fastener. The slide fastener shall be a continuous monofilament chain, type IV, style 8, size M, with long pull tab, and 11 inch heat cut thong conforming to V-F-106, except the tape shall be $9/16 \pm 1/32$ inch wide and water repellent treated. The color including chain, tape, slider, and thong shall be black. The pin and box shall be metal. The length of the slide fastener shall correspond to the undershirt size as listed below.

<u>Undershirt size</u>	<u>Slide fastener length (inches)</u>
32	27
34	27 3/4
36	28 1/2
38	29 1/4
40	30
42	30 3/4
44	31 1/2
46	32 1/4
48	33

3.3.5 Fastener tape. The 1-inch and 2-inch wide synthetic fastener tapes (hook and loop) shall conform to type I or type II, class 1, color black of MIL-F-21840.

3.3.6 Nylon reinforcing textile tape. The black nylon reinforcing textile tape for the bartack at sleeve vents shall conform to type III, any class, 3/8 or 1/2 inch width of MIL-T-5038.

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3.3.7 Elastic webbing. The elastic webbing for making the waistband shall be a woven, knitted, or braided textured polyester webbing conforming to the requirements listed below. The color of the polyester webbing shall be black.

<u>Characteristic</u>	<u>Requirement</u>
Width	1 1/4 ± 1/16 inches
Weight	0.55 (min) ounces per linear yard
Elastic ends	17 (min)
Picks per inch	36 (min)
Warp ends	17 (min)

3.3.8 Labels. Each component (undershirt and drawers) shall have a combination identification/size/instruction label conforming to type VI, class 14 of DDD-L-20 except that the surveillance marking requirement for the body material (see 6.6) shall appear under the last line of inscription on the label. The surveillance marking may be hand printed or stamped. Size of the characters for the surveillance marking shall be a minimum of ten points.

For the undershirt, all required information shall be printed on one side and attached to the protective flap as specified in operation 6b of table III.

For the drawers, the size and identification information shall be printed on the top portion of the label and the care instructions below the size and identification information such that spacing is allowed for the label to be folded (fold-line not through printing), spacing for the bottom of the label to be caught by stitching when attaching it to the waistband (stitching not through printing) as specified in operation 15 of table III, that is the care instructions are right side up when the drawers label is turned over.

The label shall include the following care instructions:

CHEMICAL PROTECTIVE UNDERWEAR

CARE INSTRUCTIONS

a. Field/post laundry: The chemical protective underwear (CPU) shall be laundered utilizing Formula II of FM 10-280 or Post laundered using Formula IV of "Natick Formulas". Tumble dry not to exceed 120°F. Remove immediately.

b. Machine (home)/hand laundering: Use permanent press wash cycle, or hand wash using warm water (90-110°F) and mild laundry detergent. Tumble dry, medium temperature setting. Remove immediately. Drip dry on rust proof hanger.

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DO NOT LAUNDRER THE CPU MORE THAN ONCEDO NOT STARCH/BLEACH/DRY CLEAN/STEAM PRESSWARNING: CPU IS NOT FLAME RETARDANT

DO NOT REMOVE THIS LABEL

3.3.9 Instruction sheet for donning the underwear. Each unit pack of drawers shall be furnished with a 8-1/2 by 11 inches instruction sheet placed inside the packaging. The instruction sheet shall be printed on white bonded paper. The contents and printing of the instruction sheet shall be in accordance with figure 1.

3.4 Design.

3.4.1 Undershirt. The undershirt shall have long sleeves with adjustable hook and loop closures, a front slide fastener closure with an inside protective flap and a collar that converts to a turtleneck when the slide fastener is closed completely. The underarms shall be lined with underarm shields (see figure 2).

3.4.2 Drawers. The drawers shall be full length with an elastic waist. The inside back and front crotch shall be lined with a crotch shield (see figure 3).

3.5 Patterns. Standard patterns which show size, directional lines, placement marks, notches for assembly and seam allowance unless otherwise specified will be furnished by the Government. The Government patterns shall not be altered in any way and shall be used as a guide for cutting the working patterns.

NOTE: The seam allowances for patterns shall be as follows:

Type 607 stitch - 1/2 inch (includes 3/8 inch allowed for trimming).
 Sleeve setting
 (to armhole) - 1/2 inch (includes 1/4 inch allowed for trimming).
 All other seams - 1/4 inch.

3.5.1 List of pattern parts. The component parts of the underwear shall be cut from the materials specified in accordance with table II and in accordance with the number of cut parts required for the manufacturing process.

TABLE II. Pattern parts

<u>Material</u>	<u>Pattern nomenclature</u>	<u>Cut parts</u>
LANX I body material	<u>Undershirt:</u> Body	1

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TABLE II. Pattern parts (cont'd)

<u>Material</u>	<u>Pattern nomenclature</u>	<u>Cut parts</u>
LANX I body material	<u>Undershirt:</u> (cont'd)	
	Sleeve	2
	Under collar	1
	Front flap	1
LANX I body material	<u>Drawers:</u>	
	Leg	2
Nylon/Lycra tricot	<u>Undershirt:</u>	
	Top collar	1
	Flap	1
	Underarm shield	2
	Front sleeve shield	2
	Back sleeve shield	2
Nylon/Lycra tricot	<u>Drawers:</u>	
	Front crotch shield	1
	Back crotch shield	1
Elastic webbing	Waistband	1
Fastener tape	<u>Undershirt:</u>	
	<u>Sleeve:</u>	
	1 inch loop	2
	2 inch hook left	1
	2 inch hook right	1

3.6 Construction. The construction shall conform in all respects to the requirements specified in table III and herein. Figures 2 and 3 are furnished solely for guidance and information. Should variation from the specification appear in figure 2 or 3, the specification shall govern.

3.6.1 Stitches, seams, and stitchings. Stitches, seams, and stitching types specified in table III shall conform to FED-STD-751. Whenever two or more methods, seams, or stitches are given for the same part of an operation, any one of them may be used. Seam allowances shall be maintained with seam sewn so that no raw edges, run-offs, pleats, puckers, or open seams occur. Ends of all stitching when not caught in other seams or stitching shall be backstitched not less than 1/2 inch. Thread tension shall be maintained so there will be no loose stitching resulting in a loose bottom or top thread or no excessively tight stitching resulting in puckering of the materials sewn. The minimum and maximum number of stitches per inch shall be as specified in table III.

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3.6.2 Repair of stitching.

a. When thread breaks or bobbin run-outs occur during sewing for stitch types 301 and 304, the stitching shall be repaired by restarting a minimum of 1/2 inch back of the end of the stitching.

b. Repairs of types 607 and 504/406 combination shall be made with a type 304 stitch.

c. Thread breaks (all stitch types) or two or more consecutive skipped or run-off stitches noted during inspection 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 tight stitching shall be repaired by removing the defective stitching without damaging the material and restitching in the required manner. The ends of stitching are not required to be backstitched when making the above repairs.

3.6.3 Types 304, 504, and 406 stitching. Type 304 seam shall be maintained to provide a zigzag pattern width of 1/8 to 3/16 inch on the armshield and crotch piece components. The gage of the overedge stitching (type 504/406) shall be $3/16 \pm 1/16$ inch. The guide knives for the overedge machines shall be set to trim only raw edge of material. The seam allowance of the type 504/406 stitch joining seam shall be finished towards the outside of the underwear.

3.6.4 Type 607 stitching. Type 607 (flat lock), a six thread (four needle, one looper, one cover) flatseam stitch. The seam shall be $3/16 \pm 1/16$ inch wide and lapped such that a minimum of one needle penetrates through both the top and bottom layer of lap to provide for a flat even seam.

3.6.5 Bartacking. Bartacking shall be $5/8 \pm 3/16$ inch long, $1/8 \pm 1/32$ inch wide and shall contain 42 stitches nominal. Bartacks shall be free from thread breaks and loose stitching. Bartacking reinforcement material shall be as specified in 3.3.6.

3.7 Manufacturing operations requirements. The underwear (undershirt and drawers) shall be manufactured in accordance with all operations specified in table III. The contractor is not required to follow the exact sequence of operations.

NOTE: Sewing machines should use the smallest possible ball point needles and set up so as to avoid needle cutting of the body material.

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NO.	TABLE III. MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD	
					NEEDLE	BOBBIN/ LOOPER COVER
1.	<p><u>Cut under shirts and drawers.</u></p> <p>a. The under shirts and drawers shall be cut in strict accordance with the patterns. All component parts shall be cut lengthwise in the machine direction unless otherwise indicated on patterns. The wale or rib surface of material shall face the inside of the garments.</p> <p>NOTE: This material has a significant amount of stretch and surface friction. Special care needs to be utilized to insure that this material is not cut under any tension.</p> <p>b. Cut the collar lining, flap lining, crotch, and underarm shields in strict accordance with the patterns.</p> <p>c. Cut the hook and loop portions of fastener tape in accordance with the pattern pieces.</p> <p>d. Cut waist elastic for drawers in accordance with the pattern piece.</p> <p>e. Cut nylon reinforcing textile tape $2 \pm 1/8$ inches.</p>					
2.	<p><u>Replacement of damaged parts.</u></p> <p>Care shall be exercised during the spreading, cutting and manufacturing operations to assure that material defects and damages as classified in table VII are excluded and replaced with non-defective material.</p>					

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NO.	TABLE III. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD	
					NEEDLE	BOBBIN/ LOOPER COVER
3.	<p><u>Marking.</u></p> <p>a. Mark or bundle cut parts of the undershirt and drawers to insure a uniform size, uniformity of shade, and proper assembly throughout fabrication.</p> <p>b. Any method of marking may be used except:</p> <p>(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.</p> <p>UNDERSHIRTS</p>					
4.	<p><u>Attach underarm shields.</u></p> <p>a. Place shields on sleeve and undershirt at underarm to finish on the inside of the garment as indicated by marks on pattern and stitch the outer edges of the corresponding underwear part.</p> <p>NOTE: Threads, size tex 45-50 (50s) and size tex 35 (70s) are interchangeable except for stitch type 607.</p> <p>b. Zig-zag stitch the curved edges of the shields to the undershirt. The raw edge of the shield shall be covered by the stitching.</p>	301	SSa-1	10-14	50/2	50/2 or 70/2
		304	LSbj-1	10-14	50/2	50/2 or 70/2

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NO.	MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD	
					NEEDLE	BOBBIN/ LOOPER COVER
	UNDERSHIRTS (cont'd)					
5.	<u>Make collar.</u> With top and under collars face to face, stitch together along top collar edge only.	301	SSa-1	10-14	50/2	50/2 or 70/2
6.	<u>Make protective flap and attach label.</u> a. Place front flap and flap lining face to face and stitch along top, one side and bottom. Turn, force out corners and raise stitch 3/16 to 1/4 inch from edge. NOTE: Lining fabric faces the body. Pre-stitch the flap prior stitch operation may be used to stabilize to sewing. b. Position the label on the inside portion of the front flap (as worn) and stitch on all four sides. Stitching shall not be thru the printing. The label bottom shall be positioned 1/2 inch nominal from the finished flap bottom edge. NOTE: Stitching may go thru all layers of garment.	301	SSE-2(a)	10-14	50/2	50/2 or 70/2
7.	<u>Make sleeves.</u> a. Overedge stitch bottom raw edge of sleeve and sleeve vent.	504	EFa-1	10-14	50/2	50/2 or 70/2 or T-50

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NO.	TABLE III. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD	
					NEEDLE	BOBBIN/ LOOPER COVER
7.	<p>UNDERSHIRTS (cont'd)</p> <p><u>Make sleeves.</u> (cont'd)</p> <p>b. Position the material back to back, join sleeve inseam from top of wrist opening to underarm catching edges of underarm shield in seam.</p> <p>NOTE: Stitches per inch is 8-12 typical for all type 607 stitch operations.</p> <p>c. Turn up bottom of sleeve 1 + 1/8, -0 inch and hem with a double row of stitching having a 1/4 + 1/16, -0 inch gage between the rows.</p> <p>d. Position hook and loop fastener tapes on sleeve opening edges. The fastener tapes shall start at the top of the wrist opening and finish on the bottom turn-up. Stitch all four sides 1/16 to 1/8 inch from edge.</p> <p>NOTE: The previously overedged vent edge shall be turned back 3/8 inch and caught under the hook and loop fastener tape during tape stitching.</p> <p>e. Position reinforcement material on inside of wrist opening at underarm seam. Fold top edge of the tape over (approximately 45 degrees) and bartack. Place a 3/8 inch bartack on each side of the wrist seam. Bartacks shall be at an approximate 45 degrees to the seam opening. Bartacks may catch the fastener tape and raw edge of wrist opening seam.</p>	607	FSa-1	8-12	T-50 OR T-35	
		406	EFa-2	10-14	70/2 OR T-35	
		301	ISbj-1	10-14	50/2	
		Bartack		42 stitches nominal bartack	50/2	50/2

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NO.	TABLE III. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD		
					NEEDLE	BOBBIN/ LOOPER	COVER
8.	<p><u>Join shoulder seams.</u></p> <p>Position the material back to back, join shoulder seams.</p>	607	FSa-1	8-12	T-50	T-50 or T-35	T-50 or T-35
9.	<p><u>Set slide fastener, protective flap and collar.</u></p> <p>a. Seam undercollar to neck of undershirt. The collar ends shall finish even with the edges of the undershirt front opening.</p> <p>b. Position back edge of slide fastener tape even with raw edges of front opening and undercollar, with stops even with the top edge of the collar, +0, -1/8 inch. Fold top collar over slide fastener tape and undercollar. Turn under ends of slide fastener tape and stitch to front edges and collars, catching protective flap in the right side stitching only. The top edge of protective flap shall finish even with the collar joining seam.</p> <p>c. Turn undercollar to finished position and force out corners. Turn in bottom edge of top collar and stitch to neck of undershirt 1/16 to 1/8 inch from edge, with the stitching not more than 1/8 inch from undercollar joining seam.</p> <p>d. With slide fastener tape turned to inside of shirt, turn up hem allowance and top stitch 1/4 inch from turned edge. Stitching shall start at base of</p>	301 504 301	SSa-1 SSa-1 ISb-1	10-14 10-14 10-14	50/2 50/2 50/2 or 70/2	50/2 or 70/2 50/2 or 70/2	50/2 or 70/2

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NO.	TABLE III. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD	
					NEEDLE	BOBBIN, LOOPER COVER
	UNDERSHIRTS (cont'd)					
9.	<u>Set slide fastener, protective flap and collar.</u> (cont'd) left side opening (as worn), continuing around collar edges and down right side. The protective flap shall extend out beyond the slide fastener.	504 and 406	SSa-1 SSh-2	10-14 10-14	50/2 70/2 or T-50 70/2 or T-35	
10.	<u>Set sleeves.</u> Join sleeve to shirt armhole position the material back to back. Spread seam flat, and cover stitch seam.					
11.	<u>Hem undershirt.</u> a. Overedge bottom of shirt. b. Turn up bottom of shirt 1 + 1/8 inch and stitch with a double row of stitching having a 1/4 + 1/16, -0 inch gage between the rows. The double row of stitching shall start and terminate on the slide fastener joining seam.	504 406	EFD-1 EFA-2	10-14 10-12	50/2 70/2 or T-50 70/2 or T-35	

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NO.	TABLE III. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD		
					NEEDLE	BOBBIN/ LOOPER	COVER
12.	DRAWERS <u>Attach crotch shields.</u> a. Place shields on front, back and legs at crotch to finish on inside of drawers, as indicated by pattern marks. Stitch the outer edges of shield to the corresponding drawers part. b. Zig-zag stitch the curved edges of the shields to the drawers. The raw edge of the shield shall be covered by the stitching.	301	SSa-1	10-14	50/2	50/2 or 70/2	
		304	ISbj-1	10-14	50/2	50/2 or 70/2	
13.	<u>Join front and back seams.</u> a. Position the material back to back, join front seam catching edges of crotch shield in seam. b. Position the material back to back, join back seam catching edges of crotch shield in seam.	607	FSa-1	8-12	T-50	T-50 or T-35	T-50 or T-35
		607	FSa-1	8-12	T-50	T-50 or T-35	T-50 or T-35
14.	<u>Join inseam.</u> Position the material back to back, join inseam catching edges of crotch shield in seam.	607	FSa-1	8-12	T-50	T-50 or T-35	T-50 or T-35
		606 or 607	FSa-1	10-14	50/2 or T-50	70/2 or T-35	
15.	<u>Attach waistband and set label.</u> a. Overlap ends of waistband and stitch across the full width of the waistband webbing.	606 or 607	FSa-1	10-14	50/2 or T-50	70/2 or T-35	

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NO.	TABLE III. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD		
					NEEDLE	BOBBIN/ LOOPER COVER	
15.	<p><u>DRAWERS</u> (cont'd)</p> <p><u>Attach waistband and set label.</u> (cont'd)</p> <p>b. Stitch webbing to drawers with the overlap on the back seam. The webbing shall overlap the top edge of drawers by $3/8 \pm 1/8$ inch.</p> <p style="text-align: center;"><u>OR</u></p> <p>c. Position webbing on drawers with the overlap on the back seam and stitch with a double row of stitching having a 5/16 inch gage. The webbing shall overlap the drawers by $3/8 \pm 1/8$ inch.</p> <p>d. Fold bottom of label under (with fold shall be in between the printed lines) and center label over the webbing seam (inside center back). Align top edge of label with top edge of the waistband and stitch on all four sides, catching the size and identification information in stitching. The remainder of the label shall hang free. The stitching shall not be thru the printing.</p>	604 or 607	LSa-1	8-12	T-50	T-50 or T-35	T-50 or T-35
		406	LSa-1	10-12	70/2 or T-35	50/2 or T-35	
		301	LSbj-1	10-14	50/2 or 70/2	50/2 or 70/2	
16.	<p>a. <u>Overedge</u> bottom of legs.</p>	504	EFd-1	10-14	50/2	50/2 or 70/2 or T-50	

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NO.	TABLE III. (cont'd) MANUFACTURING OPERATIONS REQUIREMENTS	STITCH TYPE	SEAM AND STITCHING TYPE	STITCHES PER INCH	THREAD	
					NEEDLE	BOBBIN/ LOOPER COVER
16.	<p>DRAWERS (cont'd)</p> <p><u>Hem legs.</u> (cont'd)</p> <p>b. Turn up leg bottom $5/8 \pm 1/8$ inch and stitch with a double row of stitching with a 5/16 inch gage.</p>	406	EFa-2	10-12	70/2 OR T-35	70/2 OR T-35
17.	<p><u>Clean undershirt and drawers.</u></p> <p>Trim all ends of stitching to 3/8 inch maximum length throughout and remove loose threads.</p>					

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3.8 Finished measurements. The finished measurements shall be as shown in tables IV and V.

TABLE IV. Undershirt finished measurements (inches)

Size	One half chest 1/	Back length 2/	Sleeve length 3/	One half neck 4/
32	14 1/2	26 1/4	18	8
34	15 1/2	27	18 1/2	8 1/4
36	16 1/2	27 3/4	19	8 1/2
38	17 1/2	28 1/2	19 1/2	8 3/4
40	18 1/2	29 1/4	20	9
42	19 1/2	30	20 1/2	9 1/4
44	20 1/2	30 3/4	21	9 1/2
46	21 1/2	31 1/2	21 1/2	9 3/4
48	22 1/2	32 1/4	22	10
Tolerance	+1/2 -1/2	+3/4 -1/2	+1/2 -1/2	+1/4 -1/4

1/ With slide fastener closed, measure at base of armhole from folded edge to folded edge.

2/ Measure along center back from collar seam to bottom of undershirt.

3/ Measure along underarm seam from bottom of armhole to sleeve cuff.

4/ With slide fastener closed, measure from folded edge to folded edge.

NOTE: All measurements shall be taken with the undershirt laid out flat and under no tension.

TABLE V. Drawers finished measurements (inches)

Size	One half waist 1/	Inseam 2/	One half leg bottom width 3/
26	11 1/2	27	5
28	12	27 1/2	5 1/8
30	12 1/2	28	5 1/4
32	13	28 1/2	5 3/8
34	13 1/2	29	5 1/2
36	14	29 1/2	5 5/8
38	14 1/2	30	5 3/4
40	15	30 1/2	5 7/8
42	15 1/2	31	6

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TABLE V. Drawers finished measurements (inches) (cont'd)

Size	One half waist 1/	Inseam 2/	One half leg bottom width 3/
Tolerance	+1/2 -1/2	+1/2 -1/2	+1/4 -1/4

1/ Measure along center of waistband from front seam to back seam assuring that the top edges of the elastic webbing are aligned.

2/ Measure inseam of drawers from crotch seam to bottom edge of drawers.

3/ Measure width of leg at hem from folded edge to folded edge cuff.

NOTE: All measurements shall be taken with the drawers laid out flat with no smoothing of the fabric and under no tension.

3.9 Carbon tetrachloride absorption. The carbon tetrachloride absorption of the body material in the end item shall show no individual sample result less than 1.8 mg/cm², when tested in accordance with 4.4.5.

3.10 Workmanship. The finished underwear shall conform to the quality of product established by this specification and the occurrence of defects shall not exceed the applicable acceptable quality levels. Utmost care shall be taken during the underwear fabrication to ensure quality workmanship and safety of the service person using the item.

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 the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall 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

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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 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 Classification of inspection. 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 as required in 4.4.5.

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.

4.4.1.1 Component testing. In addition to the quality assurance provisions of the reference documents, components and materials listed in 3.3.2 shall be tested for the characteristics shown in table VI. The methods of testing specified in FED-STD-191 wherever applicable and as specified herein shall be followed. All test reports shall contain the individual values utilized in expressing the final result. The inspection level shall be S-1. The lot shall be unacceptable if one of more sample units fail to meet any requirement specified.

TABLE VI. Component tests

Characteristic	Requirement	Test method
Lining fabric: Type of knit	3.3.2	Visual

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TABLE VI. Component tests (cont'd)

Characteristic	Requirement	Test method
Lining fabric: (cont'd)		
Weight (oz per sq yd)	3.3.2	5041 of FED-STD-191
Breaking strength	3.3.2	ASTM D 5035
Breaking elongation	3.3.2	ASTM D 5035

4.4.1.2 Component and material certification. A certificate of compliance may be acceptable as evidence that the elastic webbing conforms to the requirements specified in 3.3.7.

4.4.2 End item critical defect examination. Prior to performing the end item sampling examination required in 4.4.3, the underwear shall be 100 percent examined for the critical defects listed in table VIII. This 100 percent critical defect examination shall become a part of the contractor's inspection system or quality program.

4.4.3 End item visual examination. The underwear shall be examined for the defects listed in table VII. The lot size shall be expressed in units of underwear. The sample unit shall be one underwear. The inspection level shall be II and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 1.5 for major defects and shall be 4.0 for combined major and minor defects. The finding of one or more critical defects shall be cause for rejection of the lot.

TABLE VII. End item visual defects

Examine	Defect	Classification		
		Critical	Major	Minor
Material defects	Any hole, cut, tear, or delamination	1		
	Imbedded matter greater than 1/4 inch in diameter		101	
	Lump greater than 1/2 inch in diameter			201
	Permanent set-in crease or wrinkle		102	
	Excessive coating, coating bands or stop marks		103	
	Any spot or stain greater than 1 inch			202
	Material puckered			203
	Abrasion mark which extends partially through material or thin place	2		

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

Examine	Defect	Classification			
		Critical	Major	Minor	
Seams and stitching	Needle chew and/or needle cutting <u>1</u> / Loose or tight tension over 1/2 inch	3			
	Loose or tight tension 1/4 to 1/2 inch		104		
	For 607 stitch - cover stitch or bottom looper missing: - more than 1/2 inch - up to 1/2 inch	4		204	
	End of stitching when not caught in another seam or stitching not backstitched or any part of underwear badly pleated, caught or twisted in any unrelated row of stitching			106	
	Broken stitch not repaired as specified			205	
	Wrong seam type	5			
	Wrong stitch type	6			
	Stitches per inch - more or less than specified			107	
	Open seam: - Any broken stitches or continuous skipped or runoff stitches more than 1/4 inch - Any broken stitches or continuous skipped or runoff stitches up to 1/4 inch	7		108	
	Raw edge 1/2 inch or more in length			206	
	<u>1</u> / Needle cutting occurs when a seam is physically cut or ravel back when the body material is slightly pulled perpendicular to the seam (including bartack stitching).				
	Slide fastener	Any part of slide fastener defective affecting function	8		
		Thong not attached as specified			207
Fastener tape cut or torn			109		
	Fastener tape puckered			208	

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

Examine	Defect	Classification		
		Critical	Major	Minor
Slide fastener (cont'd)	NOTE: The slide fastener shall be fully closed and opened to determine if the slide fastener is operable.			
Operation	Any operation omitted, improperly performed		110	
Components	Any component part missing, or other than specified		111	
Cleanliness	Any spot, dirt, or stain (grease, oil, ink, etc.) greater than 1 inch			209
	Five or more thread ends of more than 3/8 inch			210
	Two or more in-process tickets or loose threads not removed			211
	NOTE: Stains attributed to charcoal content should not be scored.			

4.4.4 End item dimensional examination. The end items shall be examined for conformance to dimensions specified in tables IV and V. Any dimension deviation from the specified requirement and tolerance shall be classified as a defect. The lot size shall be expressed in units of undershirts and drawers. The sample unit shall be one underwear. The inspection level shall be S-2 and AQL, expressed in terms of defects per hundred units, shall be 4.0.

4.4.5 End item testing. Samples of the undershirt and drawers shall be submitted to the Government for acceptance testing for the characteristic specified in table VIII (see 6.9). The lot size shall be expressed in units of undershirts and drawers. The sample unit shall be one undershirt or drawers. Any test failure shall be cause for rejection of the lot. The inspection level shall be S-1. Any failure shall result in rejection of the lot.

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TABLE VIII. End item testing

Characteristic	Requirement paragraph	Test method	No. of determinations per sample unit	Results reported to nearest
Carbon tetra-chloride absorption	3.9	<u>1</u> /	4 <u>2</u> /	0.1 mg/cm ²

1/ The test procedure shall be as specified in 4.5.1, except that the test samples shall be conditioned in an air circulating oven at 50°C for at least 3 hours and that no individual sample determination shall be less than 1.8 mg/cm².

2/ A sample of seamless chemical protective underwear (CPU) material shall be taken from an area adjacent to each of the following areas of the undershirt and drawers:

Undershirt a. Adjacent to the underarm including sleeve, side and armhole seams. (Do not take sample from the sleeve).

b. Adjacent to the top of shoulder including shoulder, armhole and sleeve seams. (Do not take sample from the sleeve.)

Drawers a. Adjacent to the crotch including crotch, seat, and inseams.

b. Adjacent to the side seam midway between the top of the waist and top of the knee.

4.4.6 Packaging examination.

4.4.6.1 Packaging examination. Each filled and sealed unit pack shall be examined for the defects listed below. The finding of any defect shall be cause for rejection of the unit pack. Underwear from rejected unit packs (except for damaged items) may be repacked as specified in 5.1.1 and resubmitted for examination.

Defect

Closure seal width not as specified

Tear, cut, or hole in unit pack

Closure seal not continuous

Underwear damaged by heat seal

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4.4.6.2 Seam strength test. Filled and sealed unit packs shall be tested as specified in 4.5.3 for conformance to closure seam strength required in 5.1.1.1. Lot size shall be expressed in unit packs. The sample unit shall be one unit pack. The inspection level shall be S-2. Any failure shall result in rejection of the lot.

4.4.6.3 Unit pack leakage test. One out of every ten filled and sealed unit packs, prior to packaging as specified in 5.2, shall be tested as specified in 4.5.2 for conformance to the leakage requirements in 5.1.1.1. Any failure shall result in the rejection of the lot. Any unit pack which fails the test in 4.5.2 shall be opened and the underwear shall be removed, thoroughly dried, repacked as specified in 5.1.1.1, and retested as above.

4.4.6.4 Unit pack volume testing. The filled and sealed unit packs shall be tested as specified in 4.5.4 for conformance to volume requirements in 5.1.1.1. The lot size shall be expressed in finished packed units. The sample unit shall be one unit pack. The inspection level shall be S-2. Any failure shall result in the rejection of the lot.

4.4.6.5 Shipping container 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)	Omitted, incorrect, illegible or improper size, location, sequence, or method of application
Material	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 Inside dimensions of container not as specified
Contents	Number of unit packs per container less than required Size shown on one or more unit packs not as specified on container <u>1/</u>

1/ For this defect, one unit pack from each container in the sample shall be examined.

4.4.6.6 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

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palletized unit load, fully packaged. The inspection level shall be S-1 and 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 Loads not bonded as specified
Weight	Exceeds maximum load limits
Marking	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application

4.5 Methods of inspection.

4.5.1 Carbon tetrachloride adsorption.

4.5.1.1 Apparatus and reagents.

4.5.1.1.1 Vapor generator. Any apparatus can be used that generates a carbon tetrachloride/nitrogen gas mixture which contains 4 to 6mg of carbon tetrachloride per minute. Once established, the rate is maintained at ± 0.5 mg/minute.

4.5.1.1.2 Diluent. Prepurified nitrogen shall be used as the diluent gas for the concentrated carbon tetrachloride vapor generated. The total flow rate of 0.9 to 1.1 liter/minute through each test cup must be maintained at ± 0.03 liter/minute. The rate of flow can be controlled by use of a critical orifice or other suitable flow controlling device.

4.5.1.1.3 Constant temperature cabinet. The constant temperature cabinet shall be large enough to hold the system, as shown on figure 5, and shall be capable of maintaining a temperature of $32^{\circ} \pm 1^{\circ}\text{C}$ at the distribution manifold and $32^{\circ} \pm 2^{\circ}\text{C}$ at the sample cups.

4.5.1.1.4 Fabric sample cup. The fabric sample cup shall conform to the requirements shown on figure 6.

4.5.1.1.5 Flat elastomer ring. Each sample holder cup requires three rings to prevent seal leakage. Rings are cut from neoprene or butyl rubber sheet of 30 mil thickness with 40-50 Shore "A" hardness. Prepare two rings 13.80 cm OD X 11.28 cm ID and one ring 13.80 cm OD X 12.70 cm ID for each sample cup.

4.5.1.1.6 Pyrolyzer. The platinum pyrolyzer shall conform to the requirements shown on figure 7. The pyrolyzer is used between the outlet of

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the sample cup and the inlet of the "break point" indicator bubbler. It is heated by applying 10 volts AC across the terminals during the test.

4.5.1.1.7 Bubbler. The bubbler shall conform to the requirements shown on figure 8.

4.5.1.1.8 Schwartz-type drying tube. The tube shall be filled with activated charcoal as specified in 4.5.1.1.9, loosely packed as shown on figure 9. Glass wool, loosely packed, shall be placed on top of the activated carbon.

4.5.1.1.9 Charcoal, coconut, activated, 6 to 14 mesh.

4.5.1.1.10 Potassium iodide solution. Dissolve 2.5 grams of potassium iodide in a liter of deionized water. Store in an amber bottle.

4.5.1.1.11 Starch solution. A commercial stabilized starch indicator solution may be purchased, otherwise, prepare a starch solution by dissolving 5 grams of soluble starch in 50 mL of boiling deionized water while stirring. Add the 50 mL of concentrated starch solution to 450 mL of boiling deionized water. Cool and store in a refrigerator. A fresh solution must be prepared whenever cloudiness or mold growth develops.

4.5.1.1.12 Starch/iodide reagent solution. Add 9 mL of potassium iodide solution (4.5.1.1.10) and 1 mL of starch solution (4.5.1.1.11) to each bubbler tube, as needed, during the testing period.

4.5.1.1.13 Analytical balance.

4.5.1.1.14 "C" type clamp.

4.5.1.1.15 Ice bath.

4.5.1.2 Determination of carbon tetrachloride concentration.

4.5.1.2.1 Tare weight of drying tube. The schwartz-type drying tube, filled with charcoal and prepared as shown on figure 9, shall be conditioned for ten minutes or more using the apparatus with a flow of 5 ± 1 mg/minute carbon tetrachloride vapor in nitrogen. The drying tube replaces the sample cup for this procedure. Remove the drying tube from the apparatus and place near the weighing balance. After 10 minutes, weigh the drying tube. All newly filled drying tubes must be conditioned. The last weight of the drying tube should be used as the initial weight for the next determination. NOTE: The carbon tetrachloride test vapor must always enter the drying tube through the same stopcock.

4.5.1.2.2 Calibration of carbon tetrachloride concentration. Pass the diluted carbon tetrachloride vapor from the generator manifold at a steady rate between 0.9 to 1.1 liter/minute through a tared Schwartz-type drying

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tube at each sample port. At 19.7 minutes stop the vacuum pump. At 20 minutes close the stopcocks and remove the Schwartz tubes to cool for 10 minutes at ambient temperature. Open and close one stopcock to equalize pressure and weigh to ± 0.1 mg. Calibration conducted at the beginning and end of the day are averaged for the adsorption calculation (4.5.1.4.2).

4.5.1.2.3 Calculation. The carbon tetrachloride rate (± 0.1 mg/minute) for each sampling port is determined by dividing the weight increase (± 0.1 mg) by the sampling time (± 0.1 minute). Determine the rate separately for each port. Two or more calculations must agree by ± 0.5 mg/minute in the range of 4.0 to 6.0 mg/minute.

4.5.1.3 Specimen preparation.

4.5.1.3.1 Test specimen. The test specimen shall be a 12.5 ± 0.2 cm diameter circular piece of finished fabric. For each 3 yard sample unit, cut three equally spaced specimens along the left side, three specimens equally spaced along the right side and three specimens equally spaced along the center. Each specimen shall be tested.

4.5.1.3.2 Specimen conditioning. All specimens shall be conditioned in an air circulating oven at 50°C for a minimum of 3 hours prior to adsorption testing. Specimens should be stored in water vapor impermeable containers and exposure to atmospheric moisture should be minimized before adsorption testing.

4.5.1.4 Adsorption test method.

4.5.1.4.1 Procedure. Assemble the complete apparatus as shown on figure 5. Mount a single specimen, face side up in the test cup (figure 6), using three flat rubber rings prepared according to 4.5.1.1.5. The up-side is the inlet side of the carbon tetrachloride vapor mixture flow. First, place one of the 13.80cm X 11.28cm rings on the lower cup half. Place a 13.80cm X 12.70 cm ring on top followed by the test sample so it butts evenly with the narrow ring. Place another 13.80cm X 12.70cm ring on top. Place the upper cup half on top. Compress the cups with a "C" type clamp. Place 10 mL of starch/iodide reagent solution mixture (4.5.1.1.12) in each of the bubblers (figure 8) and immerse the bubbler in an ice water bath. A white background behind the bubbler will facilitate detection of the blue color to appear in the bubbler. This establishes the recorded time as the original "break" time. This bubbler is replaced with a fresh bubbler which is run until the blue color is observed. If more than 2 minutes elapse before the color develops, this bubbler is replaced with fresh bubblers until the indicator solution turns blue within a 2 minute period. The true "break time" is taken as the total run time prior to the final bubbler. The sample cup shall be purged with air after running each sample to remove any residual carbon tetrachloride vapor.

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4.5.1.4.2 Calculation. The carbon tetrachloride sample adsorption shall be calculated as follows:

$$\text{mg/cm}^2 = \frac{T \times C}{A}$$

Where: T = break time (accurate to 0.1 minute)
 C = mg carbon tetrachloride/minute (accurate to 0.1 mg)
 A = area of test specimen (100 cm²)

4.5.2 Leakage test. Each unit pack shall be tested for leaks in accordance with the hot water technique of Method 5009 of FED-STD-101. Bubbles which may appear on the surface of the unit pack, but are released at a slowly decreasing rate, are not to be construed as an indication of failure. A steady stream or recurring succession of bubbles from any surface or seam shall be considered a failure.

4.5.3 Seam strength test. Seam strength shall be tested in accordance with ASTM F 88.

4.5.4 Volume test. The total volume of the unit pack shall be determined by a water displacement method. The measuring container shall have a surface area of not more than 155 square inches. The container shall be filled with water to a level that allows total submersion of the unit pack. A vertical gauge shall be mounted on the container so that the change in water level can be determined. Each unit pack shall be placed in the water and held under the water so that the tip surface of the bag is 1/8 to 2 inches below the surface of the water. When the water turbulence has subsided to less than 1/8 inch total fluctuation, the vertical gauge shall be read. Calculate the total displacement of water to determine volume.

5. PACKAGING

5.1 Preservation. Preservation shall be level A.

5.1.1 Level A preservation.

5.1.1.1 Unit packing. One drawers with the instruction sheet or one undershirt shall be folded and unit packed with three desiccant units conforming to type II of MIL-D-3464 in a barrier bag conforming to MIL-B-44433, type I or II. The barrier bag shall have inside dimensions of 12 inches by 17 inches for all undershirt sizes and 12 inches by 13 inches for all drawers sizes. Excess air in the bag shall be removed by physical compression or by use of a partial vacuum (not to exceed 15 inches of mercury). The closure shall be heat sealed. The heat seal shall be 1/8 inch (minimum) in width, uniform and smooth (without wrinkles or foreign matter) and shall have a seam strength of not less than 7 pounds per inch of width when tested in accordance with 4.4.6.2. The filled and closed unit pack shall not leak when

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tested in accordance with 4.4.6.3. The total volume of the packaged Undershirt or drawer shall not exceed 370 cubic inches, when tested in accordance with 4.4.6.4.

5.1 Packing. Packing shall be level A or B as specified (see 6.2).

5.2.1 Level A packing. Ten undershirts or ten pair of drawers of one size and one lot only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC-L, class weather resistant, grade V2s of PPP-B-636. Inside dimensions of the shipping container shall be approximately 20 inches in length, 13 inches in width, and 16 inches in depth for all undershirts and 18 inches in length, 11 inches in width, and 14 inches in depth for all drawers. If the box bottom has been stapled or stitched, it shall be fitted with a bottom pad. The liner and pad shall be constructed from fiberboard conforming to grade V3c of PPP-F-320. Each container shall be closed in accordance with method III, waterproofed, and reinforced as specified in the appendix of PPP-B-636. 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 undershirts or ten drawers of one size and one lot only, preserved as specified in 5.1, shall be packed on end in a fiberboard shipping container conforming to style RSC-L, class weather resistant, grade V3c of PPP-B-636. Inside dimensions of each shipping container shall be approximately 20 inches in length, 13 inches in width, and 16 inches in depth for all undershirts and 18 inches in length, 11 inches in width, and 14 inches in depth for all drawers. If the bottom has been stapled or stitched, the box shall be fitted with a bottom pad. The liner and pad shall be constructed from fiberboard conforming to grade V3c of PPP-F-320. Each container shall be closed in accordance with method III and waterproofed in accordance with method V, as specified in the appendix of PPP-B-636.

5.3 Palletization. When specified (see 6.2), undershirts or drawers packed as specified in 5.2.2, shall be palletized on a 4-way entry pallet in accordance with load type Ia of MIL-STD-147. Pallet types shall be type I (4-way entry), type IV or type V in accordance with MIL-STD-147. Each prepared load shall be bonded with primary or secondary straps in accordance with bonding means C and D of film bonding means F or G. Pallet pattern shall be number 5 for undershirts and number 7 for drawers in accordance with the appendix of MIL-STD-147.

5.4 Marking. In addition to any special marking required for the contract or purchase order, unit packs, shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129. Inspection/test data as specified in MIL-STD-129 for shelf life markings shall be based on the date of body material manufacture and not the date that the underwear is manufactured. (The last six digits of the surveillance number are the day, month, and year of material manufacture). Additionally, unit packs and shipping

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containers shall be marked as specified in 5.4.1.1 thru 5.4.1.4. All unit pack markings including item size, except for the fit and size prediction legend, shall be marked on the same face of the vapor barrier bag. The fit and size prediction legend shall be marked on the reverse side of bag (see figure 4).

5.4.1 Surveillance marking (see 6.6).

5.4.1.1 Unit pack. Each unit pack shall be marked with the surveillance marking indicated on the enclosed underwear (see 3.3.8). The markings shall be printed or stamped below the identification and contract data markings in 1/2 inch high black characters.

5.4.1.2 Shipping container. Each shipping container shall be marked with the surveillance marking indicated on the enclosed underwear (see 3.3.8). The markings shall be stenciled, stamped, or printed on the same side of the container as the identification and contract data markings and on one end of the container in 1-inch high black characters.

5.4.1.3 Labels, mixed sizes. Each shipping container and palletized unit load, packed with mixed sizes shall have securely attached to the end and side, directly under the printing or stenciling and beside the label for mixed lots, a white paper label 5 by 4 inches in size with the words "Mixed NSNs" plainly printed or stamped thereon and under these words shall be legibly printed or stamped the correct quantity and NSNs contained therein.

5.4.1.4 Labels, mixed fabric lots. Each shipping container and palletized unit load, packed with mixed lots shall have securely attached to the end and side, directly under the printing or stenciling and beside the label for mixed sizes, a white paper label 5 by 4 inches in size with the words "Mixed Lots" plainly printed or stamped thereon and under these words shall be legibly printed or stamped the correct quantity and lots contained therein.

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 underwear is intended for use by combat personnel to provide protection against battlefield concentrations of chemical agents in liquid and vapor form; 12 hours of protection for up to 15 days of wear.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Special provisions for verification inspection of Life Support Clothing and Equipment (see 1.1).
- c. Size required (see 1.2).

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- d. 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).
- e. When a first article is required (see 3.1, 4.3, and 6.3).
- f. Level of packing (see 5.2).
- g. Type and class of unit load required (see 5.2.1).
- h. 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 52.209-4. 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 acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Sample. For access to a sample of the end item, address the contracting activity issuing the invitation for bids.

6.5 Shelf-life. The end item has been designated as a type II shelf-life item (3 year extendible) IAW AR 700-89.

6.6 Surveillance marking format.

6.6.1 Surveillance marking. Each roll from each lot of finished body material shall be identified with a specific surveillance marking which will consist of and shall be in the following format:

XXXXX 1/ AA 2/ XXXXXX 3/

NOTE:

1/ First five Xs (digits) designate the lot.

2/ Two letters designate the master rolls.

3/ First two Xs (digits) designate day of lot production.
Middle two Xs (digits) designate month of lot production.
Last two Xs (digits) designate year of lot production.

6.7 Warning.

6.7.1 Protection of in-process and processed goods. In-process and processed goods should be protected from exposure to chemical vapors such as solvents to prevent contamination of the activated carbon.

6.7.2 Carbon tetrachloride warning. Carbon tetrachloride is a suspect carcinogen per OSHA. Personnel working with carbon tetrachloride should be informed of the potential hazards. Use should be contained in a ventilation hood. Ensure personnel use measures to prevent respiratory, skin, or other

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exposure by using personnel protective equipment. Consult the Material Safety Data Sheet (MSDS) for handling procedures and appropriate protective equipment.

6.7.2.1 Personnel protection. During the handling of the charcoal containing material used in fabricating the chemical protective underwear, the Charcoal dust may collect in various places; for example, on the skin of the personnel, particularly on the hands, and on sewing machines and cutting tables. Therefore, it is essential that the industrial hygiene procedures required by the Occupational Safety and Health Standards be closely adhered to during the manufacturing of the undergarment. Provide general and local exhaust ventilation sufficient to maintain airborne dust concentration below that listed in OSHA 1910.1000Z. Otherwise, respiratory protection may be required due to charcoal dust generation. Personnel should wear gloves and protective clothing when handling the material. Chemical safety goggles should be worn whenever eye contact may occur. Personnel shall not wear contact lens. Also, washing facilities and eyewash stations should be available in the work areas.

6.8 Sources of supply for lining fabric and elastic webbing. It has been determined that the following suppliers are capable of meeting lining fabric and elastic webbing requirements:

For lining material

Guilford Mills
469 Seventh Avenue
New York, NY 10018
(212)630-5500

Darlington Fabric Corp.
1359 Broadway
New York, NY 10018
(212)279-7733

For elastic webbing

Elastic Corporation of American
455 Highway 70
Columbia, Alabama 35051
(205)669-3101

United Elastic Corporation
P.O. Box 519
Stuart, Virginia 24171
(703)694-7171

6.9 Address for acceptance testing (see 4.4.5). The address to which the sample of undershirt or drawers for resistance to acceptance testing should be forwarded to:

Commander
Defense Personnel Support Center
2800 South 20th Street
Philadelphia, PA 19101

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6.10 Subject (key word) listing.

Chemical warfare agent
Combat
LSC&E
Protection
Undergarment

Preparing activity:

Army - GL

(Project 8415-A838)

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DONNING THE CHEMICAL PROTECTIVE UNDERGARMENT



FIGURE 1

MIL-U-44435 (GL)

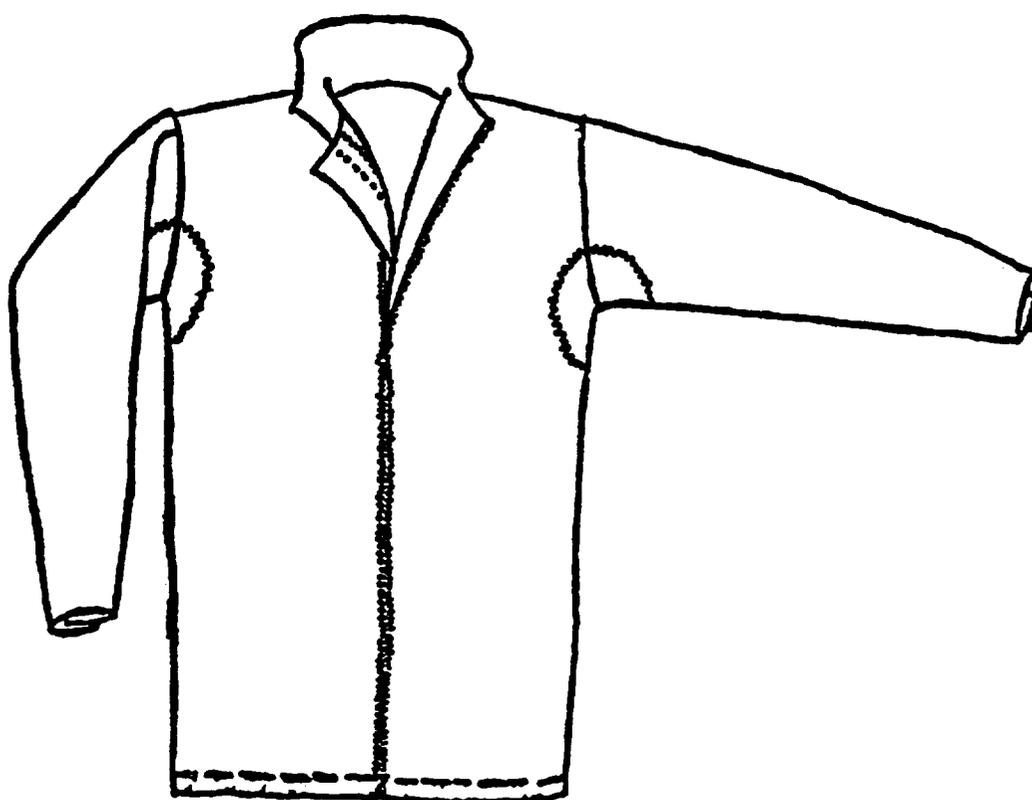


FIGURE 2 Undershirt, Chemical Protective

MIL-U-44435 (GL)

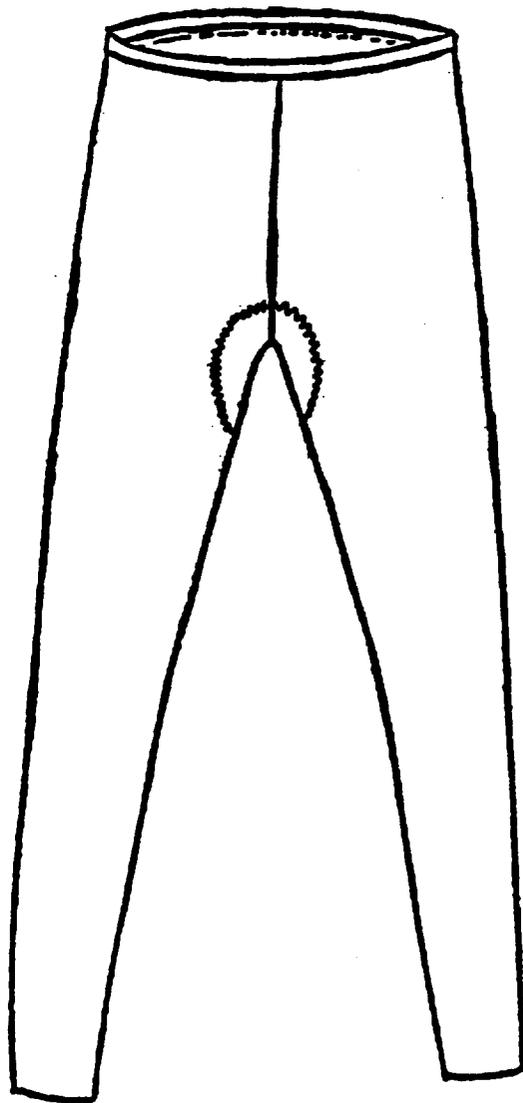


FIGURE 3 Drawers, Chemical Protective

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SIZE PREDICTION TABLE FOR UNDERWEAR, CHEMICAL PROTECTIVE

<u>Chest Size (inches)</u>	<u>SHIRT</u> <u>Corresponds To</u>	<u>Shirt Size</u>
31-32		32
33-34		34
35-36		36
37-38		38
39-40		40
41-42		42
43-44		44
45-46		46
47-48		48

<u>Waist Size (inches)</u>	<u>DRAWERS</u> <u>Seat 1/ Corresponds To</u>	<u>Waist Size</u>
25-26	34	26
27-28	36	28
29-30	38	30
31-32	40	32
33-34	42	34
35-36	44	36
37-38	46	38
39-40	48	40
41-42	50	42

1/ If individual seat measurement is larger than the size indicated for regular garment - select the next larger seat drawer size

FIGURE 4

MIL-U-44435 (GL)

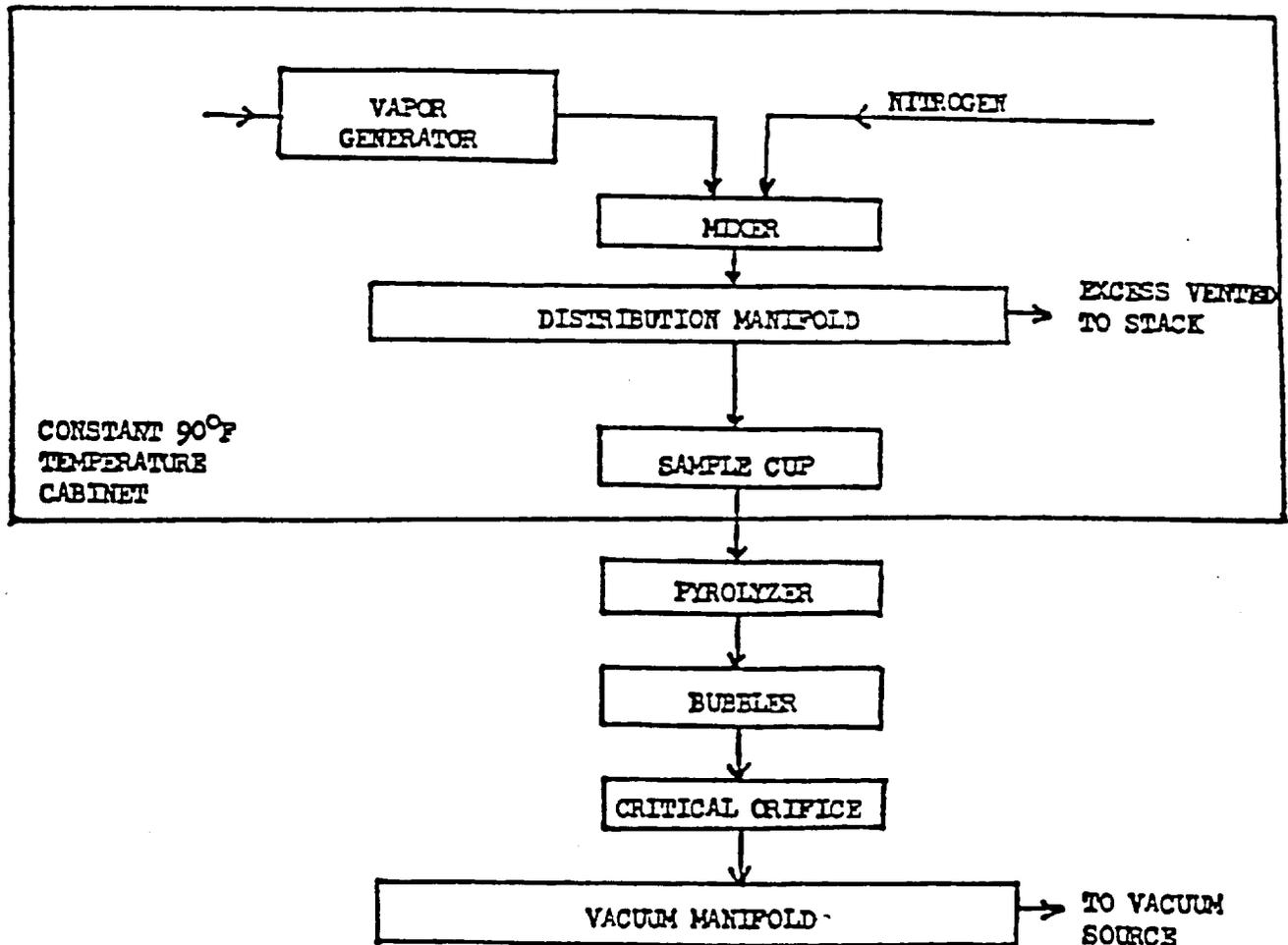
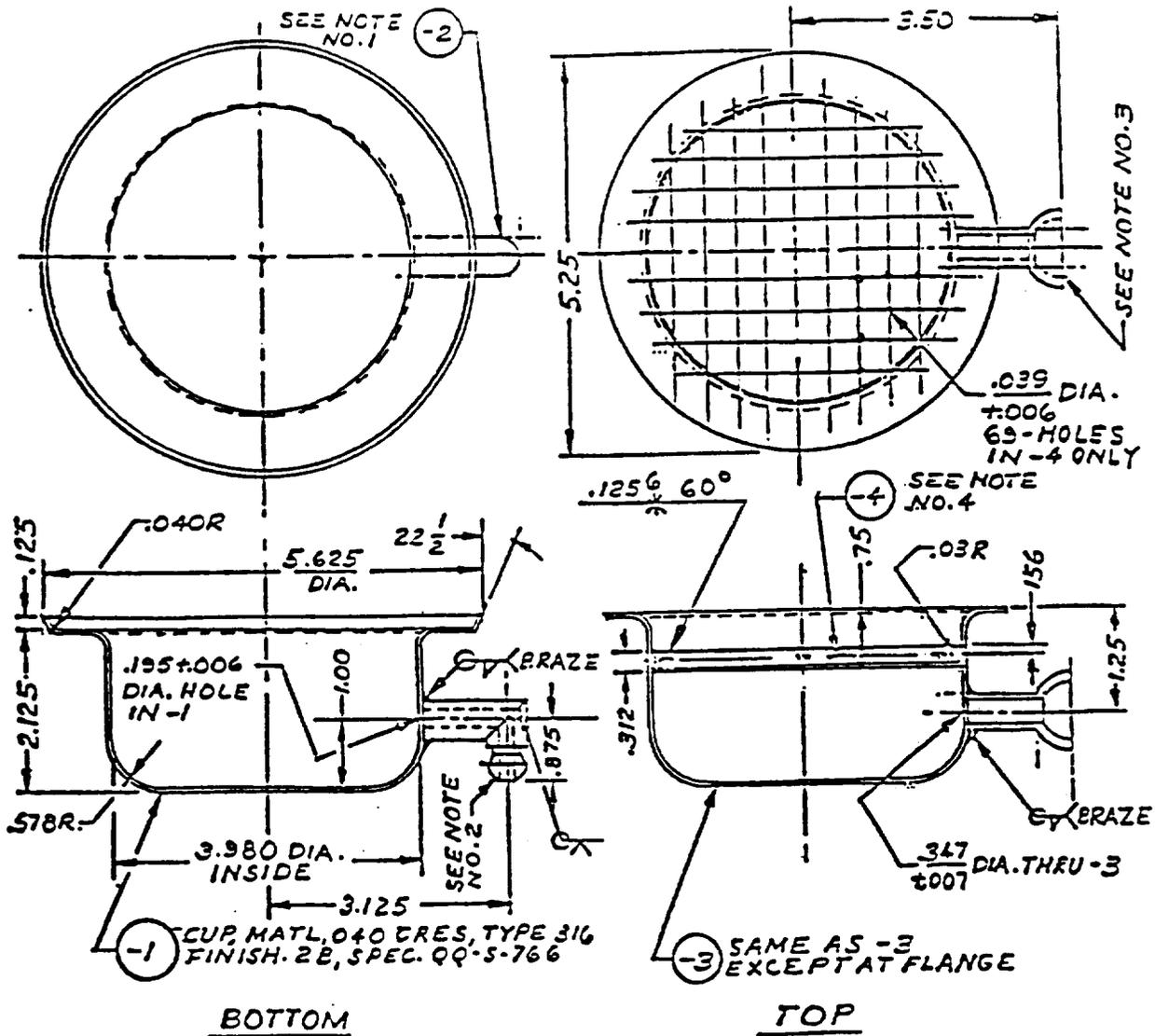


FIGURE 5

FLOW DIAGRAM OF VAPOR PENETRATION APPARATUS

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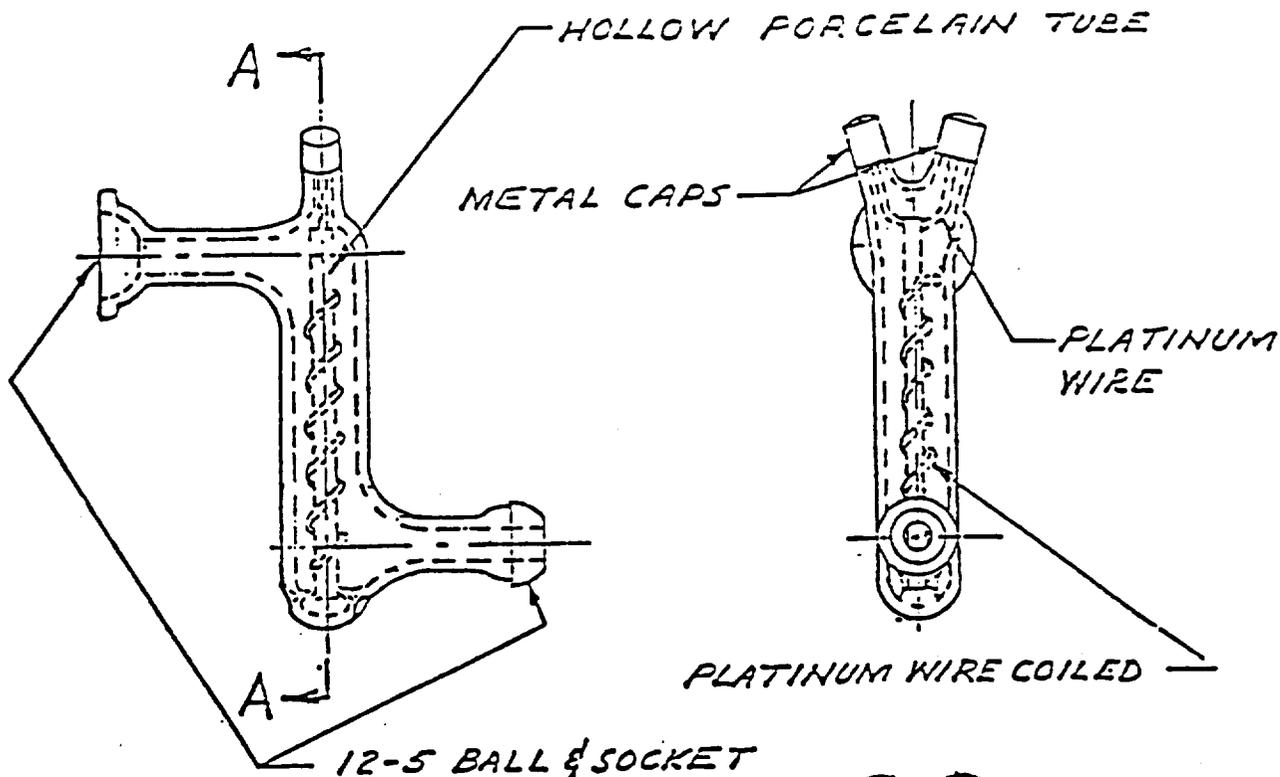


NOTE:

1. 540-.010 O.D. X .190 \pm .006 I.D. CRES TYPE 316, SPEC. QQ-S-763.
2. GROUND JOINT S, METAL BALL SIZE 12/5, TYPE 316, CRES. KONTES, TECH GLASS CO., VINELAND, N.J.
3. GROUND JOINT S, METAL SOCKET SIZE 18/5 TYPE 316 CRES. KONTES TECH GLASS CO., VINELAND, N.J.
4. MAT'L., .021 THICK, CRES, TYPE 316, FINISH 2B, SPEC QQ-S-766
5. REMOVE ALL BURRS & BREAK SHARP EDGES.

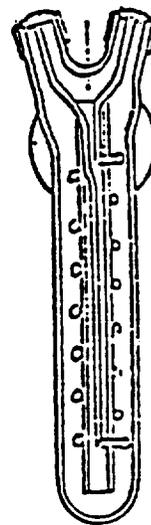
FIGURE 6 FABRIC SAMPLE CUP

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Materials:

- (1) 18 gauge platinum wire used in leads.
- (2) 30 gauge platinum wire used for heating element. Wire is 36 inches long and is wound around a 0.040 diameter wire to produce a coiled element. The 0.040 diameter wire is removed from the coiled wire. One inch of wire is left uncoiled on each end of the heating element to facilitate fusion to the leads.
- (3) The coiled heating element is wrapped around a hollow alundum tube 1/8 inch O.D. and 1/6 inch I.D.

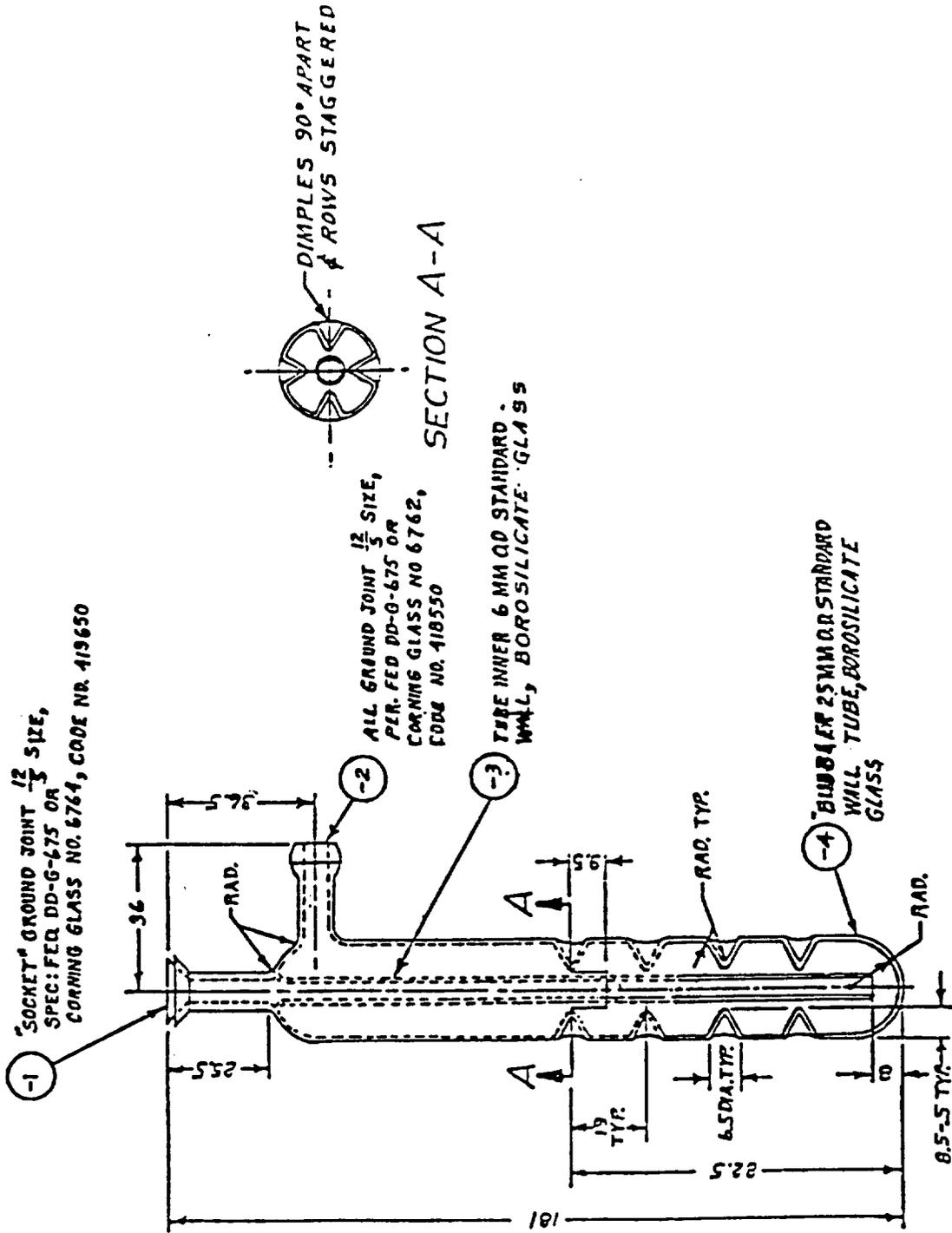


Scale 1/1

SECTION A-A

FIGURE 7
PYROLYZER

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NOTE: ALL DIM. ARE IN MILLIMETERS.
TOL.: ± 1MM

FIGURE 8 BUBBLER

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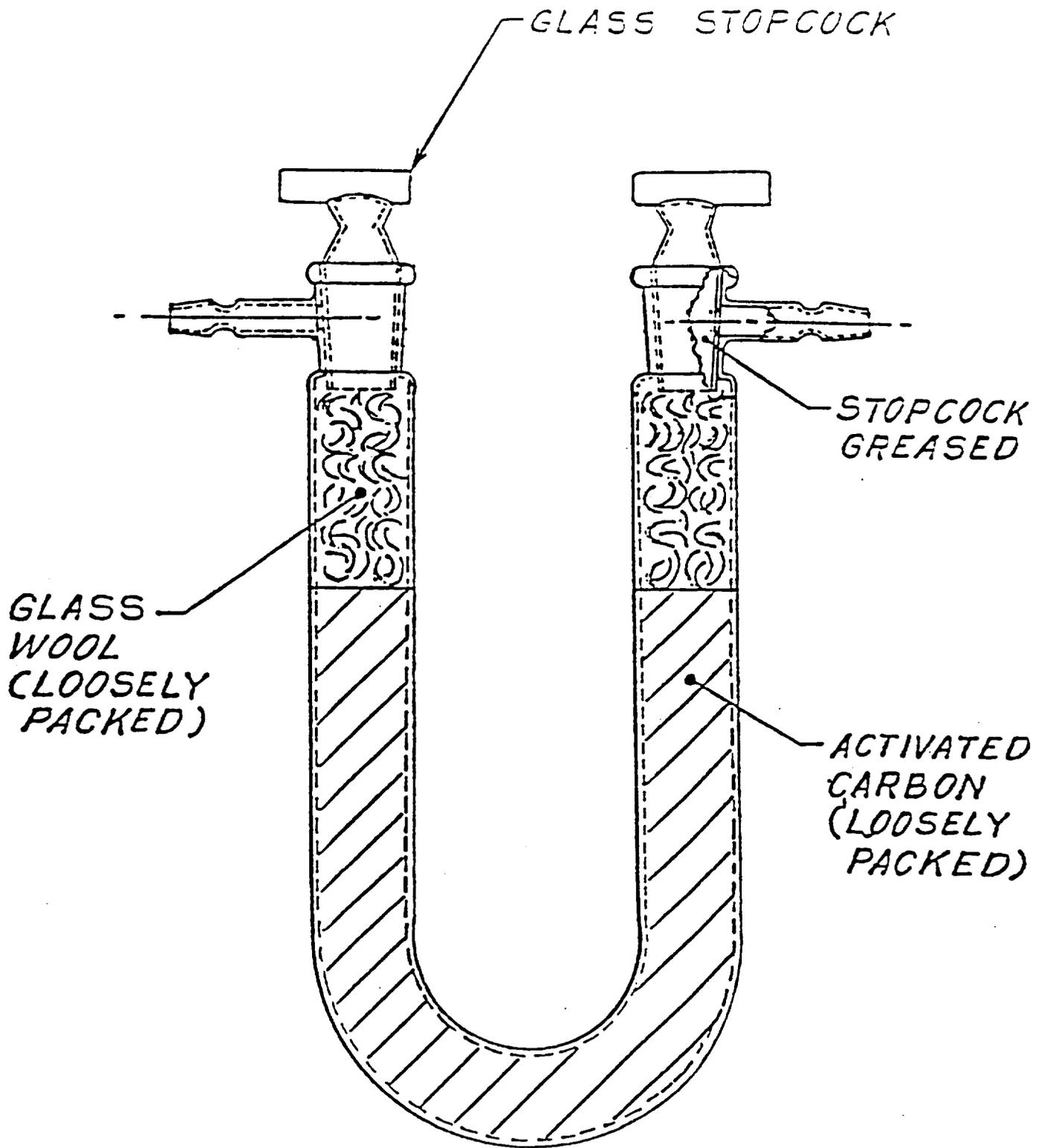


FIGURE 9

SCHWARTZ TYPE DRYING TUBES

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-U-44435 (GL)	2. DOCUMENT DATE (YYMMDD) 1992 April 16
3. DOCUMENT TITLE UNDERWEAR, CHEMICAL PROTECTIVE, TWO PIECE (UNDERSHIRT AND DRAWERS)		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (include Zip Code)	d. TELEPHONE (include Area Code) (1) Commercial (2) AUTOVON (if applicable)	e. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME U.S. Army Natick RD&E Center	b. TELEPHONE (include Area Code) (1) Commercial 508-651-4532 (2) AUTOVON/DSN 256-4532	
c. ADDRESS (include Zip Code) Commander, U.S. Army Natick RD&E Center ATTN: STRNC-IRT Natick, MA 01760-5019	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	