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Specification
No. 241

DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

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UNITED STATES GOVERNMENT MASTER SPECIFICATION FOR SOLE LEATHER

FEDERAL SPECIFICATIONS BOARD SPECIFICATION No. 241

This specification was offically promulgated by the Federal Specifications Board on November 5, 1924, for the use of the Departments and Independent Establishments of the Government in the purchase of sole leather.

CONTENTS

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I. TYPES

This specification applies to sole leather (vegetable tanned) in the form of (*a*) backs, (*b*) bends, (*c*) blocks, and (*d*) cut soles.

II. MATERIAL AND WORKMANSHIP

1. HIDES

Shall be brined, green salted or dry salted. No bull or buffalo hides shall be used.

2. TANNAGE

Shall be with oak bark or a combination of vegetable tanning materials.

III. GENERAL REQUIREMENTS

1. DEFINITIONS

A back is a side with the belly cut off at the top of the breaks on the front and hind flanks, the head cut off behind the horn hole, and the tail not more than 2 inches long.

A bend is a back with the shoulder cut off at right angles to the belly edge at the break on the fore flank.

2. SELECTIONS

Backs and bends shall be free from holes, cuts, deep wrinkles, and surface blemishes, excepting that 25 per cent of the pieces may contain as many as 8 open grub holes or 3 open grub holes and 1 small brand or hip mark not over 6 inches in the longest dimension.

Blocks and cut soles shall be cut from a selection of bends as specified above.

3. FINISH

Shall be full grain with the flesh side smooth and free from loose flesh.

IV. DETAIL REQUIREMENTS

1. THICKNESS

Backs and bends shall gauge not less than 12/64 inch (9 iron). Blocks and cut soles shall be as specified in the request for bids.

2. CRACKING

Shall not crack open on the grain.

3. PIPING

Shall not show piping as caused by loose grain or soft and spongy leather.

4. WATER ABSORPTION

Shall not exceed 25 per cent.

5. CHEMICAL REQUIREMENTS

The leather, on analysis, shall be in accordance with the requirements of the following table:

Chemical constituents

Moisture ..... 14 per cent maximum

Percentage on moisture-free basis

	Minimum	Maximum
Water soluble		30
Hide substance	35	45
Grease (petroleum ether extract)	3	8
Acidity (modified Proctor and Searle method)		1
Total ash		2
Portion of water soluble as glucose and salts		30
Portion of glucose and salts as Epsom salts		50
Degree of tannage	60	80

V. METHODS OF INSPECTION AND TESTS

1. INSPECTION TO DETERMINE COMPLIANCE WITH SPECIFICATION

Shall be at the point of manufacture when practicable, but the right is reserved to inspect at the point of delivery, in which case the material, if rejected, shall be removed by the contractor at his own expense.

2. SAMPLING

(*a*) Backs or Bends.—Five shall be sampled for each lot of 200 or fraction thereof delivered.

The sampling shall be the same for backs and bends and the samples shall be cut from locations *A*, *B*, *C*, and *D* as shown on the diagram (fig. 1).

Each individual sample with the exception of *C* shall be 8 inches long and 2½ inches wide, the 8-inch dimension always running in the lengthwise direction of the back or bend, and shall be marked to show the lot number and location on the hides.

Sample *C* shall be 4 inches long by 2½ inches wide and shall be cut along with sample *A*.

The samples for each lot shall be tested separately, and one-half inch of the exposed edge of each sample shall be cut off before preparation for test.

(*b*) Blocks and Cut Soles.—Five shall be taken for a sample from each lot of 25 dozen blocks or pairs of soles.

3. THICKNESS

The thickness of backs or bends shall be measured at a point on the back 18 inches from the root of the tail.

4. TEST CONDITIONS

Before making the tests described in the following paragraphs (5, 6, and 7) the samples shall be allowed to condition for 24 hours in an atmosphere of from 55 to 65 per cent relative humidity.

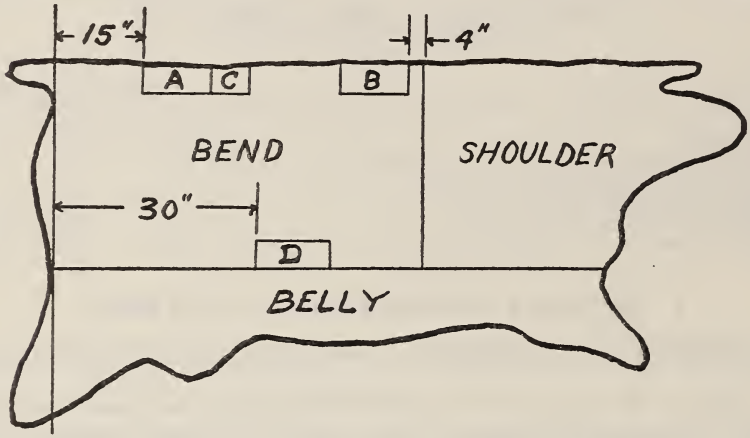

Fig. 1.—*Diagram showing locations on the hide from which samples are to be cut*

5. CRACKING

The leather shall be bent through an angle of 180° over a form 3 inches in diameter, grain side out.

6. PIPING

The leather shall be bent through an angle of 180°, over a form 4 inches in diameter, grain side in.

7. WATER ABSORPTION

A sample 2 by 4 inches from location *C* shall be weighed and placed in water at room temperature for 30 minutes. When removed, the surface water shall be wiped or blotted off, the sample again weighed and the percentage water absorption calculated.

8. MOISTURE

Dry 10 g of leather for 16 hours at a temperature between 95 to 100° C.

9. WATER SOLUBLE MATERIAL

Digest 30 g of leather in a percolator overnight, then extract with distilled water at 50° C. for three hours. The total volume of the solution to be 2 liters. Thoroughly mix solution, pipette 100 cc into a tared dish, evaporate and dry for 16 hours at a temperature of from 98 to 100° C.

10. HIDE SUBSTANCE (NITROGEN)

(Gunning modification of the Kjeldahl method, A. O. A. C. Bulletin, No. 107 (1907).)

Place 1 g of leather in a digestion flask. Add 10 g of powdered potassium or sodium sulphate and from 15 to 25 cc (ordinarily about 20 cc) of concentrated sulphuric acid. Place the flask in an inclined position and heat below the boiling point of the acid from 5 to 15 minutes or until frothing has ceased (a small piece of paraffin may be added to prevent extreme foaming). Then raise the heat and boil briskly until the liquid has become quite clear and nearly colorless (the digestion should take from four to five hours). After cooling dilute with 200 cc of water. Next add sufficient soda solution to make the reaction strongly alkaline, pouring it down the side of the flask so that it does not mix at once with the acid solution. Connect the flask with the condenser, mix the contents by shaking, and distill until all ammonia has passed over into the standard acid. The first 150 cc will generally contain all the ammonia. The operation usually requires from 40 minutes to 1½ hours. The distillate is then titrated with standard alkali.

11. GREASE (PETROLEUM ETHER EXTRACT)

Extract 5 to 10 g of air-dry leather in a Soxhlet or other suitable apparatus until free from grease, using petroleum ether boiling below 80° C. Evaporate off ether and dry to approximately constant weight.

12. ACIDITY

(*a*) Free Mineral Acid (Modified Proctor and Searle Method).—Weigh a 2 g sample. Add 25 cc of N/10 sodium carbonate in the case of an unloaded leather (or a larger amount, 35 or 50 cc in the case of a leather highly loaded with Epsom salts). After careful evaporation to dryness ignite[1] the contents of the dish until as much of the carbon is burned off as possible. Add 25 cc of hot water and digest a few moments. Filter the solution into a 300 cc flask. Wash the filter paper and unburned carbon well with hot water. Return to the dish and completely ignite. To the remaining

[1] Since sodium carbonate is very volatile this ignition should take place at as low a temperature as possible.

ash add an amount of N/10 sulphuric acid equivalent to the amount of sodium carbonate used, digest for at least 15 minutes either on the water bath or on a hot plate. Filter into the flask containing the first filtrate and titrate the excess of acid with N/10 sodium carbonate, using methyl orange as the indicator.

13. TOTAL ASH

Incinerate 5 g of leather in muffle furnace at 600° C. Cool in desiccator and weigh. If furnace is not available, carbonize sample, add hot water and pulverize, filter through an ashless filter paper, ignite filter and residue, add filtrate, evaporate to dryness, and ignite at low heat. Cool and weigh.

14. GLUCOSE

Place 200 cc of leather extract of analytical strength in a one-half liter flask, add 25 cc of a saturated solution of normal lead acetate, shake frequently (5 to 10 minutes), and filter. (The funnels and beakers must be kept covered to prevent evaporation.) Add to the filtrate an excess of solid potassium oxalate. Mix frequently for 15 minutes and filter, returning the filtrate until clear. Pipette 150 cc of this filtrate into a 600 cc Erlenmeyer flask, add 5 cc of concentrated HCl, and boil under a reflux condenser for two hours. Cool, neutralize (place a small piece of litmus paper in the flask) with anhydrous sodium carbonate, transfer to a 200 cc graduated flask, and make to volume. Filter through a double filter. (Filtrate must be clear.) Determine the dextrose immediately in 500 cc of the solution according to the Munson and Walker method,[2] and report in percentage on leather.

15. EPSOM SALTS (DETERMINE BY GRAVIMETRIC METHOD)

Ash 5 or 10 g of leather; carefully moisten ash with H_2O; add 15 cc concentrated HCl; wash into a beaker; dilute to 50 to 75 cc; add two to three drops of concentrated HNO_3; gently boil for a few minutes or heat on a steam bath for 15 minutes. Without filtering off insoluble matter add NH_4OH (approximately 1 to 1) slowly with constant stirring until nearly neutral but still slightly acid, then add dilute NH_4OH (about 3 or 4 to 1) and precipitate with a very slight excess of it. (If the NH_4OH precipitate does not have the characteristic reddish brown color of ferric hydroxide and there is known to be sufficient NH_4Cl present to hold in solution all magnesium, redissolve in HCl without filtering, add a few drops of pure ferric chloride solution and reprecipitate with NH_4OH.) Boil for a few minutes; filter and wash the precipitate thoroughly with hot H_2O. If

[2] This method may be found in the following references: J. A. C. S., 28, pp. 663–686, 1906; Bur. of Chem. Bul. 107; Methods of Analysis of the A. O. A. C., 1920 edition; and A. L. C. A., Methods of Analysis for Vegetable Tanned Leather, 1924.

necessary, evaporate the filtrate to 175 to 200 cc and make ammoniacal (about 1 cc NH_4OH); boil gently and add slowly with constant stirring 10 cc of a saturated ammonium oxalate solution; cover and let stand two hours or longer on a steam bath or in a warm place. Quantitatively wash solution and precipitate into a 250 cc volumetric flask; cool to 20 to 25° C.; fill to mark with distilled H_2O and mix thoroughly. Filter through quantitative paper making sure that filtrate is absolutely clear. Pipette an aliquot equivalent to 2 g of the original leather and dilute to about 150 cc. Make slightly acid with HCl (methyl orange); cool if necessary; add a slight excess of clear saturated sodium ammonium hydrogen phosphate solution (5 cc generally sufficient); while stirring vigorously, add a few drops of NH_4OH just until precipitation starts or until faintly ammoniacal; let stand 15 minutes; add with stirring 5 cc concentrated NH_4OH; cover and let stand overnight at room temperature.

Filter through a well-prepared Gooch; wash the precipitate free from chlorides with 1 part concentrated NH_4OH (sp. gr. 0.90) to 9 parts H_2O; finally just moisten the precipitate with a few drops of a solution of approximately 50 per cent NH_4NO_3 in 1 to 9 ammonia water; dry; ignite gently at first, then cover the crucible and ignite intensely for 20 to 30 minute intervals until constant in weight; weigh as $Mg_2P_2O_7$; multiply by factor to convert to $MgSO_47HO_2$ and express as per cent on 2 g of leather.

16. DEGREE OF TANNAGE

Ratio obtained by dividing the combined tannin by the hide substance. A section of the leather shall not show a raw streak indicating slack tannage.

VI. PACKING AND MARKING

1. PACKING

Shall be in accordance with the practice of the contractor unless otherwise specified in the request for bids.

2. MARKING

Each package shall be marked with the name of the contractor, name of material, and contract, order, requisition, or schedule number.

VII. ADDITIONAL INFORMATION

1. REQUEST FOR BIDS

Bids shall be requested on the basis of the price per pound for backs or bends; price per block, in the case of blocks; and price per pair, in the case of soles. The number of backs or bends shall be specified. Blocks and cut soles shall be specified as to number, sizes, and thickness.

2. SHIPPING

Material to be shipped in accordance with the instructions of the purchaser.

VIII. GENERAL SPECIFICATIONS

No details.

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