

INCH-POUND

MIL-L-40051E
29 March 1991
SUPERSEDING
MIL-L-40051D
21 December 1977

MILITARY SPECIFICATION

LEATHER, CATTLEHIDE, FOR GLOVES

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers full grain cattlehide leather for gloves.

1.2 Classification. The leather shall of the following types and classes as specified, and treatment when specified (see 6.2).

Type I - Light, 2.0 to 3.0 ounces

Type II - Heavy, 3.1 to 4.0 ounces

Class a - Sides

Class b - Bends

Treatment A - Water resistant treated

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5019 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8330

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

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

MILITARY

MIL-P-43432 - Packaging of Leather

STANDARDS

FEDERAL

FED-STD-191 - Textile Test Methods
FED-STD-311 - Leather, Methods of Sampling and Testing

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

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

Chromatic Transference Scale

(Copies may be obtained from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 22709.)

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

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

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3), in accordance with 4.3.

3.2 Standard sample. The leather, when embossed, shall match the standard sample for fine hair cell pattern and shall be equal to or better than the standard sample with respect to all characteristics for which the standard sample is referenced (see 6.4).

3.3 Material. The types I and II leather shall be full grain, chrome tanned cattlehide sides. The type I leather shall be produced from thin, spready hides selected from native dairy cows. The type II leather shall be produced from any suitable cattlehides, except bull hides.

3.4 Trim (form) and area. The class a leather shall be trimmed to conform with the definition of a "side" and the class b leather shall be trimmed to conform with the definition of a "bend" as specified in FED-STD-311. The area expressed in square feet shall be legibly marked in the butt area on the flesh side of the leather.

3.5 Thickness. The thickness of the type I leather shall be a minimum of 2.0 ounces and a maximum of 3.0 ounces, and the thickness of the type II leather shall be a minimum of 3.1 ounces and a maximum of 4.0 ounces when examined as specified in 4.4.3.

NOTE: 1 ounce = 1/64 inch.

3.6 Color. The color of the type I leather shall be black. Unless otherwise specified (see 6.2), the color of the type II leather shall be cream, and shall be struck through from grain to flesh. The types I and II leather shall be drum dyed.

3.6.1 Colorfastness (resistance to rubbing). The leather shall be tested for resistance to dry and wet crocking in accordance with 4.4.4. Staining of the dry cloth shall be not lower than Munsell value 7.0 for the types I and II leather. Staining of the wet cloth shall be not lower than Munsell value 6.5 for the type I leather and not lower than Munsell value 8.0 for the type II leather.

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3.7 Staining. When treatment A is specified (see 6.2), the leather shall be tested for staining in accordance with 4.4.4. The stain on the test pad shall be not lower than expanded AATCC value +2.

3.8 Finish. The leather shall be soft and pliable. Application of a finish to the grain surface is prohibited. If necessary, the flesh side of the leather shall be dry buffed and shaved to obtain a smooth, clean surface and uniform thickness in all areas of the side or bend. Variations in color on the flesh side resulting from buffing or shaving are permissible. A fine hair cell embossed pattern may be applied to the grain surface of the side. Printed leather shall not be permitted. If embossed, the leather shall match the standard sample for fine hair cell pattern. Leather previously dyed or finished in a color not specified and then redyed or refinished to match a specified color shall not be acceptable.

3.9 Treatment A. When treatment A is specified (see 6.2), the leather shall be treated with a water resistant compound (see 6.5). After the water resistant compound has been applied, the leather shall not be exposed to soaps, detergents, wetting agents, or surfactants.

3.10 Stitch tearing strength. At least 80 percent of the specimens tested shall have stitch tearing strengths of not less than 17 pounds for the type I leather and 30 pounds for the type II leather when tested as specified in 4.4.4.

3.11 Elongation. At least 80 percent of the specimens tested shall have an elongation of not less than 25 percent at a load of 25 pounds when tested as specified in 4.4.4. Any specimen which ruptures or exhibits grain crack below 25 pounds shall be reported as a failing specimen.

3.12 Shrinkage. The leather shall not shrink before the temperature reaches $98^{\circ}\text{C} + 0.5^{\circ}\text{C}$, nor shall the leather shrink when subjected to a temperature of $98^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ for a period of 30 seconds when tested as specified in 4.4.4.

3.13 Stiffness. At least 80 percent of the specimens tested shall have maximum stiffness values of 120 degrees before soaking and 135 degrees after soaking for the type I leather, and maximum stiffness values of 260 degrees before soaking and 320 degrees after soaking for the type II leather, when tested as specified in 4.4.4.

3.14 Water absorption resistance. When treatment A is specified (see 6.2), at least 80 percent of the specimens tested shall gain not more than 20 percent of their weight by water absorption when tested as specified in 4.4.4.

3.15 Oil absorption resistance. When treatment A is specified (see 6.2), the leather shall show no evidence of oil absorption when tested as specified in 4.4.4.

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3.16 Air permeability. When treatment A is specified (see 6.2), 300 cubic centimeters of air shall pass through the leather in 10 minutes or less when tested as specified in 4.4.4.

3.17 Chemical requirements. The leather shall conform to the chemical requirements in table I when tested as specified in 4.4.4.

TABLE I. Chemical requirements

Characteristics	Minimum	Maximum
Chloroform soluble material, percent <u>1/</u>	-	25.0
Chromic oxide, percent <u>1/</u>	3.0	-
pH value	3.3	-
Total ash, percent <u>1/</u>	-	9.0

1/ Calculated on moisture-free basis.

3.18 Workmanship. The finished leather shall conform to the quality of product established by this specification, and the occurrence of defects shall not exceed the applicable acceptable quality levels.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

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

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4)

4.3 First article inspection. When a first article is required (see 3.1 and 6.2), it shall be examined for the defects specified in 4.4.2 and 4.4.3.

4.4 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with the referenced documents.

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

4.4.2 End item visual examination. The end items shall be examined for the defects listed below. The lot size shall be expressed in units of sides or bends. The sample unit shall be one side or bend. Any sample unit containing one or more defects shall be classified as a defective unit. Sampling for this examination shall be performed in accordance with FED-STD-311.

<u>Examine</u>	<u>Defect</u>
Trim:	
Class a	Not sides
Class b	Not bends
Color	Not specified color Color not uniform on grain side Color of type I leather does not completely penetrate leather from grain side through flesh side
Finish	Not full grain Flesh side not smooth or contains areas of coarse loose fiber Grain surface has application of finish Embossing other than a fine hair cell pattern Printed design on leather Does not match standard sample for fine hair cell pattern

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Quality of leather Not clean; stain or foreign matter 1/
 Hard, boney, loose, spongy leather, hard scar, cut,
 hole, brand, scratch, deep fat wrinkle, or grain damage
 which causes more than a 12 percent loss in total area
 of a side or more than a 6 percent loss in total area of
 a bend 1/

Marking Omitted, illegible, or not in area specified

1/ Light well healed scratches or grub holes, light fat wrinkles, or slight stains shall not be classified as defects.

4.4.3 End item dimensional examination. The end items shall be examined for the defects listed below. The lot size shall be expressed in units of sides. The sample unit shall be one side. Any sample unit containing one or more defects shall be classified as a defective unit. Sampling for this examination shall be performed in accordance with FED-STD-311, except that a sample size of 15 and a rejection number of 2 shall be applicable for thickness determinations on lots consisting of 51 or more sample units.

<u>Examine</u>	<u>Defect</u>
Area expressed in terms of square feet	Less than area marked on the side or bend

Thickness: 1/

Type I	Less than 2.0 ounces or more than 3.0 ounces
Type II	Less than 3.1 ounces or more than 4.0 ounces

1/ Thickness shall be determined in accordance with Method 1011 of FED-STD-311. No individual thickness measurement shall be less than the minimum or greater than the maximum specified.

4.4.4 End item testing. The methods of testing specified in FED-STD-311, wherever applicable and as listed in table II, shall be followed. Sampling procedure and location from which the sample unit is to be obtained shall be in accordance with FED-STD-311, except the area of the unit of product from which the specimens are taken shall be 12 by 12 inches. All test reports shall contain the individual values utilized in expressing the final result. The lot shall be rejected if any one of the following conditions exists:

- a. More than three specimens fail to meet elongation or stitch tearing strength requirements.
- b. More than three specimens fail to meet stiffness requirements.
- c. More than three specimens fail to meet water absorption requirements.

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- d. Any of the remaining requirements applicable to the sample unit show more than one test failure.
- e. Any composite sample fails to meet the specified requirement.

TABLE II. End item tests

Characteristic	Requirement paragraph	Test method	Requirement applicable to	
			Sample unit	Composite
Material identification	3.3	<u>1</u> /	-	-
Tannage	3.3	<u>1</u> /	-	-
Colorfastness	3.6.1	3031	X	-
Staining (treatment A)	3.7	3021	X	-
Stitch tearing strength	3.10	2151	X	-
Elongation	3.11	2021	X	-
Shrinkage temperature	3.12	7011	X	-
Stiffness	3.13	4.5.1	X	-
Water absorption resistance (treatment A)	3.14	4.5.2	X	-
Oil absorption resistance (treatment A)	3.15	4.5.3	X	-
Air permeability (treatment A)	3.16	5452 <u>2</u> /	X	-
Chloroform soluble material	3.17	6341	-	X
Chromic oxide	3.17	6515	-	X
pH value	3.17	6621	-	X
Total ash	3.17	6421	-	X

1/ A certificate of compliance shall be submitted and will be acceptable for the stated requirement.

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2/ Refers to test method in FED-STD-191. The leather specimen shall be mounted with grain side toward the inner cylinder so the air will pass through the specimen from grain side to flesh side. Test one specimen from each 12 by 12 inch test area.

4.4.5 Packaging inspection. The sampling and inspection of the preservation, packaging, palletization, and marking shall be in accordance with the requirements of MIL-P-43432.

4.5 Methods of inspection.

4.5.1 Measure of stiffness.

4.5.1.1 Stiffness before soaking. The leather shall be tested for stiffness in accordance with Method 4212 of FED-STD-311, except that the specimens shall be preflexed as follows:

a. Loosen knob (G). Using knob (H) slowly rotate the top dial (K) in a counterclockwise direction until the specimen clamp indicator (I) shows that the specimen has been twisted 90 degrees. Use a uniform rate of rotation that will take 4 to 5 seconds to twist the specimen through 90 degrees.

b. Reverse rotation to the clockwise direction and continue rotating slowly until the specimen clamp indicator (I) has passed the original reference line indicated on the lower dial (J) by approximately 45 degrees. Again reverse the direction of rotation and slowly realign the specimen clamp indicator (I) with the original reference line indicated on the lower dial (J).

c. Lock top dial (K) by turning knob (G) until tight, then reset dial (K) to read 270 degrees.

d. Repeat the flexing operation by following steps a, b, and c. When the second flexing cycle is completed, loosen knob (G), turn upper dial (K) slowly (4 to 5 seconds for 90 degrees rotation) in a counterclockwise direction using knob (H), until the specimen clamp indicator (I) shows 90 degrees twist. Read the angle of torsion from the upper dial (K) and record the value to the nearest 5 degrees. The angle of torsion of each specimen shall be reported to the nearest 5 degrees.

4.5.1.2 Stiffness after soaking. If the stiffness requirements specified for before soaking are not met, then do not test for stiffness after soaking. Any individual specimen exceeding the maximum stiffness values specified for before soaking shall not be tested for stiffness after soaking. The specimens shall be immersed in 1,000 mL of distilled water at $140^{\circ}\text{F} \pm 5^{\circ}\text{F}$ for 20 hours ± 2 hours. Complete immersion of the specimens shall be accomplished by placing a floating cover on the vessel used for immersion of the specimens. After the required

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immersion period, the specimens shall be removed from the water and reconditioned in accordance with standard atmospheric conditions as specified in Method 4212. The reconditioned specimens shall be placed flesh side down on a rule graduated in decimal inches and the distance between the bench marks shall be measured to the nearest 0.05 inch. If the distance is 3.4 to 3.6 inches, test the specimen in accordance with Method 4212 and the exceptions noted in 4.5.1.1. If the distance is 3.2 inches or less, the specimen shall be reported as a test failure. If the distance between bench marks is 3.25 to 3.35 inches, the specimen shall be stretched before testing. To stretch the specimen, place the specimen on the rule and align one of the bench marks with a division line on the rule. Hold the specimen against the rule by placing the finger tip of one hand on the aligned bench mark. With the thumb and index finger of the other hand, lightly grip the specimen near the aligned bench mark, then slide the finger and thumb along the specimen to the other bench mark while exerting pressure on the specimen that is sufficient to obtain the required distance between the bench marks. If the required distance between the bench marks has been obtained (3.4 to 3.6 inches), test the specimens in accordance with Method 4212 and the exceptions noted in 4.5.1.1. If the distance between the bench marks is greater than 3.6 inches discard the specimen and test a new specimen selected from the same 12 by 12 inch test sample of leather from which the discarded specimen was obtained. The new specimen shall be tested for stiffness before and after soaking. The test results obtained when the discarded specimen was tested for stiffness before soaking shall not be reported.

~~4.5.2 Water absorption resistance. One 3-inch diameter specimen shall be tested from each 12 by 12 inch test area. Prior to testing, the specimen shall be allowed to reach moisture equilibrium in accordance with section 5 of FED-STD-311. A stainless steel 500 mL, 3-inch diameter, 5-inch long container (see 6.7) with a rubber gasket and cover shall be used to test the specimen. The weighed specimen 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 23°C distilled water to the container. Secure the cover with 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 it 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 to 1-1/2 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 weigh the specimen to the nearest 0.01 g, and calculate the percent water absorption as follows:~~

$$\text{Percent water absorption} = \frac{(W_2 - W_1)}{W_1} \times 100$$

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Where:

W_1 = Original weight of conditioned specimen

W_2 = Weight of specimen after being subjected to water

4.5.3 Oil absorption resistance. One 4 by 4 inch test specimen shall be tested from each 12 by 12 inch test area. Place the specimen on a horizontal flat surface flesh side up. With a dropping bottle pipette, carefully place (do not drop) three small (approximately 3/16 inch diameter or 0.05 mL volume per drop) of Nujol mineral oil on the flesh surface of the specimen. Each drop shall be in a different location. After 5 minutes immediately observe the drops from an angle of approximately 45° for evidence of penetration of the oil into the leather at the oil-leather interface or wicking of the oil into the leather at the edges of the drops. The mineral oil shall have a saybolt viscosity of 360/390 at 100°F specific gravity of 0.880/0.900 at 60°F (see 6.7).

5. PACKAGING

5.1 Preservation, packing, palletization and marking. The preservation, packing, palletization and marking for each level of protection shall be in accordance with the applicable requirements of MIL-P-43432 (see 6.2).

6. NOTES

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

6.1 Intended use. Type I leather is intended for use in the fabrication of light duty gloves. The type II leather is intended for use in the fabrication of heavy duty gloves.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type and class (see 1.2).
- c. Treatment, when water resistant is required (see 1.2).
- d. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- e. When a first article is required (see 3.1, 4.3, and 6.3).
- f. Color, when cream is not required for type II (see 3.6).
- g. Levels of preservation and packing (see 5.1).
- h. When palletization is required (see 5.1).

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6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction 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.

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

6.5 Treatment A. Treatment A should not be specified for leather intended to have a top finish. Adhesion of top finish to treatment A leather is poor. Silicone compounds have been found to be capable of imparting the required water resistant properties to treatment A leather.

6.6 Container. The type I, 500 mL stainless steel container used with the Atlas launder-ometer is suitable for testing the leather for water absorption. The container can be purchased from the Atlas Electric Devices Co., 4114 N. Rayenswood Avenue, Chicago, IL 60613, or the Standard Mill Supply Co., 31 Esten Avenue, Pawtucket, RI 02860. The manufacturer's part No. is 11-2432.

6.7 Mineral oil. Nujol is a mineral oil available in most drug stores and has been found to be suitable for use in testing the leather for oil absorption resistance. Nujol is the trademark of Plough, Inc.

6.8 Subject term (key word) listing.

Chrome tan
Full grain
Handwear
Hides

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

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Custodians:

Army - GL
Navy - NU
Air Force - 99

Preparing Activity:

Army - GL
(Project 8330-0190)

Review activities:

Army - MD
DLA - CT

User activity:

Navy - MC

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-L-40051E	91 March 29

3. DOCUMENT TITLE
Leather, Cattlehide, For Gloves

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER INFORMATION		7. ORGANIZATION	
a. NAME (Include full name)		b. ADDRESS (Include full address)	
c. PHONE (Include Area Code)		d. DATE SUBMITTED	
e. AUTOVON (If applicable)		f. COMMENTS	

8. PREPARING ACTIVITY

a. NAME	b. TELEPHONE (Include Area Code)	(2) AUTOVON
U.S. Army Natick RD&E Center	(1) Commercial 508-651-4532	256-4532
c. ADDRESS (Include Zip Code)	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:	