

INCH-POUND

GL/PD 14-05A  
27 February 2015  
SUPERSEDING  
GL/PD 14-05  
14 October 2014

## PURCHASE DESCRIPTION

### TROUSER, ARMY COMBAT UNIFORM

This Purchase Description is approved for use by DLA Troop Support and is available for use by all Departments and Agencies of the Department of Defense (DoD).

#### 1. SCOPE

1.1 Scope. This Purchase Description specification covers the requirements for unisex and female combat trouser to be worn by the Army.

1.2 Classification. The trouser will be of the following types, styles, classes and sizes as specified.

##### 1.2.1 Types.

Type I - 50/50 Nylon/Cotton Ripstop  
Type II - 65/25/10 Rayon/Para-Aramid/Nylon Ripstop Flame Resistant  
Type III - Flame Resistant (FR) Cloth Ripstop

##### 1.2.2 Styles.

Style A - Unisex  
Style B - Female

##### 1.2.3 Classes.

Class 1 - Untreated  
Class 2 - Permethrin Treated

Comments, suggestions, or questions on this document should be addressed to: US Army Natick Soldier Research, Development and Engineering Center, Attn: RDNS-SEW-EWC, 15 Kansas Street, Natick, MA 01760-5019.

FSC 8415

1.2.4 Sizes. The trouser sizes will be as follows:

STYLE A. UNISEX SCHEDULE OF SIZES					
X-Small	Small	Medium	Large	X-Large	XX-Large
X-Short	X-Short	X-Short	X-Short	X-Short	X-Short
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	XX-Long	XX-Long

STYLE B. FEMALE SCHEDULE OF SIZES			
25	28	31	35
X-Short	X-Short	X-Short	----
Short	Short	Short	Short
Regular	Regular	Regular	Regular
----	Long	Long	Long
----	----	X-Long	X-Long

## 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.

#### FEDERAL SPECIFICATIONS

V-B-871                      Button, Sewing, Hole and Button Staple (plastic)

#### FEDERAL STANDARDS

FED-STD-4                      Glossary of Fabric Imperfections

COMMERCIAL ITEM DESCRIPTIONS

A-A-50198	Thread, Gimp, Cotton, Buttonhole
A-A-50199	Thread, Polyester Core, Cotton or Polyester Covered
A-A-55195	Thread, Para-Aramid, Spun, Intermediate Modulus
A-A-55217	Thread, Aramid, Spun, Staple
A-A-59826	Thread, Nylon

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-32075	Label: For Clothing, Equipage, and Tentage (General Use)
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
MIL-W-5664	Webbing, Textile Elastic

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

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.

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 <http://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.)

PURCHASE DESCRIPTION

GL-PD-07-12 Cloth, Flame Resistant  
GL-PD-10-08 Patch Kit, Integrated, Flame Resistant (IPK)

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

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.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC Test Method-8 - Colorfastness to Crocking: AATCC Crockmeter Method  
AATCC Test Method-15 - Colorfastness to Perspiration  
AATCC Test Method-61 - Colorfastness to Laundering: Accelerated  
AATCC Test Method-81 - pH of the Water-Extract from Wet Processed Textiles  
AATCC Test Method-96 - Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics Except Wool  
AATCC Test Method-135 - Dimensional Changes of Fabrics After Home Laundering  
AATCC Evaluation Procedure 1, Gray Scale for Color Change  
AATCC Evaluation Procedure 2, Gray Scale for Staining  
AATCC Evaluation Procedure 8, AATCC 9-Step Chromatic Transference Scale  
AATCC Evaluation Procedure 9, Option A, Visual Assessment of Color Difference of Textiles

(Copies are available on line at <http://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 on line at <http://www.asq.org> or from the American Society for Quality, 600 Plankinton Avenue, Milwaukee, WI 53203)

ASTM INTERNATIONAL

ASTM D 76 Standard Specification of Tensile Testing Machines for Textiles  
ASTM D 1424 Standard Test Methods for Tearing Strength of Fabrics by Falling-Pendulum Type (Elmendorf) Apparatus  
ASTM D 1776 Standard Practice for Conditioning and Testing Textiles  
ASTM D 3776 Standard Test Method for Mass Per Unit Area (Weight) of Fabric

ASTM D 5034	Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM D 6193	Standard Practice for Stitches and Seams
ASTM D 6413	Standard Test Method for Flame Resistance of Textiles (Vertical Test)

(Copies are available online at <http://www.astm.org> or from the ASTM INTERNATIONAL, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19426-2959.)

#### OTHER PUBLICATIONS

Repeat Insult Patch Test – Modified Draize 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.)

Sears Fabric Defect Replica Scales

(Copies are available from Sears Roebuck and Co. “Fabric Defect Replica Kit” at SHGS Hong Kong Textile Testing Laboratory, 49/F, Office Tower, Langham Place, 8 Argyle Street, Mongkok, Kowloon, Hong Kong.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document however, supersedes applicable laws and regulations unless a specific 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 only). The basic material for the Type I trouser shall be a 50/50 nylon/cotton blend, wind resistant poplin ripstop cloth in a Universal Camouflage Pattern (UCP) conforming to Class 8, or Operational Enduring Freedom Camouflage Pattern (OEF-CP) conforming to Class 11, or Operational Camouflage Pattern (OCP) conforming to Class 14, of MIL-DTL-44436 as specified (see 6.2).

3.3.1.1 Basic material (Type II only). The basic material for the Type II trousers shall be a 65/25/10 Flame Resistant (FR) rayon/para-aramid/nylon blend cloth conforming to GL/PD 07-12 Type I, Class 1 in UCP, or Class 2 in OEF-CP or Class 3 in OCP as specified (see 6.2).

3.3.1.2 Basic material (Type III only). The basic material for the Type III trouser shall be an FR ripstop cloth conforming to GL/PD 07-12 in Type III, Class 1 in UCP, or Class 2 in OEF-CP, or Class 3 in OCP, as specified (see 6.2).

3.3.2 Cloth, side and hip hanging pockets, and waistband lining (all types, styles and classes). The cloth for waistband lining, side and hip pockets, shall be basic printed material or basic printed material seconds. Seconds shall be basic material which has been rejected only for defects pertaining to shade, infrared reflectance, or camouflage printed pattern as outlined in the appropriate material specification. For Type III trousers, seconds of the Type II trouser basic material (GL-PD-07-12, Type I) may be used.

3.3.2.1. Alternate cloth, side and hip hanging pockets (all types, styles and classes). As an alternate for the Type I trouser only, a 5.0 oz/sq. yd. minimum, plain weave, 75 percent (%) polyester 25 percent (%) cotton material or equal may be used for side and hip hanging pockets only. The color for the alternate material shall be Desert Sand 503, Urban Gray 505 or Foliage Green 504 for UCP uniforms and Tan 499 for OEF-CP, and OCP uniforms. All other alternate materials shall meet the requirements outlined in Table I.

TABLE I. Alternate side and hip hanging pockets material (all types, styles and classes)

Characteristic	Requirement	
	Type I	Types II & III
Weight, oz./sq.yd.		
minimum	6.0	5.5
maximum	7.0	8.5
Breaking strength, pounds (minimum)		
Warp	190	100
Filling	80	70
Tearing strength, pounds , Dry (minimum)		
Warp	7.0	4.0
Filling	5.0	4.0
Dimensional stability, percent (After 5 laundering cycles)(maximum)		
Warp and Filling:		
Individual Sample	3.5	4.0
Lot Average	3.0	3.5

TABLE I. Alternate side and hip hanging pockets material (all types, styles and classes) -  
Continued

Characteristic	Requirement	
	Type I	Types II & III
Laundering (4 Cycles) <u>1/</u> All colors (Color change and Staining) (minimum)	3	3
Crocking (wet and dry) <u>2/</u> All colors (minimum)	3.5	3.5
Perspiration (acid & alkaline) <u>1/</u> All colors (Color change and Staining) (minimum)	3-4	3-4
Flame resistance: Initial - After Flame, seconds (maximum) After Glow, seconds (maximum) Char Length, inches (maximum)	N/A	2.0 25.0 4.5
Flame resistance: After 25 launderings - After Flame, seconds (maximum) After Glow, seconds (maximum) Char Length, inches (maximum)	N/A	2.0 25.0 4.5

3.4 Insect bite protection (Class 2 only). The Class 2 trouser shall be treated for insect bite protection. The trouser 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 - Insect repellent treatment (Class 2 only). 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 trousers shall comply with EPA Toxicological Category IV. The Class 2 trouser 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 MIL-DTL-44411 (Labels and labeling) shall also be applicable to finished garment. The trouser shall be labeled in accordance with 3.8.2.1 and 3.8.2.2. The permethrin finish shall be uniformly applied across the fabric or garment and **strictly** controlled to ensure that the permethrin concentration level meets the requirements 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 in 4.4.3. The permethrin treatment shall not degrade any performance characteristics of the garment or present any latent defects to the cloth or garment. (See 6.5).

	<u>Type I, Class 2</u>		<u>Type II, Class 2</u>		<u>Type III, Class 2</u>	
	<u>mg/cm<sup>2</sup></u>		<u>mg/cm<sup>2</sup></u>		<u>mg/cm<sup>2</sup></u>	
	Min	Max	Min	Max	Min	Max
Initial	0.095	0.135	0.087	0.130	0.095	0.140
After 20 Launderings	0.025	0.135	0.025	0.130	0.025	0.140

3.4.1.1 Permethrin garment treatment of camouflage patterns. The mixing of camouflage patterns in the same permethrin treatment garment application is not allowed. Patterns shall be treated separately.

3.4.1.2 Permethrin garment application, finished measurements. Manufacturers shall comply with the finished measurement requirements in 3.12 and compensate for actual fabric shrinkage or growth after the application of garment treatment.

3.4.2 Percent (%) insect bite protection (Class 2 only). The Class 2 finished permethrin treated garments shall provide bite protection specified below when assessed by the bite protection testing specified in 4.4.3. 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	<u>Type I, Class 2</u>	<u>Type II, Class 2</u>	<u>Type III, Class 2</u>
	% Bite Protection	% Bite Protection	% Bite Protection
Initial	>= 90%	>= 85%	>= 85%
After 20 launderings	>= 90%	>= 80%	>= 80%
After 50 launderings	>= 90%	>= 70%	>= 80%

3.4.3 pH (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 4.4.3.

3.5 Components materials and shade (all types, styles and classes). The component materials for trousers shall be made in accordance to paragraphs 3.5.1-3.5.5. Component materials for the trouser are for all types, classes and styles unless otherwise noted. All component shade shall match Foliage Green 504 for UCP uniforms and Tan 499 for OEF-CP or OCP uniforms with the exception of 3.5.5, Integrated Patch Kit (IPK). IPK shade shall be the camouflage print of the uniform.

3.5.1 Tape.

3.5.1.1 Hem tape (drawstring). The tape for the leg bottom hem shall conform to MIL-PRF-5038, Type III, 3/8-inch wide. The drawstring tape for the leg bottom hem shall be cut 32 (± 1) inches in length for all sizes. The tape ends shall be heat cut to prevent raveling and the ends of the bottom hem drawstring tape shall be finished with knotted ends.



3.5.1.2 Tape, FR identification marker (Types II and III only, all styles and classes). The tape for the FR identification marker shall be 1-inch wide conforming to Type III of MIL-PRF-5038. The tape ends shall be heat cut to prevent raveling.

3.5.2 Elastic webbing (Style B). The elastic webbing for the female trouser waistband shall be natural in color and be 1-1/2-inch wide and conform to, or have performance characteristics equal to or better than, Type II, Class 1 of MIL-W-5664. The elastic for the waistband shall be cut to the length needed to achieve both the trouser 1/2 waist finished relaxed and finished stretched measurements (for each size) as specified in 3.12.1 and Table VIIIB (see 3.7.2) and the elongation force specified below. Testing shall be as specified in 4.4.2.

	Elongation (inches)	Force (lbs.)	
	(+/- 1/16)	Minimum	Maximum
Waistband	1-1/2	1.5	4.0

3.5.3 Thread (Type I only, all styles and classes). The thread for all seaming and stitching for the Type I trouser shall conform to Table II. All thread shall be non-staining and the requirements in each Commercial Item Description (CID) shall apply.

TABLE II. Thread requirements, Type I trouser only

Component area	Thread specification	Needle thread <u>1/</u> (Tex size)	Bobbin/Looper thread <u>1/</u> (Tex size)
All seaming, stitching and bar-tacking	A-A-50199, Type II	36-45 or 46-60	36-45 46-60
Button attachment	A-A-50199, Type II	71-105	71-105
Seat patch	A-A-50199, Type II	46-60	46-60
Overedge stitching (raw edges)	A-A-50199, Type II	31-35	31-35
Crotch	A-A-59826, Type I	45-46	45-46

1/ Needle & Bobbin/Looper shall use same Tex size thread.

3.5.3.1 Thread (Types II and III only, all styles and classes). The thread for all seaming and stitching shall be as specified in Table III. All thread shall be non-staining and the requirements in each respective Commercial Item Description (CID) shall apply.

TABLE III. Thread requirements, Types II and III trouser only

Component area	Thread specification	Needle thread 1/ (Tex size)	Bobbin/ Looper thread 1/ (Tex size)
All seaming except small parts	A-A-55195, Type I	78	78
	A-A-55195, Type II	59	59
	A-A-55217, Type I	70-80	70-80
Bar-tacks, small parts, pockets, flaps, top stitching, tabs, hems and eyelets, identification marker and labels	A-A-55195, Type I	59	59
	A-A-55195, Type II	20	20
	A-A-55217, Type I	50-60	50-60
Overedge/Serge for raw edge cover	A-A-55195, Type I	39	39
	A-A-55195, Type II	16	16
	A-A-55217, Type I	24-27	24-27
Crotch seam and seat patch	A-A-55195, Type I	78	78
	A-A-55195, Type II	59	59
	A-A-55217, Type I	70-80	70-80
Button attachment	A-A-55195, Type I	59	59
	A-A-55195, Type II	39	39
	A-A-55217, Type I	50-60	50-60

1/ Needle & Bobbin/Looper shall use same Tex size thread.

3.5.3.2 Gimp. The cotton gimp for reinforcing buttonholes shall conform to A-A-50198, soft or glazed finish, Tex Size 180 or 210.

3.5.4 Buttons. Buttons shall be dull finish, four (4) holes, 30 ligne conforming to V-B-871, Type II, Class D, Style 26. When attached to the trouser, the button and thread shall withstand 40 pounds (minimum) when tested as specified in 4.4.3.

3.5.5 Integrated Patch Kit (IPK) (Types II and III only, all styles and classes). The IPK shall conform to the requirements of GL/PD 10-08. UCP uniforms shall use Class 1, Size R, OEF-CP uniforms shall use Class 2, Size R, and OCP uniforms shall use Class 3, Size R.

3.6 Design. The trouser design for Style A-Unisex shall have a waistband with clean finished ends and button/buttonhole closure (see 3.7.1). Style B female trouser shall have two (2) elasticized portions and button/buttonhole closure (see 3.7.2). Both style trousers shall have seven (7) belt loops along with a covered fly with three (3) buttons and buttonhole closure (see 3.7.4). Both style trousers shall have two (2) side hanging pockets, two (2) back single welt hip pockets with two (2) button closure flaps, two (2) front side pleated cargo pockets with three (3) buttons/two (2) buttonholes closure flaps and two (2) lower leg pockets with one (1) button/buttonhole closure flaps. Both styles shall have side cargo pockets and lower leg pockets that have sewn-in eyelets at the bottom of each of the bellows. Both styles shall have a double needle seat patch and shall have knee reinforcement patches. Each style shall have a drawstring at each leg bottom.

3.7 Construction (all types, styles and classes). The construction for trousers shall be made in accordance to paragraphs 3.7.1 - 3.7.12. Construction is for all Types, Styles and Classes unless otherwise noted. All material edges shall be clean finished, either, turned-in turned-under or serged, unless otherwise indicated. All components with a grain line shall follow the grain line of the basic garment material or as indicated on pattern.

3.7.1 Unisex waistband (Style A only, all types and classes). The finished waistband shall measure 1-3/4 ( $\pm$  1/8) inches wide with clean finished ends and a button/buttonhole closure. The width of the waistband shall be consistent so that the right and left sides match each other in width at the front within 3/16-inch. The waistband shall also have a button and horizontal buttonhole closure that shall align vertically with the fly button and buttonhole closure (see figure 6).

3.7.2 Stretch waistband (Style B only, all types and classes). The finished waistband shall measure 1-3/4 ( $\pm$  1/8) inches wide with clean finished ends and a button/buttonhole closure that shall align vertically with the fly button/buttonhole closure (see figure 6). The width of the waistband shall be consistent so that the right and left sides match each other in width at the front within 3/16-inch. The waistband shall have an elasticized portion at each side of the waist that starts at the front of the pocket bearer and extends past the outseam and belt loop into the back of the trousers to achieve the finished waist stretch circumference for each size. For sizes 25 and 28, the elastics shall be approximately 7-inches long and be bar-tacked approximately 1/2-inch from each end. For sizes 31 and 35 the elastics shall be approximately 8 inches long and be bar-tacked approximately 1/2-inch from each end. The waistband elastic shall be stitched and bar-tacked as outlined in Tables VI and VII.

3.7.3 Belt loops. The trouser shall have seven (7) belt loops measuring 5/8 ( $\pm$  1/16) inch in width and finish 2-1/8 ( $\pm$  1/8) inches between bar-tacks in the length. The belt loop placement shall be as follows: one (1) loop on each side seam, one (1) on back seam, and one (1) on each front centered between side seam and waistband end, and one (1) on each back side centered between side seam and back seam. Belt loops may be positioned immediately adjacent to felled seams to reduce bulk in sewing. When positioning belt loops adjacent to side seam, the belt loop shall be placed toward the front.

3.7.4 Fly. The fly shall be a covered fly with three (3) buttons and buttonhole closure. The buttonholes shall be horizontal and placed as indicated on the pattern. The fly shall have "J" stitching 2 ( $\pm$  1/8) inches from fly edge. The top fly shall be edge stitched 1/16 to 1/8-inch (see figure 6).

3.7.5 Seat patch. The trouser shall have a double-needle seat patch (see pattern for placement) (see figure 2).

3.7.6 Knee reinforcement. The trouser shall have a knee reinforcement patch on each leg, stitched down around all four (4) sides. See pattern for placement.

### 3.7.7 Pockets and flaps.

3.7.7.1 Front side pockets. The trouser shall have two (2) front side hanging pockets with pocket openings measuring 6-3/4 ( $\pm$  1/2) inches between bar-tacks. Pocket openings shall match each other within 1/4-inch. Any raw edge shall be overedge stitched.

3.7.7.2 Hip pockets. The trouser shall have back left and right single welt hip pockets with a two (2) button/buttonhole closure per pocket. The finished welt shall measure 1/4 ( $\pm$  1/16) inch. The buttons shall be sewn onto the outside of the pocket and the buttonholes shall be vertical and sewn into the underside of the flap as indicated on patterns (see figure 4).

3.7.7.3 Cargo pockets and flaps. The trouser shall have two (2) pleated bellows cargo pockets with flaps (see pattern for placement). The pockets shall have a sewn-in eyelet at the bottom side edge of bellow, as indicated on the pattern (see 3.7.10). The top of the folded finished pocket flaps shall finish 3/4-inch from the folded edge of pocket top (see pattern for placement). The pleated bellows shall be edge stitched to secure pleat stability. The cargo pockets and flaps shall close with a three (3) button (2) buttonhole closure per pocket. The buttons shall be sewn onto the outside of the pocket and the buttonholes shall be vertical and sewn onto the underside of the flap as indicated on patterns (see figure 3).

3.7.7.4 Lower leg pockets and flaps. The trouser shall have two (2) lower leg bellows pockets with flaps (see pattern for placement). The pockets shall have a sewn-in eyelet at the bottom of the bellow, as indicated on pattern (see 3.7.10). The top of the folded finished pocket flaps shall finish 1/2-inch from the folded edge of pocket top (see pattern for placement). The pockets shall close with one (1) button sewn onto the outside of the pocket as indicated on the pattern. The buttonhole shall be vertical and sewn into the underside of the flap as indicated on the pattern. See pattern for button and buttonhole placement.

3.7.8 Leg bottom hem and drawstring. The leg bottoms shall be hemmed and shall have a drawstring inserted through two (2) sewn-in eyelets or two (2) 1/2-inch horizontal straight cut buttonholes with reinforcement piece as indicated on patterns (see 3.7.9 and 3.11.1). The drawstring tape (see 3.5.1.1) shall overlap (cross) between holes when threaded through the hem casing. The drawstring shall be heat sealed and knotted at each end before packaging. The finished hem shall measure 7/8 ( $\pm$ 1/8) inch wide.

3.7.9 Buttonholes. The buttonholes shall be eyelet-end tapered bar type worked over gimp for the fly, back hip welt pocket flaps, cargo pocket flaps, lower leg pocket flaps-with not less than four (4) tacking stitches at bar end catching the gimp ends (not counting the crossover stitch). The purling shall be on the outside surface. The cut lengths shall be 3/4-inch to 7/8-inch. The buttonholes shall be clean cut with the stitching securely caught in fabric. When buttonholes are used in lieu of sewn-in eyelets for the waistband and leg bottom hem drawstrings they shall be 1/2-inch vertical straight cut for the waistband and 1/2-inch horizontal straight cut for the leg bottom hem.

3.7.10 Eyelets. The sewn-in eyelets for the cargo pocket and lower leg pocket bellows shall have a 1/4 (± 1/16) inch diameter finished opening. When sewn-in eyelets are used for the leg bottom they shall measure 3/8 (± 1/8) inch in diameter. See pattern for placement.

3.7.11 Identification FR marker (Types II and III only, all styles and classes). The Types II and III trouser shall have a tape marker as specified in 3.5.1.2 centered (vertically and horizontally) on the left cargo pocket flap as worn and shall be visible from the outside when worn (see pattern for placement). The tape marker shall be clean finished or heat sealed and finish 1 (± 1/8) inch in length. The finished tape identification marker shall be box stitched as specified in Table V. The thread shall be in accordance with the requirements for the Types II and III trouser (see 3.5.3.1). (See Figures 1 and 2).

3.7.12 Integrated Patch Kit (IPK) placement (Types II and III only, all styles and classes). The Types II and III trouser shall have an IPK placed into the finished left hip pocket, as worn. The IPK shall be placed into the pocket after permethrin treatment with the shortest dimension vertical and shall lie flat after placement in pocket. The pocket shall be secured with at least one (1) button to prevent IPK from falling out.

3.8 Labels (all types, styles and classes). Labels are for all types, styles and classes unless otherwise noted. All garments shall have a size label and a combination identification/care label sewn into the trouser. All garments shall have a Barcode hang tag. Class 2 trousers shall have an additional insect protection/identification/care label sewn into the trouser and a hang tag. The printing for all labels shall be black. The font size for the inscription of the size label shall be 10 points. The inscription shall have a minimum font size of 8 points for identification/care label and insect protection/identification/care label only. Inscription shall be legible. Sewn in labels and printing shall last the expected life of the trouser.

3.8.1 Size label. The size label shall conform to Type VI, Class 2 of MIL-DTL-32075 and shall be sewn and caught in the bottom of the inside waistband seam. The stitching shall not cover the printing. The color of the size labels for the Types I and II trousers shall be white or approximate the ground shade of the basic fabric. For the Type III trouser only, the color of the size label shall be Urban Gray 501. The size label shall include the information in Table IVA and Table IVB for the applicable size:

TABLE IVA. Style A. Unisex size label

X-Small – X-Short Inseam: Up to 26-1/2 in. Waist: Up to 27 in. NSN No. NATO Size: 6067/5869	X-Small – Short Inseam: 26-1/2 to 29-1/2 in. Waist: Up to 27 in. NSN No. NATO Size: 6775/5869	X-Small – Regular Inseam: 29-1/2 to 32-1/2 in. Waist: Up to 27 in. NSN No. NATO Size: 7583/5869
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TABLE IVA. Style A. Unisex size label - Continued

X-Small – Long Inseam: 32-1/2 to 35-1/2 in. Waist: Up to 27 in. NSN No. NATO Size: 8390/5869	X-Small – X-Long Inseam: 35-1/2 to 38-1/2 in. Waist: Up to 27 in. NSN No. NATO Size: 9098/5869	X-Small – XX-Long Inseam: Over 38-1/2 in. Waist: Up to 27 in. NSN No. NATO Size: 9805/5869
Small – X-Short Inseam: Up to 26-1/2 in. Waist: 27 to 31 in. NSN No. NATO Size: 6067/6979	Small – Short Inseam: 26-1/2 to 29-1/2 in. Waist: 27 to 31 in. NSN No. NATO Size: 6775/6979	Small – Regular Inseam: 29-1/2 to 32-1/2 in. Waist: 27 to 31 in. NSN No. NATO Size: 7583/6979
Small – Long Inseam: 32-1/2 to 35-1/2 in. Waist: 27 to 31 in. NSN No. NATO Size: 8390/6979	Small – X-Long Inseam: 35-1/2 to 38-1/2 in. Waist: 27 to 31 in. NSN No. NATO Size: 9098/6979	Small – XX-Long Inseam: Over 38-1/2 in. Waist: 27 to 31 in. NSN No. NATO Size: 9805/6979
Medium – X-Short Inseam: Up to 26-1/2 in. Waist: 31 to 35 in. NSN No. NATO Size: 6067/7989	Medium – Short Inseam: 26-1/2 to 29-1/2 in. Waist: 31 to 35 in. NSN No. NATO Size: 6775/7989	Medium – Regular Inseam: 29-1/2 to 32-1/2 in. Waist: 31 to 35 in. NSN No. NATO Size: 7583/7989
Medium – Long Inseam: 32-1/2 to 35-1/2 in. Waist: 31 to 35 in. NSN No. NATO Size: 8390/7989	Medium - X-Long Inseam: 35-1/2 to 38-1/2 in. Waist: 31 to 35 in. NSN No. NATO Size: 9098/7989	Medium - XX-Long Inseam: Over 38-1/2 in. Waist: 31 to 35 in. NSN No. NATO Size: 9805/7989
Large - X-Short Inseam: Up to 26-1/2 in. Waist: 35 to 39 in. NSN No. NATO Size: 6067/8999	Large – Short Inseam: 26-1/2 to 29-1/2 in. Waist: 35 to 39 in. NSN No. NATO Size: 6775/8999	Large - Regular Inseam: 29-1/2 to 32-1/2 in. Waist: 35 to 39 in. NSN No. NATO Size: 7583/8999
Large – Long Inseam: 32-1/2 to 35-1/2 in. Waist: 35 to 39 in. NSN No. NATO Size: 8390/8999	Large - X-Long Inseam: 35-1/2 to 38-1/2 in. Waist: 35 to 39 in. NSN No. NATO Size: 9098/8999	Large - XX-Long Inseam: Over 38-1/2 in. Waist: 35 to 39 in. NSN No. NATO Size: 9805/8999

TABLE IVA. Style A. Unisex size label – Continued

X-Large - X-Short Inseam: Up to 26-1/2 in. Waist: 39 to 43 in. NSN No. NATO Size: 6067/9909	X-Large - Short Inseam: 26-1/2 to 29-1/2 in. Waist: 39 to 43 in. NSN No. NATO Size: 6775/9909	X-Large - Regular Inseam: 29-1/2 to 32-1/2 in. Waist: 39 to 43 in. NSN No. NATO Size: 7583/9909
X-Large - Long Inseam: 32-1/2 to 35-1/2 in. Waist: 39 to 43 in. NSN No. NATO Size: 8390/9909	X-Large - X-Long Inseam: 35-1/2 to 38-1/2 in. Waist: 39 to 43 in. NSN No. NATO Size: 9098/9909	X-Large - XX-Long Inseam: Over 38-1/2 in. Waist: 39 to 43 in. NSN No. NATO Size: 9805/9909
XX-Large - X-Short Inseam: Up to 26-1/2 in. Waist: 43 to 47 in. NSN No. NATO Size: 6067/0919	XX-Large – Short Inseam: 26-1/2 to 29-1/2 in. Waist: 43 to 47 in. NSN No. NATO Size: 6775/0919	XX-Large – Regular Inseam: 29-1/2 to 32-1/2 in. Waist: 43 to 47 in. NSN No. NATO Size: 7583/0919
XX-Large – Long Inseam: 32-1/2 to 35-1/2 in. Waist: 43 to 47 in. NSN No. NATO Size: 8390/0919	XX-Large - X- Long Inseam: 35-1/2 to 38-1/2 in. Waist: 43 to 47 in. NSN No. NATO Size: 9098/0919	XX-Large - XX-Long Inseam: Over 38-1/2 in. Waist: 43 to 47 in. NSN No. NATO Size: 9805/0919

TABLE IVB. Style B. Female size label

25 – X Short Waist: 25 to 28 in. Inseam: 24 to 26 in. NSN No. NATO Size: 6067/5869	28 – X Short Waist: 28 to 31 in. Inseam: 24 to 26 in. NSN No. NATO Size: 6067/6979	31 – X Short Waist: 31 to 35 in. Inseam: 24 to 26 in. NSN No. NATO Size: 6067/7989	35 – X Short Waist: 35 to 39 in. Inseam: 24 to 26 in. NSN No. NATO Size: 6067/8999
25 – Short Waist: 25 to 28 in. Inseam: 26 to 28 in. NSN No. NATO Size: 6775/5869	28 – Short Waist: 28 to 31 in. Inseam: 26 to 28 in. NSN No. NATO Size: 6775/6979	31 – Short Waist: 31 to 35 in. Inseam: 26 to 28 in. NSN No. NATO Size: 6775/7989	35 – Short Waist: 35 to 39 in. Inseam: 26 to 28 in. NSN No. NATO Size: 6775/8999
25 – Regular Waist: 25 to 28 in. Inseam: 28 to 30 in. NSN No. NATO Size: 7583/5869	28 – Regular Waist: 28 to 31 in. Inseam: 28 to 30 in. NSN No. NATO Size: 7583/6979	31 – Regular Waist: 31 to 35 in. Inseam: 28 to 30 in. NSN No. NATO Size: 7583/7989	35 – Regular Waist: 35 to 39 in. Inseam: 28 to 30 in. NSN No. NATO Size: 7583/8999

TABLE IVB. Style B. Female size label - Continued

-----	28 – Long Waist: 28 to 31 in. Inseam: 30 to 32 in. NSN No. NATO Size: 7583/6979	31 – Long Waist: 31 to 35 in. Inseam: 30 to 32 in. NSN No. NATO Size: 7583/7989	35 – Long Waist: 35 to 39 in. Inseam: 30 to 32 in. NSN No. NATO Size: 7583/8999
-----	-----	31 – X Long Waist: 31 to 35 in. Inseam: 32 to 34 in. NSN No. NATO Size: 8390/7989	35 – X Long Waist: 35 to 39 in. Inseam: 32 to 34 in. NSN No. NATO Size: 8390/8999

3.8.2 Identification and care label (all types, styles and classes). The combination identification/care label shall conform to Type VI, Class 15 of MIL-DTL-32075 and shall be placed on the inside of the right hip pocket (as worn), so that on the finished trouser the label shall face the wearer. The label shall be stitched on all four (4) sides. The stitching shall not cover the printing and shall not be visible on trouser front. The color of the combination identification and care label shall be white or approximate the ground shade of the basic fabric.

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3.8.2.1 Identification and care label, (Type I only, all styles and classes). The Type I label shall include the following information:



Trouser, Army Combat Uniform - Unisex  
or  
Trouser, Army Combat Uniform – Female  
Contract Number:  
Fiber Content:  
Contractor Name:  
Lot Number 1/

**USE AND CARE**

**PRIOR TO LAUNDERING:** Empty pockets. Turn inside out. Pre-treat stains with commercially available pre-treatments.

**HOME LAUNDERING:** Use cold water detergent. Wash in cold water using permanent press cycle. Rinse in cold water. Tumble dry low.

**WASHING BY HAND:** Use cold water detergent. Wash in cold water. Rinse completely. Never twist or wring dry. Hang dry on a rust-proof hanger. Do not hang dry in direct sunlight.

**NOTE:** Wash garment separate from other garments. In military field operations, garment may be washed with other garments.


**CAUTION:**

**DO NOT USE BLEACH, BLEACH ALTERNATIVES, FABRIC SOFTENER, OR STARCH. DO NOT DRY CLEAN OR COMMERCIALY HOT PRESS.**

**DO NOT REMOVE THIS LABEL**

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

3.8.2.2 Identification and care label, flame resistant (Type II and III only, all styles and classes).  
The label for Type II and Type III shall include the following information:

	<p>Trouser, Army Combat Uniform - Unisex or Trouser, Army Combat Uniform – Female <b>FLAME RESISTANT</b> Contract Number: Fiber Content: Contractor Name: Lot Number <u>1/</u></p>
<p>This product meets the manufacturing and performance testing requirements as specified by the Program Executive Office – Soldier</p>	
<p><b><u>USE AND CARE</u></b></p>	
<p><b><u>PRIOR TO LAUNDERING:</u></b> Empty pockets. Turn inside out. Pre-treat stains with commercially available pre-treatments.</p>	
<p><b><u>HOME LAUNDERING:</u></b> Use cold water detergent. Wash in cold water using permanent press cycle. Rinse in cold water. Tumble dry low.</p>	
<p><b><u>WASHING BY HAND:</u></b> Use cold water detergent. Wash in cold water. Rinse completely. Never twist or wring dry. Hang dry on a rust-proof hanger. Do not hang dry in direct sunlight.</p>	
<p><b><u>NOTE:</u></b> Wash garment separate from other garments. In military field operations, garment may be washed with other garments.</p>	
<p><b><u>CAUTION:</u></b></p>	
<p>DO NOT USE BLEACH, BLEACH ALTERNATIVES, FABRIC SOFTENER, OR STARCH. DO NOT DRY CLEAN OR COMMERCIALY HOT PRESS.</p>	
<p><b>DO NOT REMOVE THIS LABEL THIS GARMENT IS FLAME RESISTANT</b></p>	

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

3.8.3 Insect protection/identification/care label (Class 2 only, all types and styles). The combination insect protection/identification/care label shall conform to Type VI, Class 15 of MIL-

DTL-32075 and shall be placed in the inside of the left hip pocket as worn, so that on the finished trouser the label shall face the wearer. 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 stitched on all four (4) sides. The stitching shall not cover the printing and shall not be visible on trouser front. The color for the insect protection/identification/care label (Class 2) shall be white or approximate the ground shade of the basic fabric. The Class 2 label shall include the following information:

<p><b>Insect Repellent Brand Name:</b> <b>INSECT REPELLENT APPAREL</b> Refer to hangtag for more information Contractor Name: (Permethrin Applicator Name) EPA REG. NO.: EPA EST. NO.:</p>								
<p>- Do Not Dry Clean - Dry Cleaning removes active ingredient - Wash separate from other clothing - In military field operations, garment may be washed with other garments. - Do Not Re-treat with other permethrin products - Dispose of garment in trash in accordance with Army regulations</p> <p>Repels mosquitoes Repellency remains effective for 25 washings</p> <table><tr><td><b>ACTIVE INGREDIENT</b></td><td style="text-align: right;"><b>%W/W</b></td></tr><tr><td>Permethrin.....</td><td style="text-align: right;">0.52%</td></tr><tr><td>OTHER INGREDIENTS: (Garment).....</td><td style="text-align: right;">99.48%</td></tr><tr><td>TOTAL.....</td><td style="text-align: right;">100.00%</td></tr></table> <p>It is a violation of Federal Law to use this product in a manner inconsistent with its labeling</p> <p style="text-align: center;"><b>DO NOT REMOVE THIS LABEL</b></p>	<b>ACTIVE INGREDIENT</b>	<b>%W/W</b>	Permethrin.....	0.52%	OTHER INGREDIENTS: (Garment).....	99.48%	TOTAL.....	100.00%
<b>ACTIVE INGREDIENT</b>	<b>%W/W</b>							
Permethrin.....	0.52%							
OTHER INGREDIENTS: (Garment).....	99.48%							
TOTAL.....	100.00%							

3.8.4 Hang tag, insect protection (Class 2 only, all types and styles). Each Class 2 trouser shall have an individual paper tag attached to the garment conforming to Type VIII, Class 15 of MIL-DTL-32075. The color for the hang tag shall be white. The paper tag shall be Swift tacked in the side seam approximately 2-inches below the belt loop. The tag shall provide additional insect protection information in accordance with and as required by EPA registration and labeling. The hang tag shall contain the following information:

<p><b>Insect Repellent Brand Name:</b> <b>INSECT REPELLENT APPAREL</b> Contractor Name: - (Permethrin Applicator Name) Contractor Address - (Permethrin Applicator Address) EPA REG. NO.: EPA EST. NO.:</p>								
<p>- Do Not Dry Clean - Dry Cleaning removes active ingredient - Wash separate from other clothing - In military field operations, garment may be washed with other garments. - Do Not Re-treat with other permethrin products - Dispose of garment in trash in accordance with Army regulations - For protection of exposed skin, use in conjunction with a repellent registered for direct application to the skin</p> <p>Repels mosquitoes Repellency remains effective for 25 washings</p> <table><thead><tr><th><b>ACTIVE INGREDIENT</b></th><th><b>%W/W</b></th></tr></thead><tbody><tr><td>Permethrin .....</td><td>0.52%</td></tr><tr><td>OTHER INGREDIENTS: (Garment).....</td><td>99.48%</td></tr><tr><td>TOTAL.....</td><td>100.00%</td></tr></tbody></table> <p>It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.</p> <p>Retain hangtag for future reference on proper handling of this garment.</p> <p style="text-align: center;"><b>THIS TAG NOT TO BE REMOVED EXCEPT BY CUSTOMER</b></p>	<b>ACTIVE INGREDIENT</b>	<b>%W/W</b>	Permethrin .....	0.52%	OTHER INGREDIENTS: (Garment).....	99.48%	TOTAL.....	100.00%
<b>ACTIVE INGREDIENT</b>	<b>%W/W</b>							
Permethrin .....	0.52%							
OTHER INGREDIENTS: (Garment).....	99.48%							
TOTAL.....	100.00%							

3.8.5 Barcode hang tag (all types, styles and classes). Each trouser shall have a white paper barcode hang tag conforming to Type VIII, Class 17 of MIL-DTL-32075 The hang tag shall be Swift tacked in the side seam approximately 2-inches below the belt loop and shall be completely visible on the trouser when it is folded and/or packaged as specified and so it causes no damage to the trouser. The bar coding element shall be a 13 digit National Stock Number (NSN). There shall be a 12 digit Universal Product Code (UPC) number assigned for all NSNs by the contracting activity. The initials "UPC" must appear beneath the code.

NOTE: The hang tag for insect protection and barcode may be applied jointly with the use of one (1) Swift tack.

3.9 Figures. The figures in this specification 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 outseams, seat seams, and crotch seams, 1/4-inch allowance for hip pocket flaps and 3/8-inch allowance for all other seams, except where otherwise specified. Pockets, pocket flaps, knee patches, buttons, buttonholes, and bar-tacks shall be located in accordance with marks on patterns and table references. Minor modifications to the pattern are permitted where necessary to accommodate manufacture’s processes to include garment treatments and use of automatic equipment. These modifications shall not alter the final design, serviceability, appearance or final finished measurements. Table VA and Table VB pattern list is provided to insure that the pattern set is complete for all Types and Styles of trousers (see 6.2).

TABLE VA. Style A. Unisex list of pattern parts

<b>Material</b>	<b>Nomenclature</b>	<b>Pattern Abbreviation</b>	<b>Cut Number</b>
Basic Material	Back	PD1404A-BACK	2
	Left Front	PD1404A-FRONT_LFT	1
	Right Front	PD1404A-FRONT_RT	1
	Left Fly	PD1404A-LEFT_FLY	3
	Right Fly Lining	PD1404A-RGT_FLY_LIN	1
	Knee Patch	PD1404A-KNEE_PATCH	2
	Seat Patch	PD1404A-SEAT_PATCH	2
	Side Hanging Pocket Bearer	PD1404A-SD_HG_PK_BR	2
	Side Hanging Pocket Facing	PD1404A-SD_HG_PK_FC	2
	Side Hanging Pocket	PD1404A-SD_HANG_PKT	2
	Cargo Pocket	PD1404A-CARGO_PKT	2
	Cargo Pocket Facing	PD1404A-CRG_PKT_FAC	2
	Cargo Pocket Flap	PD1404A-CG_PKT_FLP	2
	Cargo Pocket Flap Tab	PD1404A-CG_PK_FLP_TB	2
	Waistband Lining	PD1404A-WAISTBAND_LN	1
Lower Leg Pocket	PD1404A-LOLEG_PKT	2	

TABLE VA. Style A. Unisex list of pattern parts – Continued

<b>Material</b>	<b>Nomenclature</b>	<b>Pattern Abbreviation</b>	<b>Cut Number</b>
Basic Material	Lower Leg Pocket Flap	PD1404A-LOW_LEG_FLP	2
	Hip Pocket	PD1404A-HIP_POCKET	2
	Hip Pocket Bearer	PD1404A-HIP_PCKT_BR	2
	Hip Pocket Facing	PD1404A-HIP_PKT_FAC	2
	Hip Pocket Flap	PD1404A-HIP_PKT_FLP	2
	Hip Pocket Flap Tab	PD1404A-HP_PK_FL_TB	2
	Leg Eyelet	PD1404A-LEG_EYELET	2
Alternates	Back Alternate	PD1404A-BACK_ALT	2
	Left Front Alternate	PD1404A-FRT_LFT_ALT	1
	Right Front Alternate	PD1404A-FRNT_RT_ALT	1
	Left Fly Alternate	PD1404A-LFT_FLY_ALT	3
	Right Fly Lining Alternate	PD1404A-RT_FL_LNALT	1
	Hip Pocket Alternate	PD1404A-HIP_PKT_ALT	2
	Hip Pocket Flap and Tab Alternate	PD1404A-HPPKFLTB_AL	2
	Side Pocket Hanging Bearer Alternate	PD1404A-S_H_P_B_ALT	2
	Side Hanging Pocket Facing Alternate	PD1404A-S_H_P_F_ALT	2
	Side Hanging Pocket Alternate	PD1404A-SD_HGPK_ALT	2

TABLE VB. Style B. Female list of pattern parts

<b>Material</b>	<b>Nomenclature</b>	<b>Pattern Abbreviation</b>	<b>Cut Number</b>
Basic Material	Back	PD1404B-BACK	2
	Left Front	PD1404B-FRONT_LFT	1
	Right Front	PD1404B-FRONT_RT	1
	Left Fly	PD1404B-LEFT_FLY	3
	Right Fly Lining	PD1404B-RGT_FLY_LIN	1
	Knee Patch	PD1404B-KNEE_PATCH	2
	Seat Patch	PD1404B-SEAT_PATCH	2
	Side Hanging Pocket Bearer	PD1404B-SD_HG_PK_BR	2
	Side Hanging Pocket Facing	PD1404B-SD_HG_PK_FC	2

TABLE VB. Style B. Female list of pattern parts - Continued

<b>Material</b>	<b>Nomenclature</b>	<b>Pattern Abbreviation</b>	<b>Cut Number</b>
Basic Material	Side Hanging Pocket	PD1404B-SD_HANG_PKT	2
	Cargo Pocket	PD1404B-CARGO_PKT	2
	Cargo Pocket Facing	PD1404B-CRG_PKT_FAC	2
	Cargo Pocket Flap	PD1404B-CG_PKT_FLP	2
	Cargo Pocket Flap Tab	PD1404B-CG_PK_FLP_TB	2
	Waistband <u>1/</u>	PD1404B-WAISTBAND	2
	Lower Leg Pocket	PD1404B-LOLEG_PKT	2
	Lower Leg Pocket Flap	PD1404B-LOW_LEG_FLP	2
	Hip Pocket	PD1404B-HIP_POCKET	2
	Hip Pocket Bearer	PD1404B-HIP_PCKT_BR	2
	Hip Pocket Facing	PD1404B-HIP_PKT_FAC	2
	Hip Pocket Flap	PD1404B-HIP_PKT_FLP	2
	Hip Pocket Flap Tab	PD1404B-HP_PK_FL_TB	2
	Leg Eyelet	PD1404B-LEG_EYELET	2
	Hip Pocket Flap and Tab Alternate	PD1404B-HPPKFLTB_AL	2

1/ Waistband pattern will be prepared by contractor in accordance with requirements indicated in section 3.7.2.

3.11 Configuration. Each trouser shall conform to design, appearance (see figures 1-6), the finished measurements in Table VIIIA and VIIIB and the construction methods specified in 3.11.1 through 3.11.2 and Tables VI and VII 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 VI. 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. The seams for all outside visible stitching shall be sewn with 11 ( $\pm$  1) stitches per inch. Overedge or pre-hemming shall be 10 ( $\pm$  2) stitches per inch. Buttons shall be attached with 16 ( $\pm$  1) stitches per button. Buttonholes shall be 54 ( $\pm$  2) stitches per inch including tack. The sewn eyelets for the bellows pockets shall have a minimum of 16 stitches. 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. All stitches per inch and gauges shall be met prior to any applicable garment treatments.

3.11.1.1 Repair of stitch.

3.11.1.2 Repairs of stitching. Repairs of stitching shall be as follows:

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

NOTE. When making the above repairs, the ends of the stitching are not required to be backstitched. The loose ends shall be trimmed with scissors. **Caution:** Pulling or breaking the loose ends is not allowed.

3.11.1.3 Repairs of type 401 stitching only. All repairs shall be in accordance with 3.11.1.1 and 3.11.1.2, except substitute 3/4-inch for 1/2-inch wherever 1/2-inch appears. Repairs to stitch Type 401 may be accomplished by use of stitching Type 301.

3.11.2 Fly seaming and stitching. The fly construction stitching of front center crotch seam shall end at J-stitch. There shall be a horizontal bar-tack superimposed on the bottom point of the J-stitch (see figure 6b).

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TABLE VI. Seam and stitching types.

<b>Seam placement</b>	<b>Seam type</b>	<b>Gauge</b>	<b>Stitch type</b>
Side seams, back seam and inseam	LSc-2	3/16 to 9/32-inch gauge (double lap seam)	301 or 401
Top stitching of side pockets	OSf-1	3/16 to 1/4-inch from edge	301
Attachment of pockets	LSd-1	1/16 to 1/8-inch from edge and 1/4-inch gauge	301
Raw edges of pocket flaps, pocket bagging, bearer or facings	SSa-2	1/4 to 3/8-inch gauge	516, 519
FR identification marker to left cargo pocket flap (Types II and III only)	LSbj-1	Box stitch 7/8-inch by 7/8-inch	301
Setting of cargo and lower leg pocket flaps			
Top stitch	LSba-2	Two (2) rows 3/16 to 1/4-inch apart	301
OR			
Top stitch	LSb1-2	3/16 to 1/4-inch from serged edge, then turn flap burying raw edge and top stitch one (1) row 1/4 to 5/16-inches from turned edge	301
Top stitching of cargo and lower leg pocket flaps	OSf-1	3/16 to 1/4-inch from folded edge	301
Cargo and lower leg pocket bellows, pleats edge stitch all	OSf-1	1/16 to 1/8-inch from edge	301

TABLE VI. Seam and stitching types - Continued

<b>Seam placement</b>	<b>Seam type</b>	<b>Gauge</b>	<b>Stitch type</b>
Attachment of knee reinforcements	LSd-2	Two (2) rows 3/16 to 1/4-inch apart	301
Bottom hemming	Efb-1	3/4 to 1-inch wide hem	301
Belt loops	Efh-1	1/8 to 1/4-inch gauge from edge	402 or 406
Waistband attachment options (Style A, Unisex):			
Grown-on lining attachment	LSct-2	1/16 to 1/8-inch from top and bottom edge of waistband lining	301 or 401
Top stitch	LSct-3	Along top edge	301 or 401
OR			
Sewn-on 1-piece	BSo-2	1/16 to 1/8-inch from top and bottom edge of waistband	301 or 401
Top stitch	BSo-3	Along top edge	301 or 401
OR			
Sewn-on 2-piece	LSbc-2	1/16 to 1/8-inch from top and bottom edge of waistband	301 or 401
Elastic Waistband (Style B, Female only): Metered elastic <u>1</u> /	LSbc-4	Two (2) rows 3/16 to 1/4-inch apart 1/8-inch from edge	301
Seat patch	LSd-2	Two (2) rows 3/16 to 1/4-inch apart. First row of stitching shall be 1/16 to 1/8-inch from folded edge	301
Buttonhole fly – join pieces along front edge; turned in edge	SSe-2 or SSc-1	1/16 to 1/8-inch from turned in edge	301
Join left front and left fly lining along front edge; turned in edge	SSe-2 or SSc-1	1/16 to 1/8-inch from turned in edge	301

TABLE VI. Seam and stitching types – Continued

<b>Seam placement</b>	<b>Seam type</b>	<b>Gauge</b>	<b>Stitch type</b>
Overedge back edges of left fly lining and buttonhole fly	EFd-1	3/16 to 1/4-inch gauge	502, 503 or 504
J-stitch	LSbj-1	2 (± 1/8)-inch from edge	301
Join right front and right fly lining along front edge	SSe-2 or SSc-1	1/16 to 1/8-inch from turned in edge	301
Overedge right fly raw edges	FFd-1	3/16 to 1/4-inch gauge	502, 503 or 504
Crotch seam	LSb-2	Two rows 3/16 to 1/4-inch apart. Stitching shall penetrate both crotch pattern pieces. Stitching shall end 2-3/4 to 3-inches from inseam.	301
Hip pocket welt	SSbe-2	Hip pocket welt width 1/4 - 3/8 inch	301
Labels	LSbj-1	1/8 to 3/16-inch from edge	301

1/ Style B elastic: Elastic strips shall be sewn and be caught within interior of seam via all four (4) topstitchings. Inserted elastic shall be capable of meeting the finished measurements in 3.12.1 and Table VIII B. All stitch lines shall be correctly tensioned and balanced such that the stitch lines shall not impede stretch causing stitches break open or exceed the elastic stretch causing elastic to bear all the stress. Both the stitch line and elastic shall equally share the stress when stretched out.

3.11.3 Bar-tacking. To maintain garment durability and functionality, bar-tacks shall be placed as specified in Table VII. Bar-tacks shall be 1/8 to 3/16-inch wide.

TABLE VII. Bar-tack placement

<b>Bar-tack placement</b>	<b>Size of tack (inches)</b>	<b>Stitches per tack <u>1</u>/</b>	<b># of Bar-tacks per garment</b>	<b>Horizontal</b>	<b>Vertical</b>
Elastic Waist Band, Style B (1/2-inch from each cut end of elastic webbing )					
a. Left	1	55	2	----	X
b. Right	1	55	2	----	X

TABLE VII. Bar-tack placement - Continued

<b>Bar-tack placement</b>	<b>Size of tack (inches)</b>	<b>Stitches per tack <u>1</u>/</b>	<b># of Bar-tacks per garment</b>	<b>Horizontal</b>	<b>Vertical</b>
Belt loops (set 1/8-inch from top and bottom edge)					
a. Top	1/2	30	7	X	----
b. Bottom	1/2	30	7	X	----
Center back of leg bottom hems, securing lace (line tack also permitted) (Not visible on outside of trouser)	5/8	36	2	----	X
Fly (see figures 6a and 6b)					
a. J-stitching, superimposed on outside bottom point (through all layers)	5/8	36	1	X	----
b. Positioned approximately 1/4-inch from bottom right edge and 1/2-inch from front right edge (through all fly layers not visible from front)	5/8	36	1	----	X, <u>2</u> /
Fly - left front lining					
a. Between the second and third buttonholes	5/8	36	1	X	----
b. Between the third and fourth buttonholes (not visible from front)	5/8	36	1	X	----
Crotch/inseam junction, positioned on seam through center of crotch seam	5/8	36	1	X	----
Crotch centered between crotch junction and fly front J-stitch	5/8	36	1	----	X
Cargo pockets					
a. Top, (left and right side)	3/4	48	4	----	X
b. Bottom, (bellow side)	3/4	48	2	----	X
Cargo pocket pleats (on facing stitching )	5/8	36	4	X	----

TABLE VII. Bar-tack placement – Continued

<b>Bar-tack placement</b>	<b>Size of tack (inches)</b>	<b>Stitches per tack <u>1/</u></b>	<b># of Bar-tacks per garment</b>	<b>Horizontal</b>	<b>Vertical</b>
Lower leg pockets					
a. Top (left and right side)	5/8	36	4	----	X
b. Lower, right (opposite side of bellows)	5/8	36	2	----	X
Cargo and lower leg pocket flaps					
a. Cargo	5/8	36	4	X	----
b. Lower leg	5/8	36	4	X	----
Back hip pockets (at welt ends along stitchline)	5/8	36	4	----	X
Front hanging pocket openings, (meeting or overlapping pocket edge)					
a. Top opening, 1/4 - 3/8-inch below waistband	5/8	36	2	X	----
b. Bottom opening, perpendicular to front edge	5/8	36	2	X	----

1/ The tolerance shall be (± 2) stitches per tack.

2/ Bar-tack can be angled

3.12 Measurements. All measurements referenced in this document, except for end item measurements specified in 3.12.1 shall be made prior to garment treatment if applicable.

3.12.1 Finished measurements (Style A and B, all types and classes). The trouser shall conform to the finished measurements specified in Table VIIIA and Table VIIIB.

TABLE VIIIA. Style A. Unisex finished measurements (inches) all types and classes

<b>Size</b>	<b>X-Small</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>X-Large</b>	<b>XX-Large</b>	<b>Tol.</b>
<b>Half Waist, <u>1/</u></b>	13-3/4	15-3/4	17-3/4	19-3/4	21-3/4	23-3/4	± 1/2
<b>Inseam, <u>2/</u></b>							
X-Short	28-3/8	28-3/8	28-3/8	28-3/8	28-3/8	28-3/8	± 3/4
Short	30-3/8	30-3/8	30-3/8	30-3/8	30-3/8	30-3/8	
Regular	32-3/8	32-3/8	32-3/8	32-3/8	32-3/8	32-3/8	
Long	34-3/8	34-3/8	34-3/8	34-3/8	34-3/8	34-3/8	
X-Long	36-3/8	36-3/8	36-3/8	36-3/8	36-3/8	36-3/8	
XX-Long	38-3/8	38-3/8	38-3/8	38-3/8	38-3/8	38-3/8	

TABLE VIIIA. Style A. Unisex finished measurements (inches) all types and classes - Continued

Size	X-Small	Small	Medium	Large	X-Large	XX-Large	Tol.
<b>Outseam, <u>3/</u></b>							
X-Short	37-3/8	37-7/8	38-3/8	38-7/8	39-3/8	39-7/8	± 3/4
Short	39-7/8	40-3/8	40-7/8	41-3/8	41-7/8	42-3/8	
Regular	42-3/8	42-7/8	43-3/8	43-7/8	44-3/8	44-7/8	
Long	44-7/8	45-3/8	45-7/8	46-3/8	46-7/8	47-3/8	
X-Long	47-3/8	47-7/8	48-3/8	48-7/8	49-3/8	49-7/8	
XX-Long	49-7/8	50-3/8	50-7/8	51-3/8	51-7/8	52-3/8	
<b>Half Leg Opening, <u>4/</u></b>							
X-Short	8-1/2	8-1/2	8-7/8	8-7/8	9-1/4	9-1/4	± 1/2
Short	8-1/2	8-1/2	8-7/8	8-7/8	9-1/4	9-1/4	
Regular	8-1/2	8-1/2	8-7/8	8-7/8	9-1/4	9-1/4	
Long	8-1/2	8-1/2	8-7/8	8-7/8	9-1/4	9-1/4	
X-Long	8-1/2	8-1/2	8-7/8	8-7/8	9-1/4	9-1/4	
XX-Long	8-1/2	8-1/2	8-7/8	8-7/8	9-1/4	9-1/4	

1/, 2/, 3/, 4/ - See 3.12.1.1 for methods of measurement.

TABLE VIIIB. Style B. Female finished measurements (inches) all types and classes

Size	25	28	31	35	Tol.
<b>Half Waist, <u>1/</u></b>	13	14-1/2	16	18	± 1/2
<b>Inseam, <u>2/</u></b>					
X-Short	26	26	26	26	± 3/4
Short	28	28	28	28	
Regular	30	30	30	30	
Long	32	32	32	32	
X-Long	34	34	34	34	
<b>Outseam, <u>3/</u></b>					
X-Short	34	34-1/2	35	35-1/2	± 3/4
Short	36-1/2	37	37-1/2	38	
Regular	39	39-1/2	40	40-1/2	
Long	41-1/2	42	42-1/2	43	
X-Long	44	44-1/2	45	45-1/2	

TABLE VIII.B. Style B. Female finished measurements (inches) all types and classes - Continued

Size	25	28	31	35	Tol.
<b>Half Leg Opening, 4/</b>					
X-Short	8-3/4	8-3/4	9	9-1/4	± 1/2
Short	8-3/4	8-3/4	9	9-1/4	
Regular	8-3/4	8-3/4	9	9-1/4	
Long	8-3/4	8-3/4	9	9-1/4	
X-Long	8-3/4	8-3/4	9	9-1/4	
<b>Half Waist, 5/ Stretched (minimum)</b>	15	16-1/2	18	20	- 0, + 1
<b>Half Hip 6/</b>	20-3/4	22-1/4	23-1/4	25-1/4	± 1/2

1/, 2/, 3/, 4/, 5/, 6/ - See 3.12.1.1 for methods of measurement.

3.12.1.1 Methods of measurement. The measurements in Table VIIIA and Table VIII.B shall be taken in accordance with the footnotes listed below Table VIII.B and trouser waist shall be buttoned and placed flat upon a table for measuring.

1/ Half waist - Measure along center of waistband from outside folded edge to folded edge. The elastic inserts for Style B, shall be relaxed

2/ Inseam - Measure inseam of trousers from center of crotch seam to bottom edge of trouser along the inseam.

3/ Outseam - Measure from top edge of waistband to bottom of leg along outseam.

4/ Half leg opening - Measure across bottom of leg from outside folded edge to folded edge.

5/ Half waist stretched - Rotate 1/2-waist so that elastic is in the approximate center to prevent the hands or stretching device from restricting the elastic from fully elongating. Stretch waist until fully extended without excessive force, measure along center of waistband from outside folded edge to folded edge.

6/ Half hip - With trousers laid flat on table, Seat Patch facing up, measure 9-inches down from top edge of waistband at center back, measure seam edge to seam edge.

3.13 Toxicity. The finished trouser 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 trouser shall be thoroughly cleaned and all thread scraps, lint and foreign matter shall be removed and all closures engaged prior to packaging. The trouser shall be uniform in quality and shall be free from irregularities or

defects which could adversely affect fit, performance, reliability or durability. The trouser 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 VI and VII and overall workmanship. The first article shall also include the finished measurements in Table VIIIA and Table VIIIB, examination for defects in Table IX, and testing in Tables X and XI. 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 VIIIA and Table VIIIB, examination for defects in Table IX and testing in Tables X and XI. 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 trouser shall be subjected to visual examination. All fabric and garment defects shall be scored in accordance with Table IX, which are clearly noticeable at normal viewing distance (3-feet) and affect serviceability and 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.

TABLE IX. Trouser visual examination

Examination	Defect	Classification	
		Major	Minor
Material	Incorrect, not as specified (see 3.3.1, 3.3.1.1 and 3.3.1.2)	101	
	Hole, cut, tear, smash, burn, needle chew, exposed drill hole, run, thin place, dye streak, color not as specified, misweave, visible mend or otherwise damaged	102	
	Knots greater than Sears Scale Level C (See 6.6)		201
	Slubs greater than Sears Scale Level D (See 6.6)		202



TABLE IX. Trouser visual examination – Continued

Examination	Defect	Classification	
		Major	Minor
Shade	Shade variation within part or between parts of trouser, affecting appearance or serviceability	103	
<b>Components</b>	Component not in accordance to the specification	104	
Tape and elastic webbing	Omitted or misplaced Any tape or webbing distorted, full, tight, damaged or twisted Color or type not as specified	105	203 204
Thread and gimp	Color or type not as specified		204
Buttons	Omitted, damaged or ragged Not specified type, size or color	106	205
Patch kit	Omitted Not placed in correct pocket or position Patch color, type or packaging not as specified	107	206 207
Labels, hangtags, bar code, UPC/HRI codes	Omitted, illegible Color or type not as specified Human readable interpretation (HRI) illegible	108 109	208
<b>Construction</b>	Any construction part of the trouser omitted (3.7.1 to 3.7.12)	110	
Waistband	Incorrect design, not as specified in patterns, not secured, not specified width Waistband grainlines not matching to trouser Waistband button/buttonhole alignment uneven by more than 1/4-inch when buttoned	111 112 113	
Belt loops	Belt loops omitted, not secured, not specified size, opening not as specified or incorrect placement	114	
Fly	Incorrect design not specified in patterns, not secured, missing or skewed J stitch line	115	
Seat and knee Reinforcement	Omitted Not attached as specified, Not aligned at top more than 1/4-inch (seat only)	116 117 118	

TABLE IX. Trouser visual examination – Continued

Examination	Defect	Classification	
		Major	Minor
Pocket and flaps (all)	Pocket construction and openings not as specified	119	
	Pocket companions and openings not uniform in size or shape by 1/4-inch	120	
	Pocket flaps or openings not as specified	121	
	Pocket flaps twisted, curled or puckered, not stitched as specified or not well formed	122	
	Pocket flaps not completely covering pocket opening left to right, positioned or grain line not as specified	123	
	Pocket flap finished uneven from left to right more than 1/4-inch	124	
Front hanging side pockets	Raw edge not overedged	125	
Hip pocket	Omitted, or incorrect size	126	
	Missing or incorrect placement of buttons or buttonholes	127	
Cargo pockets	Omitted or incorrect size	128	
	Missing edge stitch on pleats, missing or incorrect placement of eyelets, buttons or buttonholes	129	
Lower leg pockets	Omitted or incorrect size	130	
	Missing or incorrect placement of eyelets, buttons or buttonholes	131	
Hem/bottom opening/inseam and outseam	Hem not as specified, or missing drawstring	132	
	Bottom openings varying more than 1/2-inch in width	133	
	Inseam and outseam lengths varying by more than 1/2-inch	134	
Eyelets	Omitted, misplaced or incorrect size	135	
	Loose stitching, incorrect number of stitches		209
	Eyelet hole not cut through		210
Bar-tacks, back-tacks	Omitted, misplaced or incorrect size	136	
	Loose stitching, incorrect number of stitches		211
Buttonholes	Omitted, misplaced or incorrect size	137	
	Button holes not in specified direction		212
	Loose buttonhole thread, purling on wrong side, not clean cut or securely caught in fabric	138	
	Alignment of buttonholes and buttons causing bulge, twist or distortion when engaged	139	
	Buttonholes not cleanly cut to required opening size		213
FR marker tape (Type II and III only)	Omitted, incorrect type or incorrectly placed	140	

TABLE IX. Trouser visual examination – Continued

Examination	Defect	Classification	
		Major	Minor
Labels, Hangtags, UPC/HRI codes	Size, combination identification/care labels not placed correctly		214
	Hangtags/UPC labels not placed securely attached in correct position		215
	Barcode/UPC code not visible on folded, packaged item		216
	Any label or tag having incorrect printed content	141	
	Any label, hangtag, or barcode attachment causing damage to item	142	
Seams and stitching	Open seams, puckered, distorted, wavy, twisted, or irregular	143	
	Loose or tight stitch tension		217
	Less than 1/2-inch in length		
	Greater than 1/2-inch in length	144	
	Missing stitches greater than 1/4-inch length	145	
	Edge or raised stitching sewn too close to the edge or needle chew resulting in damage to fabric over 1/4-inch in length	146	
	Seam allowance not as required by stitch type		218
	Visible raw edge on outside of trouser (inside raw edge greater than 1-inch)	147	
	Stitching not as specified	148	
	Double needle intersecting seams staggered by more than 1/4-inch	149	
	Run off of stitching more than 1/2-inch for edge or raised stitching	150	
	Stitching caught in components or fabric causing unwanted permanent folds, pleats or fullness in the garment	151	
	Free floating stitching not secured in a seam or other stitching by less than 1/4-inch or ends of a continuous line of stitching not overlapped over 1/2-inch (except label stitching)	152	
	Stitching of seams incorrectly repaired	153	

TABLE IX. Trouser visual examination – Continued

Examination	Defect	Classification	
		Major	Minor
Cleanness and workmanship	Spot/Stain affecting appearance or serviceability	154	
	Odor	155	
	Excessive thread ends (more than 3) Between 1/4 to 1-1/2-inch		219
	Excessive thread ends (more than 3) Over 1-1/2-inches	156	
	All closures on trouser not engaged		220
Packaging	Any trouser not package in accordance with contract or purchase order		221

4.4.2 Component testing. The components shall be tested for the characteristics listed in Table X. The methods of test shall be as specified in Table X. All test reports shall contain the individual values utilized in expressing the final results. The testing requirements and test sampling plan shall be as specified in the contract or purchase order.

TABLE X. Component tests (all types, styles and classes)

Characteristic	Requirement paragraph	Test method
<b>Alternate pocketing material:</b>		
Weight	3.3.2.1	ASTM D 3776 (Method C)
Breaking strength Warp Filling	3.3.2.1	ASTM D 5034 (G-E or G-T)
Tearing strength Dry Wet	3.3.2.1 3.3.2.1	ASTM D 1424 1/ ASTM D 1424 2/
Dimensional stability After laundering (5 cycles)	3.3.2.1	AATCC 135 3/
Colorfastness to: Laundering (after 1 cycle) (Color change and Staining) Crocking (wet & dry), solids Perspiration (acid & alkaline) (Color change and Staining)	3.3.2.1	AATCC- 61 3A 4/ AATCC- 8 5/ AATCC-15 4/

TABLE X. Component tests (all types, styles and classes) - Continued

Characteristic	Requirement paragraph	Test method
Flame resistance Initial After 25 launderings	3.3.2.1	ASTM D 6413 AATCC-135, 3, V, Aiii & ASTM D6413
Elastic waistband (Style B only) Force vs. Elongation	3.5.2	4.4.2.1

1/ Dry condition in accordance with ASTM D 1424, Section 9.1

2/ Wet condition in accordance with ASTM D 1424, Section 9.2

3/ Launder in accordance with AATCC 135, I, 3, V, Aiii.

4/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.

5/ Rated using the AATCC Evaluation Procedure 8, AATCC 9-Step Chromatic Transference Scale

4.4.2.1 Force versus elongation of elasticized features.

4.4.2.1.1 Specimen preparation. A waistband sample shall be constructed to duplicate the configuration of the waistband in the finished garment. A specimen shall consist of one (1) side of the elasticized waistband feature. Waistband specimen shall be laundered five (5) times in accordance with AATCC 96, VIcA and ensure stitching which sets the elastic stays secured through the washings. Tensile properties are evaluated by conducting tensile tests utilizing equipment, which conform to ASTM D 76, Standard Specification of Tensile Testing Machines for Textiles. Specimen is conditioned in accordance with ASTM D 1776 for approximately 24 hours.

4.4.2.1.2 Procedure. The specimen is clamped in pneumatic jaws in a relaxed state (no force on read out) where the jaws are spaced 4-inches apart. A Constant Rate of Extension (CRE) with a loading rate of 2-inches per minute is used. The crosshead is moved 1.5-inches for a total of 5.5-inches. The resulting force is recorded at a rate of 10 points per second. The graph shall be evaluated to record the force at 1-1/2-inch extension (10 repetitions). The sample meets requirements when the 1-1/2-inch extension does not exceed 4.0 pounds nor is less than 1.5 pounds.

4.4.3 End item testing. The finished trouser shall be tested for the characteristics listed in Table XI. The methods of test shall be as specified in Table XI. All test reports shall contain the individual values utilized in expressing the final results. The testing requirements and test sampling plan shall be as specified in the contract or purchase order.

TABLE XI. End item tests (all types, styles and classes)

<b>Characteristic</b>	<b>Requirement paragraph</b>	<b>Test method</b>
Permethrin content (Class 2 only)		
Initial	3.4.1	4.5.1
After 20 launderings	3.4.1	4.5.1 <u>1/</u>
% Bite protection (Class 2 only)		
Initial	3.4.2	4.5.2
After 20 launderings	3.4.2	4.5.2 <u>1/</u>
After 50 launderings	3.4.2	4.5.2 <u>2/</u>
pH (Class 2 only)	3.4.3	AATCC 81
Button pull/break (Class 2 prior to treatment)	3.5.4	ASTM D 5034
Toxicity	3.13	4.5.3

1/ After 20 launderings as per AATCC 135, I, 3, V, Aiii, except laundering cycles 5, 10, 15, 19 and 20 shall be performed without adding any detergent to minimize detergent accumulation in specimens.

2/ 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 only). The permethrin content of treated fabric shall be determined by gas chromatographic procedure and directly compared to an external standard containing 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 (GC/MS)**

**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 five (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. 0.0001 g sensitivity, Mettler Toledo, or equal

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

A.3 Glassware.

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

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

A.4.1 3-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, 230 psi
- b. Complete Extraction Cells, 22 mL
- c. Cellulose filters, 1.98 cm
- d. 40 mL Amber Glass Collection Vials
- e. Solvent Resistant Teflon-Silicone Coated Septa
- f. 3 mm - 4 mm 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 250 mL, 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 (GC). Gas Chromatograph equipped with ChemStation software, or equal

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

A.7 Agilent Series 5973N (G2579A) Mass Spectrometer (MS) 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  $\geq 97\%$ , 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  $\geq 99.999\%$

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 (3) to six (6) 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) shall consist of a minimum of three (3) sample units (garments) unless otherwise noted in the contract or purchase order.

D.2 Test specimens.

a. From each sample garment being evaluated (unlaundered and after 20 launderings), select three (3) 3-inch diameter specimens (use a 3-inch circular cutting die having surface area of 45.6037 cm<sup>2</sup>) for each test condition. Cut specimen from single ply areas so that no two (2) specimen 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 200 ng/μL, [1 ng/μL is equal to 1 part-per-million (ppm)]

b. Using the balance specified in A.2, weigh 10 (± 1) mg of permethrin crystals and place into a 50 mL volumetric flask and fill with 80% acetonitrile/ 20% methanol solvent to obtain the standard of 200 ng/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	22 mL
Collection vials	60 mL, 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 160 mL of the acetonitrile/methanol mixture and boiling chips into a 250 mL flask. Assemble the Soxhlet apparatus and extract the permethrin treated specimens for 6 hours or until an 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 40 mL.

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 (3) 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 (3) 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 (10) specimens. If any blank, after multiplying concentration by five (5), 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 (6) 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 3<sup>rd</sup> order polynomial regression line with R-squared value of 0.99 or greater is acceptable. Derive the equation of the 3<sup>rd</sup> 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 1  $\mu\text{L}$  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	1 $\mu\text{L}$
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<sup>2</sup>), 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:

$$\text{Concentration (mg/cm}^2\text{)} =$$

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

Where:

40 mL = Final Volume

a, b, c and d = numbers derived from 3<sup>rd</sup> degree polynomial equation from standard series following specimen series

x = area count of the specimen curve

45.6037 cm<sup>2</sup> = area of specimen

H.1.2 Conversion to permethrin weight percent content (W/W%).

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

I. Report. Report the permethrin concentrations in milligrams per square centimeter squared to the nearest 0.001 mg of the three (3) individual specimen per sample unit (garment) for all sample units tested. A single individual specimen within a sample unit (garment) shall be allowed to fall outside of the minimum to maximum range of the permethrin levels as specified in paragraph 3.4.1 as long as the average of the three (3) specimen meet the specified levels. However, for initial testing only the single individual specimen allowed to fall outside the specified range in 3.4.1 shall not fall below 0.060 mg/cm<sup>2</sup> or above 0.170 mg/cm<sup>2</sup> in which case the sample unit (garment) shall be considered a failure whether or not the sample average falls within the minimum to maximum range specified and 3.4.1. If a sample unit (garment) fails, three (3) specimen from an additional sample unit (garment) shall be tested. The additional test shall then be used to rate pass or fail of the lot. The lot shall be rated “pass” when a minimum of three (3) sample units meet the minimum to maximum concentration level range specified in 3.4.1.

4.5.2 Percent (%) biting protection assay. Percent (%) bite protection shall be measured on a finished permethrin treated garment, Class 2, under three (3) 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 (3) test conditions shall be unlaundered, after 20 launderings, and

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 (3) determinations will be run for each of the two (2) insect species (see 4.5.2.3.3). Each determination for each insect is conducted with three (3) volunteers using three (3) different fabric conditions; unlaundered, after 20 launderings and after 50 launderings and compared to non-treated control. A single untreated unlaundered control sleeve can be used for the three (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 three (3) determinations is outlined below. It is estimated that one (1) coat yields three (3) specimens and one (1) trouser yields three (3) specimens consisting of largely a single ply fabric area (see 4.5.2.2 and see 6.6).

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

1/ One (1) set of treated specimens will be used twice to test each mosquito species

2/ Total garments estimated, required to conduct three (3) determinations are;

Three (3) treated trousers and one (1) untreated trouser

4.5.2.2 Specimen size. Specimens will be cut to the shape and dimensions illustrated in Figure 7. 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 (2) species of mosquito. The results of this evaluation for the mosquitoes 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 percent (%) 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 (1) female mosquito per 300 cm<sup>3</sup> cage volume. (Cages shall be 60,000 ( $\pm$  6,000) cm<sup>3</sup>, with a sleeved opening for the arm of the volunteer to be inserted.) Cages shall be constructed of a lightweight clear plastic on three (3) sides, or an aluminum bottom panel with light weight clear plastic on two (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 three (3) test volunteers shall be used in each study for each insect species at each test facility. The same three (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 five (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 hours 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 minutes. 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. Tests 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 (three (3) for each treatment type or control), shall be averaged with all trials for the other volunteer subjects in the study. An overall average percent (%) bite protection shall be calculated by Abbott's equation below and reported in this manner for each insect and for all volunteers tested. Total percent (%) Bite Protection will be calculated by averaging the overall results for both species and meet the requirements set forth in paragraph 3.4.2.

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

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

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



4.5.3 Toxicity test. 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 finished pants is not a sensitizer or irritant, a Repeat Insult Patch Test shall be performed in accordance with the Modified Draize Procedure (see 2.3). If the toxicity requirement (see 3.13) can be demonstrated with historical use data, toxicity testing may not be required (see 6.2).

## 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 Rodenticide Act (FIFRA) (see 2.2.2).

## 6. NOTES

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

6.1 Intended use. The trouser 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 Purchase Description document.
- b. Type, style, 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 and 6.3).
- e. Camouflage pattern required (see 3.3.1.1 and 3.3.1.2)
- f. Pattern required (see 3.10)
- g. When toxicity testing is required (see 3.13 and 4.5.3)
- h. Conformance inspection acceptance quality limits (see 4.3).
- i. Inspection conditions (see 4.4).
- j. Packaging requirements (see 5.1 and 5.2).

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. Samples of approved permethrin treatment 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 Permethrin garment application. To assist in minimizing defects that may be caused during the permethrin garment application process, all garment closures should be engaged prior to the application.

6.6 Percent insect 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 23<sup>rd</sup> 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](mailto:uli.bernier@ars.usda.gov)

6.7 Pattern guide factors & measurement tables. Measurements in tables in 6.7.1 - 6.7.2 are dimensional measurements using the given stretch factor.

6.7.1 Stretch factor (Type I only). Length (X) x Width (Y) axis, 2.0% x 1.5%.

6.7.1.1 Style A. Unisex, Type I only stretch factor.

Style A. Unisex, Type I only.

Size	X-Small	Small	Medium	Large	X-Large	XX-Large	Tol.
<b>Half Waist, <u>1/</u></b>	14	16	18	20	22	24	± 1/2
<b>Inseam, <u>2/</u></b>							
X-Short	29	29	29	29	29	29	± 3/4
Short	31	31	31	31	31	31	
Regular	33	33	33	33	33	33	
Long	35	35	35	35	35	35	
X-Long	37	37	37	37	37	37	
XX-Long	39	39	39	39	39	39	
<b>Outseam, <u>3/</u></b>							
X-Short	38-1/2	39	39-1/2	40	40-1/2	41	± 3/4
Short	41	41-1/2	42	42-1/2	43	43-1/2	
Regular	43-1/2	44	44-1/2	45	45-1/2	46	
Long	46	46-1/2	47	47-1/2	48	48-1/2	
X-Long	48-1/2	49	49-1/2	50	50-1/2	51	
XX-Long	51	51-1/2	52	52-1/2	53	53-1/2	
<b>Half Leg Opening <u>4/</u></b>							
X-Short	8-5/8	8-5/8	9	9	9-3/8	9-3/8	± 1/2
Short	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
Regular	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
Long	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
X-Long	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
XX-Long	8-5/8	8-5/8	9	9	9-3/8	9-3/8	

1/, 2/, 3/, 4/ see 3.12.1.1 for methods of measurement.

6.7.1.2 Style B. Female, Type I only stretch factor.

Style B. Female, Type I only.

<b>Size</b>	<b>25</b>	<b>28</b>	<b>31</b>	<b>35</b>	<b>Tol.</b>
<b>Half Waist, <u>1/</u></b>	13-1/4	14-3/4	16-1/4	18-1/4	± 1/2
<b>Inseam, <u>2/</u></b>					
X-Short	26-5/8	26-5/8	26-5/8	26-5/8	± 3/4
Short	28-5/8	28-5/8	28-5/8	28-5/8	
Regular	30-5/8	30-5/8	30-5/8	30-5/8	
Long	32-5/8	32-5/8	32-5/8	32-5/8	
X-Long	34-5/8	34-5/8	34-5/8	34-5/8	
<b>Outseam, <u>3/</u></b>					
X-Short	34-7/8	35-3/8	35-7/8	36-3/8	± 3/4
Short	37-3/8	37-7/8	38-3/8	38-7/8	
Regular	39-7/8	40-3/8	40-7/8	41-3/8	
Long	42-3/8	42-7/8	43-3/8	43-7/8	
X-Long	44-7/8	45-3/8	45-7/8	46-3/8	
<b>1/2 Leg Opening, <u>4/</u></b>					
X-Short	8-7/8	8-7/8	9-1/8	9-3/8	± 1/2
Short	8-7/8	8-7/8	9-1/8	9-3/8	
Regular	8-7/8	8-7/8	9-1/8	9-3/8	
Long	8-7/8	8-7/8	9-1/8	9-3/8	
X-Long	8-7/8	8-7/8	9-1/8	9-3/8	
<b>Half Waist, <u>5/</u> Stretched (minimum)</b>	15-1/4	16-3/4	18-1/4	20-1/4	- 0, + 1
<b>Half Hip <u>6/</u></b>	21-1/8	22-5/8	23-5/8	25-5/8	± 1/2

1/, 2/, 3/, 4/, 5/, 6/ see 3.12.1.1 for methods of measurement.

6.7.2 Stretch factor (Type II & III only). Length (X) x Width (Y) axis, 3.0% x 1.5%.

6.7.2.1 Style A. Unisex, Type II & III only stretch factor.

Style A. Unisex, Type II and III only.

<b>Size</b>	<b>X-Small</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>X-Large</b>	<b>XX-Large</b>	<b>Tol.</b>
<b>Half Waist, <u>1/</u></b>	14	16	18	20	22	24	± 1/2
<b>Inseam, <u>2/</u></b>							
X-Short	29-3/8	29-3/8	29-3/8	29-3/8	29-3/8	29-3/8	± 3/4
Short	31-3/8	31-3/8	31-3/8	31-3/8	31-3/8	31-3/8	
Regular	33-3/8	33-3/8	33-3/8	33-3/8	33-3/8	33-3/8	
Long	35-3/8	35-3/8	35-3/8	35-3/8	35-3/8	35-3/8	
X-Long	37-3/8	37-3/8	37-3/8	37-3/8	37-3/8	37-3/8	
XX-Long	39-3/8	39-3/8	39-3/8	39-3/8	39-3/8	39-3/8	
<b>Outseam, <u>3/</u></b>							
X-Short	38-3/4	39-1/4	39-3/4	40-1/4	40-3/4	41-1/4	± 3/4,
Short	41-1/4	41-3/4	42-1/4	42-3/4	43-1/4	43-3/4	
Regular	43-3/4	44-1/4	44-3/4	45-1/4	45-3/4	46-1/4	
Long	46-1/4	46-3/4	47-1/4	47-3/4	48-1/4	48-3/4	
X-Long	48-3/4	49-1/4	49-3/4	50-1/4	50-3/4	51-1/4	
XX-Long	51-1/4	51-3/4	52-1/4	52-3/4	53-1/4	53-3/4	
<b>Half Leg Opening, <u>4/</u></b>							
X-Short	8-5/8	8-5/8	9	9	9-3/8	9-3/8	± 1/2
Short	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
Regular	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
Long	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
X-Long	8-5/8	8-5/8	9	9	9-3/8	9-3/8	
XX-Long	8-5/8	8-5/8	9	9	9-3/8	9-3/8	

1/, 2/, 3/, 4/ see 3.12.1.1 for methods of measurement.

6.7.2.2 Style B. Female, Type II and III only stretch factor.

Style B. Female, Type II and III only.

<b>Size</b>	<b>25</b>	<b>28</b>	<b>31</b>	<b>35</b>	<b>Tol.</b>
<b>Half Waist, 1/</b>	13-1/4	14-3/4	16-1/4	18-1/4	± 1/2
<b>Inseam, 2/</b>					
X-Short	27	27	27	27	
Short	29	29	29	29	
Regular	31	31	31	31	± 3/4
Long	33	33	33	33	
X-Long	35	35	35	35	
<b>Outseam, 3/</b>					
X-Short	35-1/4	36-3/4	36-1/4	37-3/4	
Short	37-3/4	38-1/4	38-3/4	39-1/4	
Regular	40-1/4	40-3/4	41-1/4	41-3/4	± 3/4
Long	42-3/4	43-1/4	43-3/4	44-1/4	
X-Long	45-1/4	45-3/4	46-1/4	46-3/4	
<b>Half Leg Opening, 4/</b>					
X-Short	8-7/8	8-7/8	9-1/8	9-3/8	
Short	8-7/8	8-7/8	9-1/8	9-3/8	± 1/2
Regular	8-7/8	8-7/8	9-1/8	9-3/8	
Long	8-7/8	8-7/8	9-1/8	9-3/8	
X-Long	8-7/8	8-7/8	9-1/8	9-3/8	
<b>Half Waist, 5/ Stretched (minimum)</b>	15-1/4	16-3/4	18-1/4	20-1/4	- 0, + 1
<b>Half Hip 6/</b>	21-1/8	22-5/8	23-5/8	25-5/8	± 1/2

1/, 2/, 3/, 4/, 5/, 6/ See 3.12.1.1 for methods of measurement.

6.8 Subject term (key word) listing.

- Clothing
- Clothing, Flame Retardant
- Insect protection
- Operational Enduring Freedom Camouflage Pattern (OEF-CP)
- Operational Camouflage Pattern (OCP)
- Permethrin
- Universal Camouflage Pattern (UCP)

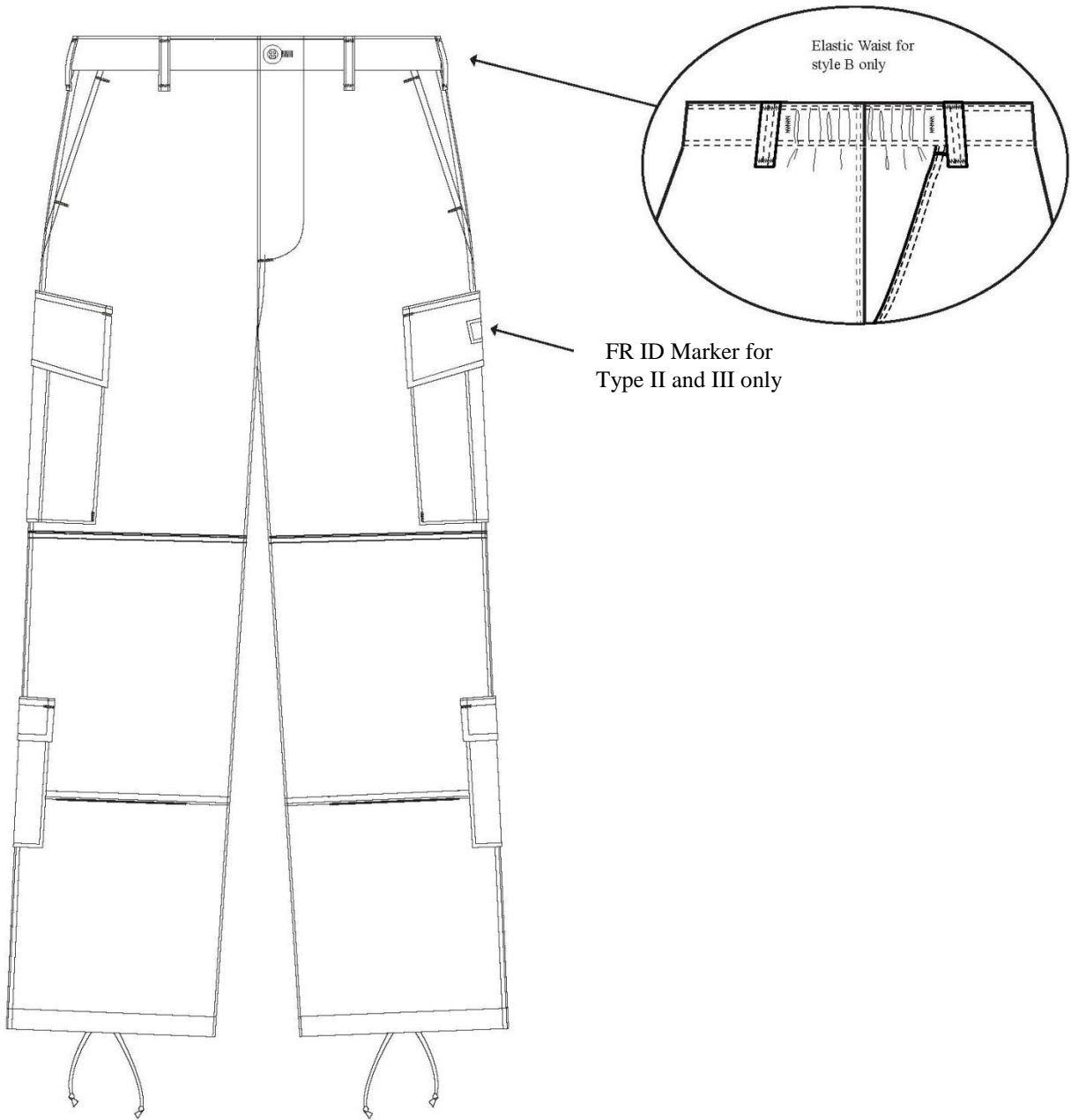


FIGURE 1. Trouser Front, Army Combat Uniform

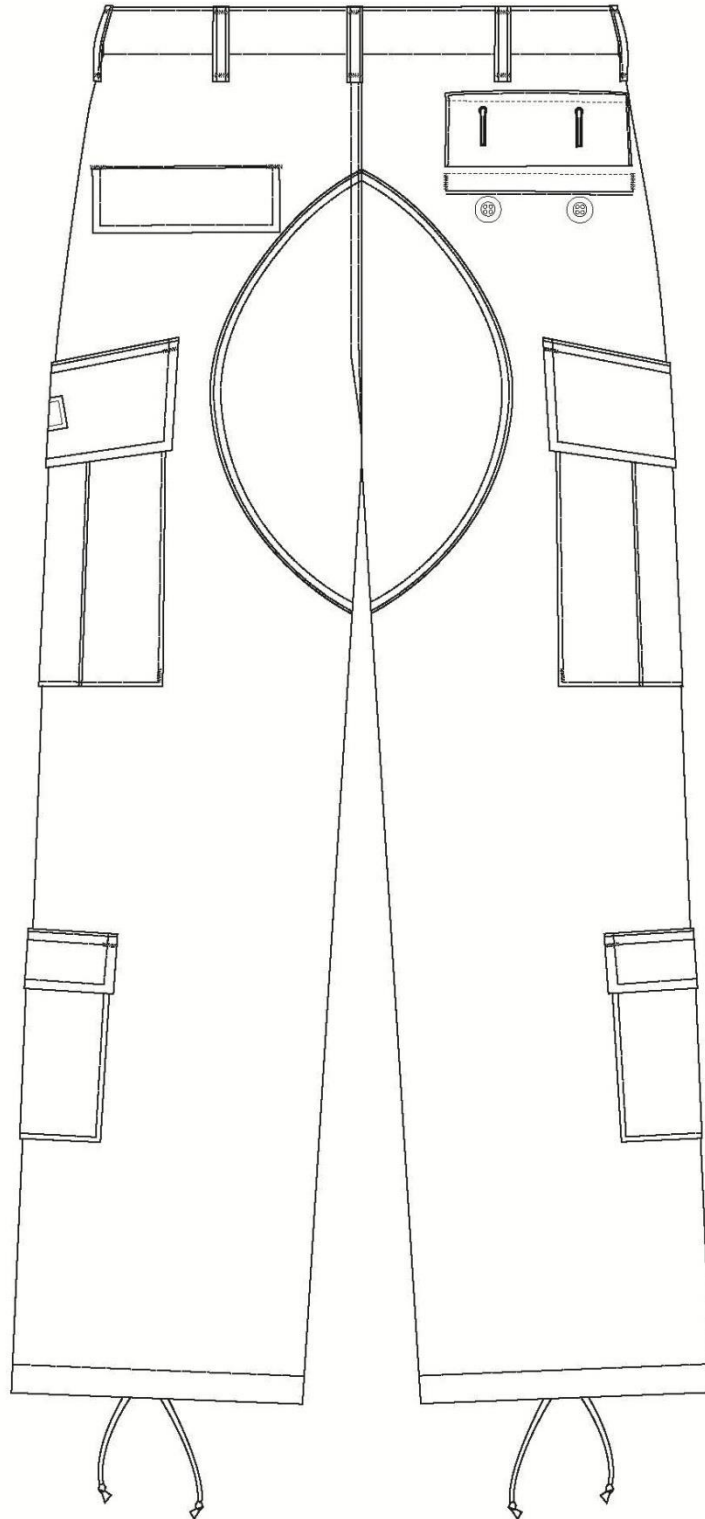


FIGURE 2. Trouser Back, Army Combat Uniform



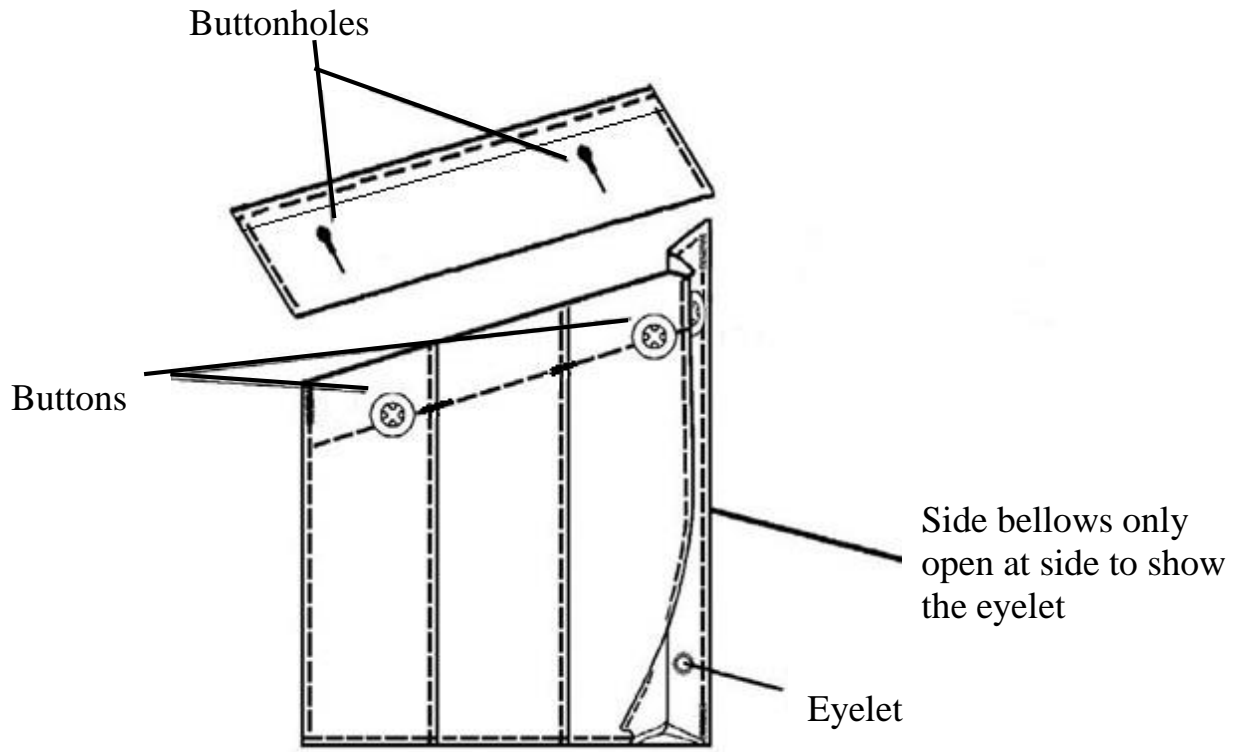


FIGURE 3. Trouser Left Leg Cargo Pocket, Army Combat Uniform

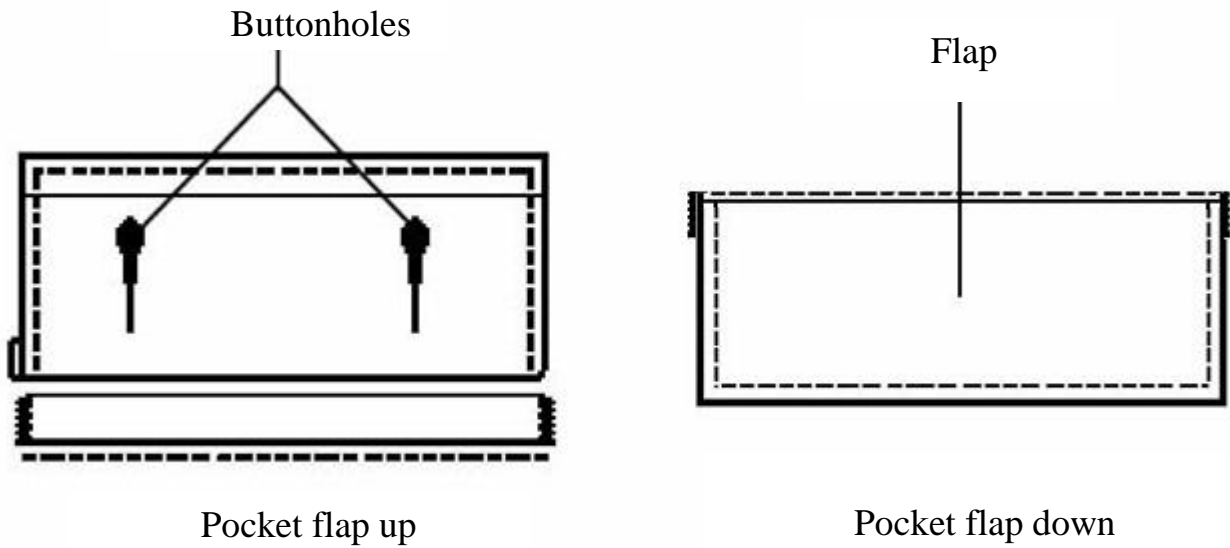


FIGURE 4. Trouser Back Hip Pocket, Army Combat Uniform

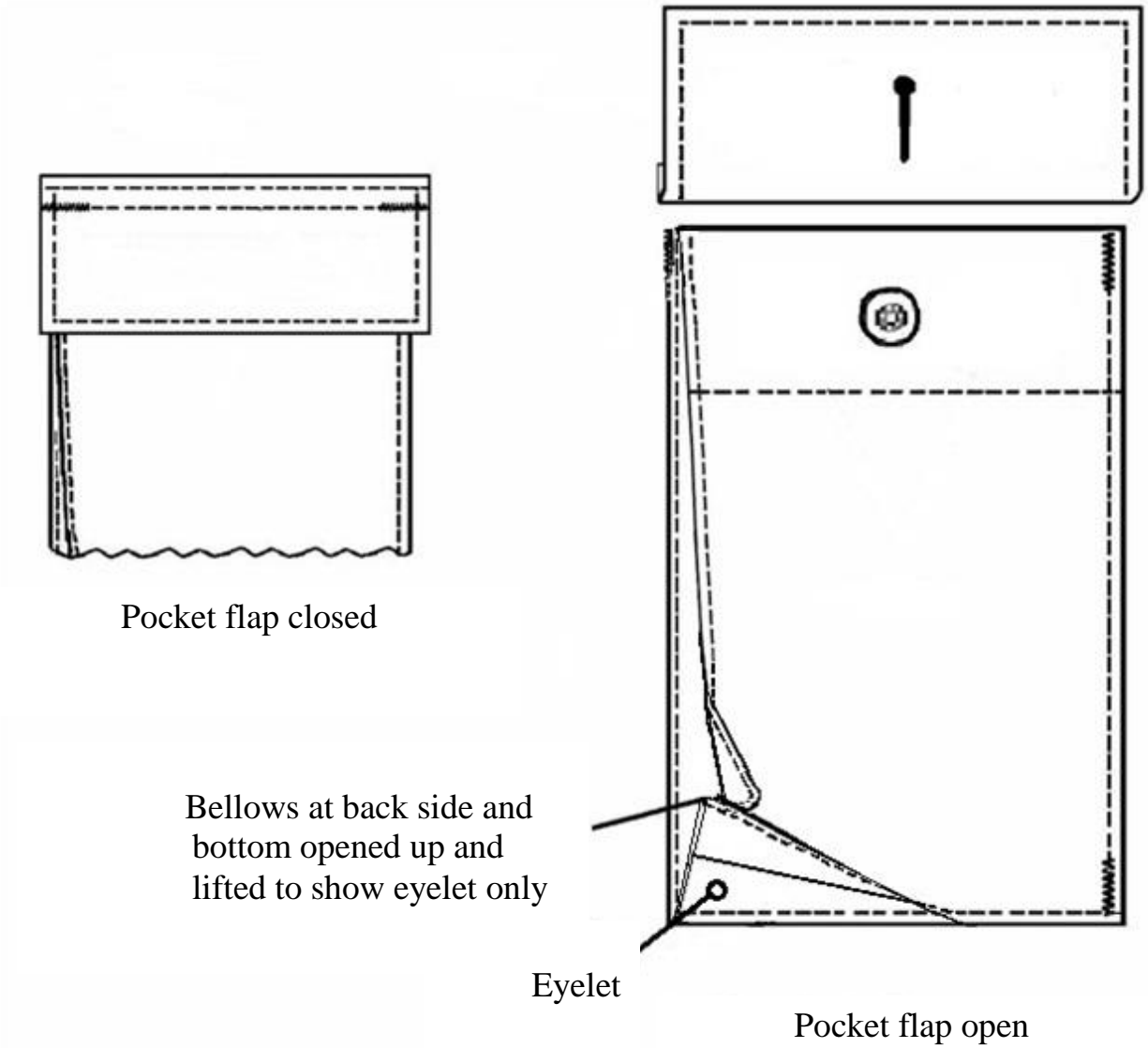


FIGURE 5. Trouser Right Leg Lower Pocket, Army Combat Uniform

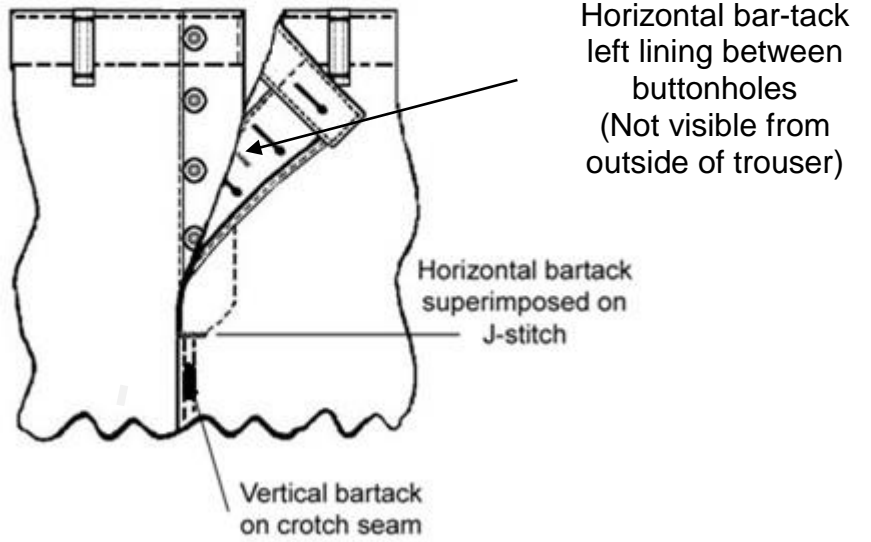


FIGURE 6a. Trouser Fly Construction (outer), Army Combat Uniform

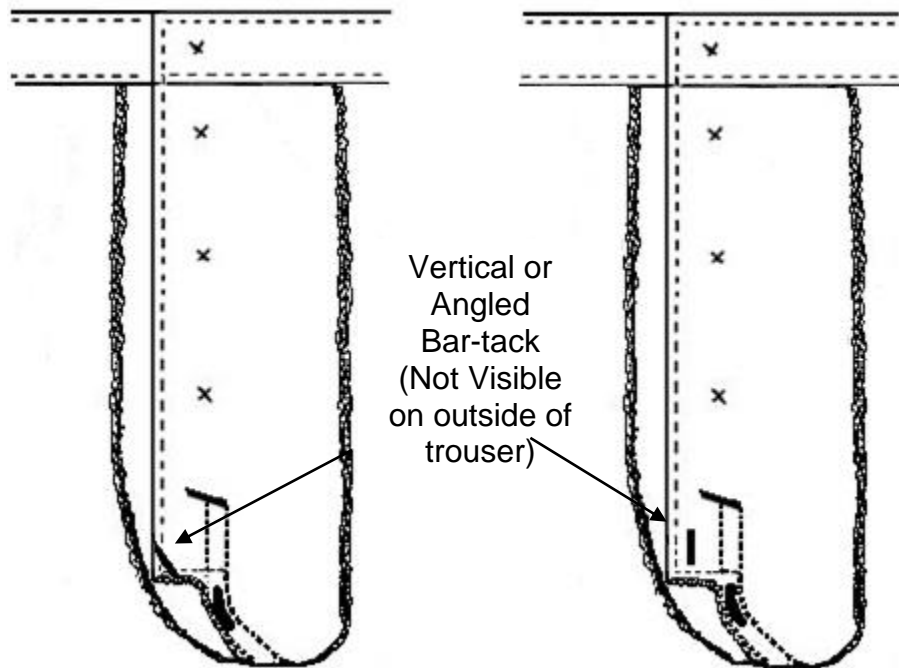


FIGURE 6b. Trouser Fly Construction (inner), Army Combat Uniform

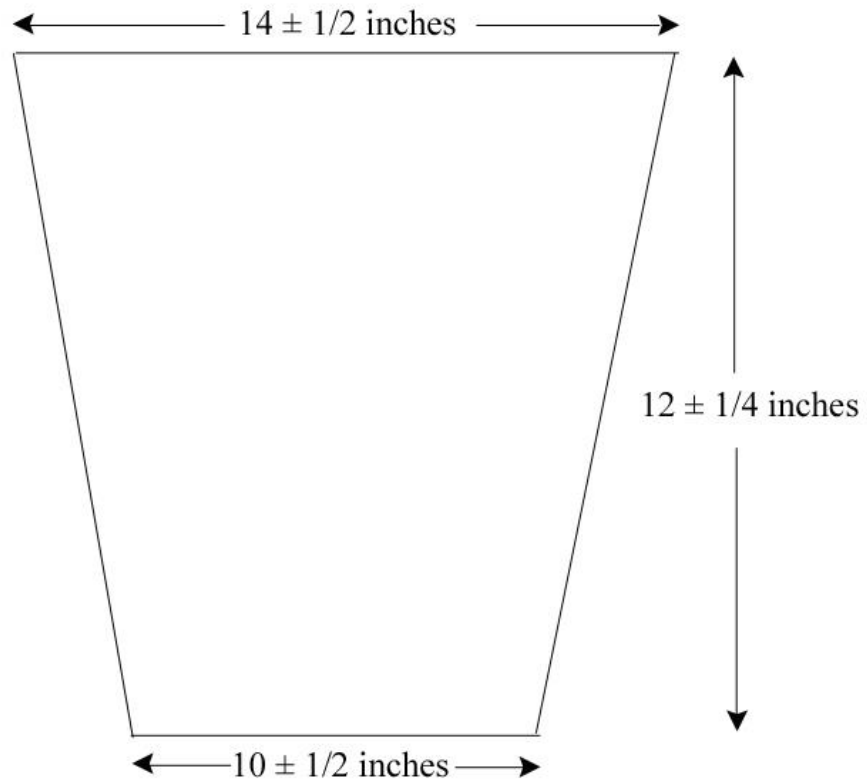


FIGURE 7. Test Specimen, % Bite Protection Test

CUSTODIAN:

Army – GL

PREPARING ACTIVITY:

DLA – CT