

INCH-POUND
GL-PD-15-05E
1 August 2019
SUPERSEDING
GL-PD-15-05D
11 February 2019

PURCHASE DESCRIPTION

TROUSERS, IMPROVED HOT WEATHER 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 covers the requirements for improved hot weather combat uniform trousers to be worn by Army personnel in hot weather environments.

1.2 Classification. The trousers for the Improved Hot Weather Combat Uniform (IHWCU) is treated for insect repellency and will be available in the following types, class and sizes.

1.2.1 Types.

Type I. Unisex
Type II. Female

1.2.2 Classes.

Class 1 Deleted
Class 2 Operational Camouflage Pattern (OCP)

Comments, suggestions, or questions on this document should be addressed to: Department of the Army, Combat Capabilities Development Command Soldier Center, 10 General Greene Avenue, Natick MA 01760- 5019. ATTN: FCDD-SCP-WC.

AMSC N/A

FSC 8415

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1.2.3 Sizes. The trousers unisex sizes will be as follows:

SCHEDULE OF SIZES TYPE I UNISEX					
X-Small (XS)	Small (S)	Medium (M)	Large (L)	X-Large (XL)	XX-Large (2XL)
X-Short (XS)	X-Short	X-Short	X-Short	X-Short	X-Short
Short (S)	Short	Short	Short	Short	Short
Regular (R)	Regular	Regular	Regular	Regular	Regular
Long (L)	Long	Long	Long	Long	Long
X-Long (XL)	X-Long	X-Long	X-Long	X-Long	X-Long
XX-Long (XXL)	XX-Long	XX-Long	XX-Long	XX-Long	XX-Long

FEMALE SCHEDULE OF SIZES TYPE II			
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 and 4 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 and 4 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.

COMMERCIAL ITEM DESCRIPTIONS

A-A-50198	Thread, Gimp, Cotton, Buttonhole
A-A-50199	Thread, Polyester Core, Cotton or Polyester Covered
A-A-55126	Fastener Tapes, Hook and Loop, Synthetic
A-A-59994	Button, Sewing, Hole and Button Staple (plastic)

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-5038	Tape, Textile and Webbing, Textile, Reinforcing Nylon
MIL-W-5664	Webbing, Textile, Elastic
MIL-DTL-32075	Label: For Clothing, Equipage, and Tentage (General Use)
MIL-DTL-32439	Cloth, Duck, Textured Nylon
MIL-DTL-44411	Insect Repellent, Permethrin

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

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

DRAWINGS

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND SOLDIER CENTER

2-1-2592 Operational Camouflage Pattern (OCP)

(Copies of drawings are available from the U.S. Army Combat Capabilities Development Command Soldier Center, ATTN: FCDD-SCP-WC, 10 General Greene Avenue, Natick, MA 01760-5019.)

OTHER GOVERNMENT DOCUMENTS AND PUBLICATIONS

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Product Performance Test Guidelines

OPPTS 810.370 Insect Repellents For Human Skin and Outdoor Premises

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

(Copies of these documents are available online at <http://www.epa.gov/pesticides>.)

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 Evaluation Procedure 1 - Gray Scale for Color Change
- AATCC Evaluation Procedure 2 - Gray Scale for Staining
- AATCC Evaluation Procedure 8 - Chromatic Transference Scale, 9-Step
- AATCC Evaluation Procedure 9 - Visual Assessment of Color Difference in Textiles
- AATCC Test Method 8 - Colorfastness to Crocking: AATCC Crockmeter Method
- AATCC Test Method 15 - Colorfastness to Perspiration
- AATCC Test Method 16.3 - Colorfastness to Light: Xenon
- AATCC Test Method 20A - Fiber Analysis: Quantitative
- AATCC Test Method 61 - Colorfastness to Laundering: Accelerated
- AATCC Test Method 81 - pH of the Water-Extract from Wet Processed Textiles
- AATCC Test Method 135 - Dimensional Changes of Fabrics After Home Laundering

(Copies of these documents are available online at <https://www.aatcc.org>.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

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

(Copies of this document are available online at <https://asq.org>.)

ASTM INTERNATIONAL

- ASTM D737 - Standard Test Method for Air Permeability of Textile Fabrics
- ASTM D1424 - Standard Test Method for Tearing Strength of Fabrics by Falling - Pendulum (Elmendorf Type) Apparatus
- ASTM D3775 - Standard Test Method for Warp (End) and Filling (Pick) Fabric Count of Woven Fabric
- ASTM D3776/D3776M - Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
- ASTM D3990 - Standard Terminology Relating to Fabric Defects
- ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
- ASTM D6193 - Standard Practice for Stitches and Seams

(Copies of these documents are available online at <https://www.astm.org>.)

OTHER PUBLICATIONS

SDL ATLAS

Part Number 402985 – Slub/Knot Replica Set

(Replica set is available for purchase from SDL Atlas Customer Service, 1-803-329-2110.)

INFORMA HEALTHCARE

Repeat Insult Patch Test - Modified Draize Procedure –
Principles and Methods of Toxicology, A Wallace Hayes (editor).

(Copies are available online at <https://www.crcpress.com>.)

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 Inspections.

3.1.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.1.2 Conformance inspection. When specified (see 6.2), a sample shall be subjected to conformance inspection in accordance with 4.3.

3.2 Recycled, recovered, environmentally preferable or biobased materials. Recycled, recovered, environmentally preferable or biobased 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 Design. The Type I trousers design shall have the following characteristics; a covered fly with a four (4) button/ buttonhole closure, or three (3) button/buttonhole closure, depending on size (see Table VIII), seven (7) belt loops, two (2) side hanging pockets, two (2) front side pleated, one (1) inverted box pleat centered on cargo pockets with two (2) button/ two (2) buttonhole closure flaps, and two (2) lower leg side pockets with one (1) button/ one (1) buttonhole closure flaps, two (2) back single welt hip pockets with two (2) button closure flaps (see Figure 5). The side cargo pockets shall have two (2) sewn-in eyelets hidden by the bellows at each side. The trousers shall have a double needle seat patch and a pleated knee reinforcement incorporated into the pant leg at the knee and one (1) pleat at each thigh. The trousers have a one (1) piece single gusset (see 3.8.8), and two (2) front side hanging pockets. The bottom of the trousers leg hems shall have drawstrings (see 3.8.7.3). The Type II Trousers shall have the same design features as Type I, four (4), three (3) or two (2) buttons at the waistband/fly, and shall have additional hook and loop adjustment tabs on the waist.

3.4 Materials.

3.4.1 Basic material. The basic material for the trousers shall meet the requirements of Table I when tested as specified in 4.5. The color of the cloth shall be OCP for Class 2.

TABLE I. Physical requirements, basic material.

Characteristic	Requirements
Fiber identification quantitative, percent	57 T420 High Tenacity Nylon 43 Cotton
Weave	Ripstop
Weight, oz./square yard	5.0 - 6.0
Construction,(yarns per inch), (min.)	
Warp	75
Filling	45
Breaking strength, lbs. (min.)	
Warp	175
Filling	100
Tearing strength, (pounds) (min.)	
Warp	18
Filling	14
Dimensional stability, percent (max):	
Warp direction	3
Filling direction	3
Air Permeability (min.)	60 CFM
Toxicity	See 3.14

3.4.1.1 Operational Camouflage Pattern (OCP), Class 2. The cloth(s) shall be dyed to a ground shade matching Dark Cream 559 and then shall be overprinted with the camouflage pattern matching Drawing 2-1-2592. When the ground shade is dyed to match Dark Cream 559, the remaining six (6) colors shall be printed as appropriate, for the Tan 525, Light Sage 560, Olive 527, Dark Green 528, Brown 529 and Bark Brown 561 areas of the pattern. When the ground shade is not dyed Dark Cream 559 all seven (7) colors of the camouflage pattern shall be printed to match all seven (7) colors of the pattern.

3.4.1.2 Pattern execution The pattern on the printed finished cloth(s) shall reproduce the standard sample in respect to design, colors and registration of the respective areas. The pattern repeat of shall be 25.255 (+1.25, -2.50) inches in the warp direction. The various areas of the pattern shall be properly registered in relation to each other and shall present definite sharp demarcations with a minimum of feathering or spew. Each pattern area shall show solid coverage; skitteriness exceeding that shown on the standard sample in any of the printed areas will not be acceptable. When the standard sample is not referenced for pattern execution, a pattern drawing shall be provided.

3.4.1.2.1 Pattern width (filling direction). The maximum camouflage printed area shall be 68-inches in the filling direction.

3.4.1.3 Labile sulfur. Dyes and compounds containing elementary sulfur capable of oxidation to sulfuric acid shall not be used.

3.4.1.4 Visual shade matching (all Classes). The color and appearance of the cloth(s) shall match the standard sample (see 6.4) when tested as specified in 4.5.

3.4.1.5 Color. The cloth for the trousers shall meet the colorfastness requirements of Table II when tested as specified in 4.5.

TABLE II. Colorfastness requirements.

Colors Evaluation	Laundering (3 cycles) Color Change and Staining (min.)	Light (40 AFU or 170kJ/ (m ² nm) @ 420 nm) (min.) 1/	Perspiration (acid & alkaline) Color Change and Staining (min.)	Crocking (Dry and Wet) (min.)
Dk. Green 528, Brown 529, Bark Brown 561	3-4	3-4	3-4	3.5
Tan 525, Olive 527, Dark Cream 559, Light Sage 560	3-4	3	3-4	3.5

1/ AATCC Fading Units (AFU)

3.4.1.6 Spectral reflectance.

3.4.1.6.1 Operational Camouflage Pattern (OCP), Class 2. The reflectance values for the Class 2 cloth shall conform to the requirements listed in Table III, when tested as specified in 4.5.

TABLE III. Spectral reflectance requirements, Class 2.

Reflectance values (percent): Operational Camouflage Pattern (OCP)						
Wavelength, Nanometers (nm)	Dark Cream 559 & Tan 525		Olive 527, Brown 529 & Light Sage 560		Dark Green 528 & Bark Brown 561	
	Min.	Max.	Min.	Max.	Min.	Max.
600	22	44	12	30	3	11
620	24	45	12	30	3	12
640	24	45	12	32	4	13
660	25	45	12	32	4	14
680	28	45	14	34	4	17

TABLE III. Spectral reflectance requirements, Class 2. - Continued

Reflectance values (percent): Operational Camouflage Pattern (OCP)						
Wavelength, Nanometers (nm)	Dark Cream 559 & Tan 525		Olive 527, Brown 529 & Light Sage 560		Dark Green 528 & Bark Brown 561	
	Min.	Max.	Min.	Max.	Min.	Max.
700	28	48	14	36	6	23
720	30	52	16	39	6	23
740	32	55	18	41	10	25
760	36	56	20	43	14	30
780	38	57	22	45	18	35
800	40	57	22	45	21	40
820	44	58	24	46	24	42
840	46	59	26	47	26	43
860	48	60	28	48	28	45

3.4.2 Cloth, side and hip hanging pockets, and waistband lining. The cloth for waistband lining, side and hip hanging pockets, shall be basic printed material (3.4.1) 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.

3.4.2.1 Waistband lining reinforcement. The waistband lining shall be reinforced with a medium weight sewn or fusible interlining.

3.4.3 Reinforcement and patch cloth. The cloth for the seat patch and knee reinforcement outer layer shall conform to MIL-DTL-32439 Type IV, Class 1, Style H (OCP).

3.4.4 Knit fabric. The knit fabric for the inner knee lining shall meet the requirements of Table IV when tested as specified in 4.5. The color of the cloth for Class 2 shall match Tan 499.

TABLE IV. Physical requirements, knit fabric.

Characteristic	Requirements
Fiber identification quantitative, percent	65 Tencel ® Lyocell/ 35 Cocona® Polyester
Knit Construction	Jersey
Weight, oz./square yard	4.80 – 5.30
Toxicity	See 3.14

3.5 Insect bite protection (All types and classes). The finished garments with insect repellent treatment shall provide the minimum mosquito bite protection specified in 3.5.1 and the treatment shall be strictly limited to the levels specified in 3.5.2

3.5.1 Percent (%) bite protection. Finished insect repellent treated garments (base fabric only) shall provide the minimum bite protection specified below when assessed by the biting protection testing specified in 4.6.2. Government approval shall be required initially, and any time there is a change in the insect repellent treatment formulation or processing conditions.

<u>Condition</u>	<u>% Mosquito Bite Protection</u>
Initial	≥ 85%
After 20 launderings	≥80%
After 50 launderings	≥70%

3.5.1.1 Insect repellent garment treatment of camouflage patterns. The mixing of camouflage patterns in the same insect repellent treatment garment application is not allowed. Patterns shall be treated separately.

3.5.1.2 Insect repellent garment application, finished measurements. Manufacturers shall comply with the finished measurement requirements in 3.13.1 and compensate for actual fabric shrinkage or growth after the application of garment treatment.

3.5.2 Insect repellent treatment. Insect repellent treatment process and garments will comply with Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) as amended (see 2.2.2). Insect repellent concentration in the trousers shall comply with EPA Toxicological Category IV. The trousers shall have an EPA registered (See 6.5) insect protection treatment. The garments shall be labeled in accordance with 3.9.3 and 3.9.4. The insect repellent finish shall be uniformly applied across the fabric or garments at an initial target level as specified in the EPA registered label and **strictly** controlled to fall within the minimum and maximum levels specified in Table V. The treatment level shall provide the percent (%) bite protection specified in 3.5.1. The insect repellent treatment shall be durable to repeated laundering to provide the minimum insect repellent level after 20 launderings specified in Table V. The insect repellent level will be measured as specified in paragraph 4.6.1. The finished insect repellent treatment shall not degrade any performance characteristics or present any latent defects to the cloth or garment.

TABLE V. Insect repellent treatment level requirements.

Repellent active ingredient (AI)	Condition	AI target level (w/w%)	AI concentration (mg/cm2)	
			Minimum	Maximum
Permethrin	Initial	0.52%	0.079	0.116
	After 20 x	--	0.025	0.116
Other AI	Initial	See 6.2	See 6.2	See 6.2
	After 20 x	--	See 6.2	--

Note: Knit fabrics are not to exceed the maximum dose rates above.

3.6 pH. 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 4.5 and 4.6.

3.7 Component materials and shade. The component materials for the trousers shall be made in accordance to paragraphs 3.4.1 - 3.4.5 and 3.8.8.3 and the color shall match Tan 499 for OCP uniforms unless otherwise noted.

3.7.1 Thread. The thread for all seaming and stitching shall conform to Table VI. All thread shall be non-staining and the requirements in each Commercial Item Description (CID) shall apply.

TABLE VI. Thread requirements.

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

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

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

3.7.3 Buttons. Buttons shall be dull finish, four (4) holes, 30 ligne conforming to A-A-59994, Type I, Class 1, Style 26. When attached to the trousers, the button and thread shall withstand a pull/break of 40 pounds (minimum) when tested as specified in 4.6.1. The button count, including the waistband, shall be as specified in Table VII for Type I and Table II-A for Type II.

TABLE VII. Button count (including waistband), Type I.

Length	Sizes Type I - UNISEX					
	X-Small (XS)	Small (S)	Medium (M)	Large (L)	X-Large (XL)	2X-Large (2XL)
X Short (XS)	3	3	3	3	3	3
Short (S)	3	3	3	3	3	4
Regular (R)	3	3	3	3	4	4
Long (L)	3	3	3	4	4	4
X Long (XL)	3	3	4	4	4	4
XX Long (XXL)	3	4	4	4	4	4

TABLE VII-A. Button count (including waistband), Type II.

Sizes Type II - FEMALE				
Length	25	28	31	35
X-Short (XS)	2	2	3	--
Short (S)	2	2	3	3
Regular (R)	3	3	3	3
Long (L)	--	3	3	3
X-Long (XL)	--	--	3	4

3.8 Construction. The construction shall be made in accordance to paragraphs 3.8.1 - 3.13.11 unless otherwise noted. All garment 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.

3.8.1 Waistband (all types). The waistband shall have clean finished ends, measuring 1-1/2 (+3/8, -1/8) inches wide (finished) for Type I and for Type II it should be 1-5/8 when measured from inside of band from top edge to the bottom folded edge. The waistband shall be single needle stitched at top and bottom for Type I and Type II shall be single needle stitched at top and double needle stitched at bottom. The waistband buttonhole shall be centered on the waistband 5/8 ($\pm$ 1/16) inch from inside cut of the buttonhole. The four (4), three (3), or two (2), buttons, of the waistband and fly (see Table VII), shall be aligned with the keyhole of the buttonholes when fly is closed.

3.8.1.1 Waistband (Type II only) The webbing end of each tab shall have a 1-inch by 2-inch piece of hook tape on front belt loops and shall be threaded to the outside of the waistband through a buttonhole, following markings on the pattern. A 1-inch by 4-inch piece of loop tape shall be centered on the top of the waistband at the side seams. Waistband shall have two (2) 1-1/8 inch vertical straight cut buttonholes with reinforcement piece following markings on pattern.

3.8.1.2 Waist adjustment tabs (Type II only). The waist adjustment tabs shall consist of elastic (see 3.8.1.3) and webbing (see 3.8.1.4) which is attached at the center back waist inside of the waistband and becomes exposed at the side waist, through a buttonhole, underneath the belt loop. The waistband has loop tape and the adjustment tabs has hook tape.

3.8.1.3 Elastic (Type II only). The elastic for the waistband adjustment tabs shall be 1-inch wide in cut lengths by size below, conforming to MIL-W-5664, Type I or Type II is acceptable.

Size	Cut elastic (inches) ($\pm$ 1/8-inch)
25	7
28	8.5
31	10
35	12

3.8.1.4 Waist tab webbing (Type II only). The webbing for the waist adjustment tabs shall be 1-inch wide and 6-inches long, conforming to Type III of MIL-PRF-5038. The tape ends shall be heat cut to prevent raveling.

3.8.1.5 Fastener tape, hook and loop (Type II only). The hook and loop fastener tape shall conform to Type II, Class 1 or Class 4, of A-A-55126. The widths shall be as specified according to application. The fastener tape, hook and loop, shall be consistent in manufacturer within a garment.

3.8.2 Belt loops (all types). The seven (7) trousers belt loops shall measure 1 (+1/16, -1/8) inch in width and finish 2-5/8 ($\pm$ 1/8) inches between bar-tacks in the length. The belt loop seam allowance/ exposed raw edge shall be no more than 1/4-inch.

3.8.2.1 Belt loops, (Type I only). The belt loop placement for Type I 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.

3.8.2.2 Belt loops, (Type II only). The belt loop placement for Type II shall be as follows: one (1) loop centered at end of each hanging pocket, one (1) on back seam, and one (1) on each front centered between end of hanging pocket and waistband end, and one (1) on each back side centered between end of hanging pocket and back seam. The back side belt loops shall cover/hide the buttonholes for the waist adjustment tabs.

3.8.3 Front fly. The fly shall be a covered fly with a three (3) button/ buttonhole closure, two (2) button/buttonhole closure or a one (1) button/ buttonhole, depending on the type and size (see Tables VII and VII-A). 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.

3.8.4 Seat patch. The trousers shall have a double-needle seat patch (see pattern for placement).

3.8.5 Knee reinforcement. The trousers shall have a knee reinforcement on the outside of each leg which incorporates four (4) pleats and is stitched into the pant leg on all four (4) sides (see pattern for placement).

3.8.6 Pockets and flaps.

3.8.6.1 Front side pockets. The trousers 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.

3.8.6.2 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. Each hip pocket shall have a drainhole/eyelet as marked on the patterns. 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 figures 4 and 5).

3.8.6.3 Cargo pockets and flaps. The trousers shall have two (2) side pleated bellows and one (1) inverted box pleat in the center of the cargo pockets with flaps (see pattern for placement). The cargo pockets shall have a sewn-in eyelet hidden under each pleat and at the bottom side edge of bellow as indicated on the pattern (see 3.11). 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 side pleated bellows and the inverted box pleat shall be edge stitched to secure pleat stability. The cargo pockets and flaps shall close with a two (2) button, two (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 5).

3.8.6.4 Lower leg pockets and flaps. The trousers shall have two (2) lower leg pockets with flaps (see pattern for placement). The pockets shall have a sewn-in eyelet at the center of bellow, as indicated on the pattern (see 3.11). The top of the finished pocket flaps shall finish 3/4-inch from the folded edge of pocket top (see pattern for placement). The lower leg pockets and flaps shall close with a one (1) button, one (1) 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. One (1) button shall be added to the underside of the left lower leg pocket flap so as to not interfere with the buttoning of the pocket as an extra replacement button for all button locations (see Figure 5).

3.8.7 Leg and bottom hem. The finished hem shall measure 7/8 ($\pm 1/8$) inch wide.

3.8.7.1 Bottom hem. The trousers leg bottoms shall be hemmed and shall have a drawstring (see 3.8.7.3) inserted through two (2) sewn-in eyelets or two (2) 1/2-inch horizontal straight cut buttonholes as indicated on the patterns with a self-reinforcement piece.

3.8.7.2 DELETED

3.8.7.3 Hem tape (drawstrings). The tape for the leg bottom hem shall conform to MIL-DTL-5038, Type III, 3/8-inch wide. The drawstring tape for the leg bottom hem shall be cut 28 (± 1) inches in length for all sizes. The drawstring tape shall overlap (cross) between holes when threaded through the hem casing. The tape ends shall be heat cut to prevent raveling.

3.8.8 Gussets. The trousers shall have a one (1) piece single gusset toward the front of the trouser with the same cloth as the basic material.

3.8.9 Buttonholes. The buttonholes for the fly and hip pockets shall be eyelet-end tapered bar type worked over gimp 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 buttonholes for the cargo and lower leg pockets shall be bar type without gimp. All buttonholes shall be reinforced with sewn, fused or self-fabric interfacing to stabilize the buttonholes. 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.

3.8.10 Lining, knee. The trousers shall have a knit inner lining at the knees (see 3.4.5) (see pattern for placement).

3.9 Labels. All garments shall have a size label and a combination identification/care label sewn into the trousers. All trousers shall have an additional insect protection/identification/care label sewn into the trousers 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.

3.9.1 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 between the back belt loops on the left side. The stitching shall not cover the printing. The color of the size labels shall be white. The size label shall include the information in Table VIII for Type I and Table VIII–A for Type II for the applicable size:

TABLE VIII. Size label - Type I (Unisex).

X-Small – X-Short Inseam: 23-1/2 to 26-1/2 in. Waist: 23 to 27 in. NSN No. NATO Size: 6067/5869	X-Small – Short Inseam: 26-1/2 to 29-1/2 in. Waist: 23 to 27 in. NSN No. NATO Size: 6775/5869	X-Small – Regular Inseam: 29-1/2 to 32-1/2 in. Waist: 23 to 27 in. NSN No. NATO Size: 7583/5869
X-Small – Long Inseam: 32-1/2 to 35-1/2 in. Waist: 23 to 27 in. NSN No. NATO Size: 8390/5869	X-Small – X-Long Inseam: 35-1/2 to 38-1/2 in. Waist: 23 to 27 in. NSN No. NATO Size: 9098/5869	X-Small – XX-Long Inseam: Over 38-1/2 in. Waist: 23 to 27 in. NSN No. NATO Size: 9805/5869
Small – X-Short Inseam: 23-1/2 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: 23-1/2 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

TABLE VIII. Size label - Type I (Unisex). - Continued

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: 38-1/2 to 41-1/2 in. Waist: 31 to 35 in. NSN No. NATO Size: 9805/7989
Large - X-Short Inseam: 23-1/2 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: 38-1/2 to 41-1/2 in. Waist: 35 to 39 in. NSN No. NATO Size: 9805/8999
X-Large - X-Short Inseam: 23-1/2 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: 38-1/2 to 41-1/2 in. Waist: 39 to 43 in. NSN No. NATO Size: 9805/9909
XX-Large - X-Short Inseam: 23-1/2 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: 38-1/2 to 41-1/2 in. Waist: 43 to 47 in. NSN No. NATO Size: 9805/0919

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TABLE VIII-A. Size label - Type II (Female).

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
-----	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

3.9.2 Identification and care label. The combination identification/care label shall conform to Type VI, Class 15 of MIL-DTL-32075 and shall be placed on the left back hip pocket as worn, so that on the finished trousers the label shall be on the pocket bag facing the garment and away from the wearer. The label shall be stitched on all four (4) sides. The stitching shall not cover the printing. The color of the combination identification and care label shall be white. The label shall include the information in Figure 1.

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Trousers, Improved Hot Weather Combat Uniform – Unisex or Trousers, Improved Hot Weather Combat Uniform – Female Contract Number: Fiber Content: Basic Material: 57% Nylon/ 43% Cotton Reinforcement Material: 100% Nylon Knit Material: 65% Tencel ® Lyocell/ 35% Cocona® Polyester Contractor Name: Lot Number <u>1</u>/
<u>USE AND CARE</u> <u>PRIOR TO LAUNDERING:</u> Empty pockets. Pre-treat stains with commercially available pre-treatments. <u>HOME LAUNDERING:</u> Use cold water detergent. Wash in cold water using permanent press cycle. Rinse in cold water. Tumble dry low. <u>WASHING BY HAND:</u> 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. <u>NOTE:</u> Wash garment separate from other garments. In military field operations, garment may be washed with other garments. <u>CAUTION:</u> 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.

FIGURE 1. Combination identification, use and care label.

3.9.3 Insect repellent protection label. The insect repellent protection label shall conform to Type VI, Class 15 of MIL-DTL-32075. The label placement shall be as specified in 3.9.3.1. The label shall include both permanent insect protection and brand labeling information; and shall comply with the approved EPA registration (see 6.4). The color for the insect repellent protection label shall be white. The label shall be the approved EPA label (see example in Figure 2).

3.9.3.1 Label placement. The label shall be placed on the right back hip pocket as worn, so that on the finished trousers the label shall be on the pocket bag facing the garment and away from the wearer. The label shall be stitched on all four (4) sides. The stitching shall not cover the printing.

Insect Repellent Brand Name: INSECT REPELLENT APPAREL Refer to hangtag for more information Trousers, Improved Hot Weather Combat Uniform – Unisex or Trousers, Improved Hot Weather Combat Uniform – Female Contractor Name: EPA REG. NO.: EPA EST. NO.:								
- 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 - Dispose of garment in trash in accordance with Army regulations Repels mosquitoes Repellency remains effective for 50 washings <table> <tr> <td>ACTIVE INGREDIENT</td> <td>%W/W</td> </tr> <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> </table> It is a violation of Federal Law to use this product in a manner inconsistent with its labeling DO NOT REMOVE THIS LABEL	ACTIVE INGREDIENT	%W/W	Permethrin.....	0.52%	OTHER INGREDIENTS: (Garment).....	99.48%	TOTAL.....	100.00%
ACTIVE INGREDIENT	%W/W							
Permethrin.....	0.52%							
OTHER INGREDIENTS: (Garment).....	99.48%							
TOTAL.....	100.00%							

FIGURE 2. Insect repellent label (example).

3.9.4 Hangtag, Mosquito bite protection. Each trousers 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 mosquito bite protection information in accordance with and as required by EPA registration and labeling. The hang tag shall be the approved EPA hang tag (see example in Figure 3).

Insect Repellent Brand Name: INSECT REPELLENT APPAREL Contractor Address: EPA REG. NO.: EPA EST. NO.:									
- 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 - 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. Repels mosquitoes Repellency remains effective for 50 washings <table> <tr> <td>ACTIVE INGREDIENT</td> <td>%W/W</td> </tr> <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> </table> It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Retain hangtag for future reference on proper handling of this garment. THIS TAG NOT TO BE REMOVED EXCEPT BY CUSTOMER		ACTIVE INGREDIENT	%W/W	Permethrin.....	0.52%	OTHER INGREDIENTS: (Garment).....	99.48%	TOTAL.....	100.00%
ACTIVE INGREDIENT	%W/W								
Permethrin.....	0.52%								
OTHER INGREDIENTS: (Garment).....	99.48%								
TOTAL.....	100.00%								

FIGURE 3. Insect repellent hang tag (example).

3.9.5 Barcode hang tag. Each trousers 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 trousers when it is folded and/or packaged as specified and so it causes no damage to the trousers. The bar coding element shall be a 13 digit National Stock Number (NSN) or Management Control Number (MCN). There shall be a 12 digit Universal Product Code (UPC) number assigned for all MCNs 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.

3.10 Figures. Figures 4A through 6B in this document are furnished for informational purposes only. To the extent of any inconsistencies between the written document and the figures, the written document shall govern.

3.11 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, 1/4-inch allowance for cargo pocket flaps, and 3/8-inch allowance for the joining of crotch pieces and all other seams, except where otherwise specified. 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. The pattern lists in Table IX and IX-A are provided to insure that the pattern sets are complete (see 6.2).

TABLE IX. List of pattern parts - Type I (Unisex).

Material	Nomenclature	Pattern Abbreviation	Cut Number
Basic Material (see 3.4.1)	Back Lower	PD15_05C-BACK-LOWER	2
	Back Upper	PD15_05C-BACK-UPPER	2
	Front Lower	PD15_05C-FRONT-LOWER	2
	Front	PD15_05C-FRONT	2
	Side Hanging Pocket	PD15_05C-FR-POCKET	2
	Side Hanging Pocket Facing	PD15_05C-FR-PKT-FAC	2
	Cargo Pocket	PD15_05C-CARGO-PKT	2
	Cargo Pocket Facing	PD15_05C-CRG-PKT-FAC	2
	Cargo Pocket Flap	PD15_05C-CRG-PKT-FLP	2
	Lower Leg Pocket	PD15_05C-LOW-LEG-PKT	2
	Lower Leg Pocket Flap	PD15_05C-LOW-LEG-FLP	2
	Hip Pocket	PD15_05C-HIP-POCKET	2
	Hip Pocket Flaps	PD15_05C-HIP-PKT-FLP	2
	Hip Pocket Bearer	PD15_05C-HIP-PCKT-BR	2
	Hip Pocket Facing	PD15_05C-HIP-PK-FCNG	2
	Gusset	PD15_05C-GUSSET	2
	Waistband	PD15_05C-WAISTBAND	2
	Fly Left Bottom	PD15_05C-FLY-LFT-BTM	1
	Fly Left Top	PD15_05C-FLY-LFT-TOP	1
	Fly Right	PD15_05C-FLY-RIGHT	1
	Front Pocket Bearer	PD15_05C-FRT-PKT-BER	2
Interfacing (see 3.4.2.1)	Waistband Interfacing	PD15_05C-WSTBND-INTR	1
	Fly Interfacing	PD15_05C-FLY-LT-INTR	1
Reinforcement Material (see 3.4.3)	Knee Patch Outer	PD15_05C-KNE-PTCH-OT	2
	Knee Patch Side	PD15_05C-KNE-PTCH-SD	4
	Seat Patch	PD15_05C-SEAT-PATCH	2
Knit (see 3.4.5)	Knee Patch Inner	PD15_05C-KNE-PTCH-IN	2

TABLE IX-A. List of pattern parts - Type II (Female).

Material	Nomenclature	Pattern Abbreviation	Cut Number
Basic Material (see 3.4.1)	Back Lower	PD15_05F-BACK-LOWER	2
	Back Upper	PD15_05F-BACK-UPPER	2
	Front Lower	PD15_05F-FRONT-LOWER	2
	Front	PD15_05F-FRONT	2
	Side Hanging Pocket	PD15_05F-FR-POCKET	2
	Side Hanging Pocket Facing	PD15_05F-FR-PKT-FAC	2
	Cargo Pocket	PD15_05F-CARGO-PKT	2
	Cargo Pocket Facing	PD15_05F-CRG-PKT-FAC	2
	Cargo Pocket Flap	PD15_05F-CRG-PKT-FLP	2
	Lower Leg Pocket	PD15_05F-LOW-LEG-PKT	2
	Lower Leg Pocket Flap	PD15_05F-LOW-LEG-FLP	2
	Hip Pocket	PD15_05F-HIP-POCKET	2
	Hip Pocket Flaps	PD15_05F-HIP-PKT-FLP	2
	Hip Pocket Bearer	PD15_05F-HIP-PCKT-BR	2
	Hip Pocket Facing	PD15_05F-HIP-PK-FCNG	2
	Gusset	PD15_05F-GUSSET	2
	Waistband	PD15_05F-WAISTBAND	2
	Fly Left Bottom	PD15_05F-FLY-LFT-BTM	1
	Fly Left Top	PD15_05F-FLY-LFT-TOP	1
	Fly Right	PD15_05F-FLY-RIGHT	1
	Front Pocket Bearer	PD15_05F-FRT-PKT-BER	2
Interfacing (see 3.4.2.1)	Waistband Interfacing	PD15_05F-WSTBND-INTR	1
	Fly left top Interfacing	PD15_05F-FLY-LT-INTR	1
Reinforcement Material (see 3.4.3)	Knee Patch Outer	PD15_05F-KNE-PTCH-OT	2
	Knee Patch Side	PD15_05F-KNE-PTCH-SD	4
	Seat Patch	PD15_05F-SEAT-PATCH	2
Knit (see 3.4.5)	Knee Patch Inner	PD15_05F-KNE-PTCH-IN	2

3.12 Configuration. Each pair of trousers shall conform to design, appearance (see Figures 4A through 6B), the finished measurements in Table XII and Table XII-A and the construction methods specified in 3.12.1 through 3.13.1.1 and Tables VIII, VIII-A, IX, IX-A, X, and XI in order to maintain configuration compliance.

3.12.1 Seams and stitching. All seams shall be consistent and exhibit a uniform appearance and conform to the ASTM D6193 seam and stitch types listed in Table X. 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 (4) overlapping stitches with the purling on the outside. All stitches per inch and gauges shall be met prior to any applicable garment treatments.

3.12.1.1 Repair of stitch.

3.12.1.2 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.

3.12.1.3 Repairs of type 401 stitching only. All repairs shall be in accordance with 3.12.1.1, and 3.12.1.2, 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.

3.12.2 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.

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TABLE X. Seam and stitching types.

Seam placement	Seam type	Gauge	Stitch type
Side seams, back seam, and inseam	LS _c -2 Or SSa ₂ -2 and LS _q -3	3/16 to 1/4-inch gauge (double lap seam)	301 or 401
Front gusset seam	LS _q -3	Join front crotch with single needle, then double needle topstitch	301
Inseam	SSa-2 LS _q -3	Over-edge 3/16 to 9/32-inch gauge, then turn and topstitch 3/16 to 1/4-inch gauge	516 301 or 401
Gusset	SSa-2 LS _q -3	Over-edge 3/16 to 9/32-inch gauge, then turn and topstitch 3/16 to 1/4-inch gauge	516 301 or 401
Top stitching of side pockets	OS _f -1	3/16 to 1/4-inch from edge	301
Attachment of pockets (Cargo and lower leg)	LS _d -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
Setting of lower leg and cargo pocket flaps Top stitch OR Top stitch	LS _{ba} -2 LS _{b1} -2	Two (2) rows 3/16 to 1/4-inch apart 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	301 301
Top stitching of cargo pocket flaps and lower leg flaps	OS _f -1	3/16 to 1/4-inch from folded edge	301
Cargo bellows, pleats edge stitch all	OS _f -1	1/16 to 1/8-inch from edge	301
Attachment of knee reinforcements and knee lining	LS _d -2	Two (2) rows 3/16 to 1/4-inch apart	301

TABLE X. Seam and stitching types. - Continued

Seam placement	Seam type	Gauge	Stitch type
Hook and Loop (Type II only)	LSbj-1	1-1/8 to 3/16-inch from the inch from the bound selvage	301
Waist adjustment tabs (Type II only)	LSbj	Box stitch 3/4-inch by 3/4-inch to attach webbing to elastic. Box stitch 1-3/4 inches by 3/4-inch to attach hook to webbing.	301
Bottom hem	Efb-1	3/4 to 1-inch wide hem	301
Belt loops	Efh-1	1/4-inch gauge between needle	402 or 406
Waistband	SSa-1	1-1/2-inch (single needle topstitch)	301 or 401
Waistband attachment	EFd-1 LSd-2	3/16 to 1/4-inch gauge then Two (2) needle topstitch, 3/16 to 1/4-inch apart	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
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 ($\pm$ 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	EFd-1	3/16 to 1/4-inch gauge	502, 503 or 504
Labels	LSbj-1	1/8 to 3/16-inch from edge	301

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

TABLE XI. Bar-tack placement.

Bar-tack placement	Size of tack (inches)	Stitches per tack <u>1/</u>	# of Bar-tacks per garment	Horizontal	Vertical
Belt loops (set 1/8-inch from top and bottom edge)					
a. Top	7/8 or 1	55	7	X	----
b. Bottom	7/8 or 1	55	7	X	----
Fly (see Figure 6)					
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 three (3), two (2), or one (1) buttonholes (not visible from front of fly)	5/8	36	3, 2 or 1	X	----
Lower leg pockets					
a. Top, (left and right side)	5/8	36	4	----	X
b. Bottom	5/8	36	2	----	X
Cargo pockets					
a. Top, (left and right side)	5/8	36	4	----	X
b. Top, Centered on facing, thru all layers	5/8	36	4	----	X
c. Bottom, (front side)	5/8	36	4	X	----
Cargo pocket pleats					
a. Top (on facing stitching)	5/8	36	2	X	----
b. Bottom	5/8	36	6	X	----
Cargo pocket flaps					
Top, (left and right side)	5/8	36	4	X	----
Lower leg pocket flaps					
Top, (left and right side)	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	----

TABLE XI. Bar-tack placement. - Continued

Bar-tack placement	Size of tack (inches)	Stitches per tack <u>1/</u>	# of Bar-tacks per garment	Horizontal	Vertical
Gusset (see Figure 6)					
a. Superimposed on outside points (through all layers). Positioned approximately 1/2-inch on each end of gusset.	5/8	36	2	----	X
b. Superimposed on outside points (through all layers). Positioned approximately 1/2-inch on each end of gusset at center crotch seam.	5/8	36	2	X	----
Leg hem					
a. Center back leg hem (through all layers including drawstring)	5/8	36	2	—	X

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

2/ Bar-tack can be angled

3.13 Measurements. All measurements referenced in this document, except for end item measurements specified in 3.13.1 shall be made prior to garment treatment if applicable.

3.13.1 Finished measurements. The trousers shall conform to the finished measurements specified in Table XII for Type I (Unisex) and Table XII-A for Type II (Female).

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TABLE XII. Finished measurements (inches) Type I (Unisex).

Size	X-Small	Small	Medium	Large	X-Large	XX-Large	Tol.
Half Waist, <u>1/</u>	13-3/4	15-3/4	17-3/4	19-3/4	21-3/4	23-3/4	± 1/2
Inseam, <u>2/</u>							
X-Short	28	28	28	28	28	28	± 3/4
Short	30	30	30	30	30	30	
Regular	32	32	32	32	32	32	
Long	34	34	34	34	34	34	
X-Long	36	36	36	36	36	36	
XX-Long	38	38	38	38	38	38	
Outseam, <u>3/</u>							
X-Short	37	37-1/2	38	38-1/2	39	39-1/2	± 3/4
Short	39-1/2	40	40-1/2	41	41-1/2	42	
Regular	42	42-1/2	43	43-1/2	44	44-1/2	
Long	44-1/2	45	45-1/2	46	46-1/2	47	
X-Long	47	47-1/2	48	48-1/2	49	49-1/2	
XX-Long	49-1/2	50	50-1/2	51	51-1/2	52	
Half Leg Opening, <u>4/</u>							
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/ Half waist - Measure along center of waistband from outside folded edge to folded edge.

2/ Inseam - Measure inseam of trousers from center back 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 on the outer cuff.

TABLE XII-A. Finished measurements (inches) Type II (Female).

Size	25	28	31	35	Tol.
Half Waist, Relaxed ^{1/}	TBD	TBD	TBD	TBD	± 1/2
Half Waist, Fully engaged ^{2/}					± 1/2
X-Short	TBD	TBD	TBD	----	
Short	TBD	TBD	TBD	TBD	
Regular	TBD	TBD	TBD	TBD	
Long	----	TBD	TBD	TBD	
X-Long	----	----	TBD	TBD	
Inseam, ^{3/}					
X-Short	TBD	TBD	TBD	----	
Short	TBD	TBD	TBD	TBD	
Regular	TBD	TBD	TBD	TBD	± 3/4
Long	----	TBD	TBD	TBD	
X-Long	----	----	TBD	TBD	
Outseam, ^{4/}					
X-Short	TBD	TBD	TBD	----	
Short	TBD	TBD	TBD	TBD	
Regular	TBD	TBD	TBD	TBD	± 3/4
Long	----	TBD	TBD	TBD	
X-Long	----	----	TBD	TBD	
Half Leg Opening, ^{5/}					
X-Short	TBD	TBD	TBD	----	
Short	TBD	TBD	TBD	TBD	
Regular	TBD	TBD	TBD	TBD	± 1/2
Long	----	TBD	TBD	TBD	
X-Long	----	----	TBD	TBD	
Half Hip, ^{6/}					
X-Short	TBD	TBD	TBD	----	
Short	TBD	TBD	TBD	TBD	
Regular	TBD	TBD	TBD	TBD	± 1/2
Long	----	TBD	TBD	TBD	
X-Long	----	----	TBD	TBD	

^{1/} Half waist, Relaxed – With adjustment tabs relaxed, measure along center of waistband from outside folded edge to folded edge.

^{2/} Half waist, Fully engaged – With adjustment tabs engaged (to the tightest location with the hook and loop completely engaged and not extending beyond the loop tape) measure along center of waistband from outside folded edge to folded edge.

^{3/} Inseam - Measure inseam of trousers from center back of crotch seam to bottom edge of trouser along the inseam.

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

5/ Half leg opening - Measure across bottom of leg from outside folded edge to folded edge on the outer cuff.

6/ Half Hip, - At the hanging hip pocket bottom bar-tack, measure from folded edge of garment to folded edge of garment.

3.13.1.1 Methods of measurement. The measurements in Table XII and Table XII-A shall be taken in accordance with the footnotes. The trousers waist shall be buttoned and placed flat upon a table for measuring. The trousers inseam shall be placed flat upon a table for measuring. Measurement should be taken along the seam that runs along back trousers leg. Measure each leg to center back trousers seam.

3.14 Toxicity. The finished trousers and its components shall not present a health hazard and shall show compatibility with prolonged, direct skin contact when tested as specified in 4.6. Chemicals recognized by the Environmental Protection Agency (EPA) as human carcinogens shall not be used.

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

3.15 Workmanship. After completion of the final assembly, the trousers shall be thoroughly cleaned and all thread scraps, lint and foreign matter shall be removed and all closures engaged prior to packaging. The trousers shall be uniform in quality and shall be free from irregularities or defects which could adversely affect fit, performance, reliability or durability. The trousers 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 thru XIII and overall workmanship. The first article shall also include the finished measurements in Tables XII and XII-A, examination for defects in Table XIII, and testing in Table XIV and Table XV. 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 Tables XII and XII-A, examination for defects in Table XIII and testing in Table XIV and Table XV. 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 materials in the 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 all components and end items to determine conformance to requirements.

4.4.1 End item visual examination. Each trousers shall be subjected to visual examination. All fabric and garment defects shall be scored in accordance with Table XIII, which are clearly noticeable at normal viewing distance (3-feet) and affect serviceability and appearance of the garment. Material defects are defined in ASTM D3990. If needed, closer inspection will be performed to verify compliance to specification requirements.

TABLE XIII. Trousers visual examination (all types).

Examination	Defect	Classification	
		Major	Minor
Materials	Incorrect, not as specified (see 3.4.1 through 3.4.5)	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 Fabric Defect Scale Level C		201
	Slubs greater than Fabric Defect Scale Level D		202
Shade	Shade variation within part or between parts of trousers, affecting appearance or serviceability	103	
Components			
Thread and gimp	Color or type not as specified		203
Buttons and drawstrings	Omitted, damaged or ragged	104	
	Not specified type, size or color		204
Labels, hangtags, bar code, UPC/HRI codes	Omitted, illegible	105	
	Color or type not as specified Human readable interpretation (HRI) illegible	106	205
Construction			
Waistband	Incorrect design, not as specified in patterns, not secured, not specified width	107	
	Waistband grainlines not matching to trousers	108	
	Waistband button/buttonhole alignment uneven by more than 1/4-inch when buttoned	109	
Belt loops	Belt loops omitted, not secured, not specified size, opening not as specified or incorrect placement	110	
Fly	Incorrect design not specified in patterns, not secured, missing or skewed J stitch line	111	

TABLE XIII. Trousers visual examination (all types). - Continued

Examination	Defect	Classification	
		Major	Minor
Construction - Continued			
Seat and knee Reinforcement and knee lining	Omitted	112	
	Not attached as specified,	113	
	Not aligned at top more than 1/4-inch (seat only)	114	
Pocket and flaps (all)	Pocket construction and openings not as specified	115	
	Pocket companions and openings not uniform in size or shape by 1/4-inch	116	
	Pocket flaps or openings not as specified	117	
	Pocket flaps twisted, curled or puckered, not stitched as specified or not well formed	118	
Pocket and flaps (all) Continued	Pocket flaps not completely covering pocket opening left to right, positioned or grain line not as specified	119	
	Pocket flap finished uneven from left to right more than 1/4-inch	120	
Front hanging side pockets	Raw edge not overedged	121	
Cargo pockets	Omitted or incorrect size	122	
	Missing edge stitch on pleats, missing or incorrect placement of eyelets, buttons or buttonholes	123	
Hem/bottom opening/inseam outseam and drawstrings	Hem not as specified	124	
	Bottom openings varying more than 1/2-inch in width	125	
	Inseam and outseam lengths varying by more than 1/2-inch	126	
	Drawstrings not as specified		206
Eyelets	Omitted, misplaced or incorrect size	127	
	Loose stitching, incorrect number of stitches		207
	Eyelet hole not cut through		208
Bar-tacks, back-tacks	Omitted, misplaced or incorrect size	128	
	Loose stitching, incorrect number of stitches		209
Buttonholes	Omitted, misplaced or incorrect size	129	
	Button holes not in specified direction		210
	Loose buttonhole thread, purling on wrong side, not clean cut or securely caught in fabric	130	
	Alignment of buttonholes and buttons causing bulge, twist or distortion when engaged	131	
	Buttonholes not cleanly cut to required opening size		211

TABLE XIII. Trousers visual examination (all types). - Continued

Examination	Defect	Classification	
		Major	Minor
Labels, Hangtags, UPC/HRI codes	Size, combination identification/care labels not placed correctly		212
	Hangtags/UPC labels not placed securely attached in correct position		213
	Barcode/UPC code not visible on folded, packaged item		214
	Any label or tag having incorrect printed content	132	
	Any label, hangtag, or barcode attachment causing damage to item	133	
Seams and stitching	Open seams, puckered, distorted, wavy, twisted, or irregular	134	
	Loose or tight stitch tension		215
	Less than 1/2-inch in length		
	Greater than 1/2-inch in length	135	
	Missing stitches greater than 1/4-inch length	136	
	Edge or raised stitching sewn too close to the edge or needle chew resulting in damage to fabric over 1/4-inch in length	137	
	Seam allowance not as required by stitch type		216
	Visible raw edge on outside of trousers (inside raw edge greater than 1-inch)	138	
	Stitching not as specified	139	
	Double needle intersecting seams staggered by more than 1/4-inch	140	
	Run off of stitching more than 1/2-inch for edge or raised stitching	141	
	Stitching caught in components or fabric causing unwanted permanent folds, pleats or fullness in the garment	142	
	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)	143	
	Stitching of seams incorrectly repaired	144	
	Missing stitches less than 1/4-inch length		217

TABLE XIII. Trousers visual examination (all types). - Continued

Examination	Defect	Classification	
		Major	Minor
Cleanness and workmanship	Spot/Stain affecting appearance or serviceability	145	
	Odor	146	
	Excessive thread ends (more than three (3)) Between 1/4 to 1-1/2-inch		218
	Excessive thread ends (more than three (3)) Over 1-1/2-inches	147	
	All closures on trousers not engaged		219
	Internal repair tags or tickets not removed from finished garment		220
Packaging	Any trousers not package in accordance with contract or purchase order		221

4.4.2 Finished measurements. The trousers shall conform to the finished measurements specified in Tables XII and Table XII-A.

4.5 Basic material and component testing. The basic material specified in 3.4 through 3.4.5 and the components of 3.7.1, 3.7.3, and 3.8.7.3, shall be tested for the characteristics listed in Table XIV in accordance with the test methods cited.

TABLE XIV. Basic material and component testing.

Characteristic	Reference paragraph	Test method
Basic Material 3.4.1 & 3.4.2		
Fiber identification, <u>1/</u>	3.4.1 & Table I	AATCC -20A
Weave	3.4.1 & Table I	Visual
Weight	3.4.1 & Table I	ASTM D3776/D3776M Option C
Construction/ fabric count	3.4.1 & Table I	D3775
Break strength	3.4.1 & Table I	ASTM D5034 (GE or GT)
Tearing strength	3.4.1 & Table I	ASTM D1424
Dimensional stability After 5 laundering cycles	3.4.1 & Table I	AATCC-135, 3,V, Aiii
Air Permeability	3.4.1 & Table I	ASTM D737
Pattern execution	3.4.1.1-3.4.1.2.1	Visual
Labile Sulfur	3.4.1.3	4.5.1
Visual shade matching	3.4.1.4	<u>2/</u>

TABLE XIV. Basic material and component testing. - Continued

Characteristic	Reference paragraph	Test method
Basic Material 3.4.1 & 3.4.2 - Continued		
Colorfastness to: Laundering (after three (3) cycles) Light (40 AFU or 170kJ/(m ² nm) @ 420 nm) Perspiration (acid & alkaline) Crocking (Dry and Wet)	3.4.1.5 & Table II	4.5
		AATCC-61 Test 3A <u>3/</u>
		AATCC 16.3 <u>4/</u>
		AATCC 15 <u>3/</u>
		AATCC 8 <u>5/</u>
Spectral reflectance Initial	3.4.1.6 - 3.4.1.6.1 & Table III	4.5.2
pH	3.6	AATCC - 81
Toxicity	Table I & 3.14	4.6.3
Knit Fabric 3.4.4		
Color matching	3.4.5	Visual
Fiber Content	3.4.5 and Table IV	AATCC 20A
Knit Construction		Visual
Weight		ASTM D3776/D3776M Option C
Toxicity		4.6.3
Thread 3.7.1 , Gimp 3.7.2, Buttons 3.7.3 and Drawstring 3.8.7.3		
Characteristic	Reference paragraph	Test method
Color Matching	3.7	Visual
Toxicity	3.14	4.6.3

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

2/ The color and appearance of the cloth shall match the standard sample when viewed using the AATCC Evaluation Procedure 9, Option A, with sources simulating artificial daylight D75 illuminant with a color temperature of 7500K (± 200) illumination of 100 (± 20) foot candles, and shall be a good match to the standard sample under incandescent A illuminant with a color temperature of 2856K (± 200).

3/ Rated using the AATCC Gray Scale for Color Change and AATCC Gray Scale for Staining.

4/ Rated using the AATCC Gray Scale for Color Change.

5/ Rated using the AATCC 9-Step Chromatic Transference Scale

4.5.1 Presence of labile sulfur test. In the determination of presence of labile sulfur in textile materials with lead acetate, two (2) 1.50 (± 0.01) gram samples from each material submitted for evaluation shall be tested. Each of the two (2) samples shall be cut into very small pieces and placed into separate test tubes. The samples shall be submersed in a stannous chloride solution that contains 100 grams of stannous chloride crystals ACS in 100 milliliters of hydrochloric acid ACS (35 percent concentration) and 50 milliliters of distilled water. A filter paper wet out with a 5.0

percent lead acetate solution shall be placed over top of the test tube. The lead acetate solution contains 5.0 grams of lead acetate CP reagent grade and enough distilled water to make up a 100 milliliter solution; if the solution is not clear, add a few drops (one at a time) of glacial acetic acid until the solution is clear. The test tube containing the textile sample, stannous chloride and wet filter paper shall be heated over a low flame until the solution is boiling. The solution should not be heated for more than 15 seconds. A brown to black stain on the filter paper should be evaluated as follows:

- Free - The filter paper shows no discoloration or staining of any kind.
- Slight - The filter paper shows a light tan to light brown discoloration stain.
- Moderate - The filter paper shows a dark brown discoloration stain.
- Severe - The filter paper shows a black color stain.

4.5.2 Spectral reflectance test. Spectral reflectance data shall be obtained from 600 to 860 nanometers (nm) at 20 nm intervals on a spectrophotometer relative to the polytetrafluoroethylene (PTFE) family of compounds, the preferred white standard. Other white reference materials may be used provided they are calibrated to absolute white or vitrolite tiles. The spectral band width shall be less than 20 nm at 860 nm. Reflectance measurements shall be made by either the monochromatic or polychromatic mode of operation. When the polychromatic mode of operation is used, the spectrophotometer shall operate with the specimen diffusely illuminated with the full emission of a continuous source that simulates either CIE Source A or CIE Source D65. Measurements shall be taken on a minimum of two (2) different areas and the data averaged. The measured areas should be at least 6-inches away from the selvage. The specimen shall be measured as a single layer backed with four (4) layers of the same fabric and shade. The specimen shall be viewed at an angle no greater than 10° from normal, with the specular component included. Measurements shall be taken on a minimum of two (2) different areas. Specimens shall be oriented in different directions during testing. When possible, the specimens tested shall not contain the same Warp or filling yarns/ Wales or courses when presented to the sample port. Photometric accuracy of the spectrophotometer shall be within one (1) percent and wavelength accuracy within two (2) nm. The diameter for standard aperture size used in the color measurement device shall be 0.3725-inches. Any color having spectral reflectance values falling outside the limits at four (4) or more of the wavelengths specified shall be considered a test failure.

4.6 End item testing. The finished trousers shall be tested for the characteristics as specified in 3.4 and 3.5 and Table XV. The test methods shall be as specified in Table XV. 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 XV. End item testing.

Characteristic	Requirement paragraph	Test method
Insect repellent content <u>1/</u>		
Initial	3.4.1	4.6.1
After 20 launderings	3.4.1	4.6.1 <u>2/</u>
% Mosquito Bite protection <u>1/</u>		
Initial	3.4.2	4.6.2
After 20 launderings	3.4.2	4.6.2 <u>2/</u>
After 50 launderings	3.4.2	4.6.2 <u>3/</u>
pH	3.4.3	AATCC 81
Button pull/break prior to treatment)	3.5.4	ASTM D5034
Toxicity	3.14	4.6.3

1/ If fabric is pre-treated, this testing can be done prior to cut and sew.

2/ After 20 launderings as per AATCC 135, 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.

3/ After 50 launderings as per AATCC 135, 3, V, Aiii, except laundering cycles 5, 10, 15, 19, 20, 25, 30, 35, 40, 45, 49 and 50 shall be performed without any detergent.

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

Evaluation of insect repellent treated fabric materials: extraction and analysis by Gas Chromatography-Mass Spectrometry (GC/MS)

NOTE: The conditions described in this method are optimum for the accelerated solvent extractor and 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 insect repellent 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. 0.0001g sensitivity, Mettler Toledo, or equal

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

A.3 Glassware.

A.3.1 10-100mL volumetric flasks

- A.3.2 Funnel
- A.3.3 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.5.1.1 Liquid Nitrogen Cylinder to Deliver High Pressure Gas, 230psi
- A.5.1.2 Complete Extraction Cells
- A.5.1.3 Cellulose filters, to fit extraction cells
- A.5.1.4 60mL Amber Glass Collection Vials
- A.5.1.5 Solvent Resistant Teflon-Silicone Coated Septa
- A.5.1.6 3mm-4mm borosilicate glass beads

- A.5.2 Soxhlet.

- A.5.2.1 Electric heater with variable control
- A.5.2.2 Heat resistant glass flask when using Soxhlet extractor. The flask shall be a 250mL, flat or round bottom, and single neck.
- A.5.2.3 Extractor condenser
- A.5.2.4 Boiling condenser
- A.5.2.5 Cellulose extraction thimbles

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

- A.6.1 Carrier Gas Cylinder, Appropriate Regulator Set at 80psi
- A.6.2 Hewlett-Packard Capillary Column, 5% Phenyl Methyl Siloxane/30.0m x 250µm x 0.25µm nominal, 325°C Max, or equal.
- A.6.3 Split Inlet Liner, Packed with Silanized Glass Wool/5mm
- A.6.4 Injector Microliter Syringe, Capable of Delivering 1µL
- A.6.5 GC Amber Injection Vials and Rinse Vials

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

- A.7.1 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 $\geq 97\%$, purity/specified technical, or equal, mixture of Cis/Trans Isomers.

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:

B.4.1 Micro-90 Ultra Cleaning Solution, or equal

B.4.2 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).

C.2.1 Perform the manufacturer's recommended calibration procedures prior to analyses.

C.2.2 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 insect repellent carries over from experiment to experiment. The techniques listed below have been determined to be suitable:

C.3.1 Evaporate excess solvent from extraction glassware and wash using conventional methods (see B.4).

C.3.2 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.3.3 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 to be tested shall be selected in accordance with ANSI/ASQ Z1.4, Special Inspection Levels S-1 and AQL of 1.5 unless otherwise noted in the contract or purchase order.

D.2 Test specimens.

D.2.1 From each sample being evaluated (unlaundered and after 20 launderings), select three (3), 3-inch diameter specimen (use a 3-inch circular cutting die having surface area of 45.6037 cm²) 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 Coat 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). Specimen for the measurement of insect repellent content after laundering shall be cut after the finished sample has been laundered according to AATCC 135, 3, V, Aiii to the specified number of cycles. Laundered specimen shall be cut from different ply areas across the garment.

D.2.2 Weigh each specimen to the nearest milligram (see A.1).

E. Standard Preparation.

E.1.1.a Prepare six (6) 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)]

E.1.2.a Using the balance specified in A.2, weigh 10 mg (± 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.

E.1.3.a 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 carryover of insect repellent is significant.

F.1.3 Accelerated solvent extraction procedures.

F.1.3.1 Parameters.

Cell Size	Machine type dependent
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 40 mL and prepare a 1 mL aliquot from every specimen extraction for GC analysis. Insect repellent 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 treated specimens for six (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 specimen 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 (3) 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.

F.4.1 Select three (3) random specimen from any treated fabric sample and perform three (3) consecutive extractions.

F.4.2 Quantify the level of insect repellent recovered from each specimen for each consecutive extraction, through GC/MS analysis.

F.4.3 Verify that the percent recovery of insect repellent 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 insect repellent concentrations obtained from each of the three (3) extractions, if the initial extraction yields insect repellent levels 95% or greater than the total percent of insect repellent 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 insect repellent levels in the second extraction should be minimal, and the 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 carryover. 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.

G.2.1 All six (6) standards will be injected at the beginning and at the end of each series of specimen to "bracket" the specimen injections. Check linearity of the standards for each set of injections by plotting the responses (area counts) on the x-axis vs. the calculated standard concentrations on the y-axis. A 3rd order polynomial regression line with R-squared value of 0.99 or greater is acceptable. Derive the equation of the 3rd order polynomial for sample calculations.

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

Initial calibration (Standards)
Instrument blank at the end of the initial calibration
Specimen Series 1 (extracts 1-10, 1st quantitation)
Instrument blank
Standard Series 1
Instrument blank
Specimens Series 2 (extracts 1-10, 2nd quantitation)
Instrument blank
Standard Series 2
Instrument blank

Subsequent specimen series, (ex. 11-20, including blanks, and standard series)
 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 insect repellent level must be adjusted using the factor of 10.

G.4 Gas Chromatograph/Mass spectrometer parameters (see A.6).

G.4.1 Injection procedures.

G.4.1.1 Place all GC vials into auto sampler tray. To avoid vapor pressure differences, all vials must be at room temperature and containing identical volumes.

G.4.1.2 Inject 1 μL into the Gas Chromatograph equipped with Mass Spectrometer. Use high purity helium carrier gas (see B.3) and appropriate column.

G.4.1.3 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 μL
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) for Permethrin 163 (confirmatory) for Permethrin

G.4.3 Evaluation procedures.

G.4.3.1 Quantify the Permethrin content detected by the mass spectrometer by extracting ion chromatograms 183 (quantitation ion) and 163 (confirmatory ion).

G.4.3.2 Integrate peaks manually from baseline to baseline using the software, or generation of report.

H. Calculations.

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

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

Concentration (mg/cm^2) =

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

Where:

40 mL = Final Volume

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

x = area count of the specimen curve

45.6037 cm^2 = area of specimen

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

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

I. Report. Report the insect repellent concentrations in milligrams per square centimeter squared to the nearest 0.001 mg of the three (3) individual specimen per sample unit for all units sample units tested. A single individual specimen within a sample unit shall be allowed to fall outside of the minimum to maximum range of the insect repellent levels as specified in paragraph 3.5.1 as long as the average of the three (3) specimens meet the specified levels. Although, for initial testing only the single individual specimen allowed to fall outside the specified range in 3.5.1 shall not fall below $0.049 \text{ mg}/\text{cm}^2$ or above $0.146 \text{ mg}/\text{cm}^2$ for Permethrin in which case the sample unit shall be considered a failure whether or not the sample average falls within the minimum/maximum range specified and 3.5.1. A single retest shall be allowed; when a sample fails, a complete set of specimens shall be pulled from an additional sample unit and retested. The retest shall then be used to rate pass or fail.

4.6.2 Percent (%) mosquito biting protection assay. Percent (%) mosquito bite protection shall be measured on a finished insect repellent treated sample, under three (3) test conditions and using a control specimen (non- insect repellent treated, sample against the two (2) selected mosquito species specified in 4.6.2.3. The three (3) test conditions shall be one (1) unlaundered, two (2) after 20 launderings, and three (3) after 50 launderings, from cloth or garments produced in the same lot.

Corresponding insect repellent content for each of these conditions will be measured as specified in 4.6.1 to correlate biological toxicity with the particular cloth or garment treatment used to meet requirements specified in 3.5.1.

4.6.2.1 Number of determinations. Three (3) determinations will be run for each of the two (2) mosquito species (see 4.6.2.3.3). Each determination for each mosquito 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 mosquito population, on the same day the specimen being tested, and tested on an arm that has not been used for testing a treated sleeve (see 4.6.2.3.6) or other area specified. The total number of specimen for the three (3) determinations is outlined below. It is estimated that one (1) coat yields three (3) specimen and one (1) trouser yields three (3) specimen consisting of largely a single ply fabric area (see 4.6.2.2). 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 sample</u>
Mosquitoes <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

4.6.2.2 Specimen size. Specimen will be cut to the shape and dimensions illustrated in Figure 7. Specimen 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 4.6.2.3.5). Specimen 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.

4.6.2.3 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.

4.6.2.3.1 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.

4.6.2.3.2 Fastening test specimen. Section (3) (iii) recommends "fastening a strip of the impregnated material to the test subject's forearm" or other area specified. This will be accomplished by utilizing specimen size specified in 4.6.2.2 (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.

4.6.2.3.3 Test mosquitoes. 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 in 4.6.2.3.3.1.

Mosquitoes:

Aedes (Stegomyia) aegypti
Anopheles albimanus

4.6.2.3.3.1 Mosquito characteristics. Mosquito ages employed for these studies shall be 5 to 11 days old after emergence from the pupal stage. Mosquitoes shall be laboratory-reared and disease free, and have been kept in stock cages containing both males and females. The mosquitoes will be maintained on 10% sugar water and have not been provided a blood meal. Methods should be used to preselect females for the studies. Use either a hand draw box or suitable aspirating device to collect host-seeking mosquitoes for the required cage density (see 4.6.2.3.3.3).

4.6.2.3.3.2 Mosquito rearing. Mosquitoes for these studies shall be reared under optimal conditions for larvae, as described in OPPTS 810.3700, section (d)(1)(iii).

4.6.2.3.3.3 Cage conditions. A cage density of 200 (± 25) female mosquitoes per cage is required to meet the biting pressure density of at least one (1) female mosquito per 300 cm³ cage volume. (Cages shall be 60,000 ($\pm 6,000$) cm³, 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.

4.6.2.3.4 Subjects. A minimum of three (3) test volunteers shall be used in each study for each mosquito species at each test facility. The same three (3) subjects can be used to evaluate different mosquito 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.

4.6.2.3.5 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 4.6.2.3.2. The ends of the garment, near the wrist and elbow shall be sealed with protective tape of adequate thickness to prevent mosquitoes from biting through the tape. The hand shall be gloved with a glove of appropriate thickness to prevent biting through to the hand.

4.6.2.3.6 Controls. For each set of specimen, a control shall be conducted. The control shall consist of the same fabric as the specimen, will not be laundered and will not contain the mosquito bite protection treatment. It will be identical in size to the test swatch (see 4.6.2.2). 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 specimen, or on the same arm used for experiments provided that the control is tested prior to testing treated specimens.

4.6.2.3.7 Biting exposure. Arms containing the controls and treated specimen shall be exposed to a cage of mosquitoes 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 specimen laundered 50 cycles, followed by the specimen laundered 20 cycles, and then conclude with testing the unlaundered treated specimen. Tests should be conducted with as little elapsed time as possible in between testing of a volunteer's arms.

4.6.2.3.8 Raw data. Raw data shall consist of the mosquito information as described in 4.6.2.3.3, the number of mosquitoes used per cage, and method of selection of these mosquitoes. The number of male and female mosquitoes shall be counted and only the number of females used for purposes of identifying mosquitoes that bite compared to non-biting mosquitoes. The number of bites received for each sample (treatment or control) shall be counted and recorded.

4.6.2.4 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 % mosquito bite protection shall be calculated by Abbott's equation below and reported in this manner for each insect and for all volunteers tested. Total % mosquito bite protection will be calculated by averaging the overall results for each species and meet the requirements set forth in paragraph 3.5.2.

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

where:

B_{NC} = bites recorded on the arm or specified testing area covered by the negative control fabric

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

B_T = bites recorded on the arm or specified testing area that was covered by the treated fabric.

4.6.3 Toxicity test. When required, (see 6.2), an acute dermal irritation study and a skin sensitization study shall be conducted. When the results of these studies indicate the finished trousers 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 3.14) 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 Insect repellent packaging. Every roll/box containing insect repellent treated fabric/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 trousers are for wear by military personnel in the United States Army as an improved hot weather combat uniform in garrison and combat missions in hot weather environments.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this Purchase Description document.
- b. Types, classes 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 3.1.1, 4.2 and 6.3).
- e. Conformance inspection acceptance quality limits (see 3.1.2 and 4.3).
- f. Camouflage pattern required (see 3.4.1, 3.4.1.1)
- g. Pattern required (see 3.11)
- h. When toxicity testing is required (see 3.14 and 4.6.3)
- 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 Standard sample. For access to samples and pattern drawings, address the contracting activity issuing the invitation for bids or request for proposal.

6.5 Approved EPA registrations. Samples of approved 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 insect repellent treatment meets the specification requirements.

6.6 Insect repellent 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.

6.7 Percent mosquito bite protection. The following facility is known to perform percent mosquito bite protection testing in conformance with 4.6.2.

Aedes aegypti and Anopheles albimanus:

USDA-Center for Medical, Agricultural & Veterinary Entomology Agricultural Research Service
1600/1700 SW 23rd Drive

Gainesville, FL 32608

POC: Kenneth J. Linthicum, PhD, BCE Center Director

Tel: (352) 374-5700 / Fax: (352) 374-5850

Kenneth.Linthicum@ars.usda.gov

6.8 Replica set. The SDL Atlas Slub/Knot Replica Set is not available from their website at this time. Recommend calling customer service, 1-803-329-2110.

6.9 Subject term (key word) listing.

Bite

Clothing

Insect protection

Jungle

Mosquito

Operational Camouflage Pattern (OCP)

Pants

Permethrin

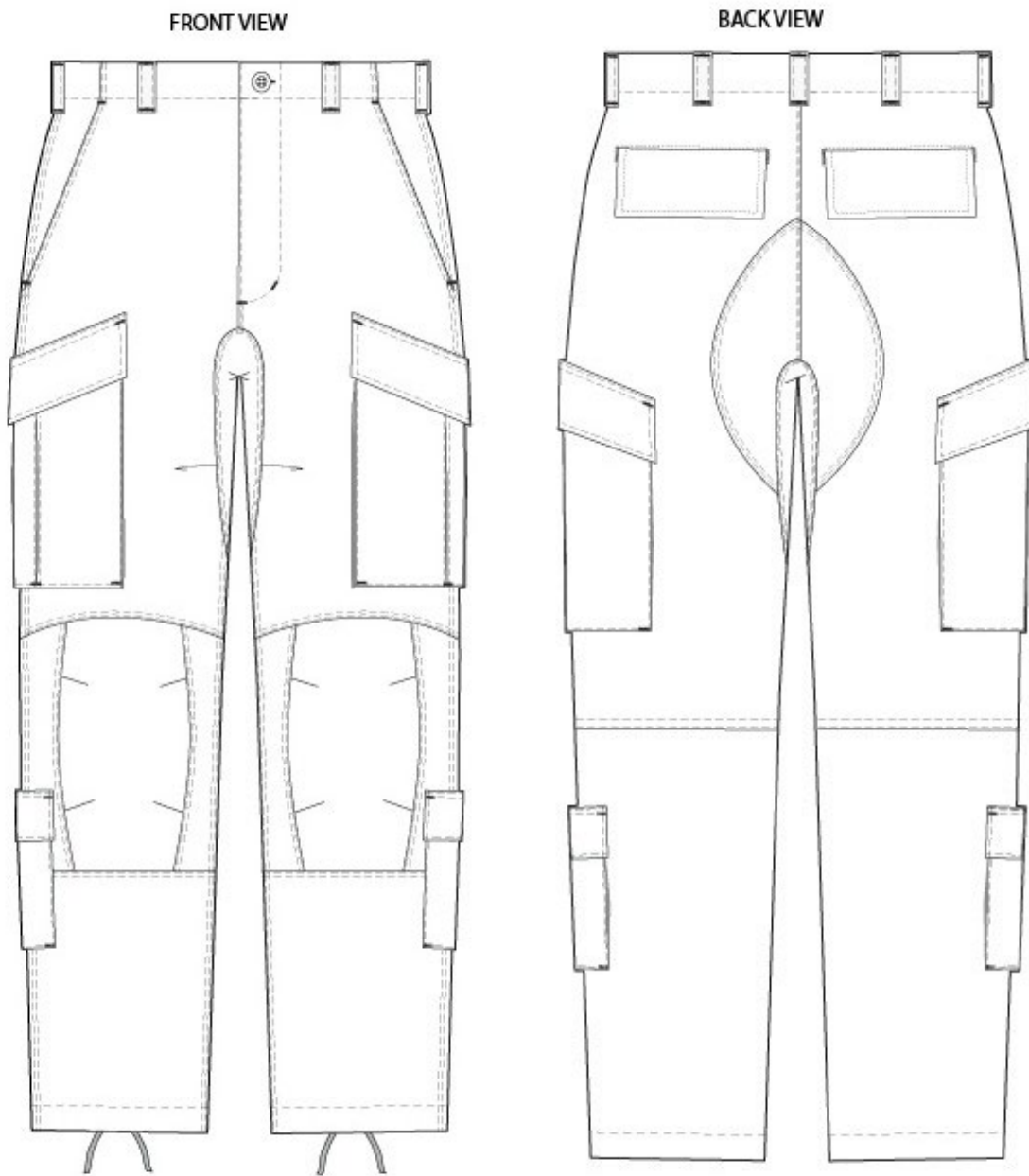


FIGURE 4A. Trousers Front and Back View, Improved Hot Weather Combat Uniform, Type I.

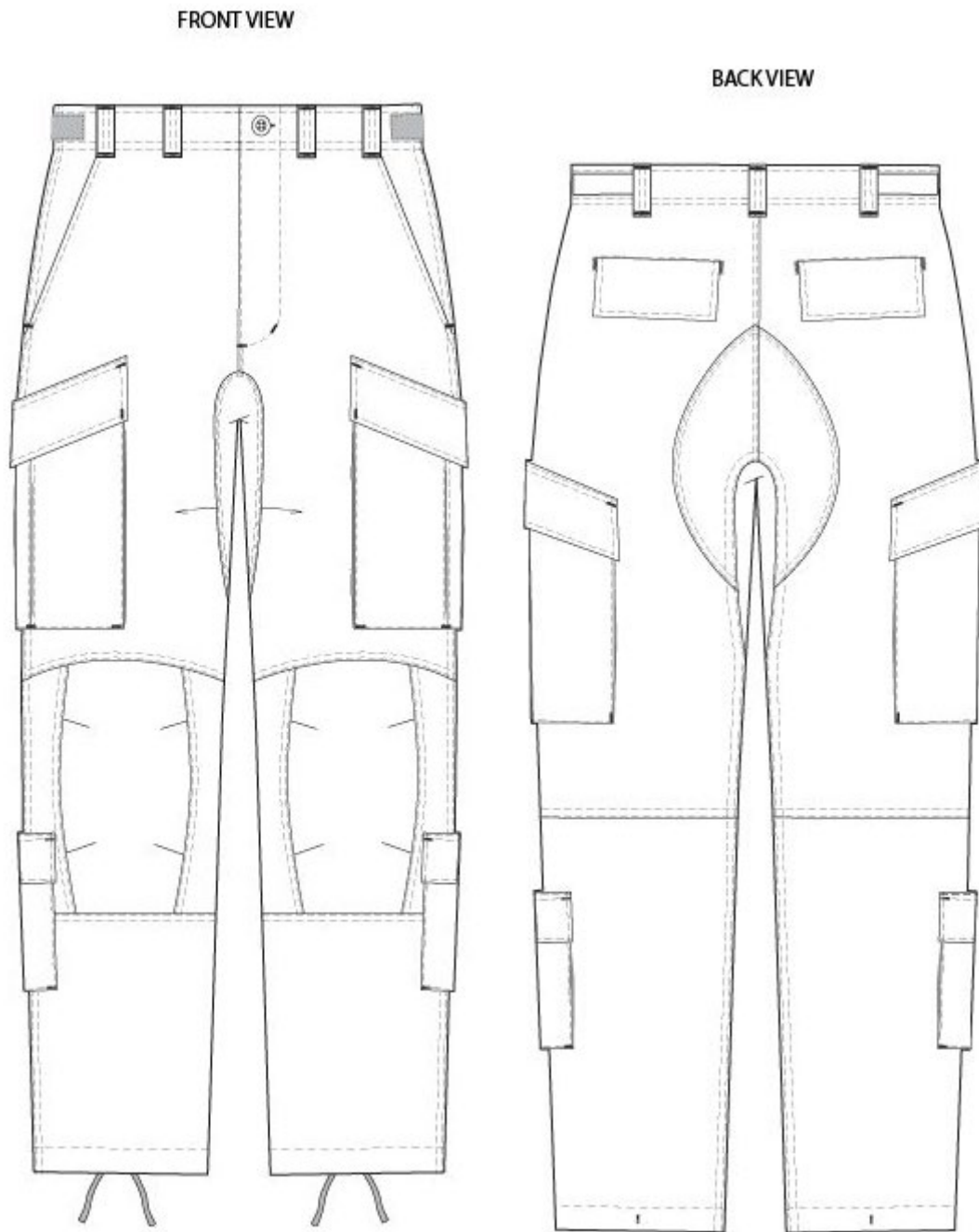


FIGURE 4B. Trousers Front and Back View, Improved Hot Weather Combat Uniform, Type II.

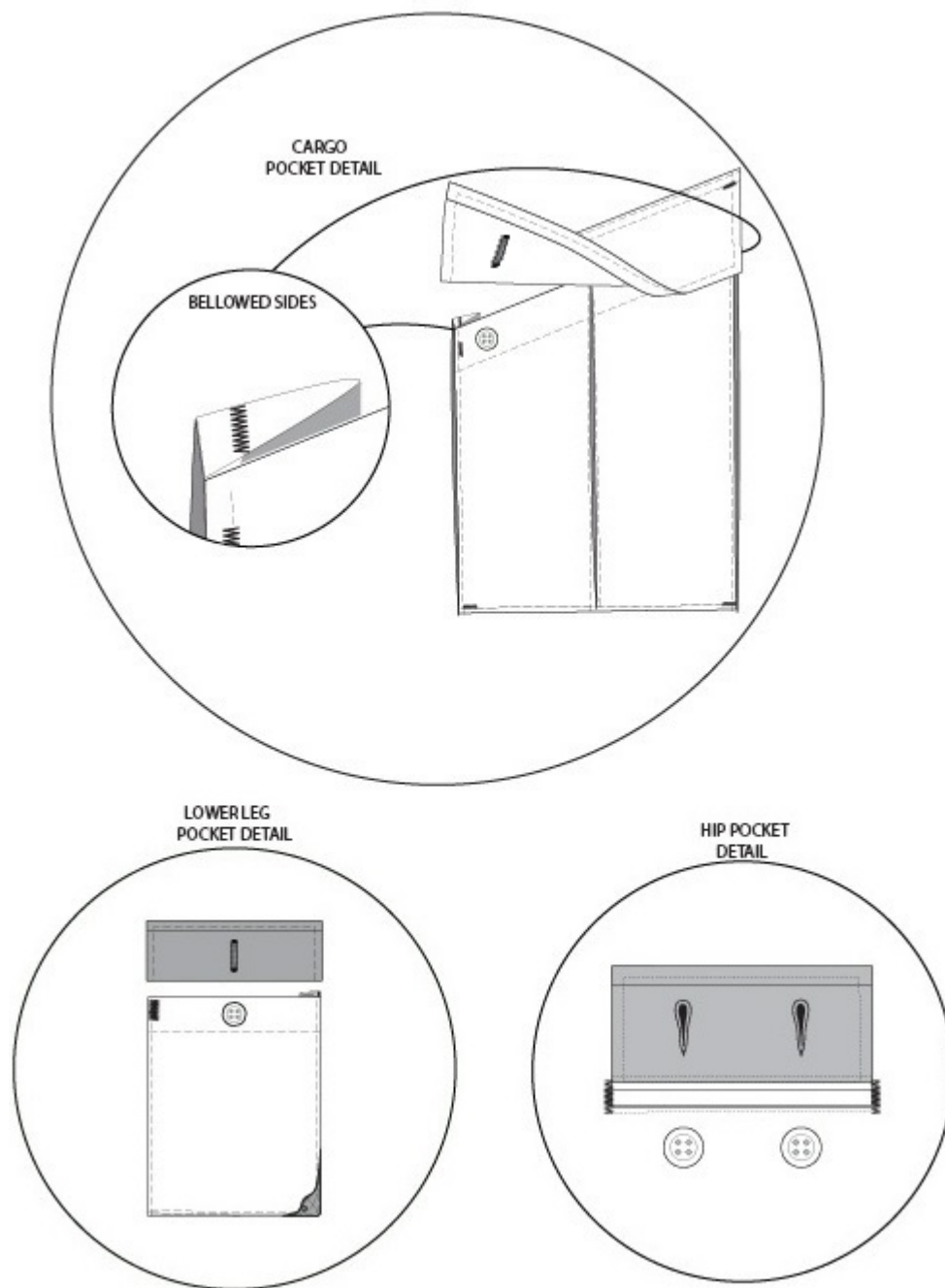


FIGURE 5. Trousers Improved Hot Weather Combat Uniform, Pocket Details, Type I.

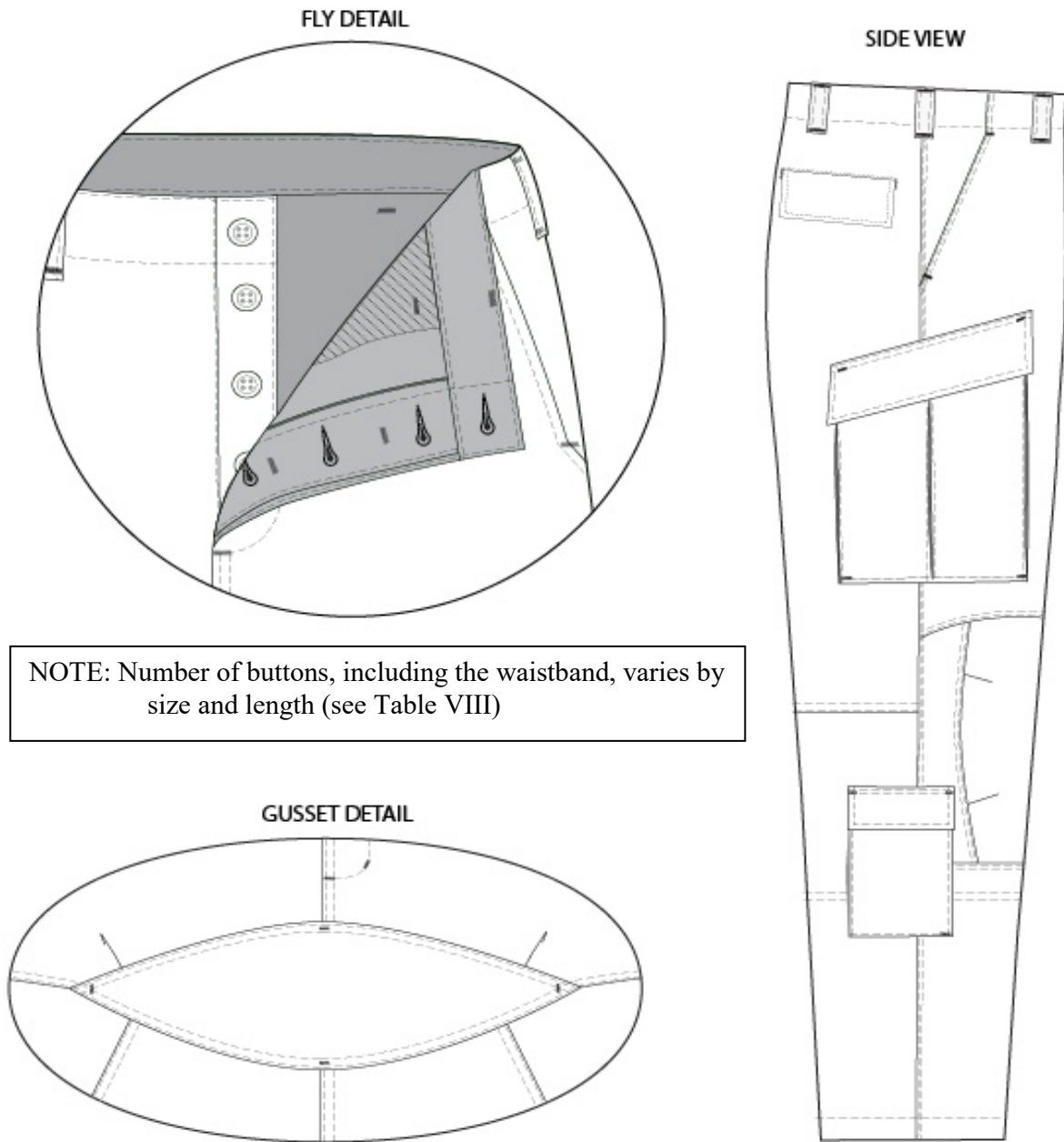


FIGURE 6A. Trousers, Side View, Fly and Gusset construction details, Improved Hot Weather Combat Uniform, Type I.

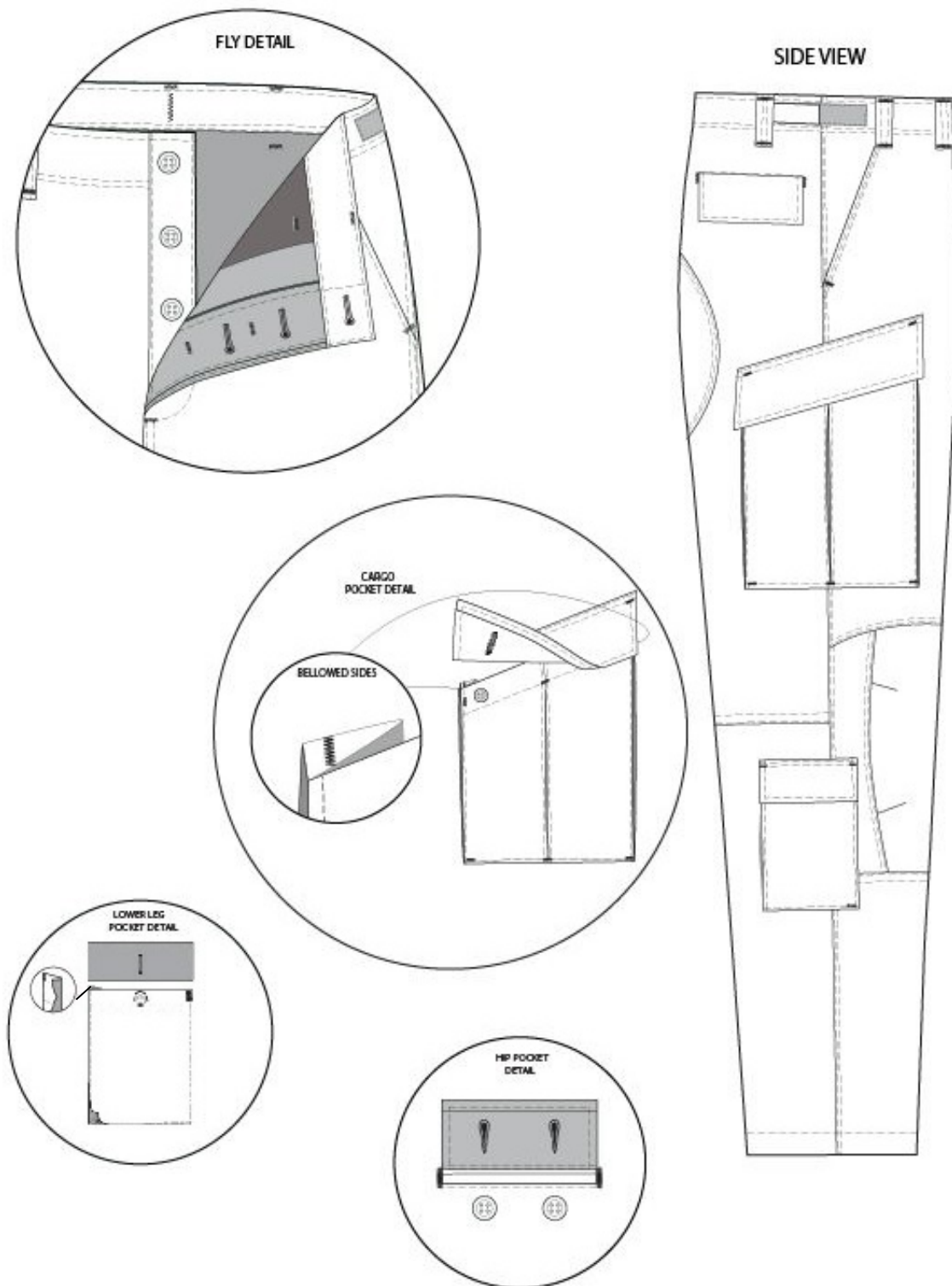


FIGURE 6B. Trousers, Side View, Fly and pocket construction details, Improved Hot Weather Combat Uniform, Type II.

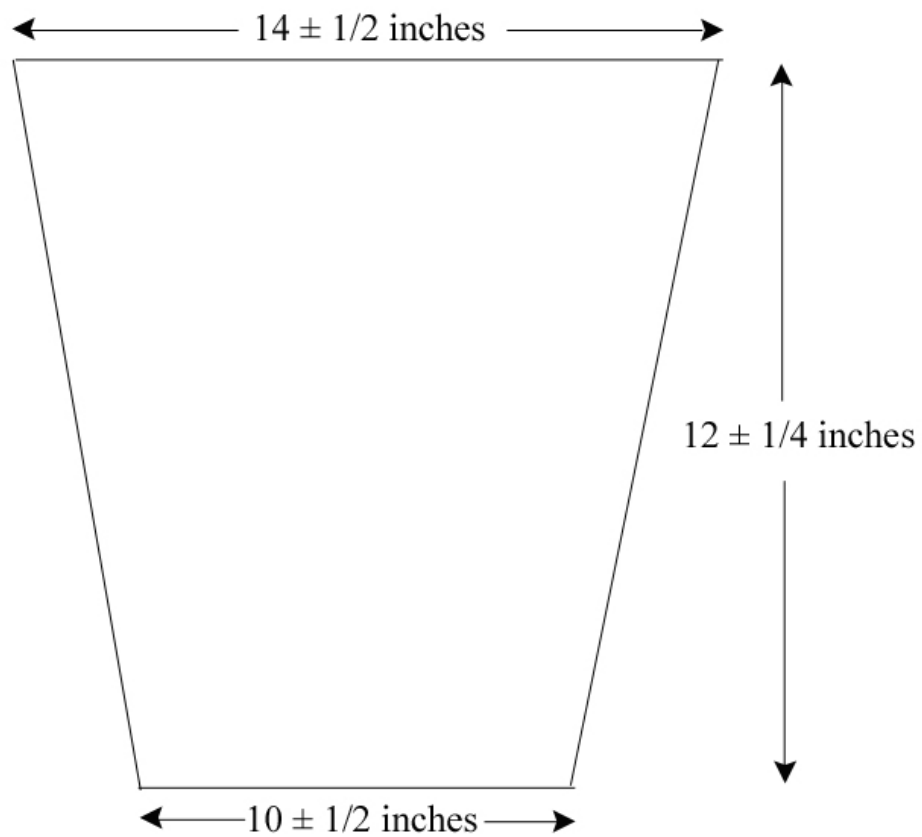


FIGURE 7. Test Specimen, % Mosquito Bite Protection Test.

CUSTODIAN:
Army – GL

PREPARING ACTIVITY:
Army– GL