

PERFORMANCE SPECIFICATION

GLOVE, INTERMEDIATE COLD WEATHER (ICWG), U.S. MARINE CORPS

The United States Marine Corps has approved this document for use.

1. SCOPE.

1.1 Scope. This document covers the requirements for the U.S. Marine Corps Intermediate Cold Weather Glove. This item is intended for wear by military personnel of the Department of Defense during cold weather conditions.

1.2 Classifications. The Intermediate Cold Weather Glove will be in the following sizes:

Schedule of Sizes

Sizes. The glove sizes are as follows:

SMALL MEDIUM LARGE XLARGE XXLARGE

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in section 3 or 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 cited in sections 3 or 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: Natick Soldier Systems Center, MCSC, PdM-ICE, NSRDEC-RDNS-WPP, Natick, MA 01760

AMSC N/A.

FSC 8440

DISTRIBUTION STATEMENT A.

Approved for public release.

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 shall be cited in the solicitation or contract (see 6.1).

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-32075	Label: For Clothing, Equipage, and Tentage, (General Use)
MIL-DTL-31011	Cloth, Waterproof and Moisture Vapor Permeable
MIL-T-43566	Tape, Textile, Cotton or Polyester, General Purpose, Natural or In Colors
MIL-PRF-5038	Tape, Textile and Webbing, Textile, Reinforcing, Nylon
A-A-55126	Fastener Tapes, Hook and Loop, Synthetic
A-A-59826	Thread, Nylon

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

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

BUREAU OF ALCOHOL, TOBACCO AND FIREARMS, DEPARTMENT OF THE TREASURY

Formulas for Denatured Alcohol (27 CFR Part 21)

(Applications for copies of referenced document should be addressed to the Bureau of Alcohol, Tobacco and Firearms, Department of the Treasury, 1200 Pennsylvania Ave., Washington, DC 20226)

ENVIRONMENTAL PROTECTION AGENCY

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

(Applications for copies of referenced documents should be addressed to the Environmental Protection Agency, 401 M Street, S.W., Washington, DC 20460)

2.3 Non-Government standards and other 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 (see 6.1).

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 8	Colorfastness to Crocking; Crockmeter Method
AATCC 16	Colorfastness to Light
AATCC 22	Water Repellency – Spray Test
AATCC 61	Colorfastness to Laundering, Home and Commercial; Accelerated
AATCC 118	Oil Repellency: Hydrocarbon Resistance Test
AATCC 127	Water Resistance: Hydrostatic Pressure Test
AATCC 135	Dimensional Changes of Fabrics after Home Laundering
AATCC Evaluation Procedure 9	– Visual Assessment of Color Difference of Textiles

(Copies of these documents are available online at <http://www.aatcc.org> or AATCC, P.O. Box 12215, Research Triangle Park, NC 27709-2125.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQC Z1.4	Sampling Procedures and Table for Inspection by Attributes (DoD adopted)
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(Copies for these documents are available online at <http://www.asq.org/> or from American Society for Quality, P.O. Box 3005, 611 North Plankinton Ave, Milwaukee, WI 53201.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM D 751	Water Resistance of Cloth; Water Permeability; Hydrostatic Pressure Method, Strength of Coating
ASTM D 1117	Standard Guide for Evaluating Nonwoven Fabrics
ASTM D 1424	Tearing Strength of Fabrics by Falling Pendulum (Elmendorf-Type) Apparatus
ASTM D 1776	Practice for Conditioning Textiles for Testing
ASTM D 1777	Standard Test Method for Thickness of Textile Materials
ASTM D 1814	Measuring Thickness of Leather Units
ASTM D 1876	Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
ASTM D 1912	Cold-Crack Resistance of Upholstery Leather
ASTM D 2209	Tensile Strength of Leather
ASTM D 2582	Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting
ASTM D 2617	Total Ash in Leather
ASTM D 2807	Chromic Oxide in Leather (Perchloric Acid Oxidation)
ASTM D 2810	pH of Leather
ASTM D 2821	Measuring the Relative Stiffness of Leather by Means of a Torsional Wire Apparatus
ASTM D 3107	Stretch Properties of Fabrics Woven from Stretch Yarns
ASTM D 3393	Specification for Coated Fabrics - Waterproofness
ASTM D 3495	Hexane Extraction of Leather
ASTM D 3775	Warp and Filling Count of Woven Fabrics

ASTM D 3776	Mass Per Unit Area (Weight) of Fabric
ASTM D 3886	Abrasion Resistance of Textile Fabrics (Inflated Diaphragm Method)
ASTM D 4705	Stitch Tear Strength of Leather, Double Hole
ASTM D 5034	Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM-D-5035	Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D 5052	Permeability of Leather to Water Vapor
ASTM D 6076	Shrinkage Temperature of Leather
ASTM D 6193	Standard Practice for Stitches and Seams
ASTM D 6828	Standard Test Method for Stiffness of Fabric by the Blade/Slot Procedure
ASTM D 7255	Abrasion Resistance of Leather (Rotary Platform, Double-Head Method)
ASTM E 96	Water Vapor Transmission of Materials
ASTM F 392	Test Method for Flex Durability of Flexible Barrier Materials
ASTM F 903	Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Liquids

(Copies of these documents are available on line at <http://www.astm.org> or from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-259.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO 17075	Leather – Chemical Tests – Determination of Chromium (VI) Content
ISO 15496	Textiles: Measurement of water vapour permeability of textiles for the purpose of quality control (First Edition 2004-05-01)

(Copies of this document are available online at <http://www.iso.org> or from International Organization for Standardization (ISO), 1 Rue de Varembe, Case Postale, 56 CH 1211 Geneva 20, Switzerland)

NFPA 1971 STANDARD ON PROTECTIVE ENSEMBLE FOR STRUCTURAL FIRE FIGHTING (2000 EDITION)

Chapter 6-33	Overall Liquid Integrity Test One
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(Applications for copies of NFPA Test Methods should be addressed to: National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.1), a sample shall be subjected to first article inspection (see 6.2) in accordance with 4.2.

3.2 Standard sample. The finished glove and design shall match the standard sample (see 6.3) for shade and design and all other characteristics or acceptance criteria for which a standard sample is referenced.

3.3 Design. The Intermediate Cold Weather Glove is designed to be worn in cold weather environments to protect the user from the elements including snow, wind, and ice. The glove shall comply with the requirements listed in the below paragraphs.

The glove shall have a curved finger design (see Figures 3 & 4) and consist of the following, or equal: the outside shell shall be constructed from a water repellent stretch-woven nylon (see 3.4.1) and a water resistant leather palm (see 3.4.3). The glove shall have a waterproof breathable insert to stop moisture from being absorbed to the inside of the glove (see 3.4.6). The glove shall be insulated: the back of the hand/fingers shall have a siliconized lofted polyester insulation bonded to brushed tricot (see 3.4.4). The front of the hand/fingers (palm) lining shall be a nylon/polyester velour with a durable water repellent treatment (see 3.4.5) and it shall be laminated to the waterproof insert (see 3.4.6). The gauntlet shall not be insulated, but shall be lined with a nylon ripstop (see 3.4.2). The linings shall be the inner most layers of the glove. The outside of the glove shall have a feature at the side seam that enables the gloves to be clipped together as a pair when not in use (see 3.4.11).

The palm side of the glove shall be designed as follows: the front of the hand/fingers, as well as the fourchettes, shall be constructed from leather (see 3.4.3). The gauntlet shall extend past the wrist and be elasticized at the inner wrist to provide stretch to accommodate varying wrist widths and provide for a closer fit (see 3.4.7). A pull loop shall be attached at the hem of the gauntlet to provide ease of donning as well as provide a means to attach the glove to other clothing items or equipment (see 3.4.10).

The back of the glove shall be designed as follows: the back hand shall be constructed from the stretch-woven nylon. (see 3.4.1). An additional strip of leather (see 3.4.3) shall be superimposed over the shell material at the knuckles to provide additional knuckle protection (see figure 1-4). The leather shall conform to the shape of the knuckles as shown in Figures 1-4. A tab shall be attached at the inner side seam and be constructed from leather and loop tape, with its corresponding hook tape attached to the gauntlet (see 3.4.8 and 3.4.9). This hook and loop tape tab allows for an adjustable fit around the wrist at the bottom of the gauntlet. See Figures 1 – 4).

The glove shall have a label to identify the item, its size, and use and care instructions.

3.4 Materials and components. The materials and components shall conform to applicable specifications, standards, drawings, and patterns required herein.

3.4.1 Basic Shell Material. The cloth for the glove shall be a stretch-woven, 91% Nylon, 9% Spandex blend. The surface cloth shall be water repellent treated and shall conform to the requirements listed in Table I. The shade shall be coyote 498.

TABLE I. Shell material characteristics and requirements

Characteristic	Requirement	Test Method
Weight, ounces per square yard	4 – 6.825	ASTM D 3776
Fabric Count, yarns per inch		ASTM D 3775
Warp	145 min	
Fill	65 min	
Break Strength, pounds		ASTM D 5034
Warp	200 min	
Fill	150 min	
Tear Strength, pounds		ASTM D 1424
Warp	25 min	
Fill	9 min	
Moisture Vapor Transmission Rate, grams/square meter/24 hours	1050 min	ASTM E96 Method B <u>1/</u>
Moisture Vapor Transmission Rate, grams/square meter/24 hours	6,000 min	ASTM E96 Method BW <u>2/</u>
Drying Time, minutes	45 max	See 4.5.1
Spray Rating (Face)		AATCC 22
Initial	100, 100, 90 min	
Puncture Propagation, kilograms		ASTM D 2582, <u>3/</u>
Warp	5.0 min	
Fill	5.0 min	
Dimensional Stability, %		AATCC 135, 120F Wash, Tumble Dry Normal
Warp	2.5 max	
Fill	3 max	
Stretch, %		ASTM D 3107
Warp	10 – 13%	
Fill	12 – 15%	

- 1/ The hand side of the fabric shall face the water. The free stream air velocity shall be 550 ± 50 fpm as measured two inches above the fabric specimen. The air flow 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 back of the specimen shall be $3/4 \pm 1/16$ inch. Five specimens shall be tested.
- 2/ The hand side 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 test shall run for 2 hours and weight measurements shall be taken at only the start and completion of the test. Five specimens shall be tested. The specimen shall be sealed in any manner which prevents wicking and/or leaking of water out of the cup.

3/ Five individual 6" x 8" specimens warp direction and five specimens 6" x 8" fill direction shall be tested and the average force shall be reported as the PPT resistance. Condition specimens 70°F 65% RH prior to testing. Use the standard drop height of 20 inches. Read tear length to nearest 0.5 mm.

3.4.2 Lining Material, Gauntlet. The lining material used on the inside of the glove gauntlet shall be a water repellent coated 1.9 oz. 70 denier nylon ripstop and shall conform to the requirements listed in Table II. The shade shall be black.

TABLE II. Lining material characteristics and requirements

Characteristic	Requirement	Test Method
Weight, ounces per square yard	2 – 2.5	ASTM D 3776
Fabric Count, yarns per inch		ASTM D 3775
Warp	100 min	
Fill	85 min	
Break Strength, pounds		ASTM D 5034
Warp	130 min	
Fill	110 min	
Tear Strength, pounds		ASTM D 1424
Warp	2.0 min	
Fill	3.5 min	
Moisture Vapor Transmission Rate, grams/square meter/24 hours	150 min	ASTM E96 Method B, <u>1/</u>
Moisture Vapor Transmission Rate, grams/square meter/24 hours	250 min	ASTM E96 Method BW, <u>2/</u>
Dimensional Stability, %		AATCC 135, Normal Cycle at 120F, Tumble Dry Normal
Warp	2.0 max	
Fill	2.0 max	
Drying Time, minutes	30 max	See 4.5.1
Spray Rating (Face)		AATCC 22
Initial	100, 100, 90	

1/ The hand side of the fabric shall face the water. The free stream air velocity shall be 550 ± 50 fpm as measured two inches above the fabric specimen. The air flow 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 back of the specimen shall be $3/4 \pm 1/16$ inch. Five specimens shall be tested.

2/ The hand side 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 test shall run for 2 hours and weight measurements shall be taken at only the start and completion of the test. Five

specimens shall be tested. The specimen shall be sealed in any manner which prevents wicking and/or leaking of water out of the cup.

3.4.3 Leather. The leather palm shall be constructed from 0.6 – 0.8 mm flat, soft grain, chrome tanned goatskin. The leather shall be 16% fat liquor, hang-dried, and slocum staker and water resistant treated. The color shall approximate the shade of the shell material and shall be drum dyed, struck through from grain to flesh. The finished leather shall conform to the requirements listed in Table III.

TABLE III. Leather characteristics and requirements

Characteristic	Requirement	Test Method
Thickness, ounces	1.5 – 2.0	ASTM D 1814
Moisture Vapor Transmission Rate, grams/square meter/24 hours	400 min	ASTM D 5052
Water Absorption Resistance, % absorption	80% - 5 max	See 4.5.2
Oil and Stain Resistance, Grade	5 min	AATCC 118
Abrasion Resistance at 1000 cycles with CS-10 wheel and 500g load, %	10 max	ASTM D 7255
Stiffness, degrees	80% – 60 max	ASTM D 2821
Stitch Tear, pounds	80% – 17 min	ASTM D 4705
Elongation at 25 pound load, %, Incl 3 Grain Cracks	80% – 25 min	ASTM D 2209
Shrink Temp, degrees Celsius	98 ± 0.5 min	ASTM D 6076
Cold Crack Resistance, degrees Celsius	-15 min	ASTM D 1912

3.4.3.1 Chemical requirements. The leather shall conform to the chemical requirements in Table IV when tested as specified.

TABLE IV. Chemical requirements

Characteristic	Requirement	Test Method
Hexane soluble material, percent <u>1</u> /	25 max	ASTM D 3495
Chromic oxide, percent <u>1</u> /	3.0 min	ASTM D 2807
pH value	3.3 min	ASTM D 2810
Total ash, percent <u>1</u> /	9.0 max	ASTM D 2617
Determination of Chromium (VI) Content, mg/kg	< 3	ISO 17075

1/ Calculated on moisture-free basis.

3.4.3.2 Toxicity. The finished glove shall not present a health hazard when used as intended and tested as specified in Table IV.

3.4.4 Insulation, Back of Hand. The insulation at the back of the hand shall be comprised of a 5 oz/yd² siliconized lofted polyester insulation laminated to moisture-wicking poly/hydrofil slip tricot.

3.4.5 Lining Material, Palm. The front of the hand/fingers (palm) lining shall be comprised of a 52% Polyester/38% Nylon/10% Spandex blend to provide insulation. The weight shall be approximately 9.5 oz/sq yd (+/-7.5%). The color shall be coyote 498. The lining material shall be laminated to the waterproof insert.

3.4.6 Insert, Waterproof. The waterproof insert shall be constructed from a waterproof, moisture vapor permeable film laminate. At least one of the film layers shall be a microporous Polytetrafluoroethylene (PTFE). The insert shall be properly sized to fit around the glove insulation. The insert shall be designed so that it can be securely affixed inside the glove, such that it cannot be pulled out when the hand is removed. The finished insert shall be manufactured in such a way that it meets the requirements below when tested as specified in 4.4.3. Take special note that the insert has no distinction between face and back and may be accidentally inverted in use; refer to end item for proper side to test. The waterproof insert shall conform to the requirements listed in Table V.

TABLE V. Waterproof insert requirements

Characteristic	Requirement	Test Method
Weight	3.3 oz/sq. yd maximum	ASTM D3776, <u>1/</u>
Thickness	0.007inches maximum	ASTM D1777, <u>2/</u>
Insert Laminate Water Vapor Transmission Rate		
ISO Method	4,300 g/m ² /day minimum	ISO 15496, <u>3/</u>
Method B (hand-side to water)	580 g/m ² /day minimum	ASTM E96, <u>4/</u>
Method BW (hand-side to water)	7,000 g/m ² /day minimum	ASTM E96, <u>5/</u>
Insert Laminate Cut Strip Break Strength		ASTM D5035
Warp	5.8 lbs. minimum	
Fill	7.0 lbs. minimum	
Insert Seam Strength	4.5 lbs. minimum	ASTM D1876, <u>6/</u>
Insert Laminate Water Permeability after Universal Wear Abrasion Test	250 cycles, no leakage	ASTM D751, <u>7/</u> ASTM D3886, <u>8/</u>
Insert Laminate Water Permeability after Cold Gelbo Flex	5,000 cycles (0°F), no leakage	ASTM D751, <u>7/</u> ASTM F392, <u>9/</u>
Insert Laminate Chemical Penetration Resistance (ASTM F903 with JP8)	No leakage	ASTM F903, <u>13/</u>
Insert Laminate Mullen Hydrostatic Resistance		
Initial	20 psi minimum	ASTM D751, <u>10/</u>
After DEET (diethyltoluamide insect repellent reagent)	16 psi minimum	ASTM D751, <u>10/</u> , <u>11/</u>
Insert Laminate Sustained Mullen Hydrostatic Resistance		
After DEET (diethyltoluamide insect repellent reagent)	10 psi	ASTM D3393, <u>11/</u> , <u>12/</u>
Insert Laminate Water Permeability after DEET (diethyltoluamide insect repellent reagent)	16 hours exposure, no leakage	ASTM D751, <u>7/</u> , <u>11/</u>
Insert Laminate and Thermal Liner Stiffness	105 grams maximum	ASTM D6828, <u>14/</u>

1/ Five 3.5 inch diameter circle specimens shall be tested. The individual and mean weight of the five specimens shall be reported to the nearest 0.1 ounces per square yard.

2/ Five 3.5 inch diameter circle specimens shall be tested. Pressure foot shall be 1.129 inches diameter applying a load of 0.125 lbs/in². The individual and mean thickness of the five specimens shall be reported to the nearest 0.001 inches.

3/ The hand side of the insert shall face the water. Five specimens shall be tested.

- 4/ The hand side of the insert shall face the water. The free stream air velocity shall be 550 ± 50 fpm as measured two inches above the fabric specimen. The air flow 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 back of the specimen shall be $3/4 \pm 1/16$ inch. Five specimens shall be tested.
- 5/ The hand side of the insert 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 test shall run for 2 hours and weight measurements shall be taken at only the start and completion of the test. Five specimens shall be tested. The specimen shall be sealed in any manner which prevents wicking and/or leaking of water out of the cup.
- 6/ A minimum of three specimens shall be tested. Reference ASTM D1876 with the following modifications: Specimens (1 inch x 6 inch) shall be cut from palm of insert to include sealed seam in center of specimen, no conditioning required, tension testing machine head speed 10 inches/minute, report maximum peeling load only.
- 7/ The water permeability shall be measured as specified in ASTM D-751, Hydrostatic Resistance, Procedure B, with a fixed hydrostatic head of 0.7 lbs/in² minimum shall be held for 3 minutes minimum, the shell of the insert shall contact the water. Three specimens minimum shall be tested. The report shall include only measurement of the appearance of the water droplets. Leakage is defined as the appearance of one or more droplets anywhere within the 3 1/2 inch minimum diameter test area. The test may be performed using any device which tests the same specimen area at the equivalent pressure. In cases of dispute, the apparatus described in Method AATCC 127 shall be used. Test the side of the sample (insert) facing the shell.
- 8/ Test 5 samples abrading the side of insert facing shell. Note that the insert is used in an inverted state so the inside of the insert shall face the abradant. The abrasion test shall be conducted in the multidirectional mode using 0 emery paper as the abradant. Use a solid rubber diaphragm without electrical contact (grounding) pin. The diaphragm shall have a smooth surface without bumps. Use diaphragm inflated to 4 +/- 0.25 psi. A load of 1 lb. shall be applied to the abradant. The test mode shall be 100 double strokes per revolution. Once abrasion is complete, specimens shall be tested using Water permeability test method as described in footnote below. In cases of dispute, Norton A621 Emery Grit: 0 shall be used.
- 9/ One specimen, 8 inches by 12 inches, shall be cut from the sample unit with the eight inch side in warp direction and one specimen with the eight inch side in the fill direction. The specimen shall be conditioned at 0°F for one hour and flexed as specified in ASTM F392 except the specimen shall not be aged, the short edges shall not be heat sealed or otherwise joined, and the specimen shall be flexed for 5,000 cycles. At the end of the flexing, the specimen shall be removed from the test chamber and conditioned prior to testing for water permeability. Test two sites for leakage at completion of flex using same conditions and inspection criteria as footnote above.
- 10/ Test five samples. ASTM D751 (Hydrostatic Resistance Procedure A1). No restraining or supporting fabrics are to be used during the testing. Test the side of the sample (insert) facing the shell.

- 11/ The specimen, 4 inches minimum by 4 inches minimum, shall be laid flat on a glass plate. Three drops of the test liquid DEET (as described below) shall be applied to the center of the specimen. Test the exterior side of the sample. A glass plate of the same dimensions shall be placed on the specimen and a four-pound weight placed in the center of the glass plate of the assembly. After 16 hours, remove the specimen and test immediately for hydrostatic resistance. The insect repellent reagent, DEET, shall be a solution of 75% by weight (min) of diethyltoluamide and the remainder denatured alcohol. The diethyltoluamide component of the solution shall be a technical grade and contain N, N-diethyl-m-toluamide of not less than 95% purity and the remainder shall consist of entirely or a mixture of ortho or para isomers of N, N-diethyltoluamide. The denatured alcohol component of the solution shall be ethanol, U.S.P. 94.9% by volume and denatured in accordance with Code of Federal Regulations 27 CFR 21, Formula 40 (see 2.2.2). The insect repellent must be registered with the U.S. Environmental Protection Agency in accordance with the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) 40 CFR Part 162 (see 2.1.2). (For guidance purposes only, DEET insect repellent conforming to A-A-59104 has been used successfully as a reagent in testing.)
- 12/ ASTM D-3393 except that the water pressure listed in Table V shall be used. A minimum of five specimens shall be tested. Also reference MIL-DTL-31011.
- 13/ Test 5 samples using exposure Procedure C. Expose exterior side of laminate to the liquid JP8.
- 14/ Barrier and Liner to be measured together as a laminate or two-layer composite. Use five specimens 4 inches square. Slot width shall be 10 mm. Load cell of 100 g max shall be used. Note that the total force reported is the sum of four individual measurements performed in the locations prescribed by ASTM 6828 (warp/fill/up/down).

3.4.7 Elastic. The elastic shall be attached at the inner wrist using a stretch stitch (such as zig-zag) to gather for a closer fit. It shall be 3/8 inches in width, knit, polyester, and high-stretch. See Figure 2.

3.4.8 Loop tape. A tab with loop tape shall be attached at the inner side seam of the gauntlet, with its corresponding hook attached to the gauntlet. The loop tape shall be cut to conform to the required die-cut shape and conform to Class 4 of A-A-55126. The hook and loop tab will allow for adjustment of the bottom of the gauntlet for a closer fit. The color shall be Coyote 498. See Figure 1.

3.4.9 Hook tape. The gauntlet shall have hook tape which corresponds with the loop tape tab allowing for a closer fit. The hook tape shall be cut to conform to the required die-cut shape and conform to Type II, Class 4 of A-A-55126. The color shall be Coyote 498. See Figure 1.

3.4.10 Pull Loop. The gauntlet cuff shall have a pull loop securely bar-tacked to the palm side of the glove to provide ease of donning and attachment to other clothing items or equipment. The pull loop shall be cotton, 5/8 inches in width and conform to Type 1, Class 3 of MIL-T-43566. The color shall be Coyote 498. See Figure 2.

3.4.11 Clasp. A clasp shall be attached on opposite sides of the left and right glove side seams to allow them to be clipped together as a pair. The clasp shall conform to the ITW Center Release Buckle, Nexus #1002-0038, 3/8 inch, or equal. The color shall be Coyote 498; black may be used as an alternate. See Figures 1 & 2.

3.4.11.1 Binding Tape. The clasp shall be attached at the side seams using binding tape. The tape shall be nylon, 3/8 inches in width and conform to Type III of MIL-PRF-5038. The color shall be Coyote 498; black may be used as an alternate. See Figures 1 & 2.

3.4.12 Thread. The thread for all construction seams shall conform to GORE® Performance Thread – M1000LTR-L-5, 1000 Denier, or equal. The thread shall be chemical, UV, weather, and fade resistant and be comprised of 100% expanded Polytetrafluoroethylene (PTFE), size 69 (Tex size 50). The color shall be clear providing an automatic color match or coyote to match the glove. As an alternate, nylon thread size letter B (Tex size 45), non-wicking, with a minimum break strength of 6lbs conforming to A-A-59826 Type I, Class B may be used. The color shall be coyote to match the glove.

3.4.13 Labels. Each glove shall have a combination identification-size label and instruction label. The inscription shall have a minimum font size of 10 points. The inscription legibility, label, and label attachment method shall last the expected life of the glove. The fastness to laundering requirements of MIL-DTL-32075 shall apply. The labels must boldly specify size, identify the item, and provide use and care instructions.

3.4.13.1 Glove combination identification-size label. The label shall be located inside the glove on the back of the wrist of both gloves in a pair. The combination identification-size label shall conform to Type VI, Class 4, MIL-DTL-32075 and shall bear the following inscription:

Identification Information
 GLOVE, INTERMEDIATE COLD WEATHER
 CONTRACT NO.:
 CONTRACTOR'S NAME:
 FIBER CONTENT:

Glove Size Label Information

Small TBD	Medium TBD	
Large TBD	X-Large TBD	XX LARGE TBD

3.4.13.2 Instruction label. The instruction label for the glove shall conform to Type VI, Class 3 of MIL-DTL-32075, and shall include the following information:

Glove Instruction Label Contents

1. Machine wash on regular cycle in cold water.

2. Do not bleach.
3. Drip dry.
4. Do not iron.
5. Do not dryclean.

DO NOT REMOVE THIS LABEL

3.4.13.3 Combination identification-size-instruction label. As an alternate, a combination identification-size-instruction label may be used conforming to Type VI, Class 14 of MIL-DTL-32075.

3.4.13.4 Label/tag. Each glove shall have an individual bar code placed on a paper tag for personal clothing items conforming to Type VIII, Class 17 of MIL-DTL-32075. The paper tag shall contain the NSN, and shall be standard bleached sulfate having a basis weight of 100 pounds. The paper used for the tags shall have a smooth finish to accept thermal transfer and direct printing. The tags shall have a hole and shall be attached to each item by a fastener. The tags shall be clearly legible and readable by a scanner.

3.5 Configuration. The following specifics are needed to ensure uniform appearance, comfort and durability in garrison use, combat, and field operations. End item construction and appearance shall conform to the requirements of this document, garment characteristics specified in Table VI, and the finished dimensions as specified in Table IX to maintain item configuration and compliance to end item and component performance tests (See 4.4 and 4.5).

TABLE VI. End item requirements

Garment Characteristic	Requirement	Test Method
Dry thermal insulation, clo	1.0 minimum	See 4.5.6
Dry time, hours	50 maximum	See 4.5.5
Home laundering durability, # of launderings with no failing seams	15 minimum	AATCC 135 – omit dimensional stability, inspect for durability
Liner retention, pounds	10 minimum	See 4.5.4
Whole glove leak test	Pass 2 psi @ 5 seconds minimum	See 4.5.3
OR Overall liquid integrity	Pass	NFPA 1971 (2000 edition) Chapter 6-33

3.6 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.

3.7 Construction.

3.7.1 Stitches, seams, and stitching. All stitching shall conform to ASTM D 6193.

TABLE VII. Stitching

Operation	Stitch Type	Stitches Per Inch
Topstitch, single needle stitch, or straight stitch	301	8-12
Single needle overedge	504	6-8
Zig Zag	304	10-12
Baste	301 or 101	8-12

3.7.2 Tacking and backstitching. Ends of seams and rows of stitching with 301 type stitch, when not caught in other seams or stitching, shall be securely backstitched not less than ¼ inch. Thread breaks (all stitch types) shall be secured by stitching back of the break not less than ½ inch.

3.8 Color matching.

3.8.1 Visual shade matching. The color and shade of the basic material shall match the standard sample and shall be a good match to the standard sample under horizon lamplight when tested in accordance with 4.5.7.1.

3.8.2 Colorfastness. The finished glove cloth shall show fastness to: light (after 40 AATCC standard fading hours or 170 Kilojoules); laundering (after 4 cycles) and crocking. The colorfastness of the cloth shall be equal to or better than the standard sample, or equal to or better than a rating of “4” using the AATCC Gray Scale for Color Change and a rating of “3-4” using the AATCC Gray Scale for Staining. The finished cloth shall show fastness to crocking equal to or better than the standard sample or shall have an AATCC Chromatic Transference Scale Rating not lower than 4.0.

3.8.3 Color. The exterior garment materials shall be solid Coyote 498 shade, which comply with visual shade standard in Visual Guide of Colors Used in Military Items. The exterior material(s) shall meet reflectance requirements specified in Table VIII when tested in accordance with AATCC Evaluation Procedure 6 and 9. No shaded parts are allowed on glove exterior. All fabrics shall show good colorfastness (rating 3-4) to crocking, light, and laundering when tested in accordance with AATCC Methods 8, 16 and 61, respectively.

3.8.3.1 Spectral reflectance. The finished outershell cloth shall meet the spectral reflectance values (in percent) for the visible/near infrared wavelength range, 600 to 860 nanometers (nm) for the colors specified in Table VIII as applicable when tested as specified in 4.5.7.2.

TABLE VIII. Spectral reflectance

Wavelengths	Coyote 498	
	Nanometers	Min.
600	8	20
620	8	20
640	8	22
660	8	24
680	12	24
700	12	34
720	16	42
740	22	46
760	30	50
780	34	54
800	36	56
820	38	58
840	38	58
860	40	60

3.9 Finished Dimensions. Finished dimensions shall be in accordance with Table IX, and measured in accordance with the footnotes listed for Table IX and Figure 5.

TABLE IX. Glove finished dimensions (inches)

	SMALL	MEDIUM	LARGE	XLARGE	XXLARGE	TOLERANCE
1/	2-3/8	2-1/2	2-5/8	2-13/16	2-7/8	+/- 1/8
2/	3-1/4	3-7/16	3-5/8	3-13/16	3-15/16	+/- 1/8
3/	4-1/8	4-5/16	4-9/16	4-3/4	4-15/16	+/- 1/8
4/	3-15/16	4-1/16	4-5/16	4-1/2	4-11/16	+/- 1/8
5/	3	3-1/8	3-5/16	3-7/16	3-9/16	+/- 1/8
6/	1-11/16	1-13/16	1-15/16	2-1/16	2-1/8	+/- 1/8
7/	1-5/8	1-3/4	1-7/8	2	2-1/8	+/- 1/8
8/	1-3/4	1-7/8	2	2-1/8	2-1/4	+/- 1/8
9/	1-11/16	1-13/16	1-15/16	2-1/16	2-13/16	+/- 1/8
10/	1-1/2	1-5/8	1-3/4	1-13/16	1-15/16	+/- 1/8
11/	4-5/8	5	5-3/8	5-3/4	6	+/- 1/4
12/	4-13/16	5-13/16	5-9/16	5-15/16	6-1/4	+/- 1/8
13/	5-13/16	5-9/16	6	6-7/16	6-3/4	+/- 1/8
14/	11-3/4	12-5/16	13	13-9/16	14-1/16	+/- 1/4

NOTE: Measurements are flat, not circumference. See Figure 5.

1/ Thumb Length – Measure on palm side from lowest point of thumb/index crotch to thumb tip.

2/ Index Finger Length – Measure on back of hand from lowest point of index/middle finger crotch to finger tip.

- 3/ Middle Finger Length - Measure back of hand from lowest point of middle/ring finger crotch to finger tip.
- 4/ Ring Finger Length - Measure on back of hand from lowest point of middle/ring finger crotch to finger tip.
- 5/ Pinky Finger Length - Measure on back of hand from lowest point of ring/pinky finger crotch to finger tip.
- 6/ Thumb Width – Measure flat width of back of thumb at midpoint. Determine midpoint by folding thumb in half to thumb/index crotch.
- 7/ Index Finger Width – Measure flat width of back of index finger at midpoint. Determine midpoint by folding index finger in half to index/middle finger crotch.
- 8/ Middle Finger Width – Measure flat width of back of middle finger at midpoint. Determine midpoint by folding middle finger in half to index/middle finger crotch.
- 9/ Ring Finger Width – Measure flat width of back of ring finger at midpoint. Determine midpoint by folding ring finger in half to middle/ring finger crotch.
- 10/ Pinky Finger Width – Measure flat width of back of pinky finger at midpoint. Determine midpoint by folding pinky finger in half to ring/pinky finger crotch.
- 11/ Hand Width – Flatten glove and measure total width back of hand at widest point.
- 12/ Wrist Width – Flatten glove and measure total width of palm side at wrist elastic, with elastic fully stretched and extended.
- 13/ Gauntlet Cuff Width – Flatten glove and measure total width of gauntlet at hem.
- 14/ Total Length – Flatten glove and measure back of hand from gauntlet hem to the middle finger tip.

3.10 Workmanship. The finished glove shall be free from loose thread, foreign matter, and irregular defects that can adversely affect usage or durability. The finished items shall be uniform in quality, free from defects that adversely affect form, fit or function and those defects specified in Table X.

4. VERIFICATION

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

1. First article inspection (see 4.2).
2. Conformance inspection (see 4.4).

4.2 First article inspection. A first article inspection when required (see 4.1) shall consist of the examinations and tests specified in Tables I – VI, VIII – X, and XII. The first article inspection shall be unacceptable if these requirements are not met.

4.2.1 First article samples. Unless otherwise specified in the procurement document, first article samples shall be provided. The sample size will be specified in the procurement document. The sample unit shall be one pair of gloves and the lot size shall be expressed in pairs.

4.3 Conformance inspection. In accordance with 4.1, conformance inspection shall include the examination specified in 4.4. Sampling for inspection shall be performed in accordance with ASQC Z1.4.

4.3.1 Conformance inspection samples. Sampling for conformance inspection shall be performed in accordance with ASQC Z1.4 (see 6.2). The sample unit shall be one pair of gloves and the lot size shall be expressed in pairs.

4.4 Component and end item inspection. In accordance with 4.1, components and end items shall be inspected in accordance with all the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document. In addition to testing provisions specified in referenced documents, components shall be tested for the characteristics specified in this specification. Tests shall be conducted with both the specimen and test apparatus under standard conditions as defined in the various ASTM, and AATCC test methods. All requirements are applicable to the sample unit. All test reports shall contain the individual values utilized in expressing final results. The lot shall be unacceptable if one or more sample units fail to meet any test requirement specified.

4.4.1 End item visual examination. The end item shall be visually examined for compliance to 3.3. The glove shall be examined for defects in shade, design, material, construction, and workmanship, with defects classified in accordance with Table X.

TABLE X. Defects

EXAMINATION	DEFECT
Glove Pairing	Not matched and paired, right and left not same size, wide variation in appearance Not tacked or joined together as specified.
Shell or lining design	Not as specified (incorrect material, pattern, etc.) Poorly shaped
Shade	Shade variation within a part or between parts. Unacceptable shade change as a result of water repellent treatment application. Any color not as specified.
Cleanness	Spot, stain, excessive thread ends not trimmed or removed, shade stamp marking on outside; odor, affecting appearance or serviceability.
Material and workmanship	Any component part omitted, distorted, full, tight, or twisted; not functioning properly, or defective; any part caught in any unrelated stitching.
	Cloth Material: Any hole, cut, tear, smash, burn, drill hole, run, thin place, dye streak, color not as specified, misweave, knot or slub affecting appearance or serviceability.
	Leather: Not specified color, not full grain, flesh side not smooth or contains area of course, loose fibers, not clean, stain or foreign matter, hard, boney, loose, spongy leather, hard scar, cut hole.
	Seam: Not type specified, puckered, distorted, pleated, wavy, twisted, irregular or open, loose or tight stitch tension, broken or missing thread or stitch, needle chew, visible mend, edge or raised stitching sewn too close to edge resulting in damage to cloth, seam allowance not as specified, visible raw edge - affecting appearance or serviceability.
	Bartacks missing, insecure, misplaced, not specified size, stitches loose or broken, bartack not serving intended purpose.
	Poorly assembled and affecting serviceability (finger distorted or twisted affecting comfort). Difference in overall length between front and back of glove is more than ½ inch.
	Unwanted permanent fold, pleat, or crease in fabric or garments, affecting appearance or serviceability.
Labels	Omitted, incorrect, illegible, not attached where specified; bar-codes omitted, not readable by scanner; human-readable interpretation (HRI) omitted or illegible; bar code not visible on folded, packaged item; bar code attachment causes damage to the item.
Packaging	Not packaged in accordance with the contract or purchase order.

4.4.2 Dimensional examination. The end item shall be examined for conformance to the dimensions specified in Table IX.

4.4.3 Component testing. The components (see 3.4.1, 3.4.2, 3.4.3, 3.4.6, 3.8) shall be tested for characteristics listed in Table XI. The methods of test shall be as specified in Table XI. All test reports shall contain the individual values utilized in expressing the final results. The testing requirements and test sampling plan shall be as specified in the contract or purchase order.

TABLE XI. Component tests

Characteristic	Requirement Paragraph	Test Method
Shell material		
Weight	3.4.1	ASTM D 3776
Fabric count	3.4.1	ASTM D 3775
Break strength	3.4.1	ASTM D 5034
Tear strength	3.4.1	ASTM D 1424
Moisture vapor transmission rate	3.4.1	ASTM E 96, Method B and BW
Drying time	3.4.1	See 4.5.1
Spray rating	3.4.1	AATCC 22
Puncture propagation	3.4.1	ASTM D 2582
Dimensional stability	3.4.1	AATCC 135
Stretch	3.4.1	ASTM D 3107
Colorfastness to crocking	3.8.2	AATCC 8
Colorfastness to light	3.8.2	AATCC 16
Colorfastness to laundering	3.8.2	AATCC 61
Color	3.8	See 4.5.7
Spectral Reflectance	3.8.3	See 4.5.7.2
Lining material		
Weight	3.4.2	ASTM D 3776
Fabric count	3.4.2	ASTM D 3775
Break strength	3.4.2	ASTM D 5034
Tear strength	3.4.2	ASTM D 1424
Moisture vapor transmission rate	3.4.2	ASTM E 96, Method B and BW
Drying time	3.4.2	See 4.5.1
Dimensional stability	3.4.2	AATCC 135
Spray rating	3.4.2	AATCC 22
Color	3.8	See 4.5.7
Leather material		
Thickness	3.4.3	ASTM D 1814
Moisture vapor transmission rate	3.4.3	ASTM D 5052
Water absorption resistance	3.4.3	See 4.5.2
Oil and stain resistance	3.4.3	AATCC 118
Abrasion resistance	3.4.3	ASTM D 7255
Stiffness	3.4.3	ASTM D 2821
Stitch tear	3.4.3	ASTM D 4705
Elongation	3.4.3	ASTM D 2209
Shrink temperature	3.4.3	ASTM D 6076
Cold crack resistance	3.4.3	ASTM D 1912
Color	3.8	See 4.5.7
Hexane soluble material	3.4.3.1	ASTM D 3495

Characteristic	Requirement Paragraph	Test Method
Chromic oxide	3.4.3.1	ASTM D 2807
pH	3.4.3.1	ASTM D 2810
Total ash	3.4.3.1	ASTM D 2617
Chromium (VI) content	3.4.3.1	ISO 17075
Waterproof Insert		
Weight	3.4.6	ASTM D3776
Thickness	3.4.6	ASTM D1777
Insert Laminate Water Vapor Transmission Rate ISO Method Method B (hand-side to water) Method BW (hand-side to water)	3.4.6	ISO 15496, ASTM E96 ASTM E96
Insert Laminate Cut Strip Break Strength	3.4.6	ASTM D5035
Insert Seam Strength	3.4.6	ASTM D1876
Insert Laminate Water Permeability after Universal Wear Abrasion Test	3.4.6	ASTM D751, ASTM D3886
Insert Laminate Water Permeability after Cold Gelbo Flex	3.4.6	ASTM D751, ASTM F392,
Insert Laminate Chemical Penetration Resistance (ASTM F903 with JP8)	3.4.6	ASTM F903
Insert Laminate Mullen Hydrostatic Resistance Initial After DEET	3.4.6	ASTM D751
Insert Laminate Sustained Mullen Hydrostatic Resistance After DEET	3.4.6	ASTM D3393
Insert Laminate Water Permeability after DEET	3.4.6	ASTM D751
Insert Laminate and Thermal Liner Stiffness	3.4.6	ASTM D6828

4.4.4 End item testing. The finished gloves shall be tested for the characteristics listed in Table XII according to the specified methods. All test reports shall contain the individual values utilized in expressing the final results. The testing requirement and test sampling plan shall be specified in the contract or purchase order.

TABLE XII. End item requirements

Characteristic	Requirement Paragraph	Test Method
Dry thermal insulation	3.5	See 4.5.6
Home laundering durability	3.5	AATCC 135 – omit shrinkage, inspect for durability.
Whole Glove Leak Test OR Overall Liquid Integrity	3.5	See 4.5.3 NFPA 1971 (2000 edition) Chapter 6-33
Liner Retention	3.5	See 4.5.4
Dry Time	3.5	See 4.5.5

4.4.5 In-process examination. Visual and dimensional examinations shall be made at any point or during any phase of the manufacturing process to determine whether construction details which cannot be examined in the finished product are in accordance with requirements specified in section 3. Materials and components, which can be classified, as a defect in accordance with Table IX and X shall be removed from production.

4.5 Examinations and tests.

4.5.1 Drying Time Test Method.

Apparatus and Materials:

Wringer (motor driven) (see notes)

Laboratory balance, accurate to 0.01g

White AATCC Textile Blotting Paper, 25 x 25 cm (see notes)

Water, distilled

250 ml glass beaker

Test Specimens:

The fabric samples and blotting paper should be conditioned at 65 +/- 2% RH and 70 +/- 2°F for a minimum of 4 hours.

3 test specimens per sample, 2 x 2 inches.

Procedure:

1. Test shall be run in standard conditions, 65 +/-2% RH and 70 +/- 2°F.
2. Weigh the conditioned specimen using a laboratory balance accurate to 0.01g. A wire mesh kitchen/bathroom sink strainer may be used by placing it on the weighing pan of the lab balance in an inverted manner and taring its weight before the measurement of any specimen weight.
3. Place 100 mls of distilled water into a 250 ml glass beaker.
4. Submerge the specimen in the beaker of water for 30 minutes. Make certain that the specimen is completely submerged to insure complete wetting.

5. Remove the specimen and sandwich it between two pieces of unused blotting paper. Pass the sandwich through the wringer with a dead weight load of 27.7 +/- 0.5 kg.
6. Immediately place specimen on the balance with top door of the balance open, side doors closed and record wet weight either to the nearest 0.01 or 0.1 grams. (Degree of dryness shall be determined by the user.) Manually monitor weight at set intervals until dry or use an automated balance with capability to weigh specimen until dry (see notes). Record time to dry.
7. Repeat for remaining specimens. Average the 3 specimens.

Notes:

American Association of Textile Chemists and Colorists (AATCC)

Wringer, (motor driven) see AATCC 70 footnote 11.2.

Blotting Paper see AATCC footnote 11.3.

Suitable Automation Software for a balance, Labtronics Inc., Web: www.labtronics.com

4.5.2 Water Absorption Resistance Test. One 3-inch diameter specimen shall be tested from each 12 by 12 test area. Prior to testing, the specimen shall be allowed to reach moisture equilibrium in the standard conditions environment. A stainless steel 500 mL, 3-inch diameter, 5-inch long container with a rubber gasket and cover shall be used to test the specimen. The specimen shall first be weighed (to the nearest 0.01 g) and then shall be placed inside the cover with the flesh side of the specimen next to the inside of the cover. Place the rubber gasket inside the cover and against the grain surface of the leather specimen. Add 100 mL of distilled or deionized water at 23°C to the container. Secure the cover with the specimen and gasket to the container. Invert the container so the water is against the grain surface of the specimen. Place the inverted container on a flat surface and allow it to remain in the inverted position for 30 minutes. At the end of 30 minutes place the container upright, remove the cover, and place in on a flat surface. The inside of the cover shall face the flat surface. Tilt the cover so the outer edge of the bottom is raised 1-1.5 inches from the flat surface, and allow it to drain for 5 minutes. After 5 minutes immediately remove the specimen from the cover, hold the specimen by its edge and shake briskly once to remove any free moisture from the surface of the specimen. Immediately reweigh the specimen to the nearest 0.01 g, and calculate the percent water absorption as follows:

$$\text{Percent water absorption} = ((W2 - W1) \times 100) / W1$$

W1 = Original weight of conditioned specimen.

W2 = Weight of specimen after being subject to water.

4.5.3 Whole glove leak test. The finished glove shall be tested for leakage in accordance with 4.5.3.1, 4.5.3.2, and 4.5.3.3. The lot size shall be expressed in units of gloves. The sample unit shall be one glove, and the selection shall be by pairs. Any test failure shall be cause for rejection of the lot.

4.5.3.1 Testing apparatus. The test apparatus shall consist of a 3 inch inside diameter tubular rigid polyvinyl chloride test chamber approximately 12 inches in length. The chamber shall be capped approximately 2 inches from the bottom with the cap having a ½ inch diameter

plastic air escape tube approximately 3 inches long. The test chamber shall be oriented vertically and placed in a container filled with approximately 1 inch of water such that the escape tube vents to the outside of the chamber, with the end of the tube under the water. The top of tube shall be beveled at a 45 degree angle on the inside. The top plug shall consist of polyethylene, approximately 4 inches in height, and 4 inches in diameter at the top tapering to approximately 2 inches in diameter at the bottom. An air passage shall be provided vertical through the plug and connected via nominal ½ inch tubing through a gage and air regulator to an oil-free compressed air source. A mechanism shall be provided that is capable of reproducibly clamping the plug into the end of the tube such that a seal is provided. An equivalent to the apparatus as mentioned above shall be qualified by US Army, Natick Soldier Center.

Note: The Whole Glove Leak Tester is covered by US Patent 4,776,209.

4.5.3.2 Testing procedure. The glove shall be inserted into the test chamber to near the cuff. The plug shall be inserted into the cuff of the glove and clamped such that a seal that holds not less than 4 psi is formed with the beveled edge of the test chamber. Air shall be provided to the chamber to a level of 2 psi for a period of not less than 5 seconds. Appearance of air bubbles at 5 seconds constitutes failure.

4.5.4 Liner Retention Test and Testing apparatus. Liner retention shall be evaluated with the use of locking forceps and a force-measuring gage. Test a minimum of three finished items. Each digit of the glove shall be tested as follows. The locking forceps shall be attached to the inner liner of the digit to be tested ensuring that an unattached liner or the outer shell is not grabbed. The hook of the force gauge shall be looped around the locking bridge of the forceps. The digit of the glove shall be gripped ensuring the inner liner is not impeded. The force gauge shall be pulled until 10 lbs registers on the dial and then released. Each digit shall be inspected for indication of detachment of inner barrier liner. Results shall be recorded and reported as pass or fail. Failure of any digit of any glove shall constitute failure. Items shall be permitted to be cut open to verify detachment.

4.5.5 Dry Time (end item), Testing procedure. Condition the item at 70°F +/- 2 and 65% RH +/- 2 according to ASTM 1776. Then use a lab balance capable of weighing to the nearest 0.01 grams to weigh the item and record as starting weight. Then submerge the item into a large beaker of reverse osmosis water at approximately room temperature and soak for ½ hour. The item shall then be spun on the Permanent Press spin cycle of a home type washing machine. The item shall be immediately weighed, recording weight again and then clipped or pinned to a clothes hanger to dry at 70°F +/-2 and 65% RH +/-2. Periodically unclipping/unpinning and weighing on the lab balance until a specified dryness is reached or until the item has dried back to its starting weight.

4.5.6 Thermal insulation test. Three separate samples of the test handwear item shall be evaluated and the average value is reported. R values can be converted to the more familiar clo unit to allow ranking order of standard for procurement purposes. Test size shall be right hand, size Large. A life-sized biophysical model of the human hand that measures localized and total thermal resistance shall be used. Insulation values for the total hand model and its 7 individual regions are calculated by an internal program during 30 minutes of steady state data collection. The surface of the hand model is controlled at 30 °C. Total thermal resistance (R) to heat exchange is calculated in the test conditions stated in Table XIII and using:

$R = (SA * \Delta T) / \text{Power}$, where R is the thermal resistance, $m^2 \text{ } ^\circ\text{C} / \text{Watt}$

SA = total surface area of 7 regional segments, m^2

Delta T = temperature gradient between the hand model surface and ambient air temperature, $^\circ\text{C}$.

P = Total power input, Watts.

TABLE XIII. Testing conditions for thermal hand (dry test)

Condition	Value
Ambient temperature	5.0 $^\circ\text{C}$
Hand temperature	30.0 $^\circ\text{C}$
Wind speed	2-3 meters/sec and turbulent

If required, gloves submitted will be tested by the Government. Testing at alternate facilities shall require side-by-side comparison due to chamber wind speed differences that cannot be controlled that will affect the total measured values.

4.5.7 Color Matching.

4.5.7.1 Visual color matching (all types and classes). The color and appearance of the cloth shall match the standard sample when viewed using AATCC Evaluation Procedure 9, Option A, under filtered tungsten lamps that approximate artificial daylight D75 illuminant with a color temperature of $7500 \pm 200 \text{ K}$ with illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under horizon lamplight at $2300 \pm 200 \text{ K}$.

4.5.7.2 Spectral Reflectance. Finished cloth shall meet requirements specified in 3.8.3.1. Spectral reflectance shall be measured and reported on the initial cloth. Certificate of compliance will be accepted on finished uniforms and subject to Government verification. Spectral reflectance data shall be determined on the face side and shall be obtained from 600 to 860 nanometers (nm) at 20 nm intervals on a spectrophotometer relative to the 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 bandwidth 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 measured areas should be taken at least 6 inches away from the selvage. The specimen shall be viewed at an angle no greater than 10 degrees from the normal, with the specular component included. Photometric accuracy of the spectrophotometer shall be within 1 percent and the wavelength accuracy within 2 nm. The standard aperture size used in the color measurement device shall be 0.3725 inches in diameter. Any color having spectral reflectance values outside the limits at four or more of the wavelengths specified shall 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 6.1). 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 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this document, including any amendments.
- b. Types, classes and sizes required (see 1.2).
- c. National stock number.
- d. Applicable Government patterns and drawings, including revisions.
- e. When first article sample is required (see 4.2 and 6.2).
- f. Number of first article inspection samples (see 4.3)
- g. Issue of DODISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.2 and 2.3).
- h. Packaging requirements (see 5.1)

6.2 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be first article sample, a first production item, or a standard production item from the contractor's current inventory, and the number of items to be tested as specified in 4.3. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for pending contract. Bidders should not alternate submit bids unless specifically requested to do so in the solicitation.

6.3 Standard sample. For standard samples, address the procuring activity issuing the invitation for bids or request for proposal.

6.4 Suggested Sources.

Outdoor Research
2203 1st Avenue South
Seattle, WA 98134-1424

W.L. Gore & Associates, Inc.
555 Paper Mill Road
Newark, DE 19711

ITW Nexus
21601 South Harlem Avenue
Frankfort, IL 60423

6.5 Subject term (key word) listing.

Glove
Handwear
Insulated
Waterproof
Water Repellent

6.6 Figures.

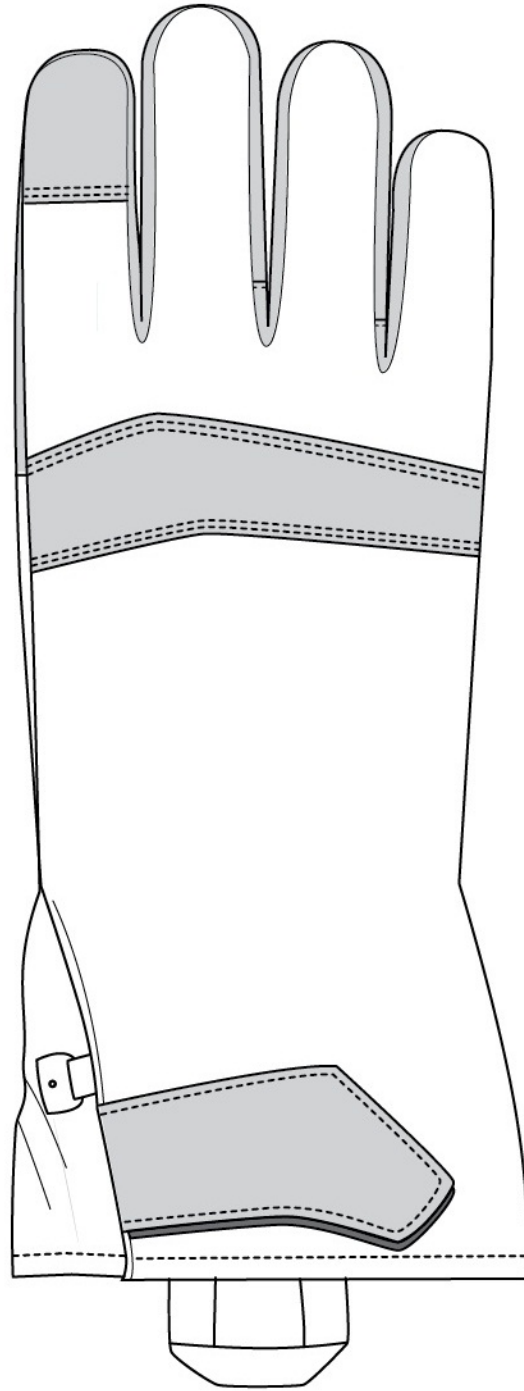


FIGURE 1. GLOVE: BACK HAND VIEW

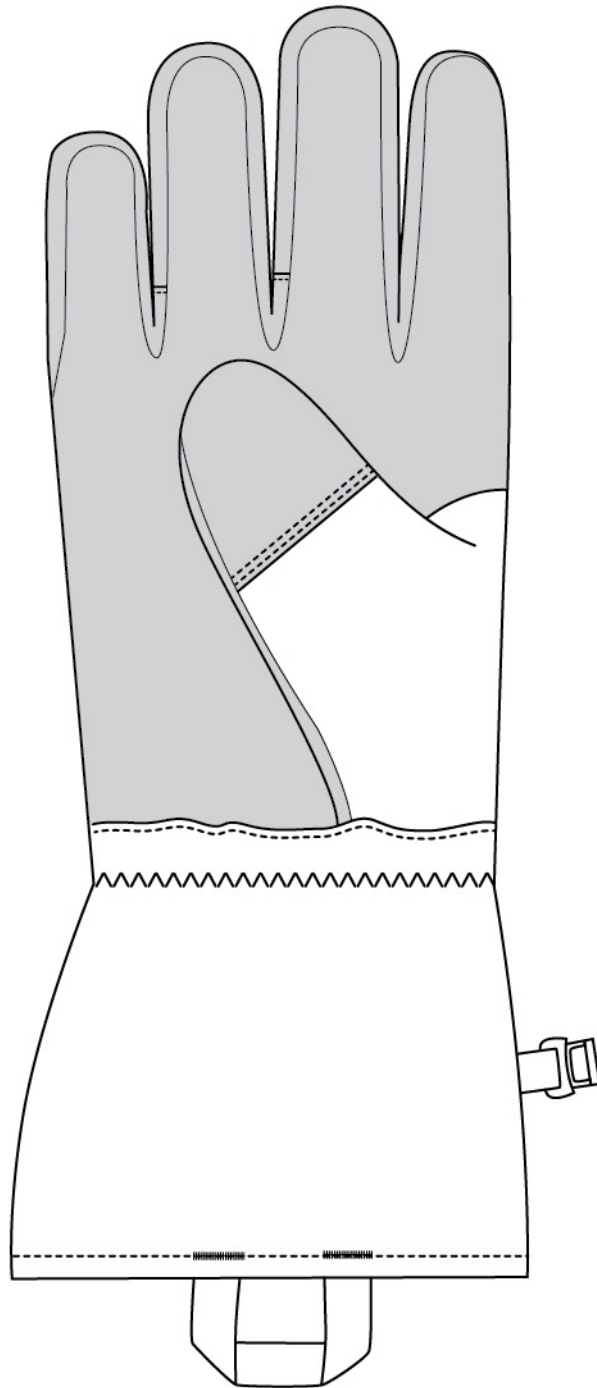


FIGURE 2. GLOVE: PALM VIEW

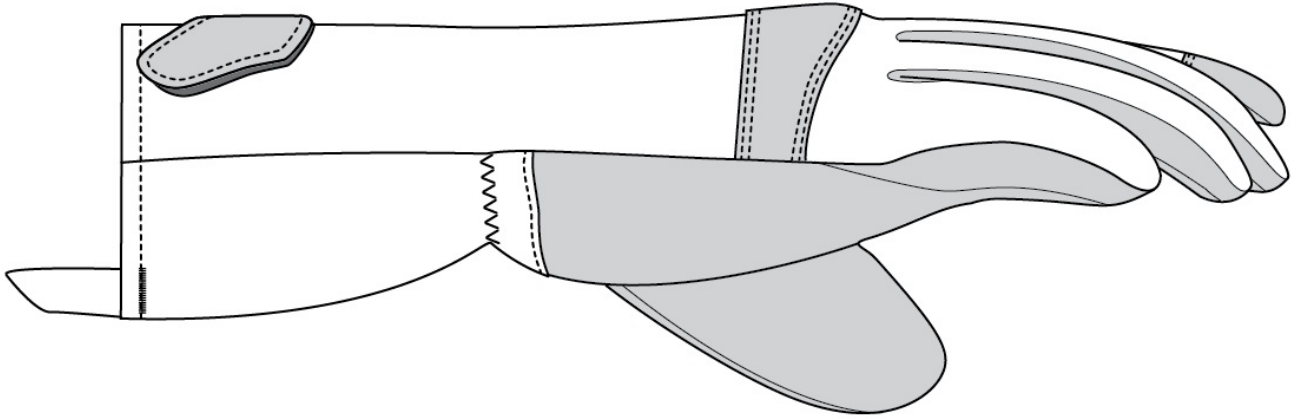


FIGURE 3. GLOVE: (4TH FINGER) SIDE VIEW

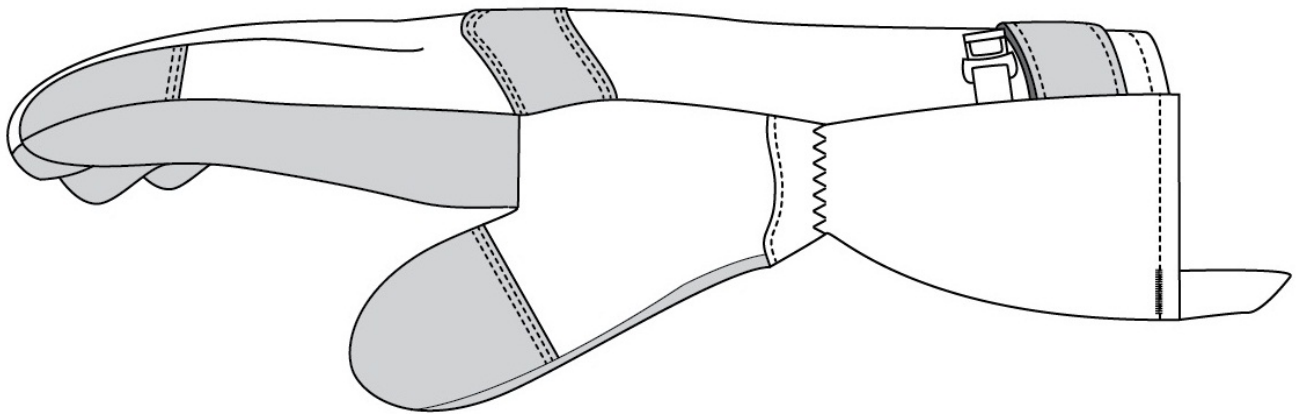


FIGURE 4. GLOVE: (THUMB) SIDE VIEW

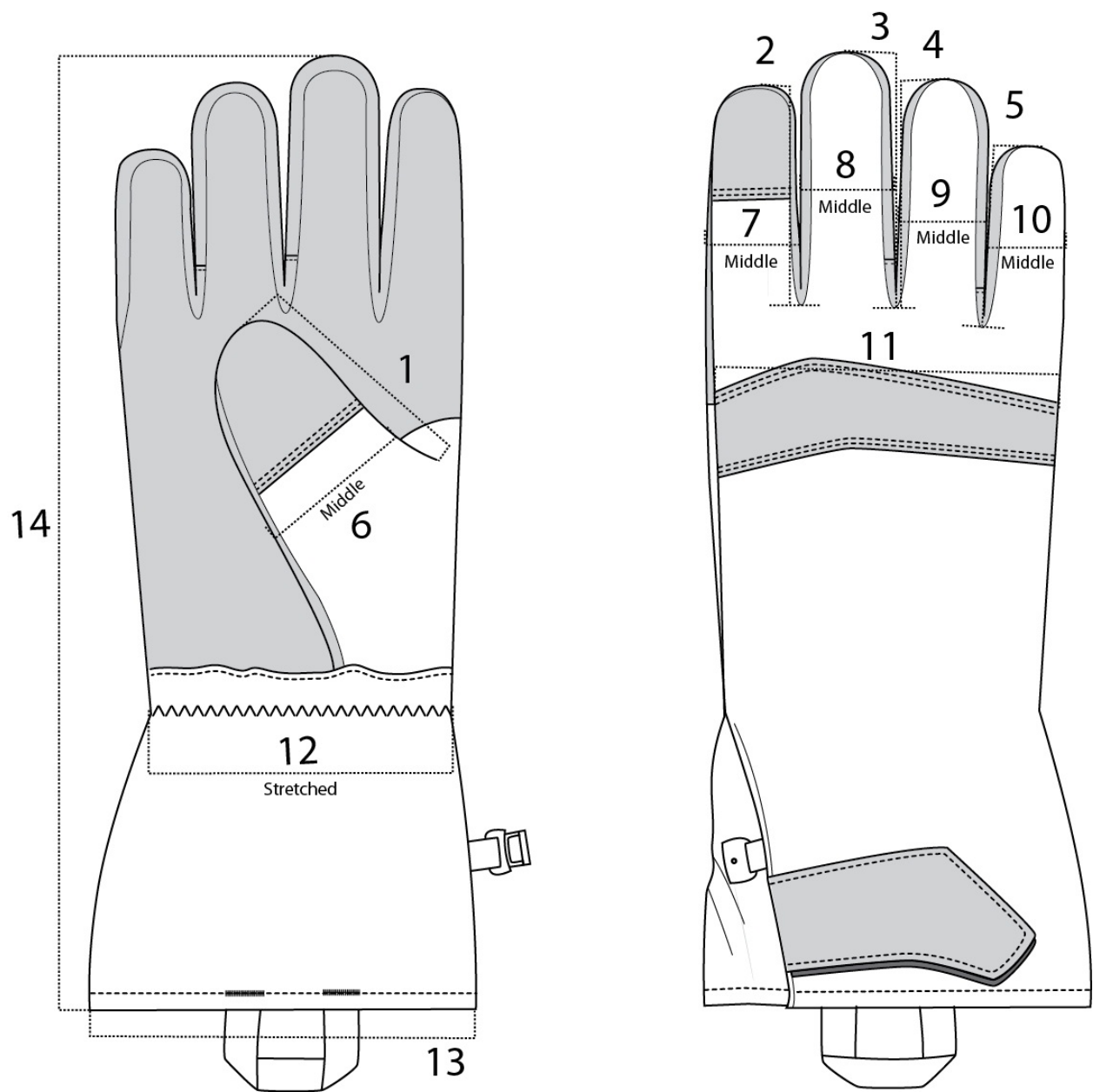


FIGURE 5. MEASUREMENTS