

INCH POUND

MIL-DTL-32185
January 12, 2005

DETAIL SPECIFICATION

TROUSERS, COLD WEATHER, UNIVERSAL CAMOUFLAGE

This specification is approved for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers nylon, three layer laminated waterproof and moisture vapor permeable trousers used as a component of the Extended Cold Weather Clothing System (ECWCS).

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

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

Comments, suggestions, or questions on this document should be addressed to: Defense Supply Center Philadelphia, Clothing and Textiles Directorate, Attn: DSCP-COCT (Bldg 6), 700 Robbins Ave., Philadelphia, PA 19111-5092 or emailed to Colleen.M.Robinson@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>

AMSC N/A

FSC 8415

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MIL-DTL-32185

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 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 listed in the solicitation or contract.

FEDERAL SPECIFICATIONS

- A-A-50083 - Bag, Plastic, Folded Garment
- A-A-50199 - Thread, Polyester Core, Cotton or Polyester-Covered
- A-A-55126 - Fastener, Tapes, Hook and Loop, Synthetic
- A-A-55634 - Fasteners, Slide, Interlocking

DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-DTL-31011 - Cloth, Waterproof and Moisture Vapor permeable
- MIL-C-43701 - Cord, Elastic, Nylon
- MIL-F-10884 - Fasteners, Snap
- MIL-DTL-32075 - Label: For Clothing, Equipage, and Tentage
(General Use)
- MIL-PRF-5038 - Tape, Textile and Webbing, Textile, Reinforcing Nylon
- MIL-T-3530 - Thread and Twine: Mildew Resistant or Water
Repellent Treated
- MIL-DTL-32072 Thread, Polyester

DEPARTMENT OF DEFENSE STANDARDS

MILITARY

MIL-STD-129 - Marking for Shipment and Storage

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

MIL-DTL-32185

2.3 Non-Government publications. The following document(s) 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.

ASTM INTERNATIONAL

D 1974-1998 - Boxes, Shipping, Fiberboard
ASTM D2582 - Puncture Propagation Tear
ASTM D3776 - Mass Per Unit Area (Weight) of Woven Fabrics
ASTM D3884 - Abrasion Resistance of Textile Fabrics
D 3951 - Standard Practice for Commercial Packaging
ASTM D5034 - Breaking Strength of Textile Fabrics
D5118 - Practice for Fabrication of Fiberboard Shipping Boxes
ASTM D6193 - Standard Practice for Stitches and Seams

(Applications for copies are available from www.astm.org or American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.)

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

AATCC-8 - Colorfastness to Crocking: AATCC Crockmeter Method
AATCC-15 - Colorfastness to Perspiration
AATCC-16 - Colorfastness to Light
AATCC-22 - Water Repellency: Spray Test
AATCC-61 - Colorfastness to Laundering, Home and Commercial:
Accelerated
AATCC-96 - Dimensional Changes in Commercial Laundering of Woven
and Knitted Fabrics Except Wool
AATCC-118 - Oil Repellency: Hydrocarbon Resistance Test
AATCC-119 - Resistance to Frosting
AATCC-135 - Dimensional Changes in Automatic Home Laundering of
Woven and Knit Fabrics Procedure 1 - Gray Scale for Color
Change

(Copies of these documents are available from <http://www.aatcc.org> or American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Triangle Park, NC 27709-2215.)

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI/ASQC Z1.4 - Sampling Procedures and Tables For Inspection
By Attributes

MIL-DTL-32185

(For all inquiries please contact the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036). Website address <http://www.ansi.org>

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

(Applications for copies of referenced documents should be addressed to TAPPI Press, Technology Park/Atlanta, P.O. Box 105113, Atlanta, GA 30348-5113.)

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

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

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

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

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

3.3.1 Base cloth. The base cloth for the trousers shall be made from waterproof and moisture vapor permeable cloth conforming to MIL-DTL-31011, Type III, Class 4. The color of the face side of the base cloth shall be Universal Camouflage. The color of the back side of the base cloth shall be Foliage Green 504.

3.3.1.1 Cloth, reinforcement. The cloth for use as knee patches, seat patches, cargo pockets, and cargo pocket flaps must be camouflage printed, water repellent treated and must resist fraying. The requirements for the cloth, reinforcement are as follows:

MIL-DTL-32185

TABLE I. Cloth reinforcement requirements

Characteristics	Requirement
Weight	- 6.0 oz/sq. yd Max
Breaking strength:	
Warp	- 200 lbs.(min)
Fill	- 155 lbs.(min)
Colorfastness to:	
Croaking	- Dry and wet: 3.5 min.
Laundering	- Equal to or better than "3-4" rating on AATCC Gray Scale for Color Change
Light	- Equal to or better than "3-4" rating on AATCC Gray Scale For Color Change
Perspiration Alkaline/Acid	- Desert Sand 500 – Good - Urban Gray 501 –Good - Foliage Green 502 -Good
Spray rating:	
Initial	- 100, 100, 90 min.
After 1 Laundering	- 90, 90, 80 min.
Stiffness (cm)	- Warp – 11.0 max Fill - 11.0 max.
Puncture Propagation Tear	- Warp 7.0 kgf min. - Filling 6.0 kgf min.
Resistance to Organic liquid	- No wetting by N-Tetradecane
Resistance to Frosting	- Equal or better than the standard sample The test specimen shall show no evidence of an appreciable change in color. Appreciable change in color means a change that is immediately noticeable on comparison of the test specimen with the original unexposed sample. If closer inspection or a change of angle of light is required to make apparent a slight change of color, the change is not considered appreciable.
Dimensional Stability:	
Warp	- 4.0% (max)
Fill	- 4.0% (max)
Abrasion Resistance	- 800 cycles (min)

MIL-DTL-32185

Infrared Spectral Reflectance Requirements

Reflectance Values (Percent)

Wavelengths Nanometers (nm)	Desert Sand 500		Urban Gray 501		Foliage Green 502	
	Min	Max	Min	Max	Min	Max
600	28	42	12	26	8	18
620	30	44	14	26	8	18
640	34	50	14	28	8	20
660	38	59	14	30	10	26
680	44	63	18	34	10	26
700	46	69	24	38	12	28
720	48	71	26	42	16	30
740	48	76	30	46	16	30
760	50	80	32	48	18	32
780	54	80	34	48	18	34
800	54	80	34	50	20	36
820	54	80	36	54	22	38
840	56	82	38	54	24	40
860	56	82	40	56	26	42

3.3.1.2 Cloth, three-layer knit. The material used for the leg insert shall be a three layer-knit, Foliage Green 504. The cloth shall conform to the following physical characteristics when tested in accordance with paragraph 4.5.

TABLE II. Physical characteristics

Characteristics	Requirement
Weight, oz/sq. yd.	- 4.0 \pm 0.4
Stiffness, cm	- 8.0 Max
Hydrostatic Resistance, psi	
Initial Taffata Restraint	- 220 Min.
After deet	- 120 Min.

MIL-DTL-32185

TABLE II. Physical characteristics

Characteristics	Requirement
Puncture Propagation Tear, kgf	
Warp -	- 3.5 Min.
Fill	- 3.5 Min.
Water permeability	
Initial	- No leakage
After Synthetic Perspiration	- No leakage
Moisture Vapor Transmission	
Rate (g/sq. m/24 hours):	
Procedure B - Initial	- 600 Min.
Procedure BW - Initial	- 5000 Min.
Physical surface appearance after laundering	- No changes after 20 launderings

3.3.2 Seam sealing tape. The tape for covering and sealing all designated seams and stitching shall be cut in $1 \pm 1/16$ inch wide strips from material that is compatible with the back side of the cloth specified in MIL-DTL-31011. The color shall be Foliage Green 504.

3.3.3 Tape, nylon. The tape for suspender loops shall be 1/2 inch flat nylon tape, Foliage Green 504, conforming to type III of MIL-PRF-5038.

3.3.4 Drawcord, elastic. The trouser drawcord shall be 3/16 inch diameter nylon elastic, Foliage Green 504, conforming to type II of MIL-C-43701. All ends shall be heat seared and knotted.

3.3.5 Fastener tape, hook and loop. The nylon fastener tapes shall be Foliage Green 504 conforming to type II, class 1 of A-A-55126 and in the widths specified in table II.

3.3.6 Fastener, slide, interlocking. All slide fasteners shall conform to A-A-55634, lengths shall be as specified, and the color shall be Foliage Green 504. Each slide fastener slider shall be equipped with a thong, Foliage Green 504.

3.3.7 Barrel lock. The barrel locks for the ends of the drawcords shall be Foliage Green 504, ITW Nexus Barreloc or equivalent.

3.3.8 Fastener, snap. The stud and post parts of the snap fastener shall be Foliage Green 504, style 2A, finish 2 male and female complete, consisting of stud and eyelet

MIL-DTL-32185

size 1 or 2 with button size 1 or 2 and socket conforming to MIL-F-10884, except an uncapped button may be used in areas where the surface will be concealed by a layer of base cloth.

3.3.9 Thread. The thread for all seaming and stitching shall be polyester, size B, 2 or 3 ply, conforming to type I, class 1, subclass B of MIL-DTL-32072. As an alternate, size 40, 2 or 3 ply polyester core thread conforming to A-A-50199 may be used. All thread shall be water-repellent treated as specified in MIL-T-3530. The thread color shall be Foliage Green 504.

3.3.10 Labels. Each trouser shall have a class I identification label, class 2 size label, and a class 3 instruction label, or a class 14 combination size, identification and instruction label conforming to type VI of MIL-DTL-32075. The label color shall be Foliage Green 504. The labels shall show fastness to laundering.

3.3.10.1 Identification label. The identification labels shall read "TROUSERS, COLD WEATHER, UNIVERSAL CAMOUFLAGE".

3.3.10.2 Size label. The size label shall be as follows:

X-Small X-Short

Inseam: Up to 26-1/2 in.

Waist: Up to 27 in.

Stock No: 8415-01-526-9039

NATO Size: 6067/5869

Small X-Short

Inseam: Up to 26-1/2 in.

Waist: 27 to 31 in.

Stock No: 8415-01-526-9046

NATO Size: 6067/6979

Medium X-Short

Inseam: Up to 26-1/2 in.

Waist: 31 to 35 in.

Stock No: 8415-01-526-9059

NATO Size: 6067/7989

X-Small Short

Inseam: 26-1/2 to 29-1/2 in.

Waist: 27 to 31 in.

Stock No: 8415-01-526-9044

NATO Size: 6775/5869

Small Short

Inseam: 26-1/2 to 29-1/2 in.

Waist: 27 to 31 in.

Stock No: 8415-01-526-9050

NATO Size: 6775/6979

Medium Short

Inseam: 26-1/2 to 29-1/2 in.

Waist: 31 to 35 in.

Stock No: 8415-01-526-9060

NATO Size: 6775/7989

Large Short

Inseam: 26-1/2 to 29-1/2 in.

Waist: 35 to 39 in.

Stock No: 8415-01-526-9064

NATO Size: 6775/8999

MIL-DTL-32185

X-Small Regular

Inseam: 29-1/2 to 32-1/2 in.
 Waist: Up to 27 in.
 Stock No: 8415-01-526-9043
 NATO Size: 7583/5869

Medium Regular

Inseam: 29-1/2 to 32-1/2 in.
 Waist: 31 to 35 in.
 Stock No: 8415-01-526-9062
 NATO Size: 7583/7989

X-Large Regular

Inseam: 29-1/2 to 32-1/2 in.
 Waist: Over 39 in.
 Stock No: 8415-01-526-9072
 NATO Size: 7583/9909

Small Long

Inseam: 32-1/2 to 35-1/2 in.
 Waist: 27 to 31 in.
 Stock No: 8415-01-526-9054
 NATO Size: 8390/6979

Large Long

Inseam: 32-1/2 to 35-1/2 in.
 Waist: 35 to 39 in.
 Stock No: 8415-01-526-9068
 NATO Size: 8390/8999

Small Regular

Inseam: 29-1/2 to 32-1/2 in.
 Waist: 27 to 31 in.
 Stock No: 8415-01-526-9053
 NATO Size: 7583/6979

Large Regular

Inseam: 29-1/2 to 32-1/2 in.
 Waist: 35 to 39 in.
 Stock No: 8415-01-526-9069
 NATO Size: 7583/8999

X-Small Long

Inseam: 32-1/2 to 35-1/2 in.
 Waist: Up to 27 in.
 Stock No: 8415-01-526-9048
 NATO Size: 8390/5689

Medium Long

Inseam: 32-1/2 to 35-1/2 in.
 Waist: 31 to 35 in.
 Stock No: 8415-01-526-9065
 NATO Size: 8390/7989

X-Large Long

Inseam: 32-1/2 to 35-1/2 in.
 Waist: Over 39 in.
 Stock No: 8415-01-526-9070
 NATO Size: 8390/9909

3.3.10.3 Combination identification/size label. A combination identification/size label conforming to type VI, class 4 of MIL-DTL-32075 may be used.

3.3.10.4 Care instruction label. The care instruction label shall be as follows:

TROUSERS, COLD WEATHER, UNIVERSAL CAMOUFLAGE

WARNING!! DO NOT STARCH, BLEACH, DRY CLEAN OR PRESS THE ECWCS TROUSERS

A. Home Laundering (machine/hand): Permanent press or normal cotton sturdy machine setting or hand washing using a detergent. Rinse thoroughly in warm water.
 Note: Any residual detergent on the trousers will decrease the water repellency.

Home Drying: Tumble dry on permanent press or cotton sturdy setting. Remove immediately from dryer. To drip dry, place on rust-proof hanger.

MIL-DTL-32185

B. Post Laundry: Trousers shall be laundered utilizing "Natick Formula I".

C. Field Laundry: Trousers shall be laundered utilizing "Formula VIII" of FM 42-414. Post/Field Drying: Tumble dry at low temperature setting. Remove immediately from dryer. Do not overheat or over dry.

D. Restoration of Water Repellent Finish. Trouser shall be laundered utilizing Natick Formula XI. Dry at a temperature not to exceed 150°F.

3.3.10.5 Combination size, identification, and instruction label. The identification label, size label, and instruction label may be combined into one label, conforming to type VI, class 14 of MIL-DTL-32075. The three labels shall be printed as one continuous label with the size label first and the identification and instruction labels placed below the size label. The size and identification labels may be combined and the contents placed above the instruction label. A space of 1/2 inch minimum shall be maintained between the labels. In addition, a solid line 1/16 inch minimum width shall extend across the entire label, approximately in the middle of the 1/2 inch blank space. The coating requirement shall conform to the class 3 label.

3.3.10.6 Label/tag. Each of the trousers shall be individually barcoded with the type VIII, class 17 label/tag of MIL-DTL-32075. The label/tag shall be attached to the slide fastener thong of the front fly.

3.3.11 Eyelet metallic. The eyelet for the trouser grown on waistband shall be Stimpson telescoping eyelet with neck washer, part numbers A1215 and A665 or equal (see 6.5). The metal used shall be brass with a dull Foliage Green 504 chemical finish.

3.3.12 Non-wicking buffer. The non-wicking buffer shall be a polyurethane adhesive, 2 inches wide and a minimum of 4.5 ml thick.

3.4 Design. The trousers shall be camouflage to the outside with an elastic drawcord at the waist, slide fastener fly opening and ankle openings with fastener tape adjustment tabs.

3.5 Patterns. Standard patterns which provide an allowance of 1/4 inch for all sealed seams and 3/8 inch for all other seams, will be furnished by the Government. The Government patterns shall not be altered in any way and are to be used only as a guide for cutting the contractor's working patterns. The working patterns shall be identical to the Government patterns.

3.5.1 Pattern parts. The component parts shall be cut from the material specified and according to the number of parts listed in Table III.

MIL-DTL-32185

TABLE III. List of Pattern Parts

Material	Nomenclature	Parts
TROUSER		
Cloth, laminated	Front	2
	Back	2
	Pocket flap	2
	Ankle tab	2
	Pocket facing	2
Cloth, nylon	Cargo pocket	2
	Cargo pocket flap	2
	Seat patch	2
	Knee patch	2
Cloth, 3-layer knit	Leg insert (outer)	2
	Leg insert (inner)	2

3.6 Construction. The construction shall conform in all respects to the requirements specified in table II and herein.

3.6.1 Stitches, seams, and stitching. All stitches, seams and stitching shall conform to ASTM-D-6193. The type of seam, stitching and stitches per inch shall be as specified in Table IV. Seam allowances shall be maintained with seams sewn so that no raw edges, run-offs, pleats, puckers or open seams occur. When two or more methods of seams or stitches are given for the same operation, any one may be used.

3.6.1.1 Type 301 stitching. Ends of all stitching shall be backstitched or overstitched not less than 1/2 inch except where ends are turned under or caught in other seams or stitching. Ends of a continuous line of stitching shall over-lap not less than 1/2 inch. Thread tensions shall be maintained so that there will be no loose stitching resulting in loose bobbin or top thread or excessively tight stitching resulting in puckering of the materials sewn. The lock shall be embedded in the materials sewn.

3.6.1.1.1 Repairs of type 301 stitching.

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

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

MIL-DTL-32185

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

3.6.1.2 Types 504, 515, and 516 stitching. Thread tension shall be maintained so that there will be no loose stitching. All repairs shall be in accordance with 3.6.1.1.1a and b. thread tension shall be maintained so that there will be no loose or excessively tight stitching resulting in puckering of the materials sewn.

3.6.1.3 Bartacks. Unless otherwise specified, all bartacks shall be $3/8 \pm 1/16$ inch long and $1/8 \pm 1/32$ inch wide, and shall contain 28 stitches. Bartacking shall be free from thread breaks and loose stitching.

3.6.1.4 Automatic stitching. Automatic machines may be used to perform any of the required stitch patterns provided the requirements for the stitch pattern, stitches per inch, and size and type of thread are met; and at least three tying, overlapping or back stitches are used to secure the ends of the stitching.

3.6.1.5 Thread ends. All thread ends shall be trimmed to a length of not more than 1/4 inch unless otherwise specified.

3.7 Heat sealing. Seams and stitching as indicated in table II shall be sealed with heat sealing tape on the inside of the trousers. The entire width of the seam tape shall be uniformly sealed over the seam or stitching. All seam tapes shall be applied without tension and shall be applied so that a minimum of 1/8 inch overlap is on both sides of the sewn seam and the back knit of the fabric adjacent to the seam tape shall not be melted to expose the plastic film layer of the fabric. All seam tapes shall overlap a minimum of 3/4 inch at joining points and all ends of seam tape or taped cross-over areas shall be spot sealed without additional repair tape in accordance with seam tape manufacturer temperature, time and pressure recommendations for application with cross-over heat sealing machine. As an alternate, spot sealing for taped ends can be eliminated if hot-air seam tape machine can automatically cut and seal ends of seam tape without any loose ends. However, spot sealing for taped cross-over areas shall remain sealed. Seams, cross-over areas and sealed stitching show no leakage, tape ends shall show no signs of lifting, and the tape itself shall show no sign of lifting, curling, bubbling or separation more than 1/8 inch of tape top knit shrinkage such that the tape middle layer is exposed when tested initially and after five laundering cycles as specified in 4.5.3.

3.7.1 Appearance after laundering: After five laundering cycles as specified in 4.5.3, the fabric shall show no loss in color in the printed areas of the universal camouflage pattern greater than a visual "5" rating on the AATCC gray scale for evaluating change in color and also shall show no significant change in physical surface appearance when compared to an unlaundered trousers in both fabric and taped areas. Minor defects not affecting appearance, such as puckering or seam line or creases around taped area due to manufacturing operations are acceptable and shall be used for comparison to laundered sample.

MIL-DTL-32185

3.8 Manufacturing operations requirements. The trousers shall be manufactured in accordance with operation requirements specified in table II. The contractor is not required to follow the exact sequence of operations listed. Any holding or basting stitch is permissible provided it is removed, does not show on the finished trousers, and does not interfere with proper seam taping of the trousers.

3.8.1 Repairs. Repairing the trousers by mending, patching, or darning is not allowed and at no time is the removal of heat sealing tape permitted. However, up to 25 inches of heat sealing tape may be used for repairing leaking seams, missing yarns in the tricot knit, and for repair areas where the original tape does not overlap sewn seams by the minimum 1/8 inch on both sides of the inside of the trousers. Up to five repair areas totaling 25 inches in length will be allowed. No more than five inches of repair using more than two layers of seam sealing tape is permitted.

3.9 Abbreviations in Table of Operations. The abbreviations used in Table II are as follows:

Stch	- Stitch	Lpr	- Looper
Btn	- Button	Mchne	- Machine
Btnhl	- Buttonhole	Brtck	- Bartack
Incl	- Including	Comrcl	- Commercial
Dbl	- Double	Smlr	- Similar
In	- Inch		
Ndl	- Needle		
Bob	- Bobbin		

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS

NO.	OPERATION	THREAD NDL BOB/ LPR		
1.	<p><u>Cutting and marking.</u></p> <p>a. Cut the trousers in strict accordance with patterns furnished which show size, shape, directional lines, and notches for proper assembly of parts. The directional lines indicate the warp, unless otherwise specified. The directional lines may vary from the warp direction by not more than 2-1/2 inches on both fronts and backs. Measurements shall be taken from top and bottom of directional lines on pattern to selvage edge of the fabric and the difference between the two measurements shall not exceed 2-1/2 inches. Cut all parts of the trousers from one piece of material, except under side of leg insert, belt and suspender loops, and pocket facings.</p> <p>b. Shear cut fastener tapes and hot wire cut suspender loops in lengths in inches as follows:</p> <table><tr><td>Fastener tapes for the leg tabs-(hook)-1-1/2 inch (all sizes) with a tolerance of ± 1/4 inch;</td><td>Fastener tapes (pile) 6-3/4 inch (all sizes) with a tolerance of ±1/4 inch</td></tr></table> <p style="text-align: center;"><u>Suspender loops</u> 6-1/2 inch (all sizes) with a tolerance of ± ¼ inch</p>	Fastener tapes for the leg tabs-(hook)-1-1/2 inch (all sizes) with a tolerance of ± 1/4 inch;	Fastener tapes (pile) 6-3/4 inch (all sizes) with a tolerance of ±1/4 inch	
Fastener tapes for the leg tabs-(hook)-1-1/2 inch (all sizes) with a tolerance of ± 1/4 inch;	Fastener tapes (pile) 6-3/4 inch (all sizes) with a tolerance of ±1/4 inch			

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	THREAD NDL BOB/ LPR																																																																				
1.	<p><u>Cutting and marking.</u>(cont.)</p> <p>c. Belt loops shall be cut 2-3/4 ± 1/4 inches in length. Size X-small and Small require 5 loops. Medium, Large and X-large will require 7 loops.</p> <p>d. Leg slide fasteners shall be in lengths as indicated on patterns.</p> <p>e. Fly slide fasteners shall be in the following lengths per size stated:</p> <table><tr><td>X-Small</td><td>Small</td><td>Medium</td><td>Large</td><td>X-Large</td><td></td></tr><tr><td></td><td></td><td></td><td>X-Short</td><td></td><td></td></tr><tr><td>6-1/2</td><td>7</td><td>7-1/2</td><td>8</td><td>8-1/2</td><td></td></tr><tr><td></td><td>Short</td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td>7-1/2</td><td>8</td><td>8-1/2</td><td>9</td><td></td></tr><tr><td></td><td></td><td></td><td>Regular</td><td></td><td></td></tr><tr><td>7-1/2</td><td>8</td><td>8-1/2</td><td>9</td><td></td><td>9-1/2</td></tr><tr><td></td><td>Long</td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td>8-1/2</td><td>9</td><td></td><td>9-1/2</td><td>10</td></tr></table> <p>Hot wire cut drawcords in lengths in inches as follows:</p> <table><tr><td>X-Small</td><td>Small</td><td>Medium</td><td>Large</td><td>X-Large</td><td>Total</td><td></td></tr><tr><td>38</td><td>42</td><td>46</td><td>50</td><td>54</td><td></td><td>±1</td></tr></table> <p><u>Note:</u> As an alternate to hot wiring, drawcord ends may be dipped or impregnated with cellulose acetate or cellulose butyrate</p>	X-Small	Small	Medium	Large	X-Large					X-Short			6-1/2	7	7-1/2	8	8-1/2			Short					7	7-1/2	8	8-1/2	9					Regular			7-1/2	8	8-1/2	9		9-1/2		Long					8	8-1/2	9		9-1/2	10	X-Small	Small	Medium	Large	X-Large	Total		38	42	46	50	54		±1	
X-Small	Small	Medium	Large	X-Large																																																																		
			X-Short																																																																			
6-1/2	7	7-1/2	8	8-1/2																																																																		
	Short																																																																					
7	7-1/2	8	8-1/2	9																																																																		
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7-1/2	8	8-1/2	9		9-1/2																																																																	
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8	8-1/2	9		9-1/2	10																																																																	
X-Small	Small	Medium	Large	X-Large	Total																																																																	
38	42	46	50	54		±1																																																																
2.	<p><u>Replacement of damaged parts.</u></p> <p>Care shall be exercised during the spreading, cutting, and manufacturing operations to assure that material defects and damages, as specified in 4.4.2, are removed and replaced with non-defective and properly matched material.</p>																																																																					

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR	
3.	<u>Marking.</u> Mark, ticket, or bundle all component parts to insure a correct shade and size throughout the trousers. Markings shall not be visible on the outer shell of the trousers. Drill holes shall not be used.					
4.	<u>Assemble ankle tabs.</u> a. Position a 1-1/2 \pm 1/4 inch piece of 1-1/2 inch hook fastener tape to the face side of tab per marks on patterns and stitch on all four sides 1/3 to 3/16 inch from edge. b. Fold tab in half, face side out, folding raw edges in 3/8 inch and stitch 1/8 to 3/16 inch from folded edges, tacking ends.	301 301 or 401	LSbj-1 EFn-2	10-13 10-13	B	B
5.	<u>Assemble leg insert.</u> a. Align leg insert(top pieces) face side to back side bottom and stitch together 1/4 inch from edges along top, sides and bottom. b. Turn leg insert, force out corners and top stitch 1/16 to 1/8 inch from edges.	301 or 401 301	SSe-2(a) SSe-2(b)	10-13 10-13	B	B

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
6.	<u>Make pocket flaps.</u> a. Set snap on pocket flap, according to marks on pattern with cap on backside of the fabric. b. Fold the flap in half (face side together) and stitch together 3/8 inch from edges along sides. c. Turn, work out edges and topstitch 3/16 to 1/4 inch from folded edge.	301 or 401	SSe-2(a)	10-13	B B
		301 or 401	SSe-2(b)	10-13	B B
7.	<u>Make expandable cargo pocket flaps.</u> a. Position two 1-3/4 inch pieces of one inch wide pile fastener tape to pocket flap according to marks on pattern and stitch on all four sides 1/8 to 3/16 inch from edge. b. Fold flap in half (face sides together) and stitch 3/8 to 1/4 inch from edge on both sides, tacking ends. c. Turn, force out corners and top stitch 1/8 inch from folded edge around sides and bottom with a double row of stitching, 3/16 to 1/4 inch gage.	301	LSbj-1	10-13	B B
		301	SSe-2(a)	10-13	B B
		301	SSe-2(b)	10-13	B B

MIL-DTL-32185

TABLE IV.MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
8.	<u>Assemble cargo Pocket</u>				
	a. Hem the top edge of cargo pockets by folding the raw edge 3/4 inch down and stitch 1/2 to 5/8 inch from the folded edge.	301	EFa-1	10-13	B B
	b. Position two strips of 1 inch wide, 2 inches long, loop fastener tape to the face side of the pockets per marks on pattern and stitch on all four sides 1/8 to 3/16 inch from edge.	301	EFa-1	10-13	B B
	c. Hem the bottom edge of pockets by folding the raw edge up 1/9 inch and stitch 1/16 to 1/8 inch from folded edge.	301	EFa-1	10-13	B B
	d. Form bellows by folding the side edges of pocket 2 inches and stitch 1/16 to 1/8 inch from folded edge.	301	EFa-1	10-13	B B
9.	<u>Attach knee patches.</u>				
	a. Position knee patch face side up, to face side of trousers and line with insert opening of right front, per marks on patterns.				
	b. With raw edges aligned stitch knee patch along insert opening, 1/8 inch (+1/16, -0) from edge.	301 or 401	SSa-1	10-13	B B
	c. With bottom and top of knee patch folded under 1/2 inch, position per notches on pattern,	301 or 401	LSd-1	10-13	B B

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

[illegible]

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
11.	<u>Set pocket flaps and facings for pocket openings.</u> cont.				
	c. Place flap raw edge 1/2 inch above pocket opening. Stitch 1/3-3/16 inch from raw edge. Turn flap down toward pocket opening and stitch 1/4 to 5/16 inch from fold.	301	LSbk-2(a)	10-13	B B
		301	LSbk-2(a)	10-13	B B
	d. Heat seal pocket opening along top and both sides of facing, being careful not to restrict opening. Repeat for other side.				
	e. Set one stud to each pocket opening, matching up to the snap cap on the pocket flap.				
12.	<u>Join side seam.</u>				
	a. Place right trouser front and right trouser back face to face, with top of slide fastener opening even and raw edges in alignment, and stitch from top of slide fastener opening 1/4 inch from raw edge to trouser top. Repeat for left side				
	b. Heat seal side seam.				

MIL-DTL-32185

TABLE IV.MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
13.	<u>Set cargo pockets and cargo pocket flaps to trousers.</u> a. Turn left and right sides of pocket in 1/4 inch and topstitch 1/16 to 1/8 inch from edge. Continue to topstitch pockets at prehemmed bottom (with bottom turned in and forming pleat on each side of pocket). Pockets are adjacent to the upper edge of leg insert and in accordance with marks on pattern.	301	SSb-1	10-13	B B
	b. Position preassembled cargo pocket flaps to trouser, per marks on pattern. Stitch 1/8 to 3/16 inch from raw edge from beginning to end of flaps.	301	LSbk-2(a)	10-13	B B
	c. Fold pocket flap down and top stitch 1/4 to 5/16 inch from folded edge.	301	LSbk-2(a)	10-13	B B
14.	<u>Attach leg insert/slide fastener.</u> a. Position closed slide fastener face up on face side of leg insert. With raw edges of leg insert and slide fastener tape even, stitch 1/4 inch from edge.	301	SSa-1	10-13	B B

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
14.	<u>Attach leg insert/slide fastener.</u> cont.				
	b. Tongue notch top of leg opening. Position face side of slide fastener/insert to face side of front leg opening, insert ankle tab, face side up. Between front leg opening and slide fastener, with raw edges of slide fastener insert, ankle tab, and leg opening even, stitch 1/8 inch from edge.	301	Laq-2(b)	10-13	B B
	c. Position face side of slide fastener to face side of back leg opening. With raw edge of back leg opening and slide fastener tape even, stitch 1/8 inch from edge.	301	LSq-2(b)		B B
	d. Topstitch slide fastener 1/16 to 1/8 inch from folded edges on both sides of slide fastener and across notch, tacking ends.	301	LSq-2	10-13	B B
15.	<u>Heat seal knee patches leg inserts. seat patches slide fastener seam cargo pocket and cargo pocket flap.</u>				
	a. Lay all seam sealing tape to wrong side of trousers, completely covering seam or stitching and heat seal.				
	b. Heat seal knee patch stitching across top and bottom.				

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR	
15.	<p><u>Heat seal knee patches, leg inserts, seat patches slide fastener seam. cargo pocket and cargo pocket flap. cont.</u></p> <p>c. Heat seal cargo pocket and flap stitching.</p> <p>d. Heat seal sides and top of slide fastener seam. Seal the length of the slide fastener seam on the back leg slide fastener seam, and to the top of the knee patch on the front leg slide fastener seam.</p> <p>e. Spot seal corner of knee patch.</p> <p>f. Spot seal heat seaming tape across top of insert</p> <p>g. Heat seal seat patch stitching. The tape shall be cut and repositioned at each corner.</p> <p>h. Spot seal corner and end by side entry.</p>					
16.	<p><u>Assemble front fly.</u></p> <p>a. Overedge stitch around edge of fly, from top of trousers around bottom of fly curve.</p> <p>b. With slide fastener closed and face up, position to right side of right front of trousers and stitch 1/16 to 1/8</p>	<p>504 or 516</p> <p>301</p>	<p>Efd-1</p> <p>SSa-1</p>	<p>10-13</p> <p>10-13</p>	<p>B</p> <p>B</p>	<p>B</p> <p>B</p>

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS(cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR	
16.	<u>Assemble front fly.</u> cont. inch from edge of slide fastener tape, from top to bottom of slide fastener stop, and tacking ends with tape extension folded under to top of stop.	301	SSa-1	10-13	B	B
	c. Position left slide fastener tape to left front of trousers with right sides together and stitch 1/8 inch from tape edge tacking ends.	301	SSa-1	10-13	B	B
	d. Position left and right trouser fronts with right sides together and crotch seam edge aligned. Stitch 1/9 inch from raw edge from inseam edge to 1/2 inch past curved edge tacking both ends. Turn to face side and with seam turned to the left side, edge stitch 1/8 inch from fold seam.	301	SSb-1	10-13	B	B
	e. Fold the left front fly to the inside per marks on pattern and stitch through trousers and slide fastener and fly, from top to form J curve under slide fastener stop, tacking end.	301	SSa-1	10-13	B	B
					B	B
	f. Stitch the bottom of fly extension together with edges aligned for 1-1/2 inch (min) at curve g. Place a 3/8 inch horizontal bartack across the right side of the zipper tape 1/8 inch from tape fold			28 bar- tack		

MIL-DTL-32185

TABLE IV.MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCH IN	THREAD NDL BOB/ LPR	
17.	<p><u>Close trousers and heat seal seams.</u></p> <p>a. With right sides together and edges aligned join center back seam, stitching 1/4 inch from raw edge, tacking ends.</p> <p>b. With right sides together and edges aligned close inseam by stitching 1/4 inch from raw edge, tacking ends. Crotch and seat seams shall not be staggered more than 1/4 inch (measurement taken from center of seams.)</p> <p>c. Lay all seam sealing tape to wrong side of trousers, completely covering seam or stitching and heat seal.</p> <p>d Back center seam shall lie on same side of trousers as crotch seam.</p> <p>e. Inseam shall lie towards either side of the trousers.</p> <p>f. Starting at top edge of back, heat seal seat and crotch seam to bottom of front fly.</p> <p>g. Starting at bottom of leg, heat seal to crotch. Repeat other leg. As an alternate, heat seal seam from bottom of leg to crotch, and continue down inseam of other leg.</p>	301	LSb-1	10-13	B	B
		301	SSa-1	10-13	B	B

MIL-DTL-32185

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
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MIL-DTL-32185

17.	<u>Close trousers and heat seal seams.</u> cont. h. Spot seal crotch.					
18.	<u>Apply non-wicking buffer. hem trousers (and attach fastener tape).</u> a. Attach (heat seal) a 2 inch wide non-wicking buffer tape over the in side bottom of legs and insert 1-5/8 (+ 1/4) inches above bottom raw edge, no less than 1/4 inch from ends. b. Position a 6-3/4 inch strip of 1-1/2 inch pile fastener tape to bottom of back leg per marks on pattern and stitch on all four sides 1/8 to 3/16 inch from edge. NOTE: Start pile fastener tape at mark closest to insert c. Turn bottom edge of right leg to inside 1/2 inch. Fold over 1/2 inch, and stitch 1/16 to 3/32 inch from fold around leg. Repeat for left leg.	301	LSbj-1	10-13	B	B
		301	EFb-1	10-13	B	B
19.	<u>Hem waist.</u> a. Position eyelet reinforcement or buttonhole on inside of right side on mark for eyelet and attach eyelet through reinforcement piece and trousers. The eyelet shall be centered on the reinforcement	304	Whip or purl btnhl type	42-46/70/2 including tack	70/2 or B	B

TABLE IV.MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCH IN	THREAD NDL BOB/ LPR
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MIL-DTL-32185

Hem waist (continued). piece. Thread end of drawcord through eyelet.					
	b. Overedge top raw edge of trousers.	515 or 516	SSa-2	10- 13	B B
	c. Insert drawcord. Turn top of trousers over draw- cord, align top edge at notches provided on pattern and stitch with one row of stitching 3/16 inch to 1/4 inch from overedge stitching edge, catching combina- tion label on the left of seat seam.	301	EFt-1	10- 13	B B
NOTE: The drawcord shall not be caught in the stitching,					
	d. Attach barrel locks and knot drawcord ends.				
	e. Position suspender loop tapes to fronts per marks on patterns. Fold raw edges of tapes under 3/8 inch with edges of tapes extending toward top of waist and bartack in place with a 3/8 inch horizontal bartack. The suspender loops shall finish 5-1/4 ±1/8 inches (from outer edges of bartack) in length.	3/8 inch bar- tack		21- 28	B B

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
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MIL-DTL-32185

20.	<p><u>Set snaps.</u></p> <p>a. Set cap to outside of left fronts on waistband aligned with center of fly.</p> <p>b. Set three studs, one to outside of right waistband to match with cap on left and one to each side entry to match with cap on entry flaps.</p>					
21.	<p><u>Make belt loops.</u></p> <p>a. Make stripping for belt and suspender loops by folding stripping with the edges abutted at center and stitch with each row of stitching not less than 1/16 inch from edge and the covering stitch on the underside. The finished stripping shall measure 5/16 to 3/8 inch wide.</p> <p>b. All belt loop openings shall measure $1-7/8 \pm 1/8$ inches from bartacking of loop to folded edge. The tacking shall extend the width of the loops. All loops shall be vertically straight. The center back loops shall be centered on seat seam. Sizes X-small and small will require 5 loops. Medium, Large, and X-large will require 7 loops.</p>	406	EFh-1	10-13	B	B

TABLE IV. MANUFACTURING OPERATIONS REQUIREMENTS (cont.)

MIL-DTL-32185

NO.	OPERATION	STCH TYPE	SEAM/ STCH TYPE	STCHIN	THREAD NDL BOB/ LPR
22.	<p><u>Attach belt loops</u></p> <p>a. X-Small and Small Attach 5 belt loops to trouser waist: one on each frontside of side seam, one on right side of seat joining seam and one centered on each side of pant front panels.</p> <p><u>Medium large and X-large.</u> Attach 7 belt loops to trouser waist: one on each frontside of side seam, one on right side of seat joining seam, one centered on each side of pant front panels, and one centered on each side of pant back panels.</p> <p>b. Fold belt loop under 3/8 inch and place fold even with top of trousers and bartack in place. Fold under bottom edge of beltloop 3/8 inch and bartack with horizontal bartack 1/8 inch from fold. The finished loop will have a concealed tack at top and exposed tack at bottom.</p>	3/8 inch bar- tack		21- 28	B B
23.	<p><u>Exam and trim thread ends</u></p> <p>Trim thread ends to a minimum of 1/4 inch and remove any spots, and insert zipper thongs.</p>				

1/ With trousers fastened measure along center of waistband from folded edge to folded edge.

MIL-DTL-32185

2/ Measure inseam of trousers from crotch seam to bottom edge of trouser leg hem.

3/ Fasten slide fastener and ankle tab at leg insert. Snap pocket welt. With trouser flat, measure from top of waistband above front edge of welt to trouser leg hem below the ankle tab seam attachment at gusset front.

3.10 Workmanship. The finished trousers shall conform to the quality of product established by this specification. The occurrence of defects shall not exceed the applicable acceptable quality level.

4. VERIFICATION

4.1 Classification of inspections. 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. When a first article is required (see 3.1 and 6.2), it shall be examined for the defects specified in 4.2.1 and 4.5.2 and tested as specified in 4.5.3.

4.2.1 End item visual examination. The end items shall be examined for the defects listed in table V. The lot size shall be expressed in units of trousers. The sample unit shall be one of the trousers.

TABLE V. End item visual defects

Examine	Defect	Classification	
		Major	Minor
Materials defects and damages	Any smash, multiple float or loose slub	101	
	Cut, tear, mend, burn, needle chew, or hole	102	
	Misweave area of poor dye penetration dyestreak, broken or missing yarn, visible mend, thin place, or shade bar <u>1/</u>	103	201

TABLE V. End item visual defects – Continued.

Classification

MIL-DTL-32185

Examine	Defect	Major	Minor
Cleanliness	Any spot, streak, or stain of a permanent nature on any portion of trousers which would be visible when trousers are worn		202
	Removable spot, streak, or stain on outside of trousers		203
	Thread ends not trimmed throughout trousers		204
	Any holding or basting threads visible on the outside of the finished trousers when applicable		205
Component and assembly	Any defective component 1/	104	206
	Any component part omitted	105	
	Any required operation omitted or improperly performed 1/	106	207
Drawcord	Any drawcord caught in waistband stitching restricting use of drawcord	107	
	Any end not heat sealed		208
	Any drawcord omitted	108	
	Any end not knotted or not having a toggle		209
	Any drawcord insufficient in length	109	
	Any drawcord not caught in center back bartack		210
Slide fastener	Any part of slide fastener bent, broken, or otherwise defective	110	
	Not closing and locking properly	111	
	Length not as specified	112	
	Color not as specified		211
	Thong not as specified		212
Labels	Missing, illegible or incorrect	113	
	Incorrectly placed or attached		213

TABLE V. End item visual defects - Continued.

Classification

MIL-DTL-32185

Examine	Defect	Major	Minor
Accuracy of seaming	Seam twisted, pleated, or puckered 1/	114	214
	Part of trouser caught in any unrelated operation or stitching 1/	115	215
	Thread break secured by stitching back of the break less than 1/2 inch		216
	Ends of all seams and stitchings when not caught in other seams or stitching, backtacked less than 1/2 inch		217
	Color of thread not as specified		218
	Gage of stitching not as specified		219
	Edge of seam tape less than 1/8 inch from seam allowance	116	
	Any sealing tape with wrinkle, turn under, or pleat 1/	117	220
	Any seam tape not located as specified (see 3.7)		221
	Any required stitching not covered by seam tape	118	
Heat sealed seams and non-wicking buffer	Any area where heat sealing tape has been removed 1/	119	222
	Any seam tape not 1/8 inch overlap on each side of sewn seam	120a	
	Any seam tape not overlapped 3/4 inch minimum	121	
Heat sealed seams (cont.)	Any needle punctures that have not been repaired using heat sealing tape		223
	Any area of knit fabric bordering the seam tape that is melted exposing film	122	
	More than two layers of heat sealing tape in any one area 1/	123	224
	Non-wicking buffer missing	124	
	Non-wicking buffer not properly		

TABLE V. End item visual defects – Continued.

Classification

MIL-DTL-32185

Examine	Defect	Major	Minor
	placed	125	
Repairs	Any heat sealing repairs extending beyond 25 inches in length <u>1/</u>	126	225
	More than five repairs on any one item <u>1/</u>	127	226
Seam tape adhesion	Seam tape lifting off fabric within 3/4 inch of seam <u>1/</u>	128	227
	Visible scorching (heat degradation of the fabric on the laminate) in excess of 3/16 inch in width or 1/2 inch in length at any location along a taped seam. The length requirement shall not apply to the leg insert seams <u>1/</u>	129	228
Open seams	More than 1/8 inch up to 1/4 inch		229
	More than 1/4 inch	130	
NOTE: One or more broken or two or more continuous skipped or run-off stitches constitute an open seam. On double stitched seams, a seam is considered open when one or both sides of the seam is open. Raw edge not securely caught in stitching shall be classified as an open seam.			
Seams and stitchings	Not specified seam or stitch type	131	
	Missing, broken, or skipped stitches <u>1/</u>	132	230
Stitch tension	Loose tension in any area: - more than 1 inch but not more than 2 inches		231

TABLE V. End item visual defects - Continued.

Classification

MIL-DTL-32185

Examine	Defect	Major	Minor
	- more than 2 inches	133	
	Tight tension (stitches break when normal strain is applied to the seam or stitching)	134	
Stitches per inch (to be scored only when the condition exists on major portion of the seam)	Less than minimum specified:		
	- one stitch		232
	- two or more stitches	135	
	More than maximum specified		233
Shaded parts	Variation in shade within an outside part <u>1</u> /	136	234
	Any part required to be cut from one piece of material, shaded <u>1</u> /	137	235
NOTE: Parts suspected as being shaded shall be examined at a distance of three feet against the background of the other parts and colors of the garment. When shade difference is readily discernible under these examining conditions, it shall be scored as a shaded part.			
Bottom hems	Width not as specified		236
	Hems uneven at leg insert by more than 1/4 inch		237
Bartacks	Bartack omitted	138	
	Any bartack not in specified location, insecure, or not serving intended purpose:		
	- more than two	139	
	- two or less		238

TABLE IV. End item visual defects - Continued.

Classification

MIL-DTL-32185

Examine	Defect	Major	Minor
	Any loose stitching, incomplete or broken		239
	Length or width not as specified		240
Inseams	Inseam staggered at crotch more than specified (center to center)		241
	Crotch and seat seam staggered at inseam more than specified (center to center)		242
Ankle tab	Missing	140	
	Improperly located or not width specified 1/	141	243
Snap fasteners	Any part of assembly missing, mismatched, broken, cracked, bent, not securely clinched, affecting function:		
	- two or more snap fasteners	142	
	- one snap fastener		244
	One or more clinched too tightly cutting surrounding fabric	143	
	Loose, i.e., socket or stud spins freely or wobbles in connection portions		245
	One or more having rough or sharp edges	144	
Label/tag	Bar-code omitted or not readable by scanner		246
	Causes damage to trousers	145	

1/ This defect shall be scored as major when seriously affecting serviceability and as minor when affecting serviceability but not seriously.

4.3 Conformance inspection. Unless otherwise specified, sampling for inspection shall be in accordance with ANSI/ASQC Z1.4

4.3.1. Component testing. The components specified in paragraphs 3.3.1.1, 3.3.1.2 and 3.3.2 shall be tested for the characteristics listed in table VI in accordance with the test method cited.

MIL-DTL-32185

TABLE VI. Component tests requirement.

Characteristic	Reference Paragraph	Test method
Cloth, Reinforcement		
Weight	3.3.1.1	ASTM D-3776 (Method C)
Breaking strength	3.3.1.1	ASTM D-5034
Colorfastness to:		
Crocking	3.3.1.1	AATCC-8
Laundering	3.3.1.1	AATCC-61-1A
Light	3.3.1.1	AATCC-16 Opt. A (after
40 fading units) or E (after		
75 kilojoules)		
Perspiration	3.3.1.1	AATCC-15
Spray rating initial	3.3.1.1	AATCC-22
Spray rating after		
one laundering	3.3.1.1	AATCC-135 & AATCC-22
Stiffness	3.3.1.1	TAPPI-T-451 <u>7/</u>
Puncture Propagation		
Tear (kgf)	3.3.1.1	ASTM D-2582 <u>8/</u>
Resistance to organic liquid	3.3.1.1	AATCC-118
Resistance to Frosting	3.3.1.1	AATCC 119
Dimensional stability	3.3.1.1	AATCC-96 Opt.1C/ AATCC-135
Abrasion Resistance	3.3.1.1	ASTM-D-3884
Infrared reflectance	3.3.1.1	<u>9/</u>
Cloth, three-layer knit		
Weight	3.3.1.2	ASTM D-3776 (Method C)
Stiffness	3.3.1.2	TAPPI -T-451 <u>7/</u>
Hydrostatic Resistance		
(initial taffata restraint)	3.3.1.2	ASTM D-751

1/ Five 4 x 4 inch specimens shall be laid flat, face side up on a glass plate, 4 x 4 inches by 1/4 inch thick. Three drops of diethyltoluamide shall be applied to the center of each specimen. A glass plate shall be placed on each specimen and a four pound weight placed on top. After 16 hours, remove the specimen and test immediately for water permeability.

2/ The water permeability shall be measured as specified in AATCC No. 127, except that a fixed hydrostatic head of 50 centimeters shall be held for 10 minutes, the face side of the test cloth shall contact the water and five specimens shall be tested. The report shall only include measurement of the appearance of water droplets. Leakage is defined as one (1) or more droplets any place within the 4-1/2 inch diameter area.

3/ The specimen, 8 inches by 8 inches, shall be cut and exposed to synthetic perspira-

MIL-DTL-32185

tion as follows: the synthetic perspiration solution shall be made by combining 3.0 grams sodium chloride, 1.0 gram trypticase soy broth powder, 1.0 gram normal propylpropionate, 0.5 gram of liquid lecithin and 500 ml of distilled water. Cover the solution and stir while heating to 50°C until all ingredients are dissolved. Then, cool the solution to 35°C, remove cover and dispense it immediately with a pipette or other suitable measuring device. Dispense 2 ml of perspiration solution at 35°C, onto the center of an 8 inch by 8 inch by 1/4 inch glass plate. Place the specimen on the glass plate with the knit side contacting the glass. Dispense an additional 2 ml of the synthetic perspiration solution onto the center of the specimen. Place second 8 inch by 8 inch by 1/4 inch glass plate on top of the specimen and then place a 4 pound weight on top of and in the center of the assembly. After 16 hours, remove the specimen (do not rinse) and air dry the specimen before testing. Test the specimen for water permeability as specified in AATCC-127.

- 4/ The back side of the test cloth shall face the water, the free stream air velocity shall be 550 ± 50 FPM as measured 2 inches above the fabric specimen. The air flow shall be measured at least 2 inches from any other surface. The specimen cups shall be conditioned in the air stream for not less than 4 hours, nor more than 16 hours, before the initial weighing to start the test. The test shall be run for 24 hours and weight measurements shall be taken at only the start and completion of the test. At the start of the 24 hour test period, the air gap between the water surface and the back of the specimen shall be $3/4 \pm 1/16$ inch. Five (5) initial specimens shall tested.
- 5/ The back side of the test cloth shall face the water. The free stream air velocity shall be 550 ± 50 FPM as measured two (2) inches from any other surface. The specimen cups shall be inverted such that the water inside each cup contacts the back side of the specimen. The cups shall be examined for water seepage/leakage of the specimen or the cup seal; specimen cups exhibiting water seepage/leakage shall be replaced. The test shall run for two (2) hours and weight measurements shall be taken at the start and completion of the test. Five (5) initial specimens shall be tested. The specimens shall be sealed in any manner which prevents water wicking and/or leaking out of the cup.
- 6/ Conduct 20 laundering and drying cycles in accordance with 4.6.2. Each sample, 48 inches in length by full width shall be cut in half across the width of the cloth. One half of the sample (24 inches in length) shall be laundered and the remaining half retained as the unlaundered portion for the final evaluation, as necessary. After each drying cycle, examine both sides of the cloth for changes in physical surface appearance when compared to the unlaundered sample.
- 7/ Preferred Procedure (1) except that five specimens shall be tested under standard textile test conditions as specified in ASTM D-1776.
- 8/ Five warp and five filling specimens shall be tested. Specimen size shall be 8 inches by 8 inches. Only one tear shall be made on a single specimen. The specimen shall be positioned with the face side toward the probe and with the designated yarns of the face fabric at right angles to the direction of the tear. The

MIL-DTL-32185

test shall be conducted using the standard drop height of 508 ± 2 mm. If the tear is not straight on the face side of the specimen, the result shall be considered invalid and another specimen shall be tested. The thickness of the specimen is not measured.

Note: This test will be performed at least once at the beginning of each new contract. The government reserves the right to test this characteristic when samples are sent for verification testing.

9/ Infrared reflectance data shall be determined on the face side of the material and shall be obtained from 600 to 860 nanometers (nm), at a 20 nm intervals on a spectrophotometer relative to a barium sulfate standard, the preferred white standard. Other white reference materials may be used, provided they are calibrated to absolute white, e.g., magnesium oxide, or vitrolite tiles. The spectral band width shall be less than 26 nm at 860 nm. Reflectance measurements may be made by either the monochromatic or polychromatic mode of operation. When the polychromatic mode is used, the spectrophotometer shall operate with the specimen diffusely illuminated with the full emission of a source that simulates either CIE Source A or CIE Source D65. The specimen shall be measured as a single layer, backed with six layers of the same fabric and shade. Measurements shall be taken on a minimum of two different areas and the data averaged. The measurement areas should be at least 6 inches away from the edges of the finished cloth. The specimen shall be viewed at an angle no greater than 10 degrees from normal, with the specular component included. Photometric accuracy of the spectrophotometer shall be within 1 percent and wavelength accuracy within 2 nm. The standard aperture size used in the color measurement device shall be 1.0 to 1.25 inches in diameter. Any color having infrared reflectance values falling outside the limits at four or more of the wavelength specified shall be considered a test failure.

4.4 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.5 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.5.1. Component and material certification. Unless otherwise specified, a certificate of compliance will be acceptable as evidence that the heat sealing tape conforms to the requirements specified in 3.3.2. A certificate of compliance will be acceptable as evidence that the textured nylon cloth conforms to the requirements specified for yarn type, scouring, dying, printing, heat setting, and that an approved, water repellency treatment was used.

4.5.2 End item dimensional examination. The end items shall be examined for conformance to the dimensions specified in table III. Any dimension not within the

MIL-DTL-32185

specified tolerance shall be classified as a defect. The lot size shall be expressed in units of trousers. The sample unit shall be one of the trousers.

TABLE VII. Finished measurements (inches)

	<u>1/2 Waist 1/</u>	<u>Inseam 2/</u>	<u>Outseam 3/</u>
<u>X-Short</u>			
X-Small	15	26-1/8	35
Small	17	26-1/4	35-1/2
Medium	19	26-3/8	36
<u>Short</u>			
X-Small	15	28	37-1/2
Small	17	28-1/8	38
Medium	19	28-1/4	38-1/2
Large	21	28-3/8	39
X-Large			
<u>Regular</u>			
X-Small	15	30	40
Small	17	30-1/8	40-1/2
Medium	19	30-1/4	41
Large	21	30-3/8	41-1/2
X-Large	23	30-1/2	42
<u>Long</u>			
X-Small	15	32	42-1/2
Small	17	32-1/8	43
Medium	19	32-1/4	43-1/2
Large	21	32-3/8	44
X-Large	23	32-1/2	44-1/2
<u>Tolerance</u>			
Plus	1/2	3/4	1/2
Minus	1/2	3/4	1/2

1

4.5.3 End Item Testing. The end items shall be tested as specified in 4.6 for conformance to the requirements for the print color of the camouflage pattern, hydrostatic resistance of seam tape, tape end lifting, tape integrity and physical surface

MIL-DTL-32185

appearance changes specified in para 3.7 and 3.7.1 the lot size shall be expressed in units of trousers. The sample unit shall be one trouser.

4.6 Methods of testing.

4.6.1 Hydrostatic resistance test. The hydrostatic resistance of sealed seam areas of the trousers, before and after five laundering cycles (see 4.6.2), shall be tested in accordance with AATCC 127, except for the following: the test specimen need not be conditioned and does not need to be tested in a conditioned environment (ambient conditions may be used). The test may be performed on any device which tests the same specimen area at the equivalent pressure. The hydrostatic head shall be 50 centimeters pressure (or 0.8 psi) for 3 minutes. The trousers shall be tested at three different locations as follows: one on top seam of knee patch, one leg seam, and one seat seam. The water shall contact the outside of the garment. The sealed seam shall be centered in the 4-1/2 inch diameter test area of the testing machine. Evidence of leakage in one or more seam locations shall be considered a test failure. Leakage is defined as the appearance of one droplet of water anywhere in the 4-1/2 inch diameter test area in cases of dispute the apparatus described in AATCC 127 shall be used.

4.6.2 Trouser laundering test. Select trousers in accordance with the criteria in paragraph 4.2.1. Prior to laundering, one pair of trousers shall be retained for use as the unlaundered sample in evaluating the trousers after laundering. Taped areas of the trousers shall be visually examined prior to laundering for physical surface appearance characteristics and initial tape end and integrity conditions. The sliders, hook/loop tapes and snap fasteners of each trouser shall be closed with the right side of each trouser out during the wash and drying cycles. Place two (2) pairs of trousers, (one pair may be ballast) (approximately 4 pounds total load), in an automatic washing machine set on permanent press cycle, high water level and warm (100 + 10, - 0° F) wash temperature. Place 28 grams of detergent conforming to 1993 AATCC Standard Reference Detergent (non-phosphate) without optical brighteners into the washer. The duration of each laundering cycle shall be 30 to 35 minutes. After laundering, place trousers in an automatic tumble dryer set on permanent press cycle, high heat setting (150-160° F) and run for approximately 30 minutes. Conduct five laundering and drying cycles. After the fifth laundering and drying cycle, test and evaluate the trousers for conformance to the required characteristics in 4.6.2.1. The laundering equipment (washer and dryer) shall be in accordance with AATCC test method 135.

4.6.2.1 Appearance after laundering.

a. Tape ends integrity test. After five laundering cycles, the test trousers shall be examined for any sign of tape ends lifting, within 3/4 inch of sewn seam; tape ends lifting more than 1/8 inch when tape extends beyond 3/4 inch of the sewn seam, tape curling, bubbling, separation along tape edges or across the tape width, or tape outer layer more than 1/8 inch exposing the tape membrane or inner layers (see 3.7). The occurrence of any of these defects shall be considered a test failure. Tape ends lifting more than 1/8 beyond 3/4 inch of the sewn seam shall be tested for hydrostatic resistance in accordance with paragraph 4.6.1 and are acceptable with no leakage.

MIL-DTL-32185

b. Color loss in print areas of universal camouflage pattern. After five laundering cycles the color loss shall be determined by comparing the test trouser and the unlaundered sample. Any color change on any are of trouser less than the required rating (see 3.7.1) on the AATCC gray scale for evaluating change in color shall be considered a test failure.

c. Physical surface appearance changes of the fabric. After five laundering cycles the universal camouflage printed side of the test trouser shall be visually examined on all visible pattern parts of the trouser for any evidence of physical surface appearance changes as compared to the unlaundered sample (see 3.7.1). Any physical surface appearance change shall be considered a test failure. Any physical surface appearance characteristic noted in a taped area on the unlaundered trousers (see 4.5.2) shall not be considered a test failure on the laundered trousers if there is no adverse change in the characteristic. Puckering and creases within taped areas, not adversely affecting appearance, shall not be considered a test failure.

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 materiel is to be performed by DoD or in-house contractor 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 commands. 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.

6. NOTES

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

6.1 Intended use. The trousers are intended for use by personnel of the Department of Defense as a component of the Extended Cold Weather Clothing System.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of this specification.
- b. Type and Size (see 1.2).
- d. When a first article is required (see 3.1, 4.2, and 6.3).
- e. Packaging (see 5.1)

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. m e first article should be a preproduction sample. The contracting officer should specify the appropriate type of first

MIL-DTL-32185

article and the number of units to be furnished. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Standard samples. For access to standard samples, address the contracting activity issuing the invitation for bids or request for proposal.

6.5 Source for eyelets and washers. Eyelets and washers may be purchased from Stimpson Co., Inc., Bayport, NY 11704, telephone (516) 472-2000 or Stimpson Co., Inc., Pompano Beach, FL 33060, telephone (305) 946-3500.

6.6 Alternative seam tape set-up procedures. As with any seam tape, it is always best to consult the seam tape manufacturer for recommended settings depending on type of taping machine utilized. However, it has been determined that the following set-up procedures offer the best results for taping the polyolefin based material with the alternative tape:

Set the seam tape machine nozzle as close to 1/16 inch and evenly aligned as possible to the edges of the seam tape without touching the adhesive layer. Adjust the heat setting and run at the desired roller speed without exceeding 20 feet per minute. Place an unseamed sample of option material face down into the rollers. Set the roller pressure as to create a positive feed with no slippage. While bonding tape onto the material knit backing, adjust the nozzle air pressure such that only the fabric knit backing is scorched within a 3/8-5/8 inch center area relative to heat reflected off the tape. This condition can be achieved using a very low nozzle pressure. Under no circumstances can the option material knit backing be scorched a full 1 inch width, otherwise leakage will occur. Also, any change in heat setting vs. roller speed will create varying reflected heat scorching patterns and therefore the nozzle pressure would be expected to be changed. Record the setting to achieve the correct reflected scorching pattern.

NOTE: CONTRACTOR USING THE ALTERNATE TAPE SHOULD VERIFY THAT SEAM SEAL MACHINE SETTINGS FOR APPLYING THE SEAM SEAL TAPE ARE OPTIMIZED TO PRODUCE A PRODUCT THAT PASSES HYDROSTATIC PRESSURE TESTS ON STRAIGHT, CURVED AND CROSSOVER SEAMS.

6.7 Subject term (key word) listing.

ECWCS
Extended cold weather clothing system
Laminated cloth
Moisture vapor permeable
Waterproof

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

MIL-DTL-32185

6.9 Or equal. Prior to the use of an "or equal" item, the supplier shall submit the item with supporting data to the contracting officer for subsequent approval or disapproval by the responsible military agency.

Custodians:

Army - GL

Navy – NU

Preparing Activity:

DLA - CT

(Project No. 8415-0281)

Review Activities:

Army - MD

Navy – MC

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>