INCH-POUND
GL/PD 07-13A
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SUPERSEDING
GL/PD 07-13
6 April 2007

PURCHASE DESCRIPTION

COAT, ARMY COMBAT UNIFORM

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

1. SCOPE

1.1 Scope. This specification covers the requirements for universal camouflage pattern, single-breasted combat coats to be worn by the Army.

1.2 Classification. The coat shall be of the following types, classes and sizes, as specified (see 6.2).

1.2.1 Type I - 50/50 Nylon/Cotton Ripstop
Type II - 65/25/10 Rayon/Para-Aramid/Nylon Ripstop Flame Resistant

Class1 - Untreated
Class 2 - Permethrin treated

1.2.2 Size. The coat sizes shall be as follows:

SCHEDULE OF SIZES

X-Small	Small	Medium	Large	X-Large	XX-Large
XX-Short	XX-Short	XX-Short	XX-Short	XX-Short	
X-Short	X-Short	X-Short	X-Short	X-Short	
Short	Short	Short	Short	Short	
Regular	Regular	Regular	Regular	Regular	Regular
Long	Long	Long	Long	Long	Long
X-Long	X-Long	X-Long	X-Long	X-Long	X-Long
		XX-Long	XX-Long	XX-Long	XX-Long

Comments, suggestions, or questions on this document should be addressed to: US Army Natick Research, Development and Engineering Center, Attn: RDNS-WPW-C, Kansas Street, Natick, MA 01760-5019.

AMSC N/A FSC 8415

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 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 cited in the solicitation or contract. (See 6.2)

FEDERAL STANDARDS

FED-STD-4B	Glossary of Fabric Imperfections

COMMERCIAL ITEM DESCRIPTIONS

A-A-50195	Thread, Aramid
A-A-50199	Thread, Polyester Core, Cotton or Polyester-Covered
A-A-55126	Fastener Tape, Hook and Loop, Synthetic
A-A-55195	Thread, Para-Aramid, Spun, Intermediate Modulus
A-A-55217	Thread, Aramid, Spun Staple
A-A-55634	Zippers (Fasteners, Slide Interlocking)

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-32075	Label: For Clothing, Equipage, and Tentage (General Use)
MIL-C-44296	Cloth, Fusible
MIL-DTL-44411	Insect Repellent, Permethrin
MIL-DTL-44436	Cloth, Camouflage Pattern, Wind Resistant Poplin, Nylon/Cotton Blend
MIL-PRF-5038	Tape, Textile and Webbing, Textile, Reinforcing Nylon

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

PURCHASE DESCRIPTION

CO/PD 06-05	Patch and Brassard, Identification, Infrared Retroflective
GL/PD 07-12	Cloth, Flame Resistant

(Copies of document are available through the contracting activity.)

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

DRAWINGS

U.S. ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND

2-1-2519	Universal Camouflage Pattern
2-1-2519-1	ARPAT Camouflage Pattern Desert Sand 500
2-1-2519-2	ARPAT Camouflage Pattern Urban Gray 501
2-1-2519-3	ARPAT Camouflage Pattern Foliage Green 502

(Copies of drawings are available from the U.S. Army Natick Research Development and Engineering Center, Natick Soldier Center, ATTN: RDNS-WPW-C, Natick, MA 01760.)

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)
(40 CFR Part 162) State Registration of Pesticide Products

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)
FIFRA as amended by the Food Quality Protection Act of 1996 and the Pesticide Registration Improvement Act of 2003

EPA Product Performance Test Guidelines
OPPTS 810.370 Insect Repellents For Human Skin and Outdoor Premises

(Copies are available online at www.epa.gov/pesticides or from the Environmental Protection Agency, 1200 Pennsylvania Avenue, N.W., Washington, DC 20460)

FEDERAL ACQUISITION REGULATIONS (FAR)

52.209-4 – First Article Approval – Government Testing

(Copies are available online at http://acquisition.gov/far/index.html or by contacting the Superintendent of Documents at 202-512-1800.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those specified in the solicitation or contract. (See 6.2).

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC Evaluation Procedure 9, Visual Assessment of Color Difference of Textiles
AATCC Test Method 81 - pH of the Water-Extract from Wet Processed Textiles
AATCC Test Method 135- Dimensional Changes of Fabrics After Home Laundering

(Copies of documents are available online at www.aatcc.org or from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709-2215.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection of Attributes

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

ASTM INTERNATIONAL (ASTM)

ASTM D 6193 Standard Practice for Stitches and Seams

(Copies of documents are available online at www.astm.org or from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19426-2959.)

OTHER PUBLICATIONS

Repeat Insult Patch Test – Modified Draze Procedure
Principles and Methods of Toxicology, (fourth edition) A Wallace Hayes (editor), pp 1057 – 1060,2001

(Copies are available online at http//www.taylorandfrancis.co.uk/ or from Taylor and Francis, 325 Chestnut Street, Philadelphia, PA 19106.)

2.4 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 in accordance with 4.2.

3.2 Recycled, recovered or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Materials.

3.3.1 Basic material (Type I). The basic material for the Type I coat shall be a 50/50% nylon/cotton ripstop blend, wind resistant poplin cloth in a universal camouflage pattern conforming to Class 8 of MIL-DTL-44436.

3.3.1.1 Basic material (Type II) The basic material for the Type II coat shall be a 65/25/10 flame resistant rayon/para-aramid/nylon blend, cloth in universal camouflage pattern conforming to GL/PD 07-12.

3.3.2. Fusible interlining. The interlining shall be a fusible conforming to MIL-C-44296, Type V, VI or VII, style B or C substrate with class 1 (polyamide) or 3 (Polyethylene, high density) adhesive. The fusible shall meet the bonding strength and shrinkage requirements, initial and after 3 launderings as specified in MIL-C-44296 and in the end item as specified in the Care Label.

3.4 Insect bite protection. The Class 2 coat shall be treated for insect bite protection. The finished coat with bite protection treatment shall be strictly limited to the level specified in 3.4.1 and provide the minimum insect bite protection specified in 3.4.2.

3.4.1 Permethrin treatment (Class 2). Permethrin treatment process and garments will comply with Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) as amended (see 2.2.2). Permethrin concentration in Class 2 coats shall comply with EPA Toxological Category IV. The Class 2 coat shall have an EPA registered (See 6.4) permethrin insect protection treatment which shall use permethrin in accordance with Type II specified in MIL-DTL-44411 except that the application for Type II specified in paragraph 3.5 (Labels and labeling) of MIL-DTL-44411 shall also be applicable to finished garment. The coat shall be labeled in accordance with 3.8.2.1.1 and 3.8.2.1.2. The permethrin finish shall be uniformly applied across the fabric or garment and **strictly** controlled to fall within the initial minimum to maximum permethrin levels specified below. The treatment level shall provide the percent (%) bite protection specified in 3.4.2. The permethrin treatment shall be durable to repeated laundering. The permethrin level testing shall be as specified 4.4.2. The finished permethrin treatment shall not degrade any performance characteristics of the garment or present any latent defects to the cloth or garment.

	Min: mg/cm2	Max: mg/cm2
Initial	0.087	0.130
After 20 launderings	0.025	0.130

3.4.2 Percent (%) Bite Protection (Class 2). Type II finished permethrin treated garments shall provide bite protection specified below when assessed by the biting protection testing specified in 4.4.2. Government notification and approval is required initially, and any time there is a change in the permethrin treatment formulation or processing conditions (see 3.13.1).

Condition	% Bite Protection
Initial	>/= 90%
After 20 launderings	>/= 90%
After 50 launderings	>/= 70 - 90%

3.4.3 pH (Type II, Class 2). The pH value of the water extract of all the finished cloth and garments shall be no lower than 5.0 or higher than 8.5 when tested as specified in 4.4.2.

3.5 Components.

3.5.1 Slide fastener. The slide fastener shall be a two-way separating, non-reversible, automatic locking slider, Size 5, plastic individual element fastener (IEF) conforming to Type III, Style 13 of A-A-55634 except that it shall have a crosswise breaking strength of not less than 100 lbs. (average) with no individual reading less than 90 lbs, a single element slippage of 16 lbs. (min.), separable pin holding strength of 35 lbs. (min.) and slider tab 90 degree pull off strength of 35 lbs. (min.) when tested as specified in A-A-55634. The pin engagement force into the dual sliders shall be a smooth single action without sticking or having to rework pin or sliders. The opening for the slider's top and bottom pull-tabs shall be a minimum of 5mm length x 7mm width. The length of the slide fastener shall be 19-inches for size XX-short, 20-inches for sizes X-Short/Short; 21-inches for sizes Regular/Long; and 22-inches for sizes X-Long/XX-Long.
NOTE: Slide fastener lengths are coordinated with coat lengths and not coat size.

3.5.1.1 Slide fastener components color The color of the slide fastener, slide fastener tape, thong (pull-tab) (Type I coat only) and components shall match Foliage Green 504 and shall show colorfastness to laundering requirements as specified in the base fabric.

3.5.2 Slide fastener thong (top pull tab)(Type I coat only). The slide fastener thong (top pull tab) for the Type I coat shall be a tape 3/8 inch wide conforming to type III of MIL-PRF-5038. The thong shall finish 2 $\pm$ 1/8 inches in length when folded. The thong shall be placed through the top pull-tab only and the ends shall be knotted or bartacked.

3.5.2.1 Slide fastener thong (top pull tab) (Type II coat only). The slide fastener thong (top pull tab) for the Type II coat shall be fabricated from the Type II coat basic material in a belt loop construction. The finished thong shall measure 3/8 - 1/2 inch in width and finish 2 $\pm$ 1/8 inches in length. A bartack shall enclose raw edges and secure thong.

3.5.3 Tape. The tape for the identification friend or foe (IFF) cover (Type I and II coat) and FR identification marker (Type II coat only) shall be 1-inch wide conforming to type III of MIL-PRF-5038. The color shall match Foliage Green 504.

3.5.4 Fastener tape, hook and loop. The hook fastener tape shall conform to Type II, Class 1 or Type III, Class 4 and the loop fastener tape shall conform to Class 1 or Class 4 of A-A-55126. Hook and loop with slit, split edges or any splicing of fastener tape is not permitted. The widths shall be as specified for each application throughout this specification. The tolerance for all widths specified shall be ± 1/32 inch as to prevent stitching runoffs or improper fit into automatic sewing equipment. The color shall match Foliage Green 504. The fastener tape hook and loop Type and Class shall be consistent (same manufacturer/lot) within a garment. (See 6.5.)

3.5.5 Identification friend or foe (IFF) material. The IFF material shall conform to Type I of CO/PD-06-05. (See 6.6).

3.5.6 Thread (Type I coat). The thread for seaming and stitching for the Type I coat shall conform to Table I. The color shall match Foliage Green 504. All thread shall be non-staining and colorfastness requirements in each Commercial Item Description (CID) shall apply.

TABLE I. Thread requirements, Type I coat only.

Component area	Thread specification	Needle thread (Tex size)	Bobbin/ Looper thread (Tex size)
All seaming, stitching and bartacking	A-A-50199, Type II	36-45	36-45
Alternate shoulder and armhole, safety stitch(5 thread)	A-A-50199, Type II	46-60	46-60
Alternate shoulder and armhole, top stitching	A-A-50199, Type II	36-45	36-45
Overedge stitching (raw edges)	A-A-50199, Type II	31-35	31-35

3.5.7 Thread (Type II coat). The thread for seaming and stitching of the Type II Flame Resistant coat shall be as specified in Table II. The color shall match Foliage Green 504. All thread shall be non-staining and colorfastness requirements in each Commercial Item Description (CID) shall apply.

TABLE II. Thread requirements, Type II coat only.

Component area	Thread specification	Needle thread (Tex size)	Bobbin/ Looper thread (Tex size)
All seaming except small parts	A-A-50195 (Soft or Bonded)	60	40
	A-A-55195, Type I	78	59
	A-A-55195, Type II	59	39
	A-A-55217, Type I	70-80	50-60

TABLE II. Thread requirements, Type II coat only - Continued.

Safety stitch with top stitch, bartack, and small parts, (hook and loop, pockets, flaps, collar, front placket, top stitching, cuffs, tabs, hems and eyelets), IFF tape, IFF tape webbing cover, identification marker, labels and zipper	A-A-50195 (Soft or Bonded) A-A-55195, Type I A-A-55195, Type II A-A-55217, Type I	40 59 20 50-60	40 39 20 50-60
Overedge/Serge for portions of safety stitch operation for raw edge cover	A-A-50195 (Soft or Bonded) A-A-55195, Type I A-A-55195, Type II A-A-55217, Type I	40 39 16 24-27	40 39 16 24-27

3.6 Design. The coat has a single-breasted front with a slide fastener (double slider) closure and a secondary hook and loop fastener tape closure; long sleeves with cuffs and adjustable hook and loop fastener tape closure; a stand-up collar with a front extension with hook and loop fastener tape closure and a bi-swing back. The front has two (2) angled chest pockets with flaps with hook and loop fastener tape closures with bartacks at ends of loop tapes (see figure 1). Above each chest pocket there is loop tape to accommodate the Name and US Army Tapes. On the left center front placket between the first and second closure is a loop tape for the Rank Patch. Both sleeves have a bellows pocket with flap with a stitched eyelet (drainhole) at the base of the bellows. Both sleeve pockets and sleeve pocket flaps have loop fastener tape on the outside. Each sleeve pocket flap shall also have tape, with sewn-on IFF material, sewn and centered on flap, with hook tape on end and loop tape on the underside of flap (see figure 4). The sleeves also have an elbow patch with opening (for foam inserts) and top closure of hook and loop fastener tape and a drainhole at the bottom. The left sleeve has a three (3) channel pencil pocket. The coat has a double turned and cleaned finished hem.

3.7 Construction. All material edges shall be clean finished, either turned-in, turned-under or serged unless otherwise indicated.

3.7.1 Fastener tape, (hook and loop). All widths of hook and loop tape shall be sewn 1/8 - 3/16 inch from bound selvage (for fastener tape with selvage) or from tape edge (for fastener tape without selvage) to prevent needle cutting along edges, stitching runoffs or improper fit into automatic sewing equipment. To prevent raveling on fastener tape with selvage, do not sew directly on the selvage. The use of fastener tape that is slit, has split edges, or any splicing of fastener tape is not permitted. Under no circumstances shall any fastener tape be re-stitched for repair purposes. New tape shall be used for repairs to prevent needle cutting, thus offering maximum field life. All fastener tape maybe sewn through all layers on coat as indicated on the figures, (see patterns for placement). Tolerance for all lengths of fastener tape shall be $\pm$ 1/8 inch.

3.7.2 Collar. The collar shall be interlined with a fusible as specified in 3.3.2 (see figure 3). The hook and loop fasteners for the left side under collar (outer surface) shall be 1-1/2 inches wide by 1-1/2 inches in length. The loop fastener for the left collar tab extension, top collar, shall be 1-1/2 inches wide by 3-inches in length. The hook fastener for the right under collar (outer surface) shall be 1-1/2 inches wide by 3-inches in length. See pattern for placements.

3.7.3 Front closure. The front closure is a (double slider) slide fastener with a secondary hook and loop tape closure (see figure 1). The secondary closure consists of three pairs of hook and loop fastener tape. The hook portion is on the underside of the front overlapping facing (left side) and is additionally stitched with a box-x stitch. The loop portion is stitched to the front side of the under facing (right side) and is additionally stitched with a box-x stitch and coincides with the hook. The hook and loop fasteners for the front closure shall be 1-inch wide by 1-1/2 inches in length. See pattern for placement.

3.7.3.1 Front Facing. As an option the overlapping facing may be fused (see Table IV).

3.7.4 Sleeve pockets and flaps. Both sleeves shall have a bellows pocket with a flap.

3.7.4.1 Sleeve pocket. The pocket is a bellows type with a stitched drainhole at the base of the bellow and a pocket opening of 4-3/4 ($\pm$ 1/8 inch) for all sizes. Each pocket shall have a 4-inch wide by 6-inch long loop fastener tape sewn on all sides, positioned 1/16 inch from bottom of pocket and centered side to side (within 3/16 inch). The loop tape shall be additionally stitched thru the center (see figure 4). See pattern for loop fastener tape placement.

3.7.4.2 Sleeve pocket flap. Each pocket flap shall have a 4-inches wide by 2-inches in length, loop fastener tape centered and sewn onto flap (see figure 4). Prior to sewing the loop fastener tape, the cover tape specified in 3.5.3 for sewing the IIF tape onto (see 3.7.10) shall be sewn on. The pocket flap fold-back (underside) shall have two (2) pieces of hook fastener tape 1-inch wide by 1-1/4 inches in length and one (1) piece of loop fastener tape 1-inch wide by 1-inch in length sewn on. See pattern for placement of loop fastener tape, hook fastener tape, IFF tape cover and IFF tape.

3.7.4.3 Pencil pocket. The left sleeve shall have a 3-channel pencil pocket above the sleeve cuff. The pocket shall be 2-1/2 $\pm$ 1/8 inches wide and have a 3/4-inch double turned cleaned finished hem. The pocket shall have three evenly spaced channels (permitted variation within 1/8 inch). See pattern for placement.

3.7.5 Sleeve cuff. The sleeve cuff shall be as specified in the pattern. The main body of the sleeve cuff shall have loop fastener tape, 1-1/2-inches wide by 8-inches in length, sewn onto it. The sleeve cuff shall have a pointed adjustable tab with hook fastener tape 1-1/2-inches wide by 2-inches in length sewn to the underside for closure adjustment (see figure 1). See pattern for hook and loop fastener tape placement.

3.7.6 Elbow patches. Each sleeve shall have an elbow patch sewn on with opening on top for foam inserts. The elbow patch shall have a drain opening on the bottom of approximately 1-inch and a hook and loop fastener tape top closure. The hook and loop fastener tape shall be 5/8-inch wide by 6-1/2-inches in length. The loop tape shall be sewn to the sleeve and the hook tape sewn to inside of the elbow patch. The ends of the hook and loop closure opening shall be bartacked (see Table VI). The hook and loop fastener tape shall be sewn on prior to finishing the elbow patch assembly. See pattern for placements.

3.7.7 Chest pockets and flaps. There shall be two (2) chest pockets with flaps, one on each chest side.

3.7.7.1 Chest pockets. The two (2) chest pockets shall be angled inward toward the facing and have a pocket opening of 6-1/4 (± 1/8) inches (see figure 1). Each pocket shall have a piece of loop fastener tape, 5/8-inch wide by 6-1/8 inches in length, sewn onto it. See pattern for loop fastener tape placement.

3.7.7.2 Chest pocket flaps. The chest pocket flaps shall be of sufficient length to cover top of pocket at opening and finish 1-1/2 inches in width. The underside of each chest pocket flap shall have a piece of hook fastener tape, 5/8-inch wide by 6-1/4 inches in length, sewn onto it for pocket closure (see figure 1).

3.7.8 Coat hem. The coat hem shall be 1/2 inch to 5/8 inch wide, double turned and clean finished. The ends of the hem at front shall be tacked.

3.7.9 Name Tape and U.S. Army Tape. Above each chest pocket flap there shall be a piece of loop fastener tape, 1-inch by 5-1/4 inches in length, sewn on to accommodate the name tape and U.S. Army tape. The loop tape shall be placed horizontal and be 1/8-inch +1/8, -0 above the top corner of the pocket flap (see figure 1). See pattern for loop fastener tape placement.

3.7.10 Identification Friend or Foe (IFF) tape cover. The cover for the IFF material shall be tape conforming to Type III of MIL-PRF-5038. The tape cover shall have a piece of hook fastener tape 1-inch wide by 1-inch in length sewn on so as to finish 1/2-inch in length on both sides of the tape cover when folded and sewn on. The tape shall be 1-inch wide and when sewn on the pocket flap shall finish 2 ± 1/8 inches in length. The tape shall have a 3/4 by 3/4-inch piece of IFF material (see 3.5.5) sewn onto the underside of it. The finished tape with IFF material shall be capable of exposing the IFF material when folded up and fastened to the loop tape sewn on the pocket flap and hiding it when folded under and fastened to the loop tape sewn on the underside of the pocket flap (see figure 4). See pattern for tape and hook fastener tape placement.

3.7.11 Rank patch. There shall be a piece of loop fastener tape, 2-inches wide by 2 inches in length, centered on the left front flap between the first and second hook and loop fastener tape closure 1/8 inch from front edge to accommodate the rank patch (see figure 3).

3.7.12 Identification marker (Type II coat only). The Type II coat shall have a tape FR identification marker on the left sleeve cuff as worn (see pattern for placement. The tape marker shall finish 1-inch (± 1/8) in length. The finished tape identification marker shall be box stitched as specified in Table V using 10 – 14 stitches per inch. The thread shall be in accordance with the requirements for the Type II coat (see 3.4.7).

3.8 Labels. Each coat shall have a size label and a combined identification and care label. The color of the labels shall be white or approximate the ground shade of the basic fabric and the printing shall be black. The inscription shall have a minimum font size of 8 points for the identification/care label only. The font for the size label shall be 10 points. The inscription legibility, label, and label attachment shall last the expected life of the coat.

3.8.1 Size label. The size label shall conform to Type VI, Class 2 of MIL-DTL-32075 and shall be sewn on the inside center back approximately 1/2 inch below the neckline. The label shall be sewn on all four sides and the stitching shall not cover the printing. The size label shall include the information in Table III for the applicable size:

TABLE III Size label.

X-Small - XX-Short Height: 55 to 59 in. Chest: Up to 33 in. NSN No. NATO Size: 4050/7484	X-Small - X-Short Height: 59 to 63 in. Chest: Up to 33 in. NSN No. NATO Size: 5060/7484	X-Small - Short Height: 63 to 67 in. Chest: up to 33 in. NSN No. NATO Size: 6070/7484
X-Small - Regular Height: 67 to 71 in. Chest: up to 33 in. NSN No. NATO Size: 7080/7484	X-Small - Long Height: 71 to 75 in Chest: Up to 33 in. NSN No. NATO Size: 8090/7484	X-Small - X-Long Height: 75 to 79 in. Chest: Up to 33 in. NSN No. NATO Size: 9000/7484
Small – XX-Short Height: 55 to 59 in. Chest: 33 to 37 in. NSN No. NATO Size: 4050/8494	Small – X-Short Height: 59 to 63 in. Chest: 33 to 37 in. NSN No. NATO Size: 5060/8494	Small – Short Height: 63 to 67 in. Chest: 33 to 37 in. NSN No. NATO Size: 6070/8494
Small – Regular Height: 67 to 71 in. Chest: 33 to 37 in. NSN No. NATO Size: 7080/8494	Small – Long Height: 71 to 75 in. Chest: 33 to 37 in. NSN No. NATO Size: 8090/8494	Small – X-Long Height: Above 75 in. Chest: 33 to 37 in. NSN No. NATO Size: 9000/8494
Medium – XX-Short Height: 55 to 59 in. Chest: 37 to 41 in. NSN No. NATO Size: 4050/9404	Medium – X-Short Height: 59 to 63 in. Chest: 37 to 41 in. NSN No. NATO Size: 5060/9404	Medium – Short Height: 63 to 67 in. Chest: 37 to 41 in. NSN No. NATO Size: 6070/9404

TABLE III Size label - Continued.

Medium – Regular Height: 67 to 71 in. Chest: 37 to 41 in. NSN No. NATO Size: 7080/9404	Medium – Long Height: 71 to 75 in. Chest: 37 to 41 in. NSN No. NATO Size: 8090/9404	Medium – X-Long Height: 75 to 79 in. Chest: 37 to 41 in. NSN No. NATO Size: 9000/9404
Medium – XX –Long Height: Above 79 in. Chest: 37 to 41 in. NSN No. NATO Size: 6070/0414	Large – XX-Short Height: 55 to 59 in. Chest: 41 to 45 in. NSN No. NATO Size: 4050/0414	Large – X-Short Height: 59 to 63 in. Chest: 41 to 45 in. NSN No. NATO Size: 5060/0414
Large – Short Height: 63 to 67 in. Chest: 41 to 45 in. NSN No. NATO Size: 6070/0414	Large – Regular Height: 67 to 71 in. Chest: 41 to 45 in. NSN No. NATO Size: 7080/0414	Large – Long Height: 71 to 75 in. Chest: 41 to 45 in. NSN No. NATO Size: 8090/0414
Large – X-Long Height: 75 to 79 in. Chest: 41 to 45 in. NSN No. NATO Size: 9000/0414	Large- XX-Long Height: Above 79 in. Chest: 41 to 45 in. NSN No. NATO Size: 0010/0414	X-Large – XX-Short Height: 55 to 59 in. Chest: 45 to 49 in. NSN No. NATO Size: 4050/1424
X-Large – X-Short Height: 59 to 63 in. Chest: 45 to 49 in. NSN No. NATO Size: 5060/1424	X-Large – Short Height: 63 to 67 in. Chest: 45 to 49 in. NSN No. NATO Size: 6070/1424	X-Large – Regular Height: 67 to 71 in. Chest: 45 to 49 in. NSN No. NATO Size: 7080/1424
X-Large - Long Height: 71 to 75 in. Chest: 45 to 49 in. NSN No. NATO Size: 8090/1424	X-Large - X-Long Height: 75 to 79 in. Chest: 45 to 49 in. NSN No. NATO Size: 9000/1424	X-Large - XX-Long Height: Above 79 in. Chest: 45 to 49 in. NSN No. NATO Size: 0010/1424
XX-Large - Regular Height: 67 to 71 in. Chest: 49 to 53 in. NSN No. NATO Size: 7080/2435	XX-Large - Long Height: 71 to 75 in. Chest: 49 to 53 in. NSN No. NATO Size: 8090/2435	XX-Large - X-Long Height: 75 to 79 in. Chest: 49 to 53 in. NSN No. NATO Size: 9000/2435
XX-Large - XX-Long Height: Above 79 in. Chest: 49 to 53 in. NSN No. NATO Size: 0010/2435		

3.8.2 Identification and care label, Type I coat. The combination identification/care label shall conform to Type VI, Class 15 of MIL-DTL-32075 and shall be placed under the chest pocket vertically on right, (as worn) on the inside of coat. The label shall be sewn on all four sides. Label stitching shall not cover the printing and shall be completely covered from the outside by the pocket (stitching shall not be visible from the front of the coat). The label shall include the following information:

TEAM SOLDIER CERTIFIED GEAR U.S.ARMY	**This product meets the manufacturing and performance testing requirements as authorized by the Program Executive Office - Soldier**	Coat, Army Combat Uniform Contract Number: Fiber Content: Contractor Name: Lot Number: 1/

Use and Care Label

1. Wear outside of trouser
2. Before washing, remove all patches from coat and all items from pockets.
   Close all hook and loop fasteners to prevent snagging.
   Close zipper to prevent damage. Turn coat inside out

3. Washing and Drying. Machine wash in cold water using Permanent Press Cycle, Rinse cold
   Machine Tumble dry on low or medium setting 140 – 160 °F or
   Hand wash using a mild detergent only without bleach, Rinse completely.
   DO NOT WRING OR TWIST, hang dry

CAUTION:

DO NOT USE CHLORINE BLEACH, BLEACH ALTERNATIVES, FABRIC SOFTENER OR STARCH
DRY CLEANING OR COMMERCIALLY HOT PRESSING THE ACU WILL PERMANENTLY DAMAGE THE COAT.

Applying heat or an iron to any hook & loop fastener area will permanently damage the fasteners. Lightly brushing the hook & loop fasteners will remove accumulated debris.

DO NOT REMOVE THIS LABEL

1/ Lot number shall be stamped with indelible black ink prior to shipment.

3.8.2.1 Identification and care label, Type II flame resistant coat. The combination identification/care label shall conform to Type VI, Class 15 of MIL-DTL-32075 and shall be placed under the chest pocket vertically on right, (as worn) on the inside of coat. The label shall be sewn on all four sides. Label stitching shall not cover the printing and shall be completely covered from the outside by the pocket (stitching shall not be visible from the front of the coat). The label shall include the following information:

This product meets the manufacturing and performance testing requirements as authorized by the Program Executive Office - Soldier	Coat, Army Combat Uniform **Flame Resistant** Contract Number: Fiber Content: Contractor Name: Lot Number: 1/

Use and Care Label

1. Wear outside of trouser
2. Before washing, remove all patches from coat and all items from pockets.
   Close all hook and loop fasteners to prevent snagging.
   Close zipper to prevent damage. Turn coat inside out

3. Washing and Drying. Machine wash in cold water using Permanent Press Cycle, Rinse cold
   Machine Tumble dry on low or medium setting 140 – 160 °F or
   Hand wash using a mild detergent only without bleach, Rinse completely.
   DO NOT WRING OR TWIST, hang dry

CAUTION:
DO NOT USE CHLORINE BLEACH, BLEACH ALTERNATIVES, FABRIC SOFTENER OR STARCH
DRY CLEANING OR COMMERCIALLY HOT PRESSING THE ACU WILL PERMANENTLY DAMAGE THE COAT.

Applying heat or an iron to any hook & loop fastener area will permanently damage the fasteners. Lightly brushing the hook & loop fasteners will remove accumulated debris.

DO NOT REMOVE THIS LABEL
THIS GARMENT IS FLAME RESISTANT

1/ Lot number shall be stamped with indelible black ink prior to shipment.

3.8.2.1.1 Combination insect protection/identification/care label (Class 2 coat only). The combination insect protection/identification/care label shall conform to Type VI, Class 15 of MIL-DTL-32075 and shall be placed under the chest pocket vertically on left, (as worn) on the inside of coat. The label shall include both permanent insect protection and brand labeling information; and shall comply with the approved EPA registration (see 6.4). The label shall be sewn on all four sides. Label stitching shall not cover the printing and shall be completely covered from the outside by the pocket (stitching shall not be visible from the front of the coat). The label shall include the following information:

Insect Repellent Brand Name:
INSECT REPELLENT APPAREL
Refer to hangtag for more information
Coat, Army Combat Uniform, **Flame Resistant**
Contract Number:
Contractor Name:
(Brand Name) INSECT REPELLENT APPAREL
EPA REG. NO.:
EPA EST. NO.:
Lot Number 1/

-Do Not Dry Clean
Dry Cleaning removes active ingredient
-Wash separate from other clothing
-May be laundered with other clothing when in field or combat situations
-Do Not Re-treat with a permethrin product
-Dispose of garment in trash (Remove IFF tape first)
Repels mosquitoes, ticks, ants, flies, chiggers and midges

Repellency remains effective for 25 washings

ACTIVE INGREDIENTS	**%W/W**
Permethrin	0.52%
OTHER INGREDIENTS: (Garment)	99.48%
TOTAL	100.00%

It is a violation of Federal Law to use this product
In a manner inconsistent with its labeling

Retain hangtag for future reference on proper handling
of this garment

DO NOT REMOVE THIS LABEL

1/ Lot number shall be stamped with indelible black ink prior to shipment.

3.8.2.1.2 Hang tag, insect protection (Class 2 coat only). Each coat shall have an individual paper tag attached to the garment conforming to Type VIII, Class 15 of MIL-DTL-32075. The tag shall provide additional insect protection information as required by EPA registration. The hang tag shall contain the following information:

Insect Repellent Brand Name:
INSECT REPELLENT APPAREL

Coat, Army Combat Uniform, **Flame Resistant**

Contract Number:
Contractor Name:
(Product Brand Name) INSECT REPELLENT APPAREL
EPA REG. NO.:
EPA EST. NO.:

* Do Not Dry Clean
Dry Cleaning removes active ingredient
* Wash separate from other clothing
* May be laundered with other clothing when in field or combat situations
* Do Not Re-treat with other permethrin products
* Dispose of garment in trash. (Remove IFF tape first)
Do not contaminate water, food or feed by storage or disposal.
Do not reuse clothing/fabric for purposes other than originally intended.
* For protection of exposed skin, use in conjunction with an insecticide registered for direct application to the skin.

Repels mosquitoes, ticks, ants, flies, chiggers and midges
Repellency remains effective for 25 washings

ACTIVE INGREDIENTS	**%W/W**
Permethrin	0.52%
OTHER INGREDIENTS: (Garment)	99.48%
TOTAL	100.00%

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

Retain hangtag for future reference on proper handling of this garment. This tag not to be removed except by customer.

3.8.3 Barcode label. Each coat shall have a barcode label conforming to Type VIII, Class 17 of MIL-DTL-32075. The bar coding element shall be a 13 digit national stock number (NSN). There shall be a 12 digit UPC number assigned for all NSNs by the contracting activity. The initials "UPC" must appear beneath the code. The bar code for NSN and UPC type shall be a

medium to high density and shall be located so that it is completely visible on the coat when it is folded and/or packaged as specified and so it causes no damage to the coat.

3.9 Figures. Figures are furnished for informational purposes only. To the extent of any inconsistencies between the written document and the figure, the written document shall govern.

3.10 List of pattern parts. The Government shall furnish patterns, which show directional line markings for proper cutting and assembly, and are to be used as a guide for cutting contractor's working patterns. The Government patterns, provide a seam allowance of 1/2 inch for side seams, shoulder seams, and sleeve seams, 3/8 inch allowance for collar and all other seams, except where otherwise specified, and 1/4 inch allowance for pocket flaps. Pockets, pocket flaps, pencil pocket, elbow patches, cuffs, collar, slide fastener, patch loop tape, other hook and loop fastener tape, and bartacks shall be located in accordance with marks on patterns and table references. Minor modifications are permitted where necessary to accommodate manufacture's processes and use of automatic equipment. These modifications shall not alter the design, serviceability, appearance or finished measurements. **NOTE:** When the 5-thread safety stitch is used for the shoulder and armhole seams, contractor must adjust patterns for 3/8-inch gage in lieu of 1/2-inch double needle seams. The pattern list in Table IV is provided to insure that the pattern set provided is complete.

TABLE IV. List of pattern parts.

Pattern Abbreviation	Nomenclature	Cut Parts
FRONT_RT	Front, Right	1
FRONT_LFT	Front, Left	1
BACK	Back	1
TOP_SLEEVE	Top Sleeve	2
UNDER_SLEEVE	Under Sleeve	2
TOP_COLLAR	Top Collar	1
UND_COLLAR	Under Collar	1
CUFF	Cuff	2
CUFF_TAB	Cuff Tab	2
LFT_PEN_PKT	Left Pencil Pocket	1
ELBOW_PATCH	Elbow Patch	2
SLEEVE_PCKT	Sleeve Pocket	2
FLP_CHST_PKT	Flap, Chest Pocket	2
FT_CHST_PKT	Front Chest Pocket	2
SLV_PKT_FLP	Sleeve Pocket Flap	2
SIDE_BACK	Side Back	2
UND_CLR_FUS	Under Collar Fusible	1
FF_FUS_OPT	Front Facing Fusible - OPTIONAL	2

3.11 Configuration. Each coat shall conform to design, appearance (see figures 1-6), the finished measurements in Table VII and the construction methods specified in 3.11.1 through 3.11.2 and Tables V and VI in order to maintain configuration compliance.

3.11.1 Seams and stitching. All seams shall be consistent and exhibit a uniform appearance and conform to the ASTM D 6193 seam and stitch types listed in Table V. The backside of seams (inside garment) shall be flat with no protruding seam allowance to create irritation or discomfort. All material edges shall be clean finished, either turned-in, turned-under or serged. All pocket flaps shall be serged prior to setting. Needle and bobbin thread tension shall be balanced such that neither is too tight nor too loose relative to each other. Check tension relationship via pulling tightly on any straight stitched portion of the coat. In no case shall there be any sign of thread cracking, breakage or open seams popping within the stretched area. The seams for all outside visible stitching shall be sewn with 10-14 stitches per inch. Overedge or pre-hemming shall be 6-10 stitches per inch. As an alternate, the shoulder and armhole inseam may be safety stitched (5-thread) with 9 stitches per inch (min.). The double-needle top stitching for the shoulder and armhole shall be stitched with 10 – 14 stitches per inch. The sewn eyelets for the bellows pockets shall have a minimum of 16 stitches each with a 3/16 to 1/4 inch diameter finished opening. The width of the bight of stitching shall not be less than 1/16 inch. The eyelet stitching shall have at least four overlapping stitches with the purling on the outside. The IFF material shall be sewn with 7 – 9 stitches per inch.

3.11.2 Stitching for hook and loop tape. The hook and loop tape shall be sewn with the use of a straight stitch, box stitch, box-X stitch or box stitch with special stitched corners as specified in Table V. All hook and loop tape shall be sewn with 8 - 12 stitches per inch.

Table V. Seam and stitch types.

Seam Placement	Seam type	Gage	Stitch type
Side seams, back arm seams, set in sleeves, shoulder seams OR Alternate safety stitch for shoulder and armhole (Turn seam and combine with) Top stitch shoulder & armhole	LSc-2 SSa-2 LSq-3	3/16 to 1/4 inch gage (double lap seam) 3/8 to 1/2inch gage Two rows 3/16 to 1/4- gage apart	301 or 401 401 and 516, 519 301 or 401
Top stitching of pencil pocket, collar, and front edge Top stitching of pocket flaps and cuff tabs	OSF-1 OSf-1	1/16 to 1/8 inch from edge 3/16 to 1/4 inch gage	301 301

Table V Seam and stitch types - Continued.

Seam Placement	Seam type	Gage	Stitch type
Attachment of pockets (When using automatic pocket setting equipment topstitching shall be 1/6, 1/8, or 3/16 gauge)	LSd-1	1/16 to 1/8 inch from edge	301
Attachment of elbow patches	LSd-1 or LSd-2	Two rows 3/16 to 1/4 inch apart	301
Slide Fastener Placement	---	See pattern for placement of slide fastener teeth from front edge	---
Top Stop (location)	---	1/2 ± 1/8 inch from collar seam	---
Attachment	SSak-2	two rows 3/16 to 1/4 inch apart	301
Bottom hemming	EFb-1	1/2 to 5/8 inch wide hem, double turned clean finished. 1/16 to 1/8 inch topstitch	301
Setting cuffs	LSd-1	1/16 to 1/8 inch from edge	301
Topstitch collar	SSa-1	1/16 to 1/8 inch from edge	
Hook and Loop Tape: Collar hook Sleeve flap inner hook and loop Sleeve cuff hook and loop Chest pocket, hook and loop Elbow patches, hook and loop	LSbj-1	Box, 1/8 to 3/16 inch from selvage	301
Front closure hook and loop	LSbj-1	Box-X, 1/8 to 3/16 inch from selvage	301
Loop tape: Sleeve flap outer, Name Tape, U.S. Army Tape and Rank Tape A OR	LSbj-1	Box, 1/8 to 3/16 inch from selvage and back-tacked corner stitch (see NOTE 1/ and figure 5a)	301 and back-tack

Table V Seam and stitch types - Continued.

Seam Placement	Seam type	Gage	Stitch type
B	LSbj-1	Box, 1/8 to 3/16 inch from selvage and bar-tacked corner stitch (see NOTE 1/ and figure 5b)	301 and bar-tack
Sleeve pocket A	LSbj-1	Box, 1/8 to 3/16 inch from selvage and vertical center stitch plus back-tacked corner stitch (See NOTE 1/ and figure 5c)	301 and back-tack
OR			
B	LSbj-1	Box, 1/8 to 3/16 inch from selvage and vertical center stitch plus bar-tacked corner stitch (See NOTE 1/ and figure 5d)	301 bar-tack
IFF tape – Hook tape attachment	Bsa-1	1/8 inch from bound selvage	301
Top stitch pleat of Bi-swing	OSf-2	Two rows 3/16 to 1/4inch gage apart	301
FR identification marker to left sleeve cuff (Type II coat only)	LSbj-1	Box stitch 7/8-inch by 7/8-inch	301

1/ See 3.10.3 for back-tack and bar-tack stitch requirements.

3.11.3 Bartacks and backtacks. To maintain durability and functionality, bartacks shall be placed as specified in Table VI. Nominal lengths and stitches per tack shall also be as specified in Table VI. When specified in Table V, Seam and stitch type, after sewing loop tape with box stitch, the loop tape shall be sewn with additional bartacks that are 3/8 - 5/8 inch in length with approximately 28 stitches per bartack placed perpendicular to selvage on each corner (see figures 5b or 5d). When required at corners of loop tape an acceptable alternate to bartacks are 3/8 - 5/8 inch in length backtacks, with a minimum of 3 rows placed perpendicular to selvage on each corner (see figures 5a or 5c). Bartacks or backtacks shall be set to straddle loop tape selvage as long as it does not interfere with the garment construction/feature or if there is interference, the bartack or backtack shall be set on loop tape and loop tape selvage.

Table VI. Bar-tack and back-tack placement.

Bar-tack or Back-tack Placement	**Size of tack**	**Stitches per tack**	**# of Bar-tacks (Per side or piece)**	**# of Back-tacks (Per side or piece)**
All pocket flaps at top superimposed on topstitching	5/8"	36	2	----
Bottom of elbow patch (drain hole opening 1 inch apart)	3/4"	48	2	----
Each side of hook/loop opening of elbow patch (vertical)	5/8"	36	2	----
Lower sleeve tab at ends	5/8"	36	2	----
Front chest pocket opening (ends of loop)	5/8"	36	2	----
Top of pencil pocket (vertical)	5/8"	36	4	----
Sleeve pocket top, both sides and bottom non bellow side	5/8"	36	3	----
Top and bottom of slide fastener tape on both sides	5/8"	36	4	----
Superimposed on top stitching of flap to secure IFF tab webbing cover (3/4 inch)	3/4"	48	1	----
Bi-swing, upper and lower locations as indicated on patterns	5/8"	36	2	----
End of cuff (underarm seam)	5/8"	36	1	----
Loop tape ends, placed perpendicular to the selvage	5/8"	36	4 or	4
Front edge of bottom hem	1/2" - 5/8"	----	----	1

3.12 Finished measurements. The coat shall conform to the finished measurements specified in Table VII.

Table VII. Finished measurements (inches).

Size	XX-Short	X-Short	Short	Regular	Long	X-Long	XX-Long
Half chest, +/- *1/2* 1/							
X-Small	20-1/4	20-1/4	20-1/4	20-1/4	20-1/4	20-1/4	-----
Small	22-1/4	22-1/4	22-1/4	22-1/4	22-1/4	22-1/4	-----
Medium	24-1/4	24-1/4	24-1/4	24-1/4	24-1/4	24-1/4	24-1/4
Large	26-1/4	26-1/4	26-1/4	26-1/4	26-1/4	26-1/4	26-1/4
X-Large	28-1/4	28-1/4	28-1/4	28-1/4	28-1/4	28-1/4	28-1/4
XX-Large	------	------	30-1/4	30-1/4	30-1/4	30-1/4	30-1/4
Back Length, +/- *1/2* 2/							
X-Small	25	26	27	28-1/2	30-3/8	31-1/8	------
Small	25-1/2	26-1/2	27-1/2	29	30-7/8	31-5/8	------
Medium	26	27	28	29-1/2	31-3/8	32-1/8	33-5/8
Large	26-1/2	27-1/2	28-1/2	30	31-7/8	32-5/8	34-1/8
X-Large	27	28	29	30-1/2	32-3/8	33-1/8	34-5/8
XX-Large	------	------	------	31	32-7/8	33-5/8	------
Sleeve Length, +/- *1/2* 3/							
X-Small	19-3/8	20-3/8	21-3/8	22-3/8	23-3/8	24-3/8	-----
Small	19-5/8	20-5/8	21-5/8	22-5/8	23-5/8	24-5/8	-----
Medium	19-7/8	20-7/8	21-7/8	22-7/8	23-7/8	24-7/8	25-7/8
Large	20-1/8	21-1/8	22-1/8	23-1/8	24-1/8	25-1/8	26-1/8
X-Large	20-3/8	21-3/8	22-3/8	23-3/8	24-3/8	25-3/8	26-3/8
XX-Large	-----	-----	-----	23-5/8	24-5/8	25-5/8	26-5/8
Chest pocket							
Width , *–0 /+1/8* (between bartacks)	6-1/4"	6-1/4"	6-1/4"	6-1/4"	6-1/4"	6-1/4"	6-1/4"
Depth, *–0 /+1/8* (inside pocket)							
X-Small and Small	3-3/4"	3-3/4"	3-3/4"	3-3/4"	3-3/4"	3-3/4"	3-3/4"
Medium – X-Large	5-1/4"	5-1/4"	5-1/4"	5-1/4"	5-1/4"	5-1/4"	5-1/4"
Sleeve tab							
Width	2 to 2-1/4"	2 to 2-1/4"	2 to 2-1/4"	2 to 2-1/4"	2 to 2-1/4"	2 to 2-1/4"	2 to 2-1/4"
Length	3 to 3-1/4"	3 to 3-1/4"	3 to 3-1/4"	3 to 3-1/4"	3 to 3-1/4"	3 to 3-1/4"	3 to 3-1/4"

1/ With slide fastener closed, hook and loop fasteners attached, and bi-swing folded in, lay coat flat on table and measure in line with arm pit of armhole from outside folded edge to opposite outside folded edge.
2/ Measure along center back from collar joining seam to bottom edge of coat.
3/ Measure along underarm seam from sleeve joining seam to bottom of sleeve (including cuff).

3.13 Toxicity. The finished coat shall not present a health hazard and shall show compatibility with prolonged, direct skin contact when tested as specified in 4.5.3. Chemicals recognized by the Environmental Protection Agency (EPA) as human carcinogens shall not be used.

3.13.1 Toxicity documents. Finishes/chemicals used in the process of this garment shall be identified and accompanied by the appropriate material Safety Data Sheet (MSDS) information.

3.14 Workmanship. After completion of the final assembly, the coat shall be thoroughly cleaned and all thread scraps, lint and foreign matter shall be removed. The coat shall not contain any fabric defects. The coat shall be uniform in quality and shall be free from irregularities or defects which could adversely affect performance, reliability or durability. The coat shall conform to the quality established by this specification.

4. VERIFICATION

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

a. First article inspection (see 4.2).
b. Conformance inspection (see 4.3).

4.2 First article inspection. First article, submitted in accordance with 3.1 shall be inspected for design, configuration in Tables V and VI and overall workmanship. The first article shall also include the finished measurements in Table VII, examination for defects in Table VIII and the testing in Table IX. The presence of excessive defects, as defined in the contract (see 6.2) or failure of any testing shall be cause for rejection of the first article.

4.3 Conformance inspection. Conformance inspection shall include shade and appearance of all components, finished measurements in Table VII, examination for defects in Table VIII and the testing in Table IX. Sampling for inspection shall be performed in accordance with ANSI/ASQ Z1.4, as defined by contract, except where otherwise indicated.

4.4 Component and end item inspections. In accordance with 4 3, components and end items shall be tested in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified or qualified in this document or applicable procurement documents. The government reserves the right to inspect and test all components and end items to determine conformance to requirements.

4.4.1 End item visual examination. Each coat shall be subjected to visual examination. In accordance with Table VII, fabric and garment defects shall be scored which are clearly noticeable at normal viewing distance (3-feet) and which affect the serviceability or appearance of the garment. Material defects are defined in Section I of FED-STD-4. If needed, closer inspection will be performed to verify compliance to specification requirements. Shade shall be evaluated at a distance of 3 feet.

Table VIII. Coat visual examination

Examination	Defect	Classification	
		Major	Minor
Material	Incorrect, not as specified (see 3.3.1 and 3.3.1.1)	101	
	Hole, cut, tear, smash, burn, exposed drill-hole, run, thin place, dye streak, color not as specified, misweave visible mends.	102	
	Knots greater than Sears Scale Level C (See 6.7)		201
	Slubs greater than Sears Scale Level D (See 6.7)		202
Component Part	Component part of coat omitted, not as specified, distorted, full, tight, or twisted any part of coat caught in unrelated stitching, the edge of any component part required to be forced out having folds of more than 1/8 inch	103	
	Fullness creating unwanted permanent fold, pleat, or crease in fabric or garment		203
Stitching and Seams	Coat seam: open stitching, puckered, distorted, pleated, wavy, twisted, irregular, or loose or tight stitch tension, broken or missing thread or stitch, needle chew, edge or raise stitching sewn too close the edge resulting in damage to cloth, seam allowance not as specified, no visible raw edge (inside raw edge greater than 1 inch)	104	
	Stitching not as specified	104	
	Double needle intersecting seams staggered by more than 1/4 inch		204
	Run off of more than 1/2 inch for edge and raised stitching		205
	Thread color not as specified		206
	Ends of stitching when not caught in other stitching back-tacked less than 1/4" or ends of a continuous line of stitching overlapped less than 1/2", except label stitching overlapped less than three (3) stitches		207
Evenness	Length of coat fronts uneven by more than 1/4 inch at top or bottom when closed		208
	Collar curls, puckers, pleats, or twists		209

Table VIII. Coat visual examination - Continued.

Examination	Defect	Classification Major	Minor
Evenness (cont'd	Sleeve lengths vary by more than 1/2 inch	105	
	Cuff and cuff tab out of alignment with bottom folded edge of sleeve hem by more than 1/8 inch.		210
	Pencil pocket channels varying more than 1/8 inch in width		211
	Front loop tapes not horizontal or uneven by more than 1/4 inch	106	
Hook & Loop	Misplaced, damaged or omitted, twist or distortion when closed, out of alignment causing bulge	107	
	Joining pieces out of alignment with each other by more than 1/4 inch	108	
	Color or type not as specified	109	
	Not stitched as specified	110	
	Stitching on tape selvage rather than hook or pile	111	
	Tape pieces not securely stitched down on cloth	112	
	Tape stitched more than 3/16" from edge, or leaving sharp or ragged edges	113	
	Yarns at selvage or cut edges of tape raveling or not secure		212
	Tape pieces not cut straight (at approximately 90 degrees)	114	
	Tape pieces not securely linked/spliced and properly aligned to each other		213
Hems	Hem of coat less than 1/2 inch or more than 5/8 inch		214
	Ends of hem not sewn closed, twisted, puckered, pleated, wavy, distorted		215
Slide Fastener	Not specified length, not specified type	115	
	Twisted, distorted, damaged, puckered, color not as specified	116	
	Thong omitted not as specified		216
	Not located in correct position on coat front		217
Pockets and Flaps	Pocket companions not uniform in size or shape		218
	Pocket twisted, curled or puckered, not stitched as specified or not well formed	117	
	Pocket flap not completely covering pocket opening, not positioned as specified		219
	Pocket construction not as specified	118	
	Pockets out of alignment 1/4 inch or more		220
	Bellows exposed		221
Eyelets	Omitted, misplaced, improper size or caught in stitching		222
	Stitch type not as specified		223

Table VIII. Coat visual examination - Continued.

Examination	Defect	Classification Major	Minor
Interlining	Interlining bubbling, delamination, bleed through, wrinkling, puckering, misplaced, omitted or added where not specified		224
Shade	Shade variation within part or between parts	119	
Elbow patches	Elbow patches not attached as specified		225
Cleanness	Spot or stain more than 1/4 inch, excessive thread ends (more than 3) not trimmed or removed, odor, affecting appearance or serviceability	120	
Bar-tacks and back-tacks	Omitted, misplaced, loose stitching, not specified size, not serving intended purpose	121	
Labels	Any label omitted, incorrect, illegible, not attached where specified Bar code/UPC code omitted, not readable by scanner; human readable interpretation (HRI) omitted or illegible Bar code/UPC code not visible on folded, packaged item, bar code attachment causes damage to the item	122 123	 226
Packaging	Any coat not packaged in accordance with contract or purchase order	124	

4.4.2 End item testing. The finished Class 2 coat shall be tested for the characteristics listed in Table IX. The methods of test shall be as specified in Table IX. All test reports shall contain the individual values utilized in expressing the final results. The sample unit shall be two complete coats. The lot shall be unacceptable if one or more sample units fail to meet any requirement specified.

TABLE IX. End item testing.

Characteristic	Requirement paragraph	Test method
Permethrin content (Class 2 only)	3.4.1	4.5.1 1/
% Bite protection (Class 2 only)	3.4.2	4.5.2 1/
pH (Class 2 only)	3.4.3	AATCC 81

1/ After 20 launderings as per AATCC 135, 3, Viii, except laundering cycles 5, 10, 15, 19 and 20 shall be performed without adding any detergent to minimize detergent accumulation in specimens. After 50 launderings as per AATCC 135, 3, Viii, except laundering cycles 5, 10, 15, 19, 20, 25, 30, 35, 40, 45, 49 and 50 shall be performed without any detergent.

4.5 Methods of Inspection.

4.5.1 Permethrin content analysis (Class 2). The permethrin content of treated fabric shall be determined by gas chromatographic procedure and directly compared to an external standard containing a known permethrin content. Testing shall be conducted according to the following test method. Alternate method(s) of extraction and analysis, and specimen size are subject to government approval and laboratory cross correlation prior to implementation.

Evaluation of Permethrin Treated Fabric Materials: Extraction and Analysis by Gas Chromatography-Mass Spectrometry

Note: The conditions described in this method are optimum for the gas chromatograph employed. These conditions may vary based on the gas chromatograph used. The carrier gas flow rate shall be adjusted so the elution of the first permethrin isomer is greater than 5 minutes. Alternate methods of extraction and analysis are subject to government approval and laboratory cross correlation prior to implementation.

A. Apparatus.

A.1 Analytical Balance. 0.0001g sensitivity, Mettler Toledo, or equal

A.2 Analytical Balance. 0.000001g sensitivity, Mettler Toledo, or equal

A.3 Glassware.
- a. 10-100mL volumetric flasks
- b. Funnel
- c. Pipettes

A.4 Automatic Die Cutter. Freeman Atom, or equal

A.4.1 Three Inch Cutting Die. 3 inch diameter circular steel die cutter

A.5 Extraction Apparatus.

A.5.1 Accelerated Solvent Extractor (ASE) Dionex Corporation or equal
- a. Liquid Nitrogen Cylinder to Deliver High Pressure Gas, 230psi
- b . Complete Extraction Cells, 22mL
- c . Cellulose filters, 1.98cm
- d. 40mL Amber Glass Collection Vials
- e. Solvent Resistant Teflon-Silicone Coated Septa
- f. 3mm-4mm borosilicate glass beads

A.5.2 Soxhlet.

a. Electric heater with variable control
b. Heat resistant glass flask when using Soxhlet extractor. The flask shall be a 250mL, flat or round bottom, and single neck.
c. Extractor condenser
d. Boiling condenser
e. Cellulose extraction thimbles

A.6 Agilent 6890N (G1530N) Series Gas Chromatograph. Gas Chromatograph equipped with ChemStation software, or equal

a. Carrier Gas Cylinder, Appropriate Regulator Set at 80psi
b. Hewlett-Packard Capillary Column, 5% Phenyl Methyl Siloxane/30.0m x 250µm x 0.25µm nominal, 325°C Max, or equal.
c. Split Inlet Liner, Packed with Silanized Glass Wool/5mm
d. Injector Microliter Syringe, Capable of Delivering 1µL
e. GC Amber Injection Vials and Rinse Vials

A.7 Agilent Series 5973N (G2579A) Mass Spectrometer, or equal.

a. Performance Turbo Pump MSD (EI Mode), or equal

A.8 Ultrasonic Cleaner. Branson, or equal

A.9 High Temperature Convection Oven. 500°C Max

A.10 Refrigerator Storage. 4°C

B. Reagents.

B.1 Permethrin Analytical Standard. Permethrin standard shall be ≥97%, mixture of Cis/Trans Isomers. Permethrin standards are available from FMC Agricultural Products; Princeton, New Jersey 08543; FMC reference #33297; 97% purity/specified technical, or equal

B.2 Solvent Mixture. Solvent mixture shall be 80% Acetonitrile/Analytical Grade and 20% Methanol/Analytical Grade

B.3 High Purity Helium Carrier Gas. Carrier gas shall be ≥99.999%

B.4 Cleaning Solutions. Cleaning solutions shall be as follows:

a. Micro-90 Ultra Cleaning Solution, or equal
b. Reversed Osmosis Water, 98% Rejection Rate

C. Calibration of Apparatus.

C.1 Analytical Balance.

C.1.1 Pre-Weighing Procedures. Prior to weighing, initiate the internal weight calibration function or use an external certified weight set to verify that the balance is operating properly.

C.1.2 Manufacturer Calibrations. Obtain manufacturer certifications within 12 months prior to taking measurement.

C.2 Gas Chromatography equipped with Mass Selective Detector (See A.6, A.7)

a. Perform the manufacturer's recommended calibration procedures prior to analyses.

b. Before samples or required blanks can be analyzed, the instrument must meet the initial calibration acceptance criteria (see G).

C.3 Cleaning Techniques. Establish cleaning techniques to ensure that no permethrin carries over from experiment to experiment. The techniques listed below have been determined to be suitable:

a. Evaporate excess solvent from extraction glassware and wash using conventional methods. (see B.4)

b. Bake off residual organic substances from glassware in high temperature convection oven, 500°C, for three to six hours. (see A.9)

c. Sonicate A.S.E. Cells in the solvent that was used for the extraction. (see A.8)

D. Sampling and Test Specimens.

D.1 Sample size. The sample size (Class 2 trouser) to be tested shall be selected in accordance with ANSI/ASQ Z1.4, Special Inspection Levels S-1 and AQL of 1.5.

D.2 Test specimens.

a. From each sample garment being evaluated (unlaundered, after 20 and after 50 launderings), select three 3 inch diameter specimens (use a 3 inch circular cutting die having surface area of 45.6037cm^2) for each test condition. Cut specimens from single ply areas so that no two specimens shall contain the same warp and filling yarns (for example, for the blouse areas-front left, front right, back, right sleeve, left sleeve; and for the trouser areas-front left leg, back left leg, right front leg, back front leg, and front left or right fly). Specimens for the measurement of permethrin content after laundering shall be cut after the finished garment has been laundered according to AATCC 135, 3, V, III to the specified number of cycles. Laundered specimens shall be cut from different ply areas across the garment.

b. Weigh each specimen to the nearest milligram (see A.1).

E. Standard Preparation.

a. Prepare six concentrations of permethrin standards which are 20, 50, 75, 100, 150, and 200ng/µL, [1ng/µL is equal to 1 part-per-million (ppm)]

b. Using the balance specified in A.2, weigh 10mg ± 1mg of permethrin crystals and place into a 50mL volumetric flask and fill with 80% acetonitrile/20% methanol solvent to obtain the standard of 200ng/µL. Make all appropriate dilutions from this flask to obtain the additional standards.

c. Calculate the actual concentrations of the standards based on the weight of the permethrin.

F. Extraction Procedure (see A.5)

F.1 ASE

F.1.1 Preparing Specimens. Roll each specimen and place into an ASE cell fitted with a cellulose filter. Fill the void with glass beads to conserve solvent. Place all cells onto ASE cell tray.

F.1.2 Quality Control. Extract a specimen blank for every run to detect if any carry over of permethrin is significant.

F.1.3 Accelerated Solvent Extraction Procedures.

F.1.3.1 Parameters.

Cell Size	22mL
Collection vials	60mL, light blocking/amber
Solvent	80% Acetonitrile, 20% Methanol

Approximate Gas Pressures:

System	50 psi
System Solvent	10 psi
Oven Compression	130 psi

Parameters:

Preheat	0 min
Heat	5 min @ 100°C
Static w/Solvent	10 min @ 1500 psi
Flush Volume	90%
Purge	90 sec
Cycles	2

F.1.3.2 Preparation for analyses. Dilute or concentrate each vial to 40mL and prepare a 1mL aliquot from every specimen extraction for GC analysis. Permethrin recovery must be 95% or greater (see F.4).

F.2 Soxhlet. Place each specimen into cellulose Soxhlet extraction thimble. Add 160mL of the acetonitrile/methanol mixture and boiling chips into a 250mL flask. Assemble the Soxhlet apparatus and extract the permethrin treated specimens for 6 hours or until and extraction recovery of 95% or greater has been achieved (see F.4). Concentrate the extract by rotoevaporation, or equal, at 35°C to a final volume of 40mL.

F.3 Storage. After the specimens are extracted, store in light blocking amber vials in refrigerator until ready to inject (see A.10). Specimen extractions shall be stored in a refrigerator for no longer than three months. When ready to analyze, allow the temperature of the GC vials to equilibrate in the area of evaluation before injection into GC.

F.4 Extraction Efficiency.

a. Select three random specimens from any permethrin treated fabric sample and perform three consecutive extractions.

b. Quantify the level of permethrin recovered from each specimen for each consecutive extraction, through GC/MS analysis.

c. Verify that the percent recovery of permethrin for any specimen size and composition, is 95% or greater by comparing the recovery level from the first extraction, to that of subsequent extractions. Combine the permethrin levels obtained from each of the three extractions, if the initial extraction yields permethrin levels 95% or greater than the total percent of permethrin extracted three sequential times, then the extraction efficiency is 95% or greater. Note - To ensure that the extraction efficiency is being accurately calculated, the permethrin levels in the second and third extraction should be minimal, and the permethrin level by the third extraction should be trace or zero.

Note: Initial verification of extraction efficiency of this test method must be performed. Once an extraction efficiency of 95% or greater is established, no further demonstration of the extraction efficiency is needed.

G. Analytical Procedure.

G.1 Quality Control. Laboratory blanks that contain no analyte are used to ensure specimens are free of contaminants or to ensure there is no cross contamination during a run. Inject a blank containing 80% acetonitrile/20% methanol before every set of standards and before and after every ten specimens. If any blank, after multiplying concentration by five, is greater than any specimen result, the specimen data points are invalid and a system check must be run to identify the source of the carry over. After system maintenance has been performed, repeat injections of

the standards for the calibration curve, new blanks, and new aliquots of the specimens affected by the previous carryover.

G.2 Standard Injection.

a. All six permethrin standards will be injected at the beginning and at the end of each series of specimens to "bracket" the specimen injections. Check linearity of the standards for each set of injections by plotting the responses (area counts) on the x-axis vs. the calculated standard concentrations on the y-axis. A 3rd order polynomial regression line with R-squared value of 0.99 or greater is acceptable. Derive the equation of the 3rd order polynomial for sample calculations.

G.3 Specimen Injection. Run specimen injections in duplicate. Sample extracts, standards, and blanks must be analyzed within an analytical sequence such as listed below:

a. Initial calibration (Standards)
b. Instrument blank at the end of the initial calibration
c. Specimen Series 1 (extracts 1-10, 1st quantitation)
d. Instrument blank
e. Standard Series 1
f. Instrument blank
g. Specimens Series 2 (extracts 1-10, 2nd quantitation)
h. Instrument blank
i. Standard Series 2
j. Instrument blank
k.-r. Subsequent specimen series,(ex. 11-20, including blanks, and standard series)
s. Final calibration (Standards)

Note: After the initial calibration, the analytical sequence may continue as long as acceptable instrument blanks and the standards are analyzed at the required frequency. If any specimen count does not fall on the standard calibration curve, the evaluator may dilute that specimen by 1:10 and re-run; calculations of the permethrin level must be adjusted using the factor of 10.

G.4 Gas Chromatograph/Mass Spectrometer Parameters. (see A.6)

G.4.1 Injection procedures.

a. Place all GC vials into auto sampler tray. To avoid vapor pressure differences, all vials must be at room temperature and containing identical volumes.

b. Inject 1µL into the Gas Chromatograph equipped with Mass Spectrometer. Use high purity helium carrier gas (see B.3) and appropriate column.

c. Ensure that rinse vials in the injector port contain 80% acetonitrile/20%methanol above the minimum solvent line.

G.4.2 Instrument Settings. The following parameters will be used in the analysis:

Oven Temperature	250 °C
Injector Temperature	275 °C
Detector Temperature	280 °C
Injection volume	1µL
Carrier Gas Flow Rate	1.3 mL/min
GC Run Time	10 min
Split Ratio	3:1
MS Single Ion Monitoring	
Scan Parameters	EM Voltage Gain Factor of 1
Real Time Plot	10 min
Resolution	Low
Solvent Delay	4 min
Start Time	4 min, 4.26 Cycles/sec
Ions Monitored	183 (quantitation), Dwell 100
	163 (confirmatory), Dwell 100

G.4.3 Evaluation Procedures.

a. Quantify the permethrin content detected by the mass spectrometer by extracting ion chromatograms 183 (quantitation ion) and 163 (confirmatory ion).

b. Integrate permethrin peaks manually from baseline to baseline using the software, or generation of report.

H. Calculations.

H.1 Permethrin Concentration. The permethrin concentration will be calculated from the area counts of the chromatographic curve and expressed in terms of mass permethrin per surface area (mg/cm^2), with the option of expressing in terms of weight permethrin per weight of specimen (W/W%):

H.1.1 Concentration. The concentration of permethrin in milligrams per square centimeter shall be calculated as follows:

Concentration (mg/cm^2) =

$40mL \times (ax^3 + bx^2 + cx + d) \times (1{,}000\ \mu L/1mL) \times 1mg/1{,}000{,}000ng) \times (1/45.6037cm^2)$

Where:
40mL = Final Volume
a, b, c and d = numbers derived from 3rd degree polynomial equation from standard series following specimen series

x = area count of the specimen curve
45.6037cm^2 = area of specimen

H.1.2 Conversion to Permethrin Weight Percent Content (W/W%).

Concentration (W/W%) = [Concentration (mg/cm^2) multiplied by (surface area) cm^2 divided by (weight of specimen) mg] multiplied by 100.

I. Report. Report the individual concentration for each specimen in milligrams per square centimeter permethrin to the nearest 0.001mg, (no individual specimen results shall fall outside of the minimum to maximum range of the permethrin levels as specified in paragraph 3.4.1). A single retest shall be allowed; when a single specimen fails, a new sample with complete set of specimens shall be sampled and tested. The retest shall be used to rate pass or fail.

4.5.2 Percent (%) Biting Protection Assay. Percent (%) bite protection shall be measured on a finished permethrin treated garment, Class 2, under three test conditions and using a control specimen (non-permethrin treated, garment, Class 1) against the two selected insect species specified in 4.5.2.3. The three test conditions shall be one unlaundered, two: after 20 launderings and three: after 50 launderings from garments produced in the same lot. Corresponding permethrin content for each of these conditions will be measured as specified in 4.5.1 to correlate biological toxicity with the particular garment treatment used to meet requirements specified in 3.4.1.

4.5.2.1 Number of determinations. Three determinations will be run for each of the 2 insect species (see 4.5.2.3.3). Each determination for each insect is conducted with 3 volunteers using 3 different fabric conditions; unlaundered, after 20 launderings and after 50 launderings and compared to non-permethrin treated control. A single untreated unlaundered control sleeve can be used for the 3 determinations for each volunteer provided that the control is run against the same insect population, on the same day the specimens being tested, and tested on an arm that has not been used for testing a treated sleeve (see 4.5.2.3.6). The total number of specimens for the 3 determinations is outlined below. It is estimated that one coat yields 3 specimens and one trouser yields 3 specimens consisting of largely a single ply fabric area (see 4.5.2.2). See 6.8.

Number of Insect tests **X**	Number of Determinations **X**	Number of Fabric conditions =	Total Specimens per garment type
Mosquitos 1/	3 x	3 x =	9 2/
Control 2/	1 x	1 x =	1 2/

1/ One set of treated specimens will be used twice to test each mosquito species
2/ Total garments estimated, required to conduct 3 determinations are;
3 treated coats and 1 untreated coat

4.5.2.2 Specimen size. Specimens will be cut to the shape and dimensions illustrated in Figure 6. Specimens shall be cut from single fabric ply areas. To minimize the number of

garments needed for each determination, multiple ply areas such as seam areas or hems may occur limitedly in the perimeter areas provided multiple plies of fabric in these areas shall-not create a gap between subject's arm and fabric (see 4.5.2.3.5). Specimens will be cut with gloved hand and placed in a plastic bag and the glove disposed of to avoid residual contamination of controls. When failure point is being quantified, the laundered samples may be used to accomplish the additional launderings needed.

4.5.2.3 Procedure. The procedure to conduct biting protection assay is derived from the "EPA Product Performance Test Guidelines, OPPTS 810.3700, Insect Repellents For Human Skin and Outdoor Premises, December 1999 (see 2.2.2), and is described in part below, noting any exceptions to this procedure.

4.5.2.3.1 Applicable Protocol. Within OPPTS 810.3700, Section 3 addresses treated fabric material and section (3)(iii) specifies that laboratory studies are conducted as described in (d)(1) of the OPPTS 810.3700 guideline.

4.5.2.3.2 Fastening Test Specimen. Section (3)(iii) recommends "fastening a strip of the impregnated material to the test subject's forearm". This will be accomplished by utilizing specimen size specified in 4.5.2.2 (see Figure 7) and ensure it covers the entire forearm of the test subject without gaps for insect access. With the arm in the pronated position, the fastening seam that closes the specimen on the volunteer's arm shall be located on the top of the forearm. Attachment of the treated specimen will be done with gloved hand, which will be disposed of prior to attaching the control to alternate arm.

4.5.2.3.3 Test Insects. OPPTS 810.3700 section (d) (1) addresses laboratory tests conducted with mosquitoes and stable except this test shall utilize two species of mosquito. The results of this evaluation for the mosquitos is a contractual requirement. Insect genus, species and subspecies, colony origin and approximate age shall be used as specified below and in 4.5.2.3.3.

Mosquitoes:
Aedes (Stegomyia) aegypti
Anopheles albimanus,

4.5.2.3.3.1 Insect Characteristics. Mosquito ages employed for these studies shall be 5-11 days old after emergence from the pupal stage. Mosquitoes shall be laboratory-reared and disease free, and have been kept in stock cages containing both males and females. The mosquitoes will be maintained on 10% sugar water and have not been provided a blood meal. Methods should be used to preselect females for the studies. Use either a hand draw box or suitable aspirating device to collect host-seeking mosquitoes for the required cage density (see 4.5.2.3.3.3).

4.5.2.3.3.2 Insect Rearing. Insects for these studies shall be reared under optimal conditions for larvae, as described in OPPTS 810.3700, section (d)(1)(iii).

4.5.2.3.3.3 Cage Conditions. A cage density of 200 $\pm$ 25 female insects per cage is required to meet the biting pressure density of at least one female mosquito per 300 cm^3 cage volume.

(Cages shall be 60,000 ± 6,000 cm^3, with a sleeved opening for the arm of the volunteer to be inserted.) Cages shall be constructed of a lightweight clear plastic on 3 sides, or an aluminum bottom panel with light weight clear plastic on 2 sides. The top of the cage and side opposite the cloth sleeve should consist of screen rather than plastic. Tests shall be conducted with fluorescent lights on and under room conditions (22-27°C, and 30-80% RH). Tests should not be conducted if the temperature or humidity is outside of the specified range.

4.5.2.3.4 Subjects. A minimum of 3 test volunteers shall be used in each study for each insect species at each test facility. The same 3 subjects can be used to evaluate different insect species done at the same facility. Due to the replication, the number of volunteers is now decreased from the 5 or more recommended in OPPTS 810.3700, section (c)(3)(i). Collection of data from both females and males are preferred for the study. Cosmetics and alcohol shall be avoided 12 hr prior and during the test. Volunteers shall read and sign the appropriate Institutional Review Board (IRB)-Human Use protocol forms, required for their consent, prior to being used in the test. IRB protocols shall be approved through the appropriate agencies' IRB mechanisms.

4.5.2.3.5 Volunteer's Test Area. The test area shall consist of the region from the wrist to approximately 1/2 inch before the elbow. Fabric material shall be secured around the forearm to eliminate gaps between the arm and material and with the fastened seam positioned on the top of the forearm as specified in 4.5.2.3.2. The ends of the garment, near the wrist and elbow shall be sealed with protective tape of adequate thickness to prevent insects from biting through the tape. The hand shall be gloved with a glove of appropriate thickness to prevent biting through to the hand.

4.5.2.3.6 Controls. For each set of specimens, a control shall be conducted. The control shall consist of the same fabric as the specimens, will not be laundered and will not contain the insect protection treatment. It will be identical in size to the test swatch (see 4.5.2.2). Controls will be cut in clean area and stored in separate plastic bags to avoid residual permethrin contamination. The controls will be tested on the arm opposite the treated specimens, or on the same arm used for experiments provided that the control is tested prior to testing treated specimens.

4.5.2.3.7 Biting Exposure. Arms containing the controls and treated specimens shall be exposed to a cage of insects for 15 min. The order of testing specimens on the arm will be sequential and in order of the most laundered to least laundered. Therefore, if the same arm will be used to test the control and specimens, the order of testing shall be control, followed by the specimens laundered 50 cycles, followed by the specimens laundered 20 cycles, and then conclude with testing the unlaundered treated specimens. Teats should be conducted with as little elapsed time as possible in between testing of a volunteer's arms.

4.5.2.3.8 Raw Data. Raw data shall consist of the insect information as described in 4.5.2.3.3, the number of insects used per cage, and method of selection of these insects. The number of male and female insects shall be counted and only the number of females used for purposes of identifying insects that bite compared to non-biting mosquitoes. The number of bites received for each sample (treatment or control) shall be counted and recorded.

4.5.2.4 Report. Calculation of the reduction in bites for the treatment, compared to the control, shall be expressed as a percentage that represents the percentage bite protection as shown below. Individual subject results for each trial (3 for each treatment type or control), shall be averaged with all trials for the other volunteer subjects in the study. An overall average % bite protection shall be calculated by Abbott's equation below and reported in this manner for each insect and for all volunteer tested. For initial and 20 wash conditions, a single average within each species trial may fall below the 90% minimum provide it is greater than or equal to 90% and the overall average of all 3 (or more) volunteer's samples results in bite protection which is greater than or equal to 90%. For the 50 wash condition, single average within each species trial may fall below the 70% minimum provide it is greater than or equal to 70% and the overall average of all 3 (or more) volunteer's samples results in bite protection which is greater than or equal to 70%.

$$\% \text{ Bite Protection} = \frac{(B_{NC}/F_C) - (B_T/F_C)}{(B_{NC}/F_C)}$$

where:

B_{NC} = bites recorded on the arm covered by the negative control fabric

F_C = female insects in the cage that are capable of biting at the start of the 15-min period

BT = bites recorded on the arm that was covered by the treated fabric.

4.5.3 Toxicity test. If the toxicity requirement (see 3.13) can be demonstrated with historical data, toxicity testing may not be required (see 6.2). When required, (see 6.2), an acute dermal irritation study and a skin sensitization study shall be conducted on laboratory animals. When the results of these studies indicate the (item) is not a sensitizer or irritant, a Repeat Insult Patch Test shall be performed in accordance with the Modified Draize Procedure. (See 2.3)

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD or in-house personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

5.2 Permethrin packaging (Class 2 only) Every box containing permethrin treated uniforms must be labeled according to EPA requirements as stated in Federal Insecticide, Fungicide And Rodentcide Act (FIFRA). (See paragraph 2.2.2)."

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 coat is for wear by military personnel in the United States Army as a combat uniform in garrison and combat missions.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this document.
b. Type, class and sizes required (see 1.2).
c. The specific issue of individual documents referenced (see 2.2).
d. When first article sample is required (see 3.1, 4.2, 6.3).
f. Conformance inspection quality acceptance limits (see 4.3).
g. Inspection conditions (see 4.4).
h. Toxicity requirements (see 4.5.3)
I . Packaging requirements (see 5.1).

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 pre-production 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 acquisitions documents regarding arrangements for selection, inspection and approval of the first article.

6.4 Approved EPA Permethrin Registrations. Permethrin treatment operation for the subject uniforms shall be EPA registered. Samples of approved permethrin registrations and labels are shown at the EPA web site: http://oaspub.epa.gov/pestlabl/ppls.home

NOTE: EPA registration does not certify that the permethrin treatment meets the specification requirements.

6.5 Fastener tape (Hook & Loop). Fastener tape hook and loop that has been found to meet the requirements in this specification is available from the following sources:

Velcro USA, Inc., 406 Brown Avenue, Manchester, NH 03103

YKK (U.S.A.) Inc., 1306 Cobb Industrial Drive, Marrietta, GA 30066

Aplix Inc., 12300 Steele Creek Road, P.O. Box 7505, Charlotte, NC 28241

6.6 IFF Material. IFF material found to meet the requirements in this specification is available from the following sources:

Night Vision Equipment Systems, P.O. Box 219, Fogelsville, PA

Cyalume Corporation (CAGE 0BY83), 96 Windsor Street, West Springfield, MA 01089,
POC: Tom McCarthy, Director of Government Products, Office Phone: 413-858-2526

TVI Corporation, 7100 Holladay Tyler Road, Glenn Dale, MD 20769,
(301) 352-8800 ext. 245

6.7 Fabric defect scales. Fabric Defect Replica Kits are available from Sears Roebuck and Company, Department 817 (ATTN: BSC 23-29), Sears Tower, Chicago, IL 60684.

6.8 Percent Bite Protection . The following facilities are known to perform percent bite protection testing in conformance with 4.5.2.

Aedes aegypti and Anopheles albimanus:
United States Department of Agriculture-Agriculture Research Service
Center for Medical, Agricultural and Veterinary Entomology
Agricultural Research Service
1600 SW 23rd Dr
Gainesville, FL 32608
POC: Dr. Ulrich R. Bernier/Research Chemist Mosquito and Fly Research Unit
Ph: (352) 374-5917
E-mail: uli.bernier@ars.usda.gov

6.9 Subject term (key word) listing.

Clothing
Clothing, Flame Retardant
Insect protection
Permethrin
Uniform
Universal Camouflage

CUSTODIAN:
Army – GL

PREPARING ACTIVITY:
DLA – CT

Project No.

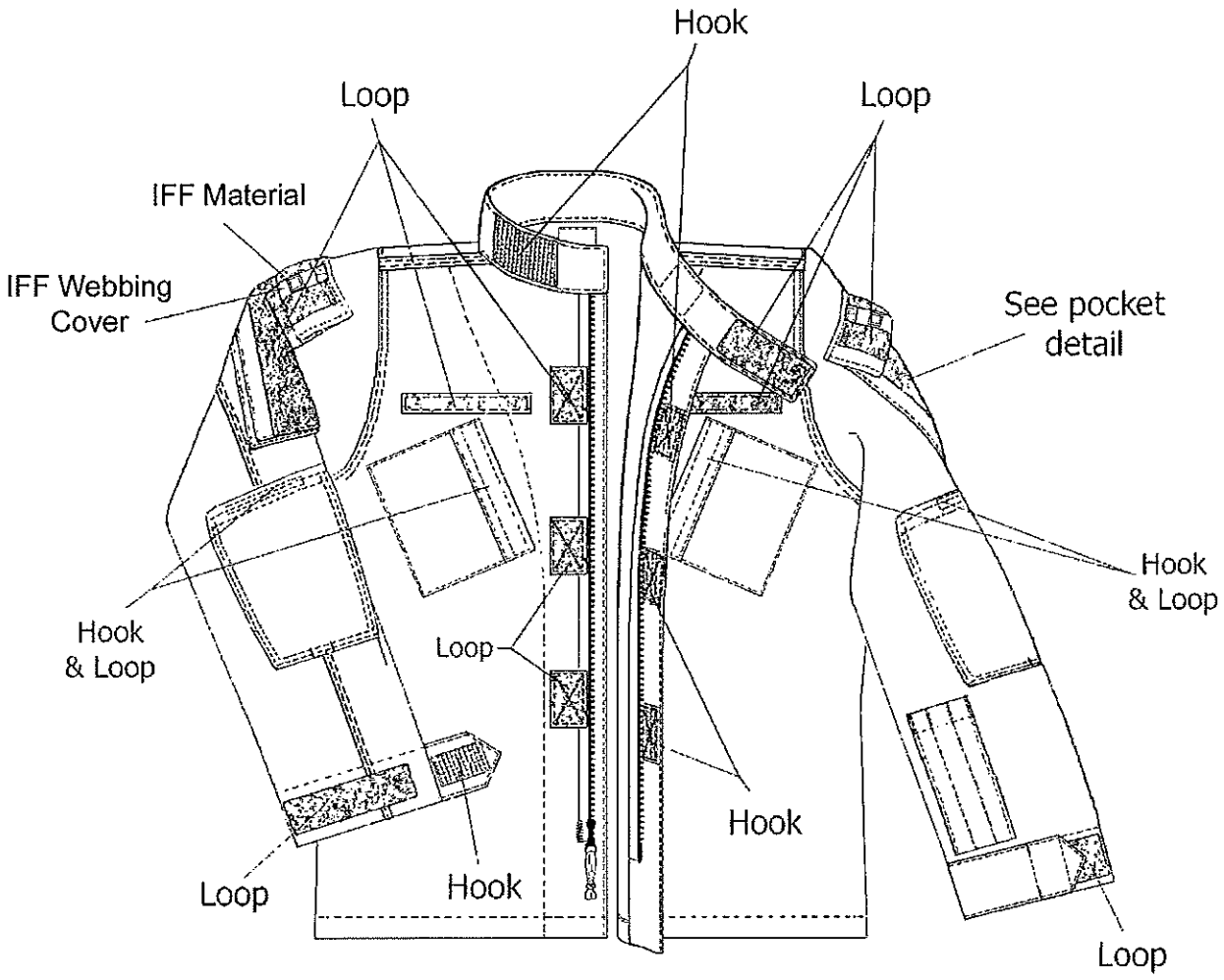

Figure 1. Coat Front, Universal Camouflage Pattern,
Army Combat Uniform

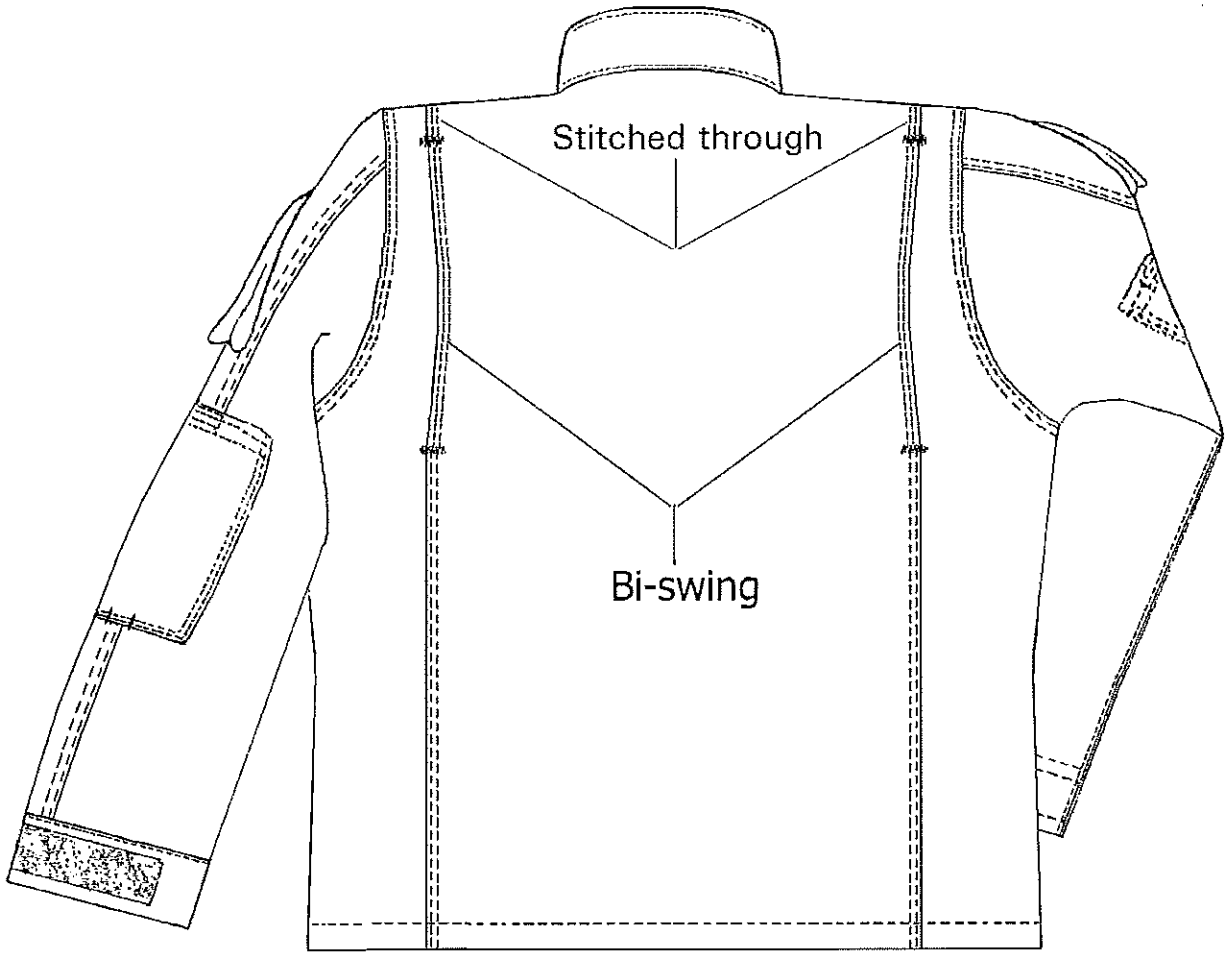

Figure 2. Coat Back, Universal Camouflage Pattern,
Army Combat Uniform

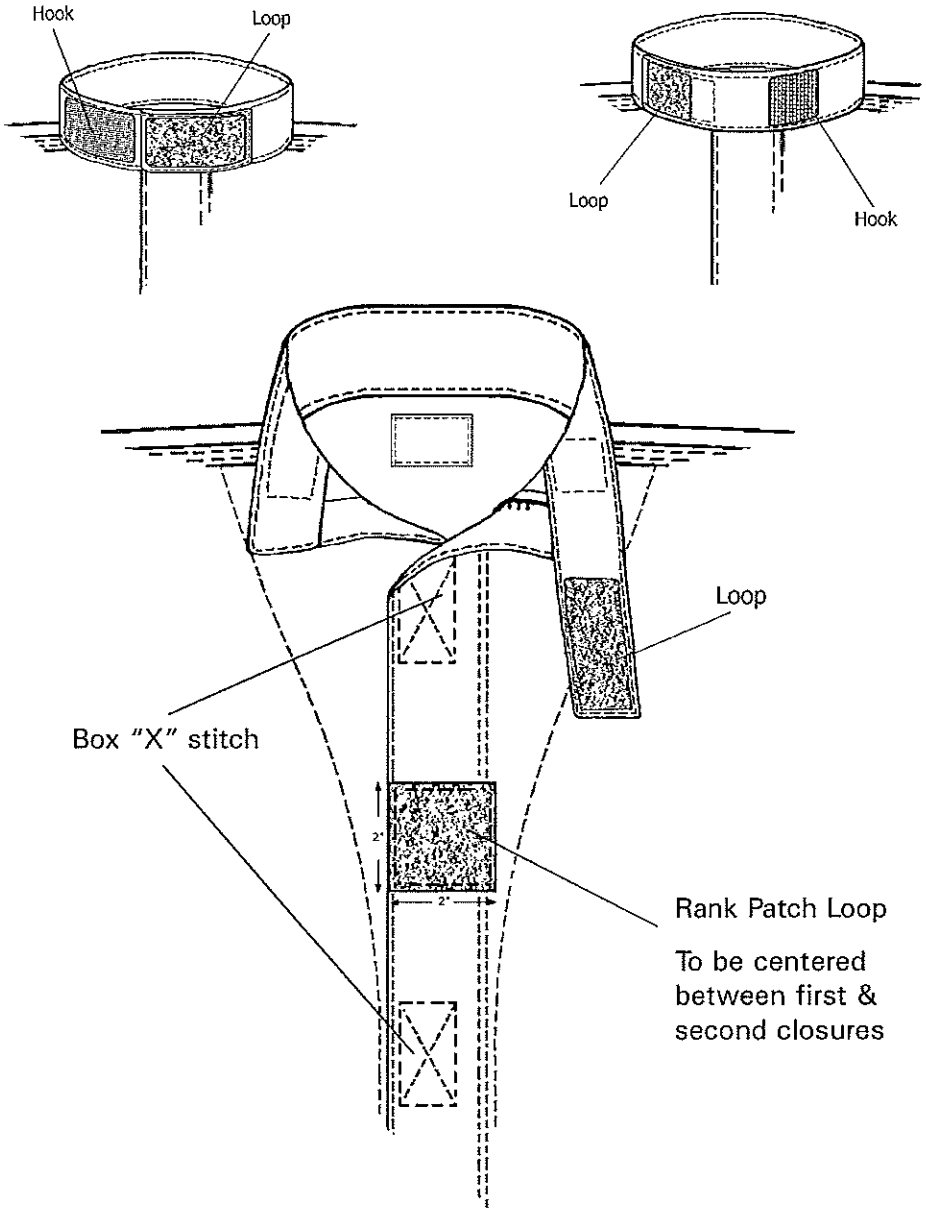

Figure 3. Coat Collar, Universal Camouflage Pattern,
Army Combat Uniform

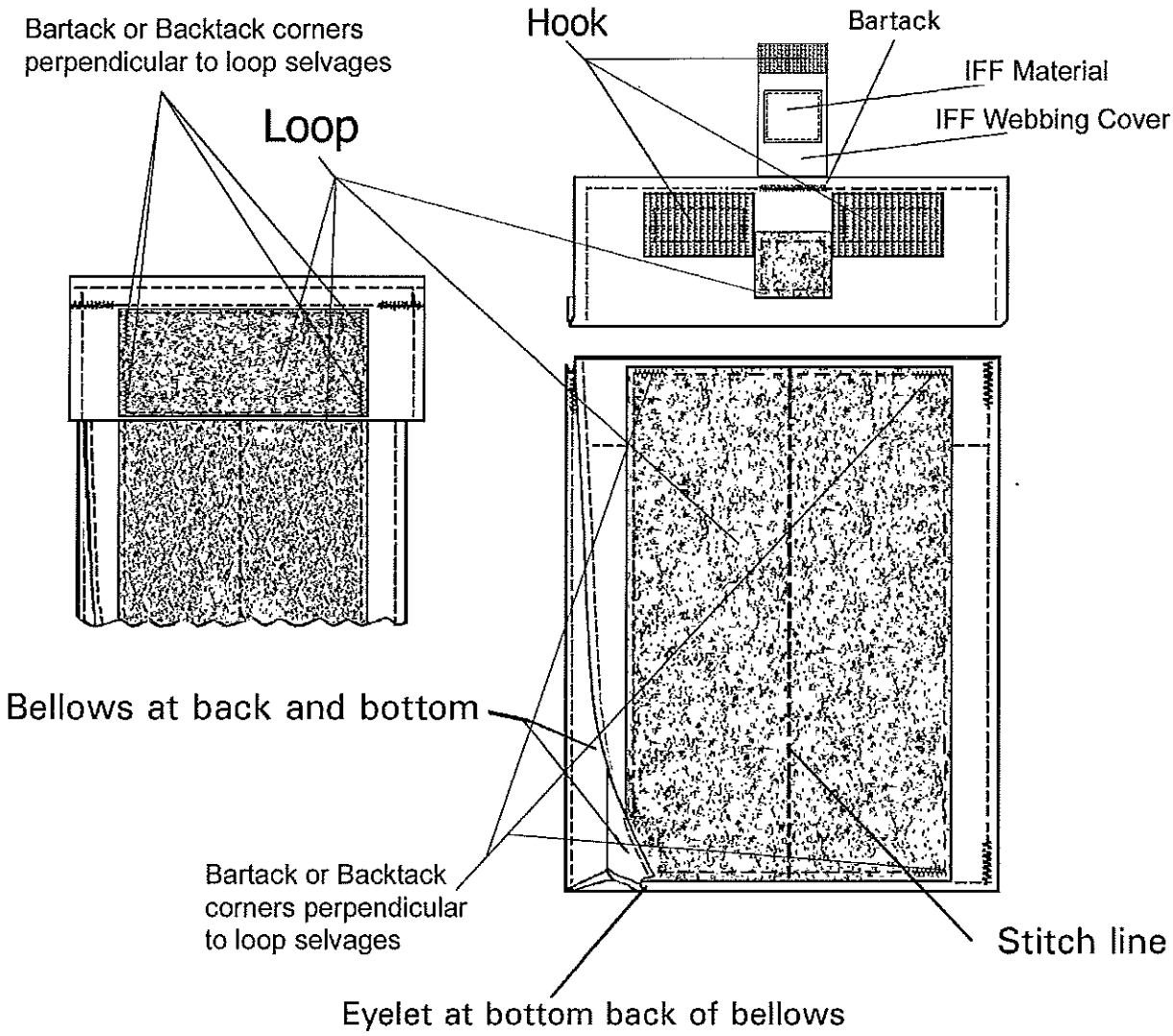

Figure 4. Coat Upper Sleeve Pocket, Universal Camouflage Pattern, Army Combat Uniform

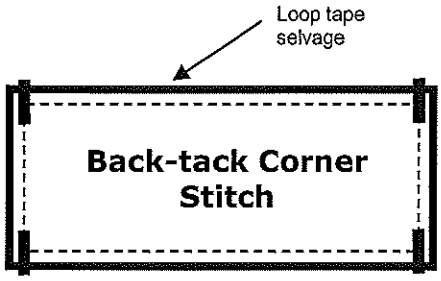

Figure 5a – Back-tack Corner Stitch 1/

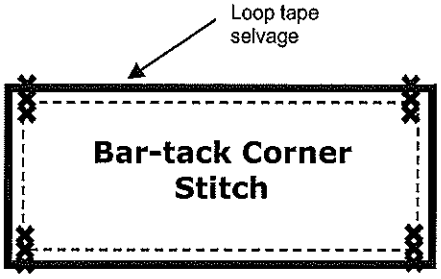

Figure 5b – Bar-tack Stitch 1/

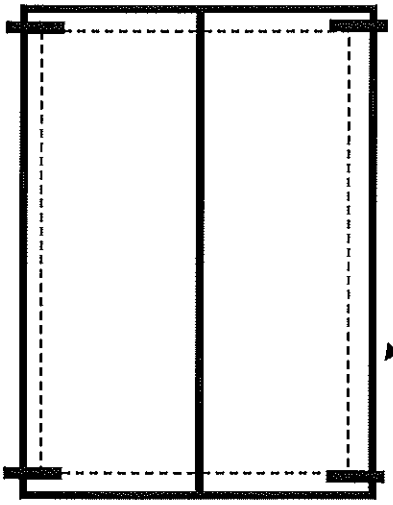

Figure 5c – Sleeve pocket center stitch with backtack corner stitch 1/

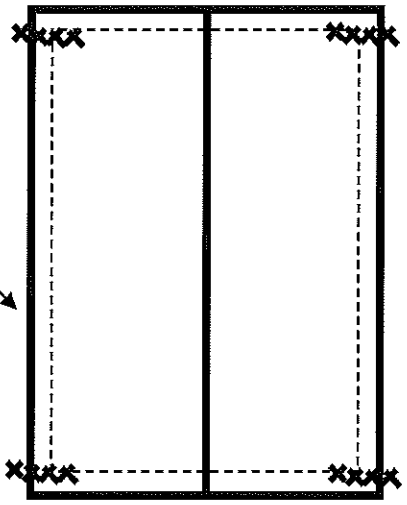

Figure 5d – Sleeve pocket center stitch with bartack stitch corner stitch 1/

1/ **NOTE:** Figures 5a-5d are Box stitched with back-tack or bar-tack.

Figure 5. Loop Tape, Stitch Methods.

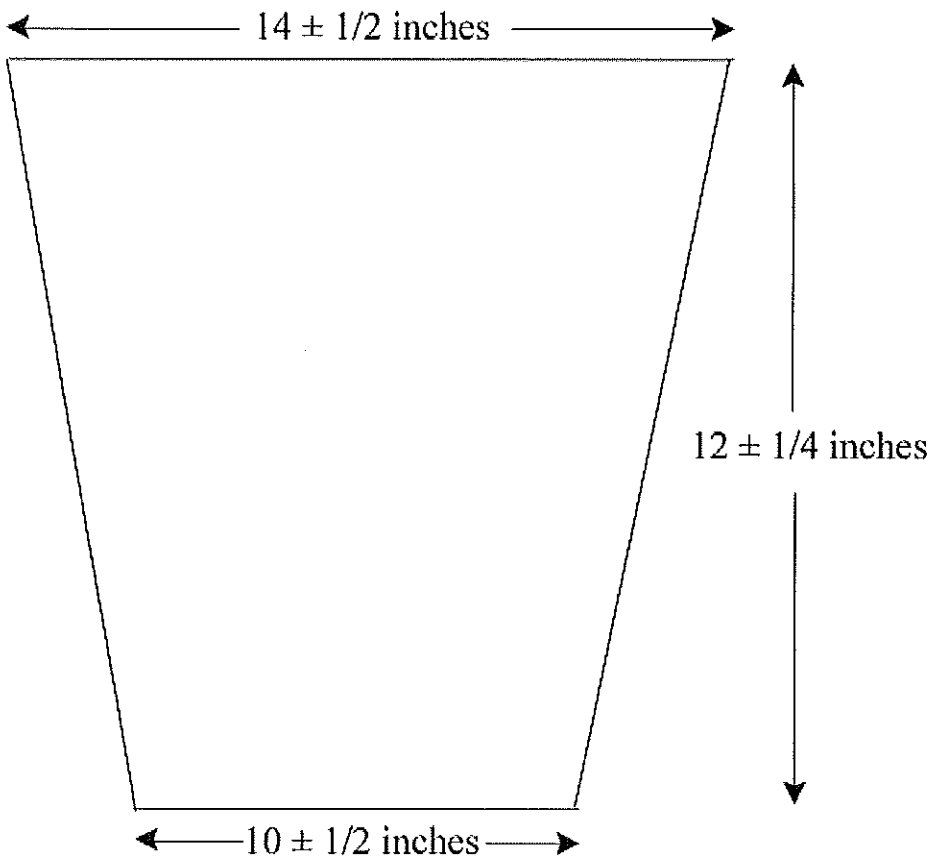

FIGURE 6. Test Specimen, % Bite Protection Test