U. S. Gov't
Master
Specification
No. 496

DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

George K. Burgess, Director

CIRCULAR OF THE BUREAU OF STANDARDS, No. 340

[Issued August 15, 1927]

UNITED STATES GOVERNMENT MASTER SPECIFICATION FOR LEATHER, HYDRAULIC PACKING (VEGETABLE TANNED)

FEDERAL SPECIFICATIONS BOARD SPECIFICATION No. 496

This specification was officially promulgated by the Federal Specifications Board on June 10, 1927, for the use of the departments and independent establishments of the Government in the purchase of hydraulic packing leather (vegetable tanned).

[The latest date on which the technical requirements of this specification shall become mandatory for all departments and independent establishments of the Government is September 10, 1927. They may be put into effect, however, at any earlier date after promulgation]

CONTENTS

51913°—27

I. GENERAL SPECIFICATIONS

There are no general specifications applicable to this specification.

II. GRADES

This specification applies to hydraulic packing leather in either butt bends or sides in three grades: A, light; B, medium; and C, heavy.

III. MATERIAL AND WORKMANSHIP

TANNAGE.—Tannage shall be with oak bark or a combination of vegetable tanning materials.

IV. GENERAL REQUIREMENTS

1. TRIM OF BUTT BEND.—A butt bend shall be considered a hide with the belly cut off at the top of the breaks on the front and hind flanks and with the shoulder cut off at right angles to the belly edge at the break in the fore flank.

2. TRIM OF SIDE.—A side shall be considered as a full half hide with the forehead trimmed off at the eye, tail not more than 2 inches long, shanks trimmed off at the knees, and snout cut off.

3. SELECTION.—The leather shall be free from holes, cuts, brand marks, deep wrinkles, and soft or spongy spots. Twenty-five per cent of the pieces may contain not more than 3 surface scratches not over 6 inches in length, 15 healed grub holes, and 5 open grub holes irrespective of location.

4. FINISH.—The leather shall be full grain, with the flesh side smooth and free from loose flesh. The leather may be shaved or leveled to an even thickness.

V. DETAIL REQUIREMENTS

1. THICKNESS.—The thickness for the different grades shall be in accordance with the following:

Grades	Thickness (in inches)
A, light	10/64 up to 12/64
B, medium	12/64 up to 14/64
C, heavy	14/64 up to 16/64

2. CRACKING.—The leather shall not crack open on the grain.

3. TENSILE STRENGTH.—The leather shall have a minimum tensile strength of 3,000 pounds per square inch and an average tensile strength of not less than 3,500 pounds per square inch.

4. STRETCH.—The stretch shall not exceed 15 per cent in 2 inches at a stress of 2,500 pounds per square inch.

5. WATER ABSORPTION.—Water absorption shall not exceed 15 per cent.

6. CHEMICAL REQUIREMENTS.—The leather on analysis shall be in accordance with the following requirements:

Chemical constituents (moisture free basis)

	Minimum	Maximum
	Per cent	*Per cent*
Water soluble material		15
Grease (petroleum ether extract)	12	18
Ash		1
Acid		.75
Glucose		2

VI. METHODS OF INSPECTION AND TESTS

1. INSPECTION TO DETERMINE COMPLIANCE WITH SPECIFICATION.—This inspection shall be at 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.—Three butt bends or sides shall be sampled for each lot of 200 or fraction thereof delivered. Samples shall be cut as to size and location as shown in Figure 1 for butt bends and Figure 2 for sides. Physical-test specimens shall be cut from the samples marked A, as described hereafter. A composite shall be prepared for the chemical tests, from the remaining portions of samples A, samples B, and samples C.

3. THICKNESS.—The thickness shall be determined by measuring several points on the butt bend or side, irrespective of location.

4. CRACKING.—The leather shall be bent through an angle of 180 degrees over a rod one-half inch in diameter, grain side out.

5. TENSILE STRENGTH.—From each sample marked A (fig. 1, butt bend) a portion shall be cut from the center, 4 inches in width and 8 inches long, for use in making the chemical tests. The backbone mark shall run approximately in the center of this strip in the lengthwise direction. From each of the remaining portions of sample A three specimens shall be cut for tensile-strength tests, of the shape and size shown in Figure 3. (After cutting these specimens there should be two pieces remaining approximately 2 by 4 inches for use in making the water-absorption tests.) From each sample marked A

(fig. 2, side) three tensile-test specimens shall be cut from the portion nearest the center of the side, of the shape and size shown in Figure 3.

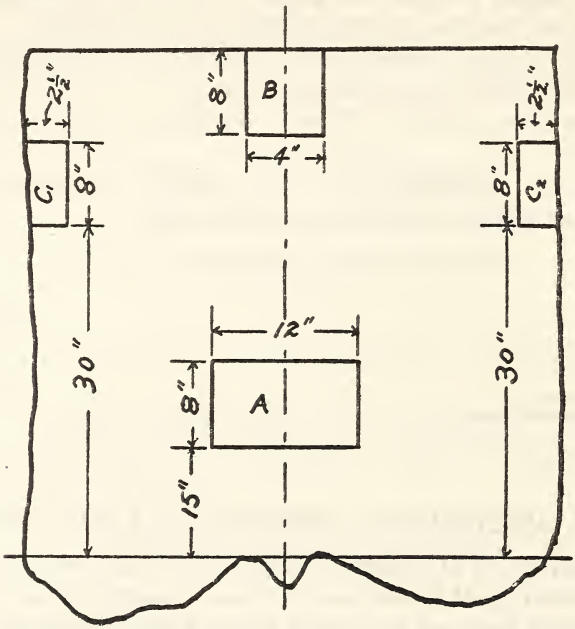

FIG. 1.—*Diagram of butt bend showing locations and sizes of samples*

Parallel gauge marks 2 inches apart shall be placed on the restricted area of each test specimen. The minimum thickness between the

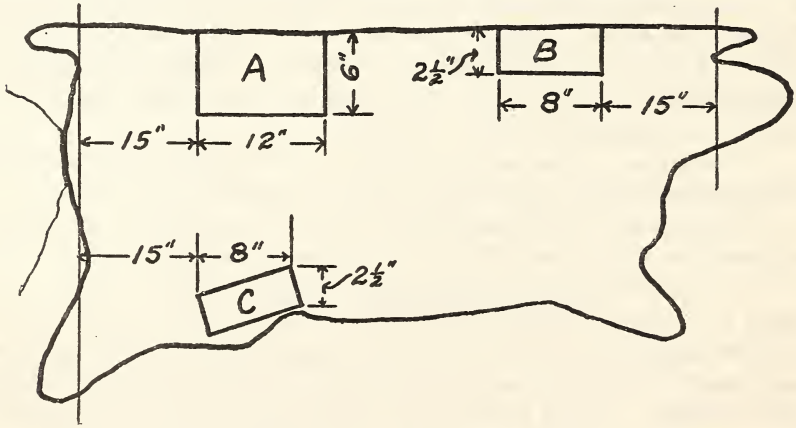

FIG. 2.—*Diameter of side showing locations and sizes of samples*

gauge marks shall be determined for each test specimen in thousandths of an inch with any suitable gauge, which, multiplied by the width, gives the area of the cross section in square inches.

The breaking strength in pounds shall then be determined on any suitable tension-testing apparatus with an accuracy of one-half per cent within a range of from 200 to 800 pounds. The tensile strength in pounds per square inch for any one test specimen is found by dividing the breaking strength in pounds by the cross-section area.

6. Stretch.—The stretch shall be determined on the same specimens used for the tensile-strength tests. At a stress of 2,500 pounds per square inch the distance between the gauge marks shall be measured and the percentage stretch calculated. A convenient method is to measure the separation of the gauge marks with a pair of dividers and note the amount of excess of 2 inches in hundredths of an inch. This value, divided by two, will give the percentage stretch.

7. Water Absorption.—One specimen, 2 by 4 inches, from each sample marked A, for sides, and two specimens from each sample marked A, for butt bends, shall be weighed and placed in water at

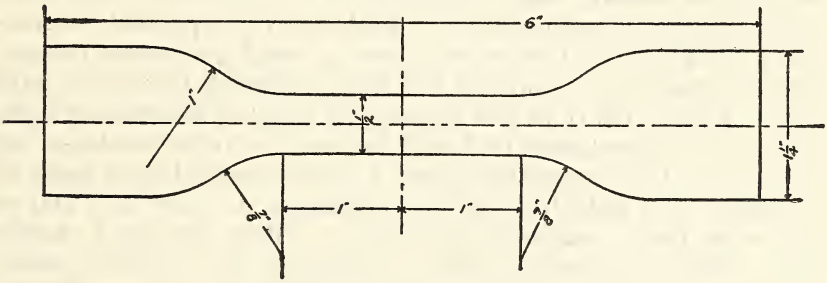

Fig. 3.—*Specimen of strength and elongation*

room temperature for 30 minutes. Upon removing from the water the surface water shall be wiped or blotted off, a new weighing made, and the percentage water absorption calculated.

8. Moisture.—Dry 10 g of leather for 16 hours at a temperature between 95 and 100° C.

9. Water Soluble Material.—Digest 30 g of leather in a percolator over night, 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. 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 the ether and dry to approximately constant weight.

11. Ash.—Incinerate 5 g of leather in a muffle furnace at 600° C. Cool in a 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.

12. 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 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. 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 50 cc of the solution according to the Munson and Walker method,[2] and report in percentage on leather.

VII. PACKING AND MARKING OF SHIPMENTS

1. Packing.—Packing shall be in accordance with the best commercial practice, 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.

VIII. NOTE

Request for Bids.—The request for bids should state the grade, and the quantity desired in pounds.

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

[2] This method may be found in the following references: J. A. C. S., 28, pp. 663–686; 1906; Bureau of Chemistry Bulletin 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.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY
▽