

INCH-POUND

GL-PD-10-01E
13 February 2012
SUPERSEDING
GL-PD-10-01D
04 January 2012

PURCHASE DESCRIPTION

BOOTS, COMBAT, TEMPERATE WEATHER, MOUNTAIN

This Purchase Description (PD) is approved for use by the 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 an olive-colored, temperate weather, waterproof combat boot for use in rugged, mountainous terrain. Unless otherwise indicated, all performances called out in this PD pertain to an item made on a size 10R last.

1.2 Classification. The boot will be of the following sizes and widths (see 6.2) as specified.

Size: 2 through 15 (whole and half sizes), 16 (whole size only)

Widths:

Narrow	(B)
Regular	(D)
Wide	(EE)
X-Wide	(EEEE)

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

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-C-41814 - Counter, Footwear
- MIL-DTL-32075 - Label: For Clothing, Equipage, and Tentage, (General Use)
- MIL-PRF-3122 - Leather, Cattlehide, for Footwear for Uppers and Gussets, Chrome Tanned, Fatliquored

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

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

ENVIRONMENTAL PROTECTION AGENCY

Regulations for the Enforcement of the Federal Insecticide, Fungicide and Rodenticide Act (40 CFR Part 162)

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

FEDERAL TRADE COMMISSION

Rules and Regulations Under the Textile Fiber Products Identification Act

(Copies are available online at <http://www.ftc.gov> or from the Federal Trade Commission, 600 Pennsylvania Avenue, N.W., Washington, DC 20580-0001.)

(Copies of documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

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

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC Test Method 100 -Assessment of Antibacterial Finishes on Textile Materials

AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test

AATCC Evaluation Procedure 9, Visual Assessment of Color Difference of Textiles

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

AMERICAN TYPE CULTURE COLLECTION (ATCC)

ATCC – 6538 - Staphylococcus Aureus

ATCC – 9027 - Pseudomonas Aeruginosa

(Information available online at <http://www.atcc.org> or from the American Type Culture Collection (ATCC) P.O.Box 1549, Manassas VA 20108 USA.)

ASTM INTERNATIONAL (ASTM)

ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers (Tension Elongation)

ASTM D 471 - Standard Test Methods for Rubber Property-Effect of Liquids

ASTM D 624 - Standard Test Methods for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

ASTM D 751 - Standard Test Methods for Coated Fabrics (Hydrostatic Resistance or Breaking Strength)

ASTM D 1052 - Standard Test Methods for Measuring Rubber Deterioration-Cut Growth Using Ross Flexing Apparatus

ASTM D 1630 - Standard Test Methods for Rubber Property-Abrasion Resistance (Footwear Abrader)

ASTM D 1777 - Standard Test Methods for Thickness of Textile Materials

ASTM D 2208 - Standard Test Methods for Breaking Force and Elongation, Grab Method

ASTM D 2240 - Standard Test Methods for Rubber Property-Durometer Hardness

ASTM D 3273 - Standard Test Methods for Resistance to Growth of Mold

ASTM D 3574 - Standard Test Methods for Flexible Cellular Materials- Slab, Bonded, and Molded Urethane Foams

ASTM D 3787 - Standard Test Methods for Bursting Strength of Textiles Constant-Rate-of-Traversal (CRT) Ball Burst Test

- ASTM D 3886 - Standard Test Methods for Abrasion Resistance for Textile Fabrics (Inflated Diaphragm Apparatus)
- ASTM D 4786 - Standard Test Methods for Stitch Tear Strength, Single Hole
- ASTM D 4966 - Standard Test Methods for Abrasion Resistance of Textile Fabrics (Martindale Abrasion Tester Method)
- ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials
- ASTM F 392 - Standard Test Methods for Flex Durability of Flexible Barrier Materials

(Copies of documents are available on line at <http://www.astm.org> or from the ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19426-2959.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA-1971 Standard on Protective Ensemble for Structural Firefighting and Proximity Fire Fighting (2007 Edition)

(Copies of this document are available online at <http://www.nfpa.org> or National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-7471)

SATRA GLOBAL TEST METHODS

- TM2 - Tensile Properties of Insole Materials
- TM3 - Flexing Index
- TM14 - Resistance to scuffing by mild circular abrasion
- TM31 - Abrasion Resistance - Martindale method
- TM77 - Flexing Machine-Water Penetration Test
- TM80 - Transverse Tensile strength of sheet materials
- TM83 - Measurement of the Area Shape Retention and Collapsing Load of formed Toe Puff and Stiffener Materials
- TM98 - Dimensional stability with changes in atmospheric humidity
- TM101 - Surface peel strength of insole materials
- TM144 - Friction (slip resistance) of footwear and floorings
- TM 223 - Floor marking by solings or top pieces

(Application for copies should be addressed to <http://info@satra.co.uk> or from the SATRA Technology Centre, Wyndham Way, Telford Way, Kettering, Northants; NN 16 8SD, United Kingdom)

OTHER PUBLICATIONS

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

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

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 Terms

3.1.1 First article. When specified (see 6.3), a sample shall be subjected to first article testing/inspection in accordance with 4.2.

3.1.2 Standard samples. The finished leather shall match a swatch of cattlehide leather for shade and sueded flesh appearance and unless otherwise indicated, shall be equal to or better than the sample with respect to all characteristics for which the standard is referenced (see 6.4).

3.1.2.1 Upper leather. The finished upper leather shall match a swatch of cattlehide leather for shade and grain side appearance and unless otherwise indicated, shall be equal to or better than the sample with respect to all characteristics for which the standard is referenced (see 6.4).

3.1.2.2 Gusset leather. The finished gusset leather shall match a swatch of cattlehide leather for shade and grain side appearance and unless otherwise indicated, shall be equal to or better than the sample with respect to all characteristics for which the standard is referenced (see 6.4).

3.1.2.3 Rubber rand. The texture and color of the rubber rand and the color of the outsole shall match a swatch of the rubber rand and unless otherwise indicated, shall be equal to or better than the sample with respect to all characteristics for which the standard is referenced (see 6.4).

3.1.3 Visual shade matching (All exterior components). The color and appearance of the components shall match the standard shade and appearance in 3.1.2 when tested as specified in 4.4.2. All associated exterior components shall be subdued and of a complimentary shade.

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

3.2.1 Leather.

3.2.1.1 Upper leather. The leather shall be grain out drum dyed olive with color penetrating throughout the thickness of the hide so that the chrome tannage is not visible. The leather shall conform to MIL-PRF-3122, Type I, Treatment A and Treatment B. The following exceptions to MIL-PRF-3122 shall be applicable for the upper leather:

- a. The grain surface shall be lightly buffed, removing the surface of the grain only, for a nubuc appearance with a fine uniform nap (see 3.1.2.1).

- b. The surface color shall be antiqued to provide a muted camouflage effect (see 3.1.2.1).
- c. The finish requirements for the leather shall not apply.
- d. The thickness shall be as specified for the cut parts in Table IX.

3.2.1.2 Gusset leather. The gusset leather shall be grain out, drum dyed olive with color penetrating throughout the thickness of the hide so that the chrome tannage is not visible. The leather shall be a good match to the standard sample for color, appearance and softness (see 3.1.2.2). The leather shall conform to MIL-PRF-3122, Type II, Treatment A. The thickness shall be as specified for the cut parts in Table IX.

3.2.2 Insoles The insole shall meet the requirements specified in Table I when tested as specified in 4.4.2.

TABLE I. Insole performance requirements

Characteristics	Physical Requirements
Thickness, inches (minimum.)	0.160
Fungal resistance, Level	10
Wet Tensile, kgf/cm ² (minimum.)	70
Flexing Index, (5000 cycles) (minimum.)	3.7
Abrasion Resistance	
Cellulose board, mm ³ (maximum)	50
Non-Woven board, (revolutions) (minimum.)	
Dry	25,600
Wet	6,400
Transverse Tensile-Dry, kgf/cm ² (minimum.)	8
Dimensional Stability, percent (maximum)	0.7
Peel Strength, kgf/cm ² (minimum.)	0.5

3.2.3 Fabrics.

3.2.3.1 Bootie lining. The bootie lining shall be constructed from pattern pieces cut from waterproof 3-layer laminate material (see 3.2.3.1.1).

3.2.3.1.1 Three-layer laminate. The three-layer laminate lining shall consist of a textile face, a waterproof film, and a tricot knit cloth. The package shall conform to the requirements in paragraphs 3.2.3.1.1.1 through 3.2.3.1.1.3. The three-layer laminate shall conform to the requirements specified in Table II, when tested as specified in paragraph 4.4.2.

3.2.3.1.1.1 Face layer. The face layer shall consist of a textile that meets the Martindale Abrasion and Burst Strength performance listed in Table II when tested as specified in 4.4.2. Any antimicrobial technology used shall be an EPA-registered antimicrobial and shall be durable for the life of the item. The requirements of this paragraph shall apply to all lining within the boot including the fabric top cover attached to the removable cushioned insert.

3.2.3.1.1.1 Toxicity (lining fabric only). The finished lining fabric shall not present a health hazard and shall show compatibility with prolonged, direct skin contact when tested as specified in 4.4.1. Chemicals recognized by the Environmental Protection Agency (EPA) as human carcinogens shall not be used.

3.2.3.1.1.2 Waterproof film. The waterproof film shall be polytetrafluorethylene, microporous.

3.2.3.1.1.3 Tricot knit. The tricot knit cloth shall be nylon weighing a minimum of 1.0 ounce per square yard and meet the requirements in Table II when tested as part of the three-layer laminate lining as specified in 4.4.2. The color shall be natural.

3.2.3.2 Adhesive. The adhesive for laminating the layers together shall be such that the laminate cloth meets the requirements of this specification. The adhesive shall have no adverse health hazard when used as intended.

3.2.3.3 Laminated cloth. The face layer specified in 3.2.3.1.1.1 shall be laminated to one side of the waterproof film specified in 3.2.3.1.1.2 and the tricot knit cloth specified in 3.2.3.1.1.3 shall be laminated to the other side of the waterproof film. The cloth shall conform to the requirements specified in Table II, when tested as specified in paragraph 4.4.2.

TABLE II. Laminated cloth performance requirements

Characteristics	Requirements
Martindale Abrasion , revolutions/cycles (minimum) Fabric only; Dry	153,600/ 9,600
Bursting Strength (lbs) Fabric Only (minimum)	125
Hydrostatic Resistance (psi) (Liner Cloth) Initial (minimum)	50
At Seam (minimum)	50
After Synthetic Perspiration (minimum)	50
After Diesel Fuel Oil (minimum)	50
Water Permeability / Resistance (Liner Cloth) Initial (minimum)	No leakage
At Seam (minimum)	No leakage
After Synthetic Perspiration (minimum)	No leakage
After Diesel Fuel Oil (minimum)	No leakage
Abrasive Durability (600 cycles) Back/Leather Side (minimum)	No leakage

TABLE II. Laminated cloth performance requirements - Continued

Characteristics	Requirements
Moisture Vapor Transmission Rate (MVTR), g/m ² /24hrs	
B method (minimum)	
BW method (minimum)	640
	4,000
Flex Durability	
Gelbo (3,000 cycles) (minimum)	No leakage
Wet, (24 hrs to leak) (minimum)	No leakage
Wet, (96 hrs to delamination) (minimum)	No leakage
Bacterial Resistance, % reduction (minimum)	
Staphylococcus Aureus	99
Pseudomonas Aeruginosa	99

3.2.3.4 Color. The color of the face side of the laminated cloth shall be olive based on Government approval unless otherwise specified in the contract or solicitation.

3.2.4 Comfort collar. The comfort collar shall be leather (see 3.2.1.2) and shall have a length equal to the circumference of the boot top, exclusive of the gusset/tongue, and an exposed width of 1.5 (± 0.125) inches on exterior of boot. The collar shall be stitched leather (see 3.2.1.2) both inside and outside the boot. The interiorly exposed portion of the comfort collar shall be 2.25 (± 0.125) inches.

3.2.5 Top band. The top band shall be leather (see 3.2.1.1) grain side out and shall have a length equal to the circumference of the boot and bordering the bottom edge of the comfort collar, exclusive of the gusset/tongue, and a width of 1 (± 0.125) inch. The top band shall be oriented in the middle of the comfort collar/boot upper juncture.

3.2.6 Gusset. The exposed gusset shall be leather (see 3.2.1.2) and shall extend 6.5 (± 0.125) inches from the medial to lateral side of boot upper 2 (± 0.125) inches from the top of the comfort collar. The gusset shall taper consistently through the boot upper, ending in the vamp area with a 1.5 (± 0.125) inch separation between medial and lateral sides of the boot vamp.

3.2.7 Tongue. The tongue shall be leather (see 3.2.1.1) grain side out and shall be a height of 3.625 (± 0.125) inches at the apex along the ends of the tongue and 3.125 (± 0.125) inches along the midline of the tongue. The width shall be 4 (± 0.125) inches. See Figure 2A for the appearance of boot tongue.

3.2.8 Tongue lining. The tongue lining shall be leather (see 3.2.1.2) and shall mirror the dimensions of the tongue (see 3.2.7) on the interior of boot. See Figure 2B for the appearance of boot tongue lining.

3.2.9 Plug at bottom of gusset. The plug at bottom of gusset shall be leather (see 3.2.1.1) grain side out and shall have a length of 1.25 (± 0.125) inches oriented along the center edge of

the vamp/gusset juncture at the bottom of the gusset. The exposed portion of plug shall be a 0.625 (\pm 0.125) inch radius. See Figure 3 for the appearance of plug at bottom of gusset.

3.2.10 Inlay. The inlay shall be leather (see 3.2.1.2) and shall be a single folded piece of leather oriented in the boot upper cut out. The inlay shall secure the speed lacer between the lace lock and first eyelet. See Figure 4 for the appearance of inlay and orientation of inlay along boot upper.

3.2.11 Eyestay. The eyestay shall be leather (see 3.2.1.1) and shall house two vertically positioned eyelets. See Figures 4 and 5.

3.2.12 Leather pull tab. The boot shall contain a one-piece backstay and pull tab which shall be leather (see 3.2.1.1) grain side out, with a half-moon shape pull tab length of 0.5 (\pm 0.125) inches when completed.

3.2.13 Box toe. The box toe material shall be a laminate of 0.020 (\pm 0.002) inch virgin ionomer resin (surlyn) sandwiched between two layers of non-woven polyester saturated with polystyrene. The total thickness shall be 0.056 (\pm 0.005) inch. The box toes shall be skived 3/8 (\pm 1/8) inch wide at the breast. Testing shall be as specified in 4.4.2. A thermoplastic box toe may be used and shall conform to the performance requirements of Table III.

TABLE III. Box toe and counter thermoplastic performance requirements

Characteristics	Physical Requirements
Initial Collapsing Load ,(N)	>130
Resilience, percent (%) (minimum)	25 <u>1/</u>
Moisture Resistance, percent (%) (minimum)	80 <u>2/</u>
Area Shape Retention, percent (%) (minimum)	
Initial	85
10 th collapse	60

1/ Resilience is percentage retention of initial collapsing load after ten collapses.

2/ Moisture resistance is percentage retention of initial dry collapsing load after 1 hour immersion.

3.2.14 Counter. Counters shall conform to the requirements of MIL-C-41814. The counter shall conform to fit the last used and fill the counter pocket area. The physical requirement for single-hole tear strength of MIL-C-41814 is eliminated. As an alternative, counters manufactured from leather board need not meet the chemical requirements of MIL-C-41814 but must meet the fungicide requirements of MIL-PRF-3122. An extruded thermoplastic film sandwiched between fusion bonded non-woven fabric made from a blend of synthetic fibers and impregnated with a styrene co-polymer and coated on each side with a thermoplastic adhesive may be used. A thermoplastic counter may be used and shall conform to the performance requirements of Table III.

3.2.15 Shank. The fiberglass shank shall be bonded to the insole and shall conform to the shape of the last. The fiberglass shank (glass and resin area), when cured, shall be 5/8 (\pm 1/16) inches in width.

3.2.16 Lacing system. The lacing hardware on each boot quarter, starting at the quarter bottom, shall consist of four (4) speed lacers (see 3.2.16.2), one (1) lacing lock (see 3.2.16.3), one (1) speed lacer (see 3.2.16.2) and two (2) eyelets (see 3.2.16.1). See Figure 4 for hardware configuration.

3.2.16.1 Eyelets. Eyelets shall be Trendware model #3434OEB, AA XXLG eyelet, brass material, antique brass finish or equal base on Government approval.

3.2.16.2 Speed lacers. Speed lacers shall be Trendware model #239OEB, Laceloop, steel material, antique brass finish or equal based on Government approval. The rivet shall be Trendware model # 7/4/10BrassOEB, brass material, antique brass finish or equal based on Government approval. The washer shall be Trendware model #9X4WashOEB, brass material or equal based on Government approval.

3.2.16.3 Lacing lock. Lacing locks shall be Trendware model # PG-E59OEB, zinc material, antique brass finish or equal base on Government approval. Rivet and washer shall comply with 3.2.16.2.

3.2.17 Foam.

3.2.17.1 Quarter foam. There shall be quarter foam, 1/2 (\pm 1/32) inch thick, located between the lining and upper in the back quarter area and extending into to the comfort collar (see Figure 8). The requirements shall be as specified in Table IV, when tested in accordance with 4.4.2.

3.2.17.2 Collar and tongue foam. There shall be collar and tongue foam 1/4 (\pm 1/32) inch thick. The tongue foam shall be used in a single layer and shall be placed between the tongue and the tongue lining (see Figure 8). The collar foam shall become a double layer with the addition of quarter foam extending into collar area, for a total thickness of 3/4 (\pm 1/16) inches (see Figure 8). The requirements shall be as specified in Table IV, when tested in accordance with 4.4.2.

TABLE IV. Foam requirements

Characteristics	Minimum	Maximum
Pore Size (ppi)	15	30
Density (lbs/ft ³)	2.0	2.5
Tensile (psi)	10.0	-
Elongation (%)	70	-
Tear (lbs/in)	2.0	-
IDF 25% R (15 X 15 X 4) (lbs)	65	75
Compression Set (50%) (%)	-	15

3.2.18 Laces. The olive laces shall be a nylon, 3.25 (+0.75) millimeters (mm) diameter at any point along the length of the lace, cover material of 950/1 denier (texturized nylon), filler material of 1260/2 denier (twisted nylon), constructed from 8 carrier braider (regular weave), olive, waterproofed, antiwick, fused tip, relaxed or equal based on Government approval. The length of the laces shall be a minimum of 87 inches for all boot sizes.

3.2.19 Rubber rand. The color and texture of the face surface shall be a good match to the standard sample (see 3.1.2.3). The thickness of the rand shall be 3.5 (± 0.25) iron. The rubber rand shall be olive in color matching the color shade of the outsole. The rubber rand shall encircle boot and be a maximum of two (2) separate pieces. The rubber rand height shall be a minimum of 1.5 inches in the toe area, 1.75 inches in the heel area, and at no point less than 0.75 inches along the boot upper.

3.2.19.1 Rubber rand compound requirements. The requirements for the rubber rand are based on the testing performed on 0.250 or 0.070 gauge inch test slabs (in accordance with ASTM procedures) and are not actual rands. The requirements shall be as specified in Table V, when tested in accordance with 4.4.2.

TABLE V. Rubber rand compound requirements

Characteristics	Requirement
NBS abrasion (minimum)	150
Hardness (shore A)	70-80A
Stitch Tear (dry), pounds (minimum)	300
Stitch Tear (Fuel B) pounds (minimum)	50
Die C tear strength pounds (minimum)	300
Ross flex, IRM 903, percent (maximum) @ 50,000 flexes	250
Volume swell, Fuel B (@ 46 hrs) percent (maximum)	30
Non-marking,	Pass
Tensile pounds (minimum)	2100
Elongation, percent (minimum)	400

3.2.20 Thread, nylon. The thread shall be bright, high tenacity, continuous filament nylon, soft or bonded finished, 50-135 Tex and have a melting point not lower than 472°F. The color shall be olive for all thread visible when the boot is worn. The thread shall be sized to provide adequate strength for the life of the boot.

3.3 Soling System.

3.3.1 Outersole. The outersole design shall be the Vibram Bifida design or equal based on Government approval (See Figure 7). The outsole shall be a minimum of 18-iron (9.5mm) in thickness of solid rubber at each of the lugs. The outersole shall be olive in color and be a good match to the standard sample (see 3.1.2.3).

3.3.1.1 Rubber compound requirements. The requirements for the rubber outsoles are based on the testing performed on 0.250 or 0.070 gauge inch test slabs (in accordance with ASTM procedures) and are not actual soles. The requirements shall be as specified in Table VI, when tested in accordance with 4.4.2.

TABLE VI. Rubber outsole compound requirements

Characteristics	Requirement
NBS abrasion (minimum.)	150
Hardness (shore A)	70-80 A
Stitch Tear (dry), pounds (minimum.)	325
Die C tear strength, pounds (minimum.)	325
Non-marking	Pass
Tensile, pounds (minimum.)	2,100
Elongation, percent (minimum.)	400
Cold Flex (@ -23 degrees C), percent At 7,500 flexes (minimum.)	500
Transitional Hardness (2 hrs @ -23 degrees C) (maximum)	change of +10 point shore hardness
Slip Index (cold/ice) (minimum.) Rough ice method	0.20

3.3.2 Bond strength.

3.3.2.1 Bond strength outsole to upper. The bond strength shall not be less than 130 pounds. Testing shall be performed on the end item as specified in 4.5.4.

3.3.3 Removable cushion insert. The removable cushion insert shall be a low-density polyether polyurethane heel cup support made of a polyurethane system, medium black in color, and molded to a cloth, black in color unless either is otherwise specified in the contract or solicitation. The fabric top cover shall meet the performance requirements in 3.2.3.1.1.1. Cushioned inserts shall be mated by size to the correct size boots and shall be uniform. The total thickness of the insert shall be 0.180 (± 0.025) inch forward of the instep, and 0.250 (± 0.030) inch elsewhere. The requirements shall be as specified in Table VII when tested in accordance with 4.4.2.

TABLE VII. Removable cushion insert requirements

Characteristics	Requirements
Density, lbs/cu.ft.	16 - 19
Foam Hardness, Shore 00	50 - 65
Tensile Strength (psi) (minimum.)	82
Compression set	
@ 25%, percent, 77° F, (maximum)	5
@ 50%, percent, 77° F, (maximum)	5

3.3.4 Insole foam. Microcellular polyurethane foam, 0.125 (\pm 0.01) inch thick, shall be permanently attached to the top of the insole board. The foam shall meet the requirements of Table VIII when tested in accordance with 4.4.2.

TABLE VIII. Insole foam requirements

Characteristics	Requirement
Density (lb/cu.ft.)	19 – 23
Tensile Strength (pounds per sq. inch – PSI) (minimum.)	60
Compression set (percent) (maximum)	
At 50% compression, 23°C	5
At 50% compression, 70°C	5
Resilience/Ball Rebound (minimum)	8

3.4 Design. The Army Temperate Weather Mountain Combat Boot is designed as a hiking-style combat boot that provides durability, stability and performance that is required for extended operation in rugged mountainous terrain. The boot is waterproof, antimicrobial, has a leather upper, foam padding for increased ankle support, speed lacing system with lacing locks, stiffened insole for increased stability, padded collar and removable cushion insert for comfort, rubber rand for increased durability and a rubber outsole well suited for mountainous terrain. (See Figures 2A, 2B, 3, 4, 5, 6 and 7).

3.4.1 Boot height. The height of the finished boot, measured upward on the outside from the bottom of the tread area at the breast of heel area to the top of the boot, shall be 9 (\pm 0.375) inches on size 10R and shall graduate up and down between sizes and widths. Testing shall be as specified in 4.4.4.

3.4.2 Boot weight. The weight of a finished boot (size 10R) shall be less than or equal to 2.1 pounds per boot when tested as specified in 4.4.4.

3.5 Lasts. The boots shall be made on commercial last model “FMT U3813-1 Military” or equal based on Government approval. An electronic table of last dimensions as well as last bottom files for each size and 3-dimensional data file for sizes 10N (B), 10R (D), 10W (EE) and 10XW (EEEE) for the Direct Attach lasts are available from U.S. Army Natick Soldier Research Development and Engineering Center, RDNS-WPW-C, Kansas Street, Natick, MA 01760-5011. The numerical size of the boot shall correspond with the numerical size of the last used to produce the boot (i.e. a size 10R boot shall be produced on a size 10R last).

3.6 Construction.

3.6.1 Cutting uppers. The leather shall conform to the thickness specified in Table IX. Vamps shall be cut from the bend area of the side leather.

TABLE IX. Required thickness (ounces) of leather uppers

Part	Min	Max
Vamp (upper leather)	5	6
Top Band (upper leather)	2.5	3
Backstay (upper leather)	3.5	4
Eyestay (upper leather)	3	3.5
Tongue (upper leather)	3.5	4
Plug –at bottom of gusset (upper leather)	3.5	4
Gusset (gusset leather)	3	4
Comfort Collar (gusset leather)	3	4
Collar Lining (gusset leather)	3	4
Tongue Lining (gusset leather)	3	4
Inlay (gusset leather)	2.5	3

3.6.2 Skiving, splitting. Skiving of upper leather parts is permitted. Splitting of the backstay, eyestay, tongue, plug and inlay is permitted.

3.6.3 Boot finishing. No finish or top coat shall be used.

3.7 End item requirements.

3.7.1 Leakage. The finished boots shall show no evidence of leakage when tested as specified in 4.5.3.

3.7.2 Whole boot moisture vapor transmission rate (MVTR). The whole boot breathability shall not be less than 3.0 grams/hour. Testing shall be as specified in 4.5.1.

3.7.3 Liquid penetration resistance. The boots shall meet the liquid penetration resistance test requirements of the NFPA 1971 when tested as specified in 4.4.4.

3.7.4 Boot height. See 3.4.1 for requirement.

3.7.5 Boot weight. See 3.4.2 for requirement.

3.7.6 Bond strength. See 3.3.2 for requirement.

3.8 Marking, permanent identification. With the exception of Product Demonstration Models (PDMs), the Contractor shall permanently mark the correct American and Mondopoint sizes and widths, the contract number (Example: 04-D-1234), and the company or brand name on the inside of the boot in the inside quarter area. The marking may be in the form of a label and shall be done in accordance with acceptable commercial practices, and it shall not reduce footwear functionality. The boot shall contain a manufacturing tracking lot number. Embossing of a company or brand name on the exterior of the boot shall not be permitted. Unit packs will include National Stock Number (NSN) and Universal Product Code (UPC) bar codes as specified in the contract. Each symbol must be human and scanner readable.

3.8.1 Instruction tag. The instruction label/tag is to be attached to the finished boots, and the print size shall be 1/8 (\pm 1/32) inch. The instruction label/tag shall be printed using the data specified in Figure 1. Each item shall be individually bar-coded with a label/tag conforming to Type VIII, Class 17, of MIL-DTL-32075. The bar-coding element shall be a 13 digit national stock number (NSN). The bar-code type shall be a medium to high code density. It shall be located so that it is completely visible on the item when it is folded and/or packaged as specified in the contract and in a manner that causes no damage to the item. As an option, a hang tag identifying the features of the boot is permitted.

3.9 Workmanship. The finished boots shall conform to the quality of product established by this document. The occurrence of defects shall not exceed the contractor's own quality assurance standards and the quality assurance standards defined by the technical data in the bid package.

3.10 Standard sample. The standard sample for color shade and grain side appearance of the leather as well as color shade of components shall be swatches of cattlehide upper. The texture pattern for the rubber rand shall be a swatch of rubber. See 3.1.2.

4. VERIFICATION

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

- a. First article testing/inspection (see paragraph 4.2).
- b. Conformance inspection (see paragraph 4.3).

4.2 First article inspection. First article testing/inspection when required (see 3.1) shall be examined for the defects specified in 4.4.3 and tested for the characteristics in 4.4.4.

4.3 Conformance inspection. Conformance inspection shall include the examinations of 4.4.1 and 4.4.3 and the testing in 4.4.2 and 4.4.4. Unless otherwise specified sampling for inspection shall be performed in accordance with ANSI/ASQ Z1.4 as set forth within the contract.

4.4 Inspection and component testing.

4.4.1 In-process inspection. Inspection may be made by the Government at any point or during any phase of manufacturing to determine whether the components are as specified or operations and/or assemblies are accomplished as specified. The Government reserves the right to exclude from consideration for acceptance any material or service for which in-process inspection has indicated nonconformance.

4.4.2 Component testing. The components shall be tested for the characteristics listed in Table X. The methods of testing specified where applicable shall be used. The sampling plan shall be as follows:

<u>Lot size (yards or units)</u>	<u>Sample size</u>
Under 800	2
801 – 22,000	5
22,001 and above	8

TABLE X. Component testing

Component	Characteristic	Requirement Paragraph	Test Method
All Exterior Components	Shade Evaluation	3.1.3	<u>1/</u>
Upper Leather	Range of Characteristics	3.2.1.1	MIL-PRF-3122
Insole	Thickness	3.2.2	ASTM D 1777 <u>2/</u>
	Fungal resistance	3.2.2	ASTM D 3273
	Wet Tensile	3.2.2	SATRA TM-2
	Flexing Index	3.2.2	SATRA TM-3
	Abrasion Resistance Cellulose board	3.2.2	SATRA TM14
	Non-Woven board	3.2.2	SATRA TM31
	Transverse Tensile-Dry	3.2.2	SATRA TM80
	Dimensional Stability	3.2.2	SATRA TM98
Peel Strength	3.2.2	SATRA TM101	
Laminated Cloth	Martindale Abrasion Fabric Only, Dry	3.2.3.1.1	ASTM D 4966 <u>3/</u>
	Bursting Strength, Fabric only	3.2.3.1.1	ASTM D 3787
	Bacterial Resistance	3.2.3.1.1	4.4.2.1
	Staphylococcus Aureus	3.2.3.1.1	AATCC 100 & ATCC 6538
Pseudomonas Aeruginosa	3.2.3.1.1	AATCC 100 & ATCC 9027	
Corynebacterium Xerosis	3.2.3.1.1	AATCC 100 & ATCC 373	

TABLE X. Component testing - Continued

Component	Characteristic	Requirement Paragraph	Test Method
	Hydrostatic Resistance (psi) (Liner cloth)		
	Initial	3.2.3.1.1	ASTM D 751 <u>4/</u>
	At seam	3.2.3.1.1	ASTM D 751 <u>5/</u>
	After synthetic perspiration	3.2.3.1.1	ASTM D 751 <u>6/ 7/ 8/</u>
	After diesel fuel oil	3.2.3.1.1	ASTM D 751 <u>9/ 8/</u>
	Water Permeability/ Resistance (Liner cloth)		
	Initial	3.2.3.1.1	AATCC 127 <u>10/</u>
	At seam	3.2.3.1.1	AATCC 127 <u>11/ 10/</u>
	After synthetic perspiration	3.2.3.1.1	AATCC 127 <u>12/ 7/ 8/ 10/</u>
	After diesel fuel oil	3.2.3.1.1	AATCC 127 <u>13/ 8/ 10/</u>
Abrasive Durability Back / Leather Side	3.2.3.1.1	ASTM D 3886 & AATCC 127 <u>14/ 10/</u>	
Moisture Vapor Transmission Rate (MVTR) (g/m ² /24hrs)			
B method	3.2.3.1.1	ASTM E 96 <u>15/</u>	
BW method	3.2.3.1.1	ASTM E 96 <u>16/</u>	
Flex Durability			
Gelbo (cycles to leak)	3.2.3.1.1	ASTM F 392 and AATCC 127 <u>17/ 10/</u>	
Wet (Hours to leak)	3.2.3.1.1	ASTM F 392 and AATCC 127 <u>18/ 10/</u>	
Toxicity	3.2.3.1.1.1.1	4.4.2.1.1	
Box Toe	Initial Collapsing load (N)	3.2.13	SATRA TM83
	Resilience(%)	3.2.13	SATRA TM83 <u>19/</u>
	Moisture Resistance (%)	3.2.13	SATRA TM83 <u>20/</u>
	Area Shape Retention	3.2.13	SATRA TM83
Counter	Initial Collapsing load (N)	3.2.14	SATRA TM83
	Resilience(%)	3.2.14	SATRA TM83 <u>19/</u>
	Moisture Resistance (%)	3.2.14	SATRA TM83 <u>20/</u>
	Area Shape Retention	3.2.14	SATRA TM83
Comfort Collar		3.2.4	N/A
Top Band		3.2.5	N/A
Gusset		3.2.6	N/A
Tongue		3.2.7	N/A

TABLE X. Component testing - Continued

Component	Characteristic	Requirement Paragraph	Test Method
Tongue Lining		3.2.8	N/A
Plug at Bottom of Gusset		3.2.9	N/A
Inlay		3.2.10	N/A
Leather Pull Tab		3.2.12	N/A
Laces		3.2.18	N/A
Eyelets		3.2.16.1	N/A
Speed Lacer		3.2.16.2	N/A
Lacing Lock		3.2.16.3	N/A
Shank		3.2.15	N/A
Foam	Pore Size	3.2.17	Visual
	Density	3.2.17	ASTM D 3574 - A
	Tensile	3.2.17	ASTM D 3574 - E
	Elongation	3.2.17	ASTM D 3574
	Tear	3.2.17	ASTM D 3574 - F
	IFD 25% R	3.2.17	ASTM D 3574 - B ₁
	Compression Set 50%	3.2.17	ASTM D 3574
Rubber Rand	NBS abrasion (minimum)	3.2.19.1	ASTM D 1630
	Hardness (shore A)	3.2.19.1	ASTM D 2240
	Stitch Tear Dry	3.2.19.1	ASTM D 4786
	Die C tear strength, pounds (minimum)	3.2.19.1	ASTM D 624
	Ross flex, Oil #3	3.2.19.1	ASTM D 1052 <u>22/</u>
	Volume swell, Fuel B (46 hrs)	3.2.19.1	ASTM D 471 <u>23/</u>
	Non-marking	3.2.19.1	SATRA TM 223
	Tensile	3.2.19.1	ASTM D 412
	Elongation	3.2.19.1	ASTM D 412

TABLE X. Component testing - Continued

Component	Characteristic	Requirement Paragraph	Test Method
Rubber Outsole	NBS abrasion (minimum)	3.3.1.1	ASTM D 1630
	Hardness (shore A)	3.3.1.1	ASTM D 2240
	Stitch Tear Dry	3.3.1.1	ASTM D 4786
	Die C tear strength, pounds (minimum)	3.3.1.1	ASTM D 624
	Non-marking	3.3.1.1	SATRA TM 223
	Tensile	3.3.1.1	ASTM D 412
	Elongation	3.3.1.1	ASTM D 412
	Cold Flex (-23 °C)		ASTM D 1052 <u>24/</u>
	Transitional Hardness, change after 2 hrs at -23°C	3.3.1.1	ASTM D 2240
	Slip Index (cold/ice)	3.3.1.1	SATRA TM 144
Removable Cushion Insert	Density	3.3.3	ASTM D 3574 - A
	Foam Hardness	3.3.3	ASTM D 2240
	Tensile strength	3.3.3	ASTM D 3574 - E
	Compression set @ 25%, percent	3.3.3	ASTM D 3574 <u>25/</u>
	Compression set @ 50%, percent	3.3.3	ASTM D 3574 <u>25/</u>
Insole Foam	Density	3.3.4	ASTM D 3574 - A
	Tensile strength	3.3.4	ASTM D 3574 - E
	Compression set @ 50%, 23°C @ 50%, 70°C	3.3.4	ASTM D 3574 - D ASTM D 3574 - D
	Resilience/Ball Rebound	3.3.4	ASTM D 3574 - H

- 1/ Unless otherwise specified, the color of the components shall be Olive, matching that of the standard samples (see 3.1.2) when tested in accordance with AATCC Evaluation Procedure 9 option A with sources simulating artificial daylight D75 illuminant with a color temperature of 7500 (± 200)°K, illumination of 100 (± 20) foot candles and shall be a good match to the standard sample under incandescent lamplight at 2856 (± 200)°K as specified in Section 3.1.3 of this Purchase Description.
- 2/ A thickness gauge of the dead-weight type equipped with a dial graduated to read directly to 0.001 inches shall be used. The presser foot shall be circular, with a diameter of 1.129 (± 0.001) inches and with moving parts weighted to apply a total load of 0.60 (± 0.03) pounds per square inch (psi) to the specimen. The anvil shall be not less than 1.129 inches in diameter. The presser foot and anvil surface shall be paned to within 0.001 inches and shall be parallel to each other to within 0.001 inches.
- 3/ Martindale Tester; Pressure applied: 12 kPa; visually examine specimens after each 3200 cycles; abradant changed after each 3200 cycles. Use Option 1 for evaluation; no hole appears.

- 4/ Test five (5) samples in accordance with ASTM D 751 Procedure A1 with the face (foot side) of the liner cloth in contact with the water.
- 5/ Test five (5) samples containing sealed seams in accordance with ASTM D751 Procedure A1 with the face (foot side) of the liner cloth in contact with the water and the seam centrally located in the circular orifice.
- 6/ Test five (5) samples, eight inch by eight inch (8" x 8"), cut from the laminate material and exposed to contamination; synthetic perspiration (Footnote 7). Contaminate prior to leak testing by dispensing 2 milliliters (ml) of perspiration solution on both sides of the sample (see Footnote 8 for contamination procedure.) Determine hydrostatic resistance in accordance with ASTM D751 Procedure A1 with the face (foot side) of the liner cloth in contact with the water.
- 7/ Synthetic perspiration shall be prepared in a 500-milliliter (ml) glass beaker by combining 3.0 grams sodium chloride, 1.0 gram trypticase soy broth powder, 1.0 gram normal propyl propionate, and 0.5 grams of liquid lecithin. Add 500 milliliters (mls) of distilled water, add a magnetic stirring bar and cover beaker. Place the beaker on a combination hot plate/magnetic stirring apparatus. While stirring, heat the solution to 50 degrees C until all ingredients are dissolved. Then, while stirring, cool solution to 35 degrees C.
- 8/ Dispense contaminate on to the center of a glass plate (8 inches by 8 inches by 0.25 inch thick). Sample shall be placed face down on the plate and an additional contaminate dispensed on the backside. Place a second glass plate on the sample. Next, position a 4-pound weight on the center of the second glass plate. After 16 hours, remove the sample (do not rinse) and test immediately.
- 9/ Test five (5) samples, eight inches by eight inches (8" x 8"), cut from the laminate material and exposed to diesel fuel as follows: Contaminate prior to leak testing by dispensing 3 drops of diesel fuel onto both sides of the sample (see Footnote 8 for contamination procedure. Determine hydrostatic resistance in accordance with ASTM D751 Procedure A1 with the face (foot side) of the liner cloth in contact with the water.
- 10/ Test five (5) samples in accordance with AATCC 127 with face/ foot side towards water. Suter test conditions shall be 0.7 psi (50 cm), for 5 minutes. Any observed water droplets in test area constitutes a failure.
- 11/ Test five (5) samples containing sealed seams in accordance with AATCC 127 with the face (foot side) of the liner cloth in contact with the water and the seam centrally located in the circular orifice. Follow Suter test conditions and inspection as specified in Footnote 10.
- 12/ Test five (5) samples, eight inches by eight inches (8" x 8"), cut from the laminate material and exposed to synthetic perspiration (Footnote 7.) Contaminate prior to leak testing by dispensing 2 milliliters (mls) of perspiration solution on both sides of the sample (see Footnote 8 for contamination procedure.) Determine water resistance in accordance with AATCC 127 with the face (foot side) of the liner cloth in contact with the water. Follow Suter test conditions and inspection specified in Footnote 10.
- 13/ Oil Test five (5) samples, eight inches by eight inches (8" x 8"), cut from the laminate material and exposed to diesel fuel as follows: Contaminate prior to leak testing by dispensing 3 drops of diesel fuel onto both sides of the sample (see Footnote 8 for contamination procedure). Determine water resistance in accordance with AATCC 127 with the face (foot side) of the liner cloth in contact with the water. Follow Suter test conditions and inspection as specified in Footnote 10.

- 14/ Test back side of five (5) laminate samples in accordance with ASTM D3886. Non-contact pin diaphragm approved for use to decrease variability. The test is to be run for the specified number of cycles prior to testing for leakage. Leakage shall be determined in accordance with AATCC 127. Follow Suter test conditions and inspection as specified in Footnote 10. Zero (0) grit emery paper or equivalent may be used as the abradant.
- 15/ Determine MVTR in accordance with ASTM E96 method B with the back side of the test cloth facing the water. The free stream air velocity shall be 550 (\pm 50) feet per minute (fpm) as measured 2 inches above the specimen. The airflow shall be measured at least 2 inches from any other surface. 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 specimen shall be 0.75 (\pm 0.06) inches.
- 16/ Determine MVTR in accordance with ASTM E96 method BW with the back side of the test cloth facing the water. The free stream air velocity shall be 550 (\pm 50) feet per minute (fpm) as measured 2 inches above the specimen. The airflow shall be measured at least 2 inches from any other surface. The specimen shall be sealed to the cup in any manner that prevents wicking or leaking of water out of the cup. The test shall be run for 2 hours and weight measurements shall be taken at only, the start and completion of the test.
- 17/ Test one (1) sample, 8 inch by 12 inch, shall be conditioned and flexed in accordance with ASTM F392 except specimen shall not be aged, the short edges shall not be heat sealed or otherwise joined and the specimen shall be flexed for the specified number of cycles. Two (2) 6 inch by 8 inch specimens, shall be cut from the flexed sample and tested for leakage in accordance with AATCC 127. Follow Suter test conditions and inspection as specified in Footnote 10.
- 18/ One (1) sample, 14 inches by full width, shall be selected from a sample unit and tested for leakage after the required number of hours of continuous agitation. The specimen shall be agitated using the “normal,” cycle in an automatic home laundering machine except that the washing machine shall be capable of continuous agitation. The water level shall be maintained at 16 (\pm 0.5) gallons, and the water temperature shall be 32 (\pm 9°C). Additional fabric shall be added to the specimen to create a load weight of 2 (\pm 0.2) pounds. Upon completion of the continuous agitation the specimen is to be air dried and then tested for leakage in accordance with AATCC 127. Follow Suter test conditions and inspection as specified in Footnote 10.
- 19/ Resilience is percentage retention of initial collapsing load after ten collapses.
- 20/ Moisture resistance is percentage retention of initial dry collapsing load after 1 hour immersion.
- 21/ Test conducted after 46 hours in Fuel B at Room Temperature
- 22/ One drop of oil per 6,000 flexes.
- 23/ Test conducted after 46 hours at Room Temperature with ASTM test slabs
- 24/ Test conducted after 2 hours conditioning.
- 25/ Parts measured at 77°F.

4.4.2.1 Bacterial resistance (lining fabric). Testing shall be conducted on a single ply of fabric. The following specificity will be followed within the AATCC 100 test method for interlaboratory correlation. An untreated control fabric will be run for each determination that closely approximates the characteristics of the treated fabric without anti-microbial technology.

- a. Grow test organisms in 1x nutrient broth (NB) overnight.
- b. Determine Optical Density at 600 nanometers (OD600). Dilute with 1x NB to OD600 = 1, yielding a cell concentration of approximately 10⁸ CFU/ml.
- c. Wash 1 milliliter (ml) cells twice with 1 milliliter (ml) 0.125x (diluted 1:8) NB medium with 0.15 % (w/v) Triton X-100. Recheck OD600.
- d. Dilute cells 1:10 with 0.125x NB/ 0.15 % (w/v) Triton X-100 to target concentration of 1-2x10⁷ CFU/ml. Serially dilute inoculum 10-fold for plating to determine concentration.
- e. For a single determination for each organism, two incubation times, 0, and 24 hr, shall be examined. Cut each specimen into 48 millimeter (mm) circles in triplicate for each time point. Do not sterilize; plating will be done on medium selective for the test organisms (see step k).
- f. Inoculate each single swatch specimen in a petri dish with 0.2 milliliter (ml) (or the amount that a single swatch specimen can absorb within 10 - 20 minutes) to avoid puddling of inoculum not in contact with the sample.
- g. Place the rolled swatch into a sterile 100 Milliliter (ml) bottle and cap. Swatch rolled with tweezers when inserting into the bottle will minimize contaminating the neck with the organisms on the swatch (purpose is to reduce or prevent inoculum not in contact with the swatch).
- h. Process 0 hour contact time immediately. Incubate 24 hour inoculated swatch at 37 (+2)°C.
- i. For swatch inoculation volume of 0.2 milliliter (ml), neutralize with 20 milliliter (ml) Dey-Engley (D-E) broth (dilution is 10-2). Shake 1 minute. Add D-E to each of the replicate before doing 10-fold dilutions. For other inoculation volumes, adjust D-E volume appropriately for a 10-2 dilution. Shake bottles 1 minute.
- j. Dilute D-E solution 10-fold in PBS buffer (final dilutions 10-3, 10-4, 10-5).
- k. Spread plate 0.1 milliliter (ml) 10-3, 10-4, 10-5 dilutions in duplicate on selective media. These dilutions are usually suitable to obtain valid counts.
 - i. *S. aureus* – BBL Mannitol salts agar (cat # 211407, BD Diagnostic Systems)
 - ii. *P. aeruginosa* – Centrimide agar (cat # 7222, Neogen Corp)
- l. Incubate plates overnight at 37 (+2)°C.
- m. Report the microbial concentrations (CFU/ml) for each swatch at both contact times. Use average triplicate concentration for 0 and 24 hour contact times to calculate percent reduction for the treated swatches and untreated control. Also report starting inoculum concentration; minimum valid concentration is 5 x 10⁶ CFU/ml. If the treated swatches show 90% reduction, the test should be rerun to verify. Untreated control would not be expected to exhibit reduction.

4.4.2.1.1 Toxicity test. When required (see 6.2, section d), an acute dermal irritation study and a skin sensitization study shall be conducted on laboratory animals. When the results of these studies indicate the finished lining fabric 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 3.2.3.1.1.1.1) can be demonstrated with historical use data, toxicity testing may not be required (see 6.2, section d).

4.4.2.1.2 Toxicity documents. All antimicrobial treatments used to process the lining fabric shall be identified and accompanied by the appropriate Material Safety Data Sheet (MSDS)

information. The use of chemicals recognized by the Environmental Protection Agency (EPA) as known human carcinogens is prohibited.

4.4.3 End item visual examination. The end item shall be examined for the defects listed in Table XI. The lot size shall be expressed in units of pairs of boots. The boots shall be examined with cushion insert inserted. For the pairing examination, and when determining possible differences in outsole thickness, the pair shall be examined together. During the inspection for the defects listed in Table XI, the departures from specification requirements listed in the table shall be observed and recorded. Presence of these departures shall not result in the rejection of the lot if items pass the established AQLs in the contract; however, the plant quality assurance and Government personnel reserve the right to establish and impose lot rejection criteria when either the severity or the presence of these departures warrants such a measure. These additional rejection criteria may be invoked at any time during the life of the contract when the Government judges this action to be in its best interest. Defects of pairing shall be classified as a single defect. Sampling for end item inspection shall be in accordance with American National Standard ANSI/ASQ ZI.4. Defects in Table XI denoted by an asterisk (“*”) shall be deemed either Major or Minor by the Government depending on the respective defect’s affect on the form, fit and function of the item.

NOTE: Appearance defects shall be scored only when the condition is plainly visible at a distance of 3 feet or more and it appreciably affects item appearance.

TABLE XI. End item visual defects.

Examine	Defect	Classification	
		Major	Minor
Pairing	Not properly mated; i.e., not right and left of same size	101	
	Variation in color, luster, or appearance	*	*
	Variation of more than 1/4 inch in height of pair	102	
Pairing	Box toe malformed	*	*
	Difference in outsole thickness between left and right boots: -more than 3/32 inch	103	
- more than 1/16 inch but not more than 3/32 inch	201		
Cleanliness	Any non-removable spot, stain, or foreign matter affecting appearance		202
Color and finish	Color not as specified	*	*
Leather	Finish streaky, chipped, flaky or shaggy/nappy on upper		203
	Any raw edges not stained to match upper/gusset leather		204
Design	Not as specified	104	

TABLE XI. End item visual defects. - Continued

Examine	Defect	Classification	
		Major	Minor
Construction & Workmanship (general)	Any cut, tear, hole, repair or damage		*
	Any component or assembly omitted or misplaced, operation omitted, not properly performed	*	*
	Any component, assembly or design present creating "hot spots"	105	
Seams & Stitching(upper)	Open seam not repaired	106	
	Repair of open seam not as specified		205
	NOTE: A seam shall be classified as open when one or more stitches joining a seam are broken, or when two or more consecutive skipped or runoff stitches occur. On multiple stitched seams, a seam is considered open when one or both sides of the seam are open. When the above conditions occur on the inside of the boot, it shall be scored as a * defect.		
Seams & Stitching(upper) Continued	Tight tension resulting in puckering or cutting of the leather	*	*
	Loose tension resulting in a loosely secured seam	*	*
	Stitching omitted where required	*	*
	Gage of stitching irregular	*	*
	Thread ends not trimmed throughout the boot		206
	Needle holes or needle chew	*	*
	Back seam malformed		207
Vamp stitching at outersole junction	One or more rows of defective stitching not repaired	107	
	Stitching repaired, but first stitch more than 1/4 inch from outersole junction	108	
	Repaired with one stitch in lieu of two or more stitches		208
Outersole	Thickness not as specified	109	
	Edge is irregular, affecting appearance		209
	Any malformation	*	*
Eyelets/ speed lacer / lace locks	Number of eyelets/speed lacer/lace locks not as specified	110	
	Not the same number of eyelets/speed laces in each row	111	
	Eyelets/speed lacers/lace locks not properly spaced within the row or misalignment between the rows to an extent	*	*
	interfering with proper lacing		210
	Any eyelet/speed lacer/ lace lock not securely clinched		211
	Any eyelet/speed lace malformed or damaged		212
Marking & instruction tag	Missing, incomplete, incorrect, not applied in the specified manner, misplaced, illegible, or not of specified size		213

TABLE XI. End item visual defects. - Continued

Examine	Defect	Classification	
		Major	Minor
Lining	Torn, loose or wrinkled Not properly mated with upper	*	*
Bar code label/tag	Bar-code omitted or not readable by scanner; human-readable interpretation (HRI) omitted or illegible; bar-code type not as specified or code density not as specified		214
Removable Cushion Insert	Missing, wrong size, or wrong side up	112	
Upper leather	Not grain side out	113	
	Leather deeply scuffed; i.e., fiber structure damaged	*	*
	Grub or tick damage, scratches, brands, or bony leather	*	*
	Fat wrinkles or veins	114	
	Stretchy vamp	*	*
	Thickness exceeds the maximum or less than the minimum specified	115	
	Rough fiber on flesh side	*	*
	Off-stretch cut or Slaughter cut	*	*
	Excessive roughing or scouring	*	*
	Leather embossed	116	
Gusset leather	Flanky	*	*
	Loose flesh, boney, or boardy	*	*

4.4.4 End item testing. The finished boot shall be tested for the characteristics listed in Table XII. The sample size shall be three (3) boots. The first two lots shall be tested for height, weight and liquid penetration resistance and if passing test results are attained, a certificate of compliance will be submitted and considered acceptable for these characteristics. The lot size shall be no less than 800 pair. The Government reserves the right to draw samples from any production lot and perform any tests deemed necessary at any time during the term of the contract for verification of the contractor's certificate of compliance.

TABLE XII. End item tests

Characteristic	Requirement Paragraph	Test Method
Height	3.4.1	-
Weight	3.4.2	-
Boot Leakage	3.7.1	4.5.3
Whole Boot MVTR	3.7.2	4.5.1
Bond Strength	3.3.2	-
Upper from Outsole	3.3.2.1	4.5.4
Liquid penetration resistance	3.7.3	4.5.2

4.5 Methods of inspection.

4.5.1 Whole boot breathability. The boot breathability test shall be designed to indicate the Moisture Vapor Transmission Rate (MVTR) through the boot by means of a difference in temperature and concentration of moisture vapor between the interior and the exterior environment.

4.5.1.1 Apparatus.

- a. The external test environment control system shall be capable of maintaining 23 (± 1)°C and 50 (± 2) percent relative humidity throughout the test duration.
- b. The weight scale shall be capable of determining weight of boots filled with water to an accuracy of (± 0.01) gram.
- c. The water holding bootie insert (WHBI) shall be flexible so that it can be inserted into the boot and conform to the interior contours; it must be thin enough so that folds do not create air gaps; it must have a MVTR value ranging between 920-990 grams/square meter/24 hour. ASTM E 96 B - Standard Test Methods for Water Vapor Transmission of Materials shall be used to determine acceptability (1); and it must be waterproof so that only moisture vapor contacts the interior of the footwear product rather than liquid water. After every five (5) uses of the WHBI it will be disposed of and replaced.
- d. The water circulating bath system for the boot shall be capable of controlling the temperature of the water uniformly in the boot to 35 (± 1)°C as measured in the toe area of the boot.
- e. The footform assembly used with the water circulating bath system shall have a boot plug oriented 12.5 centimeters (5 - inches) as measured from the bottom of the plug surface to the inside sole in the heel area.
- f. The boot plug shall be oval shaped measuring 3.5 - inches by 2.5 - inches.
- g. The top of the boot shall be sealed to create an impervious barrier to both liquid water and water vapor.
- h. Boots should be laced to the top of the lacing system. Allow for 1 (± 0.5) inch separation between lateral and medial eyelet stays, with possible exception of the eyelets at the top of boot and boot plug area. Maximize seal security at top of boot.
- i. A stationary 6-inch diameter fan shall be used to create the air current past the boot.
- j. The stationary fan shall be positioned perpendicular to the test surface and raised so the center of the fan is 5-inches from the test surface.
- k. The air current origin shall be 15.5 - inches from the back heel edge of the boot (D). Refer to Diagram 1.
- l. The air current shall be 250 (± 30) feet/minute at the heel edge of the boot (S). Measurement shall be taken without the boot assembly in place 2-inches up from the test surface at the fan center.

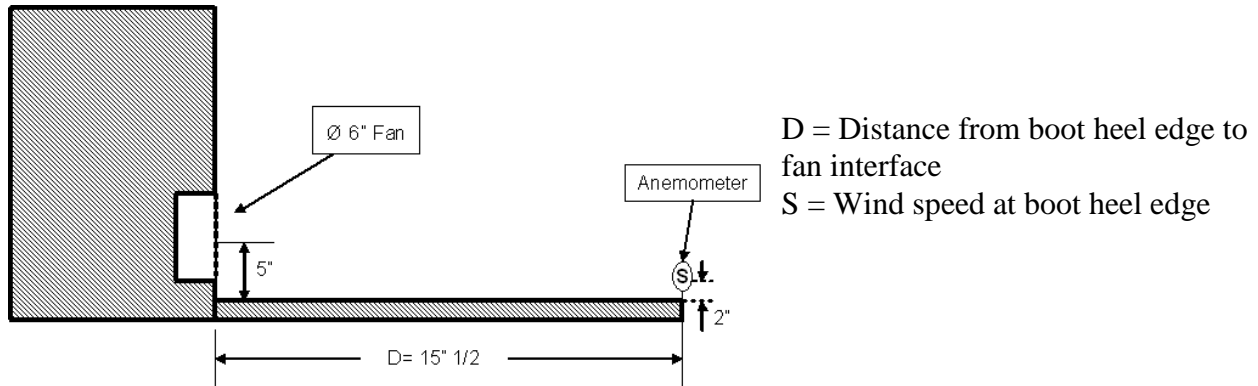


DIAGRAM 1. Whole Boot Breathability Bench-top Set-Up

1/ Determine MVTR in accordance with ASTM E96 method B with the knit side of the membrane facing the water. The free stream air velocity shall be $550 (\pm 50)$ feet per minute (fpm) as measured 2 inches above the specimen. The airflow shall be measured at least 2 inches from any other surface. 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 specimen shall be $0.75 (\pm 0.06)$ inches.

4.5.1.2 Procedure.

- a. Remove the removable cushion insert from the boot sample.
- b. Weigh boot sample and record (this will be the unconditioned weight).
- c. The boot shall be conditioned in the test environment for a minimum of 12 hours before testing.
- d. Insert WHBI and footform assembly into boot opening and fill with water preheated to $35 (\pm 1)^{\circ}\text{C}$ to a height of 12.5 centimeters (5-inches) as measured from the inside sole in the heel area and seal opening with boot plug. The water should be in contact with the bottom of the boot plug.
- e. Regulate water temperature in boot at $35 (\pm 1)^{\circ}\text{C}$.
- f. Disconnect water circulating system and weigh boot assembly and record as W_i . The water volume in system shall be noted at the time of weighing.
- g. After weighing reconnect water circulating system and maintain the temperature in boot at $35 (\pm 1)^{\circ}\text{C}$ for 6 hours (± 5 minutes).
- h. The boot assembly shall be oriented such that the boot sole lies flat on the testing surface with the heel furthest from the fan interface and in line with the center of the stationary fan (See Diagram 2).

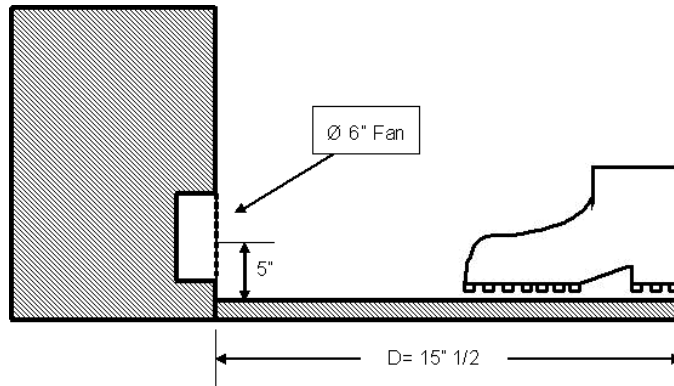


DIAGRAM 2. Whole Boot Breathability Bench-top Set-Up with Boot

- i. After 6 hours (± 5 minutes), reweigh boot assembly. The water volume in system shall match the noted W_i volume. Record weight as W_f and test duration as 6 hours.
- j. Compute whole boot MVTR in grams/hour from the equation below:

$$\text{MVTR} = \frac{W_i - W_f}{6}$$

- k. If test is aborted for any reason, thoroughly dry boot to within 5 grams of original boot weight (Step b). Recondition boot sample in test environment for the required length as outlined, and begin test procedure again.

4.5.1.3 Method of inspection. Each boot shall be tested in accordance with the method described in paragraph 4.5.1. The average whole boot MVTR from the three (3) boots tested shall be greater than 3.0 grams/hour to satisfy the breathability standard.

4.5.2 Liquid penetration resistance. The boots shall meet the Liquid Penetration Resistance Test requirements of the NFPA 1971, Standard on Protective Ensemble for Structural Firefighting, 2007 Edition. (NFPA 1971, section 6-28, specific testing to #4, surrogate gasoline fuel C, as defined in ASTM D 471, standard test method for rubber properties, effect of liquids, using a 50 percent by volume of the toluene and iso-octane.).

4.5.3 Boot leakage test. The boot leakage test shall be designed to indicate leakage by using water as a liquid medium through the boot by means of a whole shoe flex test in accordance with SATRA TM 77, modified as indicated below) while the boot is submerged. The minimum standard for passing this test is 100,000 flexes. Each boot shall be preconditioned by flexing in accordance with SATRA TM 77, DRY with a foot form of steel shot for 100,000 flexes.

4.5.3.1 Apparatus. SATRA STD 184 whole shoe flexing apparatus or equal shall be modified to allow the end item to be submerged to a depth of the mid-point between the third and fourth eyelet. The mechanism for flexing on any other apparatus shall be exactly the same as the SATRA STD 184. The sides of the apparatus shall be raised to alleviate splashing on the mechanism for flexing.

4.5.3.2 Procedure. Testing shall be in accordance with SATRA TM-77 at 140 (± 10) flexes/minute and 35 degrees for each flex cycle. A modified SATRA STD 184 whole boot flex apparatus or equal shall be used so that the water depth required can be achieved. The top of each item shall be sealed appropriately so that the water splashing from the test does not enter through the top of the boot. Absorbent blotting paper will be “balled up” and placed within the boot upper so that any water ingress through the top or upper can be determined. A change in the color between the top and the bottom sections of the absorbent blotting paper will indicate water ingress. The steel shot foot-form shall be removed for testing in water. The end item shall be checked at 100,000 cycles for leakage, as indicated by a color change in the absorbent blotting paper within the boot.

4.5.3.3 Method of inspection. End items shall be evaluated in accordance with SATRA TM 77, by checking for a change in color of the absorbent blotting paper that is “balled up” and placed within the boot upper. If water enters the top of the boot during the test, new absorbent blotting paper shall be inserted for the remainder of the test, unless the water has leaked to below the fourth eyelet. If water has definitely leaked through the top of the boot by splashing and reached to below the fourth eyelet, then the whole boot must be dried and the absorbent blotting paper replaced before the test is resumed. Water ingress into the boot by way of wicking up the boot upper (outside) and down into the boot lining (inside) shall not be considered an item failure. If it cannot be determined if the water has entered through the top or upper of the boot, a new boot shall be requested and subjected to the test.

4.5.4 Bond strength test of outsole to boot upper.

4.5.4.1 Specimen. The test specimen shall be legibly marked on each side at two points (2 inches and 4 inches from the tip of the toe). The outsole shall then be separated from the upper to the 2 inch mark. The separation may be aided by any suitable device or machine capable of withstanding the amount of force necessary to accomplish separation. After separation to the 2-inch mark is achieved, the toe cap of the boot shall be crushed to facilitate mounting of the specimen in the tester. In event that the point of separation at the 2 inch mark is not between the upper and the outsole, that portion of the soling system remaining adhered to the upper shall be separated manually (with the aid of a knife or other instrument), so as to show separation between upper and outsole. Care should be taken in order to be sure that the upper is not cut.

4.5.4.2 Apparatus and procedure. The apparatus for measuring outsole/upper separation shall be as described in test method ASTM D-2208. The separated and crushed toe portion of the boot shall be gripped by one clamp in a manner such that the minimum effective jaw surface area applied shall be 1-inch by 1-inch. The jaw surface shall be centered approximately 1/2-inch to 1-inch from the tip of the toe. The other jaw surface shall hold the overlay portion of the separated upper, and it shall not be less than 1-inch by 2-inches, with the long dimensions perpendicular to the pull of the machine. The machine shall be set in operation and the separation continued at a speed of 10 inches per minute until the outsole is separated from the upper to a point past the mark 4 inches from the tip. The maximum value attained during separation shall be taken as the bond strength.

5. PACKAGING.

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Department 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

6.1 Intended use. The boots are intended for wear by military personnel of the Department of Defense in Temperate Weather Wet Environments, Temperate Weather Dry Environments and during combat. As the combat environment is more severe than that seen during commercial wear and use, it is expected that the items procured by the US Government will be superior to those found commercially. Any item not meeting the performance(s) specified herein, or which does not meet commercial standards for retail production and purchasing will not be accepted by the US Government for use by its Military personnel.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of this Purchase Description.
- b. Sizes and widths required (see 1.2).
- c. When first article is required, (see 3.1 and 4.2).
- d. Toxicity requirements (see 3.2.3.1.1.1.1)
- e. Packaging requirements (see 5.1)
- f. Inclusion of specific instructions regarding arrangement for examinations, quantity, testing and approval.

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of Federal Acquisition Regulation (FAR) 52.209-4 and the requirements listed within the contract. The first article should be a full rate 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 also include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article (see 3.1 and 4.2).

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

6.5 Subject term (key word) listing.

Footwear
Leather
Liner
Waterproof

6.6 International standardization agreements. Certain provisions of this document are the subject of international standardization agreement as cited in NATO STANAG 2333. When an amendment, revision, or cancellation of this document is proposed that will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliatory action through international standardization channels, including departmental standardization office, if required.

6.7 Equal item. Prior to use of an "or equal" item, the contractor shall submit the item with supporting data to the contracting officer for subsequent approval or disapproval by the responsible military agency. If deemed necessary, the government reserves the right to test the mountain combat boot in the field with the "or equal" component or end item at the contractor's expense prior to approval.

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

Use and Care Instructions **Temperate Weather Mountain Combat Boot**

1. Wear with: 1 pair of cushioned sole socks depending on safety/uniform requirements; 1 pair of insole inserts if desired.
2. Sizes. These boots are supplied in whole and half sizes 2 through 16 and widths N (B), R (D), W (EE), and XW (EEEE). In some instances, it may be necessary to select a slightly larger size than normally worn in order to allow for normal swelling of the feet and the use of insole inserts or cushioned socks.
3. Pull on boot, seating heel firmly into place, then lace. Boots should fit snugly but not tightly. There should be at least a 3/4-inch minimum additional length at toe.
4. The Mountain Combat Boot has lacing system which includes a lace lock. This system allows the wearer to have two different lace tensions above and below the lock.
5. Trousers should be bloused over the outside and below the comfort collar of the Mountain Combat Boot.
6. Break-in: DO NOT soak boots in water or bake in an oven to break-in. Mountain Combat Boots should be worn-in gradually at first with ever-increasing walking or marching distances while remaining comfortable. If blistering occurs, check to make sure that boots are fitted properly and that you are wearing recommended socks
7. Your Mountain Combat Boots are waterproof. However boots may become damp or wet due to excessive perspiration or water coming over the top of the Mountain Combat Boot. If Mountain Combat Boots become wet, empty excess water, change socks, and continue to wear while changing socks regularly. Mountain Combat Boots will dry much faster when worn than if

left to stand and dry. DO NOT expose Mountain Combat Boots to excessive heat to dry, including hair dryers, heating vents, stoves etc.

8. Your Mountain Combat Boots are designed for maximum performance in a field environment. Do not apply polish to your Mountain Combat Boots.

9. Your Mountain Combat Boots are designed to be easy to care for. To clean your Mountain Combat Boots, brush with stiff nylon bristle brush to clean and then use warm water. Do not use soap to clean your Mountain Combat Boots. If additional, more stringent cleaning is necessary, only water-soluble cleaning products should be used as oil- or alcohol-based cleaning products may damage your Mountain Combat Boots.

FIGURE 1. Care and Use Instructions



FIGURE 2A. Temperate Weather Mountain Combat Boot - Tongue



FIGURE 2B. Temperate Weather Mountain Combat Boot - Tongue Lining



FIGURE 3. Temperate Weather Mountain Combat Boot - Plug at Bottom of Gusset



FIGURE 4. Temperate Weather Mountain Combat Boot (lateral view)



FIGURE 5. Temperate Weather Mountain Combat Boot (medial view)



FIGURE 6. Temperate Weather Mountain Combat Boot (back and front view)



FIGURE 7. Temperate Weather Mountain Combat Boot (tread view)



FIGURE 8. Temperate Weather Mountain Combat Boot – (foam configuration)

Custodians:
Army – GL

Preparing Activity
DLA – CT