

DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
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**UNITED STATES GOVERNMENT MASTER SPECIFICATION FOR
ROPE, MANILA**

FEDERAL SPECIFICATIONS BOARD SPECIFICATION No. 61a

[Revised November 22, 1926]

This specification was officially promulgated by the Federal Specifications Board on June 15, 1923, for the use of the departments and independent establishments of the Government in the purchase of manila rope.

[The latest date on which the technical requirements of this specification shall become mandatory for all departments and independent establishments of the Government, is February 23, 1927. They may be put into effect however, at any earlier date, after promulgation]

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I. GENERAL SPECIFICATIONS

There are no general specifications applicable to this specification.

II. GRADE

Manila rope shall be of but one grade.

III. MATERIAL AND WORKMANSHIP

1. STANDARD ROPE.—No fiber other than manila or abaca (*Musa textilis*) of the grades listed in the following table shall be used.

2. Mixtures of these grades are allowable, providing certain average values result, and these average values shall be determined by multiplying the percentage of each grade in the mixture by its value as shown in the table and taking the sum of these products:

Government grade	Values
D.....	200
E.....	150
F and S1.....	125
I and S2.....	100
J1.....	55

3. For rope 2 inches in circumference and larger, the average value of the mixture shall not be less than 100, and in addition not more than $12\frac{1}{2}$ per cent of grade J1, and not more than a total of $77\frac{1}{2}$ per cent of grade J1, I, and S2 may be used.

4. For rope from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches in circumference, inclusive, the average value of the mixture shall not be less than 120, and no grade J1, and not over 40 per cent of grades I and S2 may be used.

5. For rope up to $1\frac{1}{8}$ inches in circumference, inclusive, the average value of the mixture shall not be less than 137, and no grade J1, I, or S2 may be used.

6. No fiber shall be used unless received in bales from the central portion of which protrude the original stamped tags as placed therein by the Government Philippine Islands inspector.

IV. GENERAL REQUIREMENTS

See Section V.

V. DETAIL REQUIREMENTS

1. The rope shall be 3-strand or 4-strand, medium laid, unless other lay is specified by purchaser.

2. Maximum weights and minimum breaking strengths shall be as follows:

Standard rope (medium lay)

[3-strand rope; for requirement for 4-strand see Section V, 6]

Approximate diameter (in inches)	Circumference	Approximate feet per coil	Approximate gross weight per coil	Maximum net weight per foot of rope	Minimum feet per pound	Minimum breaking strength	200 D :
	<i>Inches</i>		<i>Pounds</i>	<i>Pounds</i>		<i>Pounds</i>	<i>Pounds</i>
3/16 (6 yarns).....	1/2	3,000	45	0.015	66.6	590	7.0
1/4 (6 yarns).....	3/4	2,750	55	.020	50.0	700	12.5
5/16 (9 yarns).....	1	2,250	65	.029	34.5	1,200	19.5
3/8 (12 yarns).....	1 1/8	1,620	66	.041	24.4	1,450	28.2
7/16 (15 yarns).....	1 1/4	1,200	70	.054	18.5	1,750	38.2
15/32 (18 yarns).....	1 3/8	1,200	80	.064	15.6	2,100	44.0
1/2 (21 yarns).....	1 1/2	1,200	90	.074	13.5	2,450	50.0
9/16.....	1 3/4	1,200	126	.103	9.71	3,150	63.4
5/8.....	2	1,200	160	.131	7.53	4,000	78.2
3/4.....	2 1/4	1,200	198	.162	6.17	4,900	112.5
13/16.....	2 1/2	1,200	234	.191	5.23	5,900	132.0
7/8.....	2 3/4	1,200	270	.221	4.55	7,000	163.0
1.....	3	1,200	324	.265	3.77	8,200	200.0
1 1/16.....	3 1/4	1,200	378	.309	3.24	9,500	226.0
1 1/8.....	3 1/2	1,200	432	.353	2.83	11,000	252.0
1 1/4.....	3 3/4	1,200	504	.412	2.43	12,500	312.0
1 5/16.....	4	1,200	576	.470	2.13	14,200	345.0
1 3/8.....	4 1/4	1,200	648	.529	1.89	16,000	378.0
1 1/2.....	4 1/2	1,200	720	.588	1.70	17,500	450.0
1 9/16.....	4 3/4	1,200	810	.662	1.51	19,500	490.0
1 5/8.....	5	1,200	900	.735	1.36	21,500	528.0
1 3/4.....	5 1/2	1,200	1,080	.882	1.13	25,500	612.0
2.....	6	1,200	1,296	1.06	.943	30,000	800.0
2 1/16.....	6 1/2	1,200	1,500	1.23	.813	34,000	850.0
2 1/4.....	7	1,200	1,764	1.44	.694	38,500	1,012.0
2 1/2.....	7 1/2	1,200	2,016	1.65	.606	43,500	1,250.0
2 5/8.....	8	1,200	2,304	1.88	.532	49,000	1,380.0
2 7/8.....	8 1/2	1,200	2,580	2.11	.474	55,000	1,660.0
3.....	9	1,200	2,916	2.38	.420	61,000	1,800.0
3 1/8.....	9 1/2	1,200	3,240	2.65	.377	67,000	1,950.0
3 1/4.....	10	1,200	3,600	2.94	.340	73,000	2,120.0
3 5/16.....	10 1/2	1,200	4,000	3.25	.308	79,000	2,190.0
3 1/2.....	11	1,200	4,400	3.57	.280	86,400	2,450.0
3 5/8.....	11 1/2	1,200	4,800	3.90	.256	93,600	2,630.0
3 3/4.....	12	1,200	5,200	4.24	.236	101,000	2,812.0

3. Rope shall be furnished in coils or half coils, in the lengths stipulated by the purchasing agency within a plus tolerance as stated hereunder, but no minus tolerance, unless the contractor at the time of bidding definitely states the length he proposes to furnish and the bid is accepted on that basis.

Diameter (inches)	Plus tolerance
	<i>Per cent</i>
3/16 to 1/2.....	10
9/16 to 3.....	5
3 1/8 and over.....	3

4. Rope shall contain oil of a good cordage grade for internal lubrication of not less than 8 per cent nor more than 12 per cent of the weight of the finished rope. No substance for the purpose of loading or weighting the rope shall be added.

5. Each end of the rope shall have a clove hitch made from rope yarn or shall be tied in a manner that will prevent it from unlaying or unraveling, and all fag ends shall be cut off before delivery.

6. Four-strand medium-laid rope, when ordered, shall not be over 7 per cent heavier than 3-strand rope of the same size, and shall have at least 95 per cent of the strength required for 3-strand rope of the same size. Other requirements are the same as for 3-strand rope.

7. Rope shall be manufactured with a streamer, tape, colored yarn, or other distinctive marker worked into the rope, as a means of identification to indicate the manufacturer.

8. If the weight of bands and covering exceeds 2 per cent of the total gross weight of the rope, the manufacturer shall deduct from the weight of the rope billed the weight of the tare in excess of the allowed 2 per cent. (See Section VI, 2.)

VI. METHOD OF INSPECTION AND TESTS

1. The inspector shall select not less than 3 nor more than 5 per cent of the coils of any one size of rope from each of which a specimen of approximately 35 feet in length shall be cut from the coil specified by the inspector, for determination of weight, size, breaking strength, lubricant content, and presence of nonmanila fiber, provided, however, at least one coil of each size offered shall be tested.

(a) *Weight*.—The specimen under existing atmospheric conditions shall be subjected to a load (P) in pounds equal to two hundred times the approximate or normal diameter (D) of the rope in inches squared ($P=200 D^2$). (See tables.) While the specimen is under this load a length of between 1 and 2 feet shall be marked off, and this length cut out of the specimen. This length shall be weighed and the weight per foot (using length measurement determined under load) shall be figured. In cases of disagreement, the specimen shall be weighed under standard atmospheric conditions of 65 per cent relative humidity and 70° F. Specimens shall be exposed to this atmosphere for four hours immediately prior to the application of the load ($200 D^2$) and weighed immediately after. The machinery for loading need not be in conditioning room.

If the average of the weights for each size exceeds the maximum net weight per foot, as given in the table under Section V, 2, the weight of rope billed by the manufacturer shall be reduced by the total excess weight thus represented.

(b) *Circumference*.—Circumference of the specimen shall be measured under the load of $200 D^2$ required by Section VI, 1 (a). A fiber shall be passed snugly around the rope and cut where it overlaps. The length of this fiber is the circumference of the rope. This test shall be repeated at least three times in different positions in the length of the rope, and the average result determined.

A rope shall be considered to meet the circumference requirements of this specification if within the plus or minus tolerance as indicated below:

Circumference of rope	Tolerance
	<i>Inches</i>
3/4 to 1 3/4 inches	1/8
2 to 2 3/4 inches	3/16
3 to 3 3/4 inches	1/4
4 to 5 inches	5/16
5 1/2 to 7 inches	3/8
7 1/2 to 9 inches	1/2
9 1/2 to 10 1/2 inches	5/8
11 to 12 inches	3/4

(c) *Breaking strength.*—The specimen for determining the breaking strength, when eye-splice is used, shall have an eye-splice in each end, having an inside diameter of not less than 7 inches. The length between inside ends of splices shall be not less than 5 feet for all sizes of rope. Splices should be carefully made to insure specimen breaking in body of rope.

If the specimen fails to meet the strength requirements, this test shall, if requested by the manufacturer, be repeated if the break occurs at the splice or holding device.

Other methods of holding in lieu of the eye-splice may be used provided there is a length of at least 5 feet between holding devices.

The speed of the straining head of the testing machine shall not be over 4 inches per minute when under no load.

The specimen shall be tested under existing humidity conditions; but in cases of disagreement, it shall be tested at 65 per cent relative humidity and 70° F. Specimens shall be exposed for a period of 10 hours in this atmosphere immediately prior to testing. The machine need not be in the conditioning room.

If not more than 30 per cent of the coils tested fail, the lot except the coils which have failed shall be accepted. If more than 30 per cent fail, the manufacturer may request and shall be granted a retest of one or more lots of an equal number of specimens taken from the same coil, or other coils of the lot. If not more than 30 per cent of the entire number of tests fail, the lots, except those coils which have failed shall be accepted. Any coil which has failed to meet tensile requirements on the first test, shall be accepted, if two subsequent tests prove satisfactory.

(d) *Lubricant content.*—The sample for oil determination shall be weighed and then the oil shall be extracted with ether, in a Soxhlet apparatus, for one hour. The ether shall be evaporated from the oil contained in a tarred flask, and the oil dried for one hour at 95 to 100° C. The specimen shall be tested under existing atmospheric conditions, but in cases of disagreement it shall be exposed before and after oil extraction for a period of four hours at 65 per cent

relative humidity and 70° F. and then weighed under these atmospheric conditions.

(e) *Nonmanila fiber*.—The test for nonmanila fiber shall be made as follows:

The specimen shall be separated into strands and the oil rinsed out with ether or alcohol. The excess of solvent shall be evaporated by waving in the air. The fibers shall then be immersed in the bleaching-powder solution for 30 seconds, rinsed in water, shaken, rinsed in alcohol, and again shaken until nearly dry. The fibers on exposure to ammonia fumes are stained a characteristic color. Manila fibers are colored brown, all adulterant fibers cherry red.

NOTE.—This test with careful manipulation gives quantitative results. Considerable care is required and it is always best to run blanks on manila and nonmanila to test the solution. Prolonged exposure to ammonia fumes leads to loss of the red color and should be avoided. In the case of mixed fibers, only one end of the strand should be treated, after which the different kinds of fibers may be sorted. The opposite ends of these bundles are then treated as a check upon the sorting, after which the fibers can be counted. It is important that the alcohol and ammonia be full strength and not weakened by prolonged exposure to the air.

Bleaching powder (35 per cent) shall be worked into a thick paste with water, and about six times the resultant volume of water added. The solution shall be allowed to settle about 12 hours and the clear liquid drawn off in a dark colored-glass bottle. Before using, it shall be acidified with acetic acid.

2. The following method shall be used for determining weight of bands and covering as compared with total gross weight of rope (see Section VIII, 4):

The bands and covering shall be removed from not less than 3 nor more than 5 per cent of the rope to be inspected. These shall be weighed and the percentage of the total gross weight of the rope figured.

3. The purchaser shall accept any coil which has been shortened or cut for test specimens, unless such coil has been rejected as not meeting this specification. The contractor shall not be paid for any test specimens cut from any coils rejected nor shall he be allowed any claim for rejected coils shortened in this manner.

4. The contractor shall furnish any information or data requested by the buyer, from any specified source respecting the grades and quantities of manila fiber which have been purchased for use in the rope to be manufactured and the disposition of such purchases.

VII. PACKING AND MARKING OF SHIPMENTS

Every coil or package, when delivered, shall bear a tag which shall contain, in addition to such other information required by the purchasing agency, the circumference, diameter, and the approximate length of the rope.

VIII. NOTES

1. The purchasing agency will, in general, stipulate the lengths given in Section V, 2, although these lengths are stated therein primarily for information with respect to the approximate gross weight of the coil.
2. Rope is paid for on a price per pound basis, gross weight.

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