

**DEPARTMENT OF COMMERCE**  
**BUREAU OF STANDARDS**  
**George K. Burgess, Director**

**CIRCULAR OF THE BUREAU OF STANDARDS, No. 115**

[[Third ed., issued June 4, 1927]

**UNITED STATES GOVERNMENT MASTER SPECIFICATION FOR  
TIRES, PNEUMATIC AND SOLID RUBBER, AND INNER TUBES**

**FEDERAL SPECIFICATIONS BOARD SPECIFICATION No. 3c**

[Revised April 25, 1927. Supersedes F. S. B. No. 3b]

This specification was officially promulgated by the Federal Specifications Board on February 3, 1922, for the use of the departments and independent establishments of the Government in the purchase of pneumatic tires, solid rubber tires, and inner tubes.

[The latest date on which the technical requirements of this revision shall become mandatory for all departments and independent establishments of the Government is July 25, 1927. They may be put into effect, however, at any earlier date after promulgation.]

**CONTENTS**

Part 1.—PNEUMATIC TIRES

	Page
I. Type.....	2
1. Carcass.....	2
2. Cushion.....	3
3. Tread.....	3
4. Side wall.....	3
5. Bead.....	3
6. Flap.....	4
II. Tests.....	3
1. Endurance test.....	3
2. Tread tests.....	5
3. Side-wall tests.....	6
4. Hydrostatic test.....	6
5. Cross section of tire.....	6
III. Fabrication.....	6
IV. Standard tire and rim sizes.....	7

	Page
V. Sampling.....	7
VI. Warranty.....	8
VII. General specifications.....	8
<b>Part 2.—SOLID RUBBER TIRES</b>	
I. Type.....	8
II. Dimensions.....	8
III. Base band.....	8
Material.....	8
Weld.....	8
IV. Construction.....	9
V. Rubber tread stock.....	9
1. Rubber compound.....	9
2. Tests.....	9
3. Rebound.....	9
4. Area of cross section.....	9
VI. Sampling.....	10
VII. General specifications.....	10
VIII. Warranty.....	10
<b>Part 3.—INNER TUBES</b>	
I. Type.....	10
II. Material.....	11
III. Dimensions.....	11
1. Pole (inside) diameter.....	11
2. Length.....	11
3. Thickness.....	11
IV. Valve.....	12
V. Sampling.....	12
VI. Physical and chemical requirements.....	12
1. Tensile strength.....	12
2. Ultimate elongation.....	12
3. Set.....	12
4. Aging test.....	12
5. Rubber by volume.....	12
VII. Inflation test.....	13
1. By manufacturer.....	13
2. By purchaser.....	13
VIII. Splice.....	13
IX. General specification.....	13

## Part 1.—PNEUMATIC TIRES

### I. TYPE

The tire shall be of a form adapted to inclose an inner tube containing air under pressure and shall properly fit a rim of corresponding size, inspected and approved by the Tire and Rim Association. It shall be of a type which has been used in actual service and recognized as a standard and shall consist of the following component parts:

1. CARCASS.—This shall consist of plies of rubberized cotton fabric or cord fabric, as follows:

Minimum number of plies required

Size in inches	Minimum number of plies	Size in inches	Minimum number of plies
2 fabric.....	4	2 truck.....	10
2½ fabric.....	4	3.40 balloon.....	4
3½ cord regular.....	4	4.75 balloon.....	4
3½ cord heavy-duty 1.....	4	4.85 balloon.....	4 or 6
4 regular.....	4	5.25 balloon.....	4 or 6
4 heavy-duty.....	6		
		5.77 balloon.....	4 or 6
4½.....	6	6.00 balloon.....	4 or 6
5 regular.....	6	6.25 balloon.....	4 or 6
5 heavy-duty 1.....	2	6.75 balloon.....	4 or 6
6 truck.....	2	7.50 balloon.....	4 or 6
7 truck.....	10		

1 Heavy-duty tires shall be marked so as to be distinguished from regular tires.  
 2 4-ply (regular), 4-ply (heavy duty).

2. CUSHION.—Between the carcass and the tread stock there shall be a sheet of rubber compound placed around the outer circumference of the carcass. This cushion may be reinforced with one or more plies of open weave cotton breaker fabric or cord fabric.

3. TREAD.—The tread shall consist of rubber compound designed to resist abrasion and to protect the carcass from injury. It shall be rib or nonskid as ordered and of a thickness as shown in Table 3, and shall meet the requirements under "Tests."

4. SIDE WALL.—This shall consist of a suitable rubber compound to protect the carcass against abrasion and moisture. It shall meet the requirements under "Tests."

5. BEAD.—The core of clincher beads shall consist of semihard rubber or a combination of rubber and cotton. The toe of clincher beads shall be tapered to a featheredge to prevent cutting the tube. For straight-side tires the bead shall be reinforced with steel wires or cables. The bead portion of the tire shall contain reinforcing and chafing strips, as shown in Table 1. If one or more plies are carried around the bead and turned up into the side wall, they will be considered as replacing a corresponding number of reinforcing strips. Reinforcing strips shall extend at least one-half inch above the flange of the rim, and when more than one are used the edges shall be stepped at least one-eighth inch apart.

TABLE 1.—Minimum number of chafing and reinforcing strips

	Number of strips	
	Chafing	Reinforcing
	Minimum	Minimum
Cord tires, 4-inch and smaller.....	1	2
Cord tires, 4½-inch and larger.....	1	3
Fabric tires, except 4-inch.....	1	1
4.40 balloon tires.....	1	1
All other balloon tires.....	1	2

6. FLAP.—This shall consist of plies of cotton fabric of different widths frictioned together, or of rubber according to the standard practice of the manufacturer. The flap shall be formed to a shape approximately the contour of the beads of the tire. The flaps of motor-cycle tires shall be cemented inside the casings.

Unless otherwise specified, the flaps will be required for all tires except automobile clincher tires and tires for drop center rims if it is standard practice of a manufacturer to design his tires so that a flap is not necessary.

## II. TESTS

1. ENDURANCE TEST.—The complete tire shall be run against a standard test wheel under the conditions shown in Table 2.

*Standard test wheel.*—The standard test wheel is a flat-faced pulley either 60 inches in diameter or 67.23 inches ( $\frac{3}{8}$  mile in circumference) which is driven at a peripheral speed of 30 miles per hour. The tire is mounted on a wheel free to revolve on a spindle and carried on a movable carriage and pressed against the drum with the desired axle load. Three cleats are bolted to the face of this wheel at 45° left and right and at 90°, respectively. The inertia of the load applied is great enough to prevent any appreciable movement of the tire axle when the cleats strike the tire. The cleats are made by cutting longitudinal pieces three-fourths inch high from a 2 $\frac{7}{8}$ -inch diameter shaft or, what is equivalent, from a 2 $\frac{1}{2}$ -inch pipe.

TABLE 2.—Axle loads and air pressures for endurance tests <sup>1</sup>

Size of tire	Axle load	Air pressure	Size of tire	Axle load	Air pressure
	<i>Pounds</i>	<i>Lbs./in. <sup>1</sup></i>		<i>Pounds</i>	<i>Lbs./in. <sup>1</sup></i>
3 fabric or cord.....	500	45	8 cord, truck.....	4,000	110
3 $\frac{1}{2}$ fabric.....	700	55	4.40 balloon.....	825	32
3 $\frac{1}{2}$ cord, regular.....	825	55	4.75 balloon.....	1,000	32
3 $\frac{1}{2}$ cord, heavy duty.....	900	60	4.95 balloon, 4 or 6 ply.....	1,100	32
4 cord, regular.....	1,200	65	5.25 balloon, 4 or 6 ply.....	1,200	32
4 cord, heavy duty.....	1,200	65			
			5.77 balloon, 4 or 6 ply.....	1,375	32
4 $\frac{1}{2}$ cord.....	1,500	65	6.00 balloon, 4 or 6 ply.....	1,450	32
5 cord, regular.....	1,800	70	6.20 balloon, 4 or 6 ply.....	1,500	32
5 cord, heavy duty.....	1,800	70	6.75 balloon, 4 or 6 ply.....	1,650	32
6 cord, truck.....	2,200	90	7.30 balloon, 4 or 6 ply.....	1,800	32
7 cord, truck.....	3,000	100			

<sup>1</sup> Speed, 30 miles per hour for all tires except 7 and 8 inch truck tires. These shall be run at 22 $\frac{1}{2}$  miles per hour.

The temperature of the surrounding air during the test shall not be less than 70° F. or more than 90° F. The machine shall be stopped after a run of one-half hour long enough to correct the inflation pressure. Thereafter the inflation pressure shall be checked at five-hour intervals. A new tube furnished or recommended by the manufacturer shall be used for such test. The rim on which the tire is

tested shall be of standard dimensions and conform with a template approved by the Tire and Rim Association.

At the end of a run of the following number of miles the tire shall be removed from the rim for examination:

	60-inch pulley	67.23-inch pulley
	<i>Miles</i>	<i>Miles</i>
Fabric tires.....	600	660
3 and 3½ inch cords.....	1,100	1,200
6, 7, and 8 inch truck.....	1,400	1,500
All other sizes.....	1,250	1,350

There shall be no tread separation, ply separation, broken threads or cords, or bead separation. Any indication of carcass weakness will be sufficient cause for rejection.

2. TREAD TESTS.—(a) *Material*.—The tread shall contain at least 70 per cent by volume of the best new wild or plantation rubber. If reclaimed rubber is used it shall be in addition to the required amount of new rubber. No oil substitutes shall be used.

(b) *Thickness*.—See Table 3.

(c) *Tensile strength*.—Minimum, 3,000 pounds per square inch.

(d) *Ultimate elongation*.—Minimum, 500 per cent (2 to 12 inches).

(e) *Set*.—Maximum, 25 per cent (stretch 400 per cent, 2 to 10 inches).

Tests shall be made after tire has been subjected to the endurance test.

TABLE 3.—*Thickness of tread*

Size of tire in inches	Total thickness in center of casing, minimum <sup>1</sup>	Thickness of tread exclusive of nonskid portion, minimum	Factor F, minimum <sup>1</sup>	Size of tire in inches	Total thickness in center of casing, minimum <sup>1</sup>	Thickness of tread exclusive of nonskid portion, minimum	Factor F, minimum <sup>1</sup>
	<i>Inch</i>	<i>Inch</i>			<i>Inch</i>	<i>Inch</i>	
3.....	0.21	0.09	0.21	4.40 balloon.....	0.29	0.08	.....
3½.....	.25	.10	.24	4.75 balloon.....	.29	.10	.....
4.....	.30	.10	.27	4.95 balloon.....	.32	.10	.....
4½.....	.35	.10	.31	5.25 balloon.....	.38	.13	.....
5 regular.....	.40	.11	.33	5.77 balloon.....	.38	.13	.....
5 heavy duty.....	.46	.16	.....	6.00 balloon.....	.38	.13	.....
6.....	.53	.19	.....	6.20 balloon.....	.42	.13	.....
7.....	.62	.22	.....	6.75 balloon.....	.42	.13	.....
8.....	.70	.25	.....	7.30 balloon.....	.42	.13	.....

<sup>1</sup> Measured from top of breaker.

<sup>1</sup>  $F = t + 0.70 (T - t)$  where  $T$  = Total thickness of tread,  $t$  = thickness of tread exclusive of nonskid portion.

3. SIDE-WALL TESTS.—(a) *Thickness*.—Thickness of side wall of the tires shall be:

Size of tire in inches	Minimum average thickness	Size of tire in inches	Minimum average thickness
	<i>Inch</i>		<i>Inch</i>
3.....	0.04	4.40 balloon.....	0.04
3½.....	.05	4.75 balloon.....	.04
4.....	.06	4.95 balloon.....	.04
4½.....	.06	5.25 balloon.....	.04
5.....	.06	5.77 balloon.....	.05
6.....	.08	6.00 balloon.....	.05
7.....	.08	6.75 balloon.....	.05
8.....	.10	7.30 balloon.....	.05

(b) *Tensile strength*.—Minimum, 1,600 pounds per square inch.

(c) *Ultimate elongation*.—Minimum, 500 per cent (2 to 12 inches).

(d) *Set*.—Maximum, 25 per cent (stretch 400 per cent, 2 to 10 inches).

4. HYDROSTATIC TEST.—Tires shall withstand, without any indication of failure, the following hydrostatic pressures:

Size of tire in inches	Hydrostatic pressure	Size of tire in inches	Hydrostatic pressure
	<i>Lbs./in.<sup>2</sup></i>		<i>Lbs./in.<sup>2</sup></i>
3 and 3½.....	200	5 heavy duty.....	320
4 regular.....	220	6.....	350
4 heavy duty.....	240	7.....	350
4½.....	240	8.....	350
5 regular.....	260	Balloon tires all sizes.....	160

5. CROSS SECTION OF TIRE.—See Table 4.

TABLE 4.—Cross-sectional diameter of inflated tire<sup>1</sup>

Size of tire in inches	Inflation	Minimum diameter of cross section <sup>2</sup>	Size of tire in inches	Inflation	Minimum diameter of cross section <sup>2</sup>
	<i>Lbs./in.<sup>2</sup></i>	<i>Inches</i>		<i>Lbs./in.<sup>2</sup></i>	<i>Inches</i>
3 fabric motor cycle.....	35	2.90	4½ cord.....	70	4.95
3 fabric.....	45	3.00	5 cord.....	80	5.50
3½ fabric.....	55	3.35	6.....	90	6.30
3½ cord, regular.....	50	3.50	7.....	100	7.40
3½ cord, heavy duty.....	50	3.70	8.....	110	8.40
4 cord.....	60	4.40	Balloon tires.....	32	Rated size.

<sup>1</sup> This shall be an average of 6 measurements at 6 places on the tire. It shall be taken after the tire has been run as in II, 1 for approximately 30 minutes.

<sup>2</sup> A rim of the size recommended by the Rubber Association of America shall be used.

### III. FABRICATION

Tires shall show no evidence of poor workmanship. All plies, including breaker, shall be smoothly and evenly laid and free from mold pinches, buckles, air pockets, or other imperfections.

IV. STANDARD TIRE AND RIM SIZES

TABLE 5.—Standard tire and rim sizes and types of rim

Nominal tire sizes in inches	Overize tire in inches	Tire seat diameter (rim)	Type of rim
		<i>Inches</i>	
26 by 3	27 by 3½	20	Clincher, motor cycle.
28 by 3	29 by 3½	22	Do.
30 by 3 <sup>1</sup>		24	Clincher.
30 by 3½	31 by 4	23	Clincher or straight side.
32 by 3½	33 by 4	25	Straight side.
31 by 4		23	Clincher or straight side.
32 by 4	33 by 4½	24	Straight side.
33 by 4	34 by 4½	25	Do.
32 by 4½	33 by 5	23	Do.
34 by 4½	35 by 5	25	Do.
34 by 5		24	Do.
36 by 6		24	Do.
38 by 7		24	Do.
40 by 8		24	Do.
31 by 4.40 balloon		23	Straight side or clincher.
29 by 4.40 balloon		21	Straight side.
30 by 4.75 balloon		21	Do.
31 by 4.95 balloon		22	Do.
32 by 4.95 balloon		23	Do.
33 by 4.95 balloon		24	Do.
30 by 5.25 balloon		20	Do.
31 by 5.25 balloon		21	Do.
30 by 5.77 balloon		20	Do.
32 by 5.77 balloon		22	Do.
33 by 5.77 balloon		23	Do.
34 by 5.77 balloon		24	Do.
33 by 6.00 balloon		21	Do.
32 by 6.20 balloon		20	Do.
33 by 6.20 balloon		21	Do.
33 by 6.75 balloon		21	Do.
35 by 6.75 balloon		23	Do.
34 by 7.30 balloon		20	Do.

<sup>1</sup> Not standard.

V. SAMPLING

On orders for 100 tires or less the manufacturer may submit one tire for test and analysis, if so requested by the purchaser. On orders for more than 100 tires the purchaser or his authorized representative shall take at random one tire from each 500 or fraction thereof, which shall be tested. If the tire fulfills all the requirements of the specification the lot of tires represented by it will be accepted, including the tire on which tests have been made. Failing to conform to the specification, the lot of tires represented by it, including the tire on which tests have been made, will be rejected. If, however, the maker of the tires demands a further test, two more tires from the lot rejected will be selected by the inspector, and if all the tests are found satisfactory the lot of tires represented by the tires subjected to test will be accepted, the manufacturer to bear the cost of the three tires upon which the tests have been conducted. If any tire fails in the latter tests the whole lot will be rejected.

## VI. WARRANTY

Every tire shall be warranted against defects in material or workmanship developing within 90 days from date of first road wear. Any tire found defective as above shall be replaced by the contractor free of expense to the purchaser.

In lieu of the above 90-day warranty clause, any department or establishment may substitute a mileage guarantee based upon its service records.

## VII. GENERAL SPECIFICATIONS

The purchaser reserves the right to make any inspection, tests, or analyses necessary to insure that the product meets all requirements of the specification.

All tests and analyses shall be made in accordance with the methods described in United States Government General Specification No. 59, General Specifications for Rubber Goods, in effect on date of proposal.

### Part 2.—SOLID RUBBER TIRES

#### I. TYPE

Unless otherwise specified, tires shall be of the pressed-on type with channel base band conforming to the Tire and Rim Association standards adopted by the S. A. E.

#### II. DIMENSIONS

All dimensions and tolerances relating to metal or rubber parts shall conform to the latest recommendations of the Tire and Rim Association adopted by the S. A. E. for the size and type of tire specified. A full-size drawing showing the exact cross section of tire and base band shall be submitted with bid.

#### III. BASE BAND

1. MATERIAL.—Open-hearth steel, which shall conform to the following chemical requirements:

TABLE 7.—Composition of base band

	Carbon	Manga- nese	Phos- phorus	Sulphur
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Minimum.....	0.10	0.30		
Maximum.....	.20	.60	0.045	0.050
Desired.....	.15	.45		

2. WELD.—Base bands are to be electrically welded. They shall be truly circular and free from appreciable warp. To determine the effectiveness of the welding process used, pieces of base-band metal



not less than 8 inches long shall be welded end to end, and three such samples pulled in a testing machine. The ultimate tensile strength of these specimens shall be not less than 45,000 pounds per square inch of cross section.

In order to determine if the base bands are being properly welded in production the inspector may from time to time require a weld on the finished steel base to be tested in the manner described above. The strength of the welds in production shall be not less than 45,000 pounds per square inch.

#### IV. CONSTRUCTION

The tire shall be so constructed and cured that the rubber will not separate from the base or the tire will not blow out due to excessive heat in service when operated under standard Tire and Rim Association and S. A. E. ratings.

#### V. RUBBER TREAD STOCK

1. RUBBER COMPOUND.—The rubber compound shall contain not less than 65 per cent, by volume, of the best new rubber. If reclaimed rubber or mineral rubber is used, it must be in addition to the 65 per cent of new rubber required. The use of "refined" or ground vulcanized rubber in the compound will not be permitted. Compound shall be free from saponifiable oils or anything made therefrom. The total sulphur shall not exceed 8 per cent of the weight of new rubber.

2. TESTS.—(a) *Tensile strength*.—Minimum, 2,400 pounds per square inch.

(b) *Ultimate elongation*.—Minimum, 450 per cent (2 to 11 inches).

(c) *Set*.—Maximum, 40 per cent two minutes after break.

3. REBOUND.—The rebound shall be not less than 50 as measured on a Whitney rebound instrument. The tire under test shall be held at 70° F. for a period of 24 hours before testing, and the instrument shall be mounted rigidly in a vertical position. Tires shall be hung on a solid anvil below the instrument.

4. AREA OF CROSS SECTION.—The minimum cross section of tire, including tread stock and hard rubber base, shall be as follows:

TABLE 8.—Minimum cross section of tire

Width of tire in inches	Minimum cross section	Width of tire in inches	Minimum cross section
	<i>Square inches</i>		<i>Square inches</i>
3½	6.75	8	19.75
4	7.75	10	25.75
5	10.75	12	31.75
6	13.75	14	37.75
7	16.75		

## VI. SAMPLING

On orders for 200 tires or less the manufacturer may submit one tire for test and analysis, if so requested by the purchaser. On orders for more than 200 tires the purchaser or his authorized representative shall take at random one tire from each 1,000 or fraction thereof, which shall be tested. If the tire fulfills all the requirements of the specification the lot of tires represented by it will be accepted, including the tire on which tests have been made. Failing to conform to the specification in any particular, the lot of tires represented by it, including the tire on which tests have been made, will be rejected. If, however, the maker of the tires demands a further test, three more tires from the lot rejected will be selected by the inspectors and if all the tires are found satisfactory the lot of tires represented by the tires subjected to test will be accepted, the manufacturer to bear the cost of the four tires upon which the tests have been conducted. If any tire fails in the latter test the whole lot will be rejected.

## VII. GENERAL SPECIFICATIONS

The purchaser reserves the right to make any inspection, tests, or analyses necessary to insure that the product meets all the requirements of the specification.

All tests and analyses shall be made in accordance with the method described in United States Government general specifications for rubber goods in effect on date of request for bids (Federal Specifications Board specification No. 59).

## VIII. WARRANTY

Every tire shall be warranted against defects in material or workmanship developing within 180 days from date of first road wear. Any tire found defective as above shall be replaced by the contractor free of expense to the purchaser.

In lieu of the above 180-day warranty clause, any department or establishment may substitute a mileage guarantee based upon its service records.

### Part 3.—INNER TUBES

#### I. TYPE

Tubes shall be of the endless type, except motor-cycle tubes, which shall be butt end, lap end, or endless, as ordered. Tubes of 6-inch nominal diameter and larger sizes shall be cured to a ring shape.

II. MATERIAL

The rubber compound shall conform to the requirements given in Table 10.

Class A represents what are commonly known as pure gum tubes; class B compounded tubes; and class C heavily compounded tubes. The manufacturer may bid on class A or B tubes for sizes less than 6 inches and on classes A, B, or C for sizes 6 inches and larger.

III. DIMENSIONS

1. POLE (INSIDE) DIAMETER.—See Table 9.

2. LENGTH.—See Table 9.

3. THICKNESS.—Tubes shall be of uniform thickness, except at the lap and splice. It shall not be less than is required to give the cross-sectional area of the tube as specified in Table 9. In calculating the area of the tube the minimum thickness shall be used.

TABLE 9.—Diameter, cross section, and length of inner tubes

Nominal size in inches	Pole inside diameter, minimum	Cross sectional area, minimum	Length, minimum
	Inches	Sq. inches	Inches
28 by 1½	1	0.114	79.0
26 by 3	1¾	.341	171.0
28 by 3	1¾	.341	176.0
30 by 3	1¾	.341	83.0
27 by 3½	2½	.483	171.0
29 by 3½	2½	.483	177.5
30 by 3½, regular	2½	.483	81.0
30 by 3½, heavy duty	2½	.585	82.0
32 by 3½	2½	.585	87.0
31 by 4	2½	.615	83.0
32 by 4	2½	.615	86.0
33 by 4	2½	.615	89.0
32 by 4½	2¾	.802	84.5
33 by 4½	2¾	.802	87.5
34 by 4½	2¾	.802	90.5
33 by 5	3½	1.065	87.0
34 by 5	3½	1.065	90.0
35 by 5	3½	1.065	93.0
36 by 6	3¾	1.750	92.0
38 by 7	4¼	2.700	97.0
40 by 8	5	3.311	100.0
29 by 4.40, balloon	2¾	.548	76.0
31 by 4.40, balloon	2¾	.548	82.0
30 by 4.75, balloon	2¾	.632	77.5
31 by 4.95, balloon	3	.675	80.5
32 by 4.95, balloon	3	.675	83.5
33 by 4.95, balloon	3	.675	86.5
30 by 5.25, balloon	3¼	.730	76.0
31 by 5.25, balloon	3¼	.730	79.0
30 by 5.77, balloon	3¼	.772	77.0
32 by 5.77, balloon	3¼	.772	83.0
33 by 5.77, balloon	3¼	.772	86.0
34 by 5.77, balloon	3¼	.772	89.0
33 by 6.00, balloon	3½	.900	82.0
32 by 6.20, balloon	3¾	.962	79.0
33 by 6.20, balloon	3¾	.962	82.0
33 by 6.75, balloon	4½	1.150	82.0
35 by 6.75, balloon	4½	1.150	88.0
34 by 7.30, balloon	5	1.275	82.0

1 For butt-end tubes add 8 inches to this figure.

## IV. VALVE

Each tube shall be equipped with a complete Schrader or other air valve approved by the purchaser. Each valve shall be fitted with lock nut, rim nut, and valve cap. A spreader or bridge washer shall be furnished for all sizes up to and including 35 by 5 inches according to the standard practice of the manufacturer supplying the tubes.

## V. SAMPLING

On orders for 100 tubes or less the manufacturer may submit one tube for test and analysis, if so requested by the purchaser. On orders for more than 100 tubes the purchaser or his authorized representative shall take at random one tube from each 1,000 or fraction thereof, which shall be tested. If the tube fulfills all the requirements of the specification the lot of tubes represented by it will be accepted, including the tube on which tests have been made. Failing to conform to the specification, the lot of tubes represented by it, including the tube on which tests have been made, will be rejected. If, however, the maker of the tube demands a further test, three more tubes from the lot rejected will be selected by the inspector, and if all the tubes are found satisfactory the lot of tubes represented by the tubes subjected to test will be accepted, the manufacturer to bear the cost of the four tubes upon which the tests have been conducted. If any tube fails in the latter test the whole lot will be rejected.

## VI. PHYSICAL AND CHEMICAL REQUIREMENTS

1. TENSILE STRENGTH.—See Table 10.
2. ULTIMATE ELONGATION.—See Table 10.
3. SET.—See Table 10.

TABLE 10.—*Physical and chemical requirements*

Class	Rubber by volume, minimum	Organic acetone extract, maximum <sup>1</sup>	Tensile strength, minimum	Ultimate elongation, minimum	Set (stretch) 1 to 6 inches, maximum
	Per cent	Per cent	Lbs./in. <sup>2</sup>	Per cent	Per cent
A.....	90	5.0	1,800	750	8
B.....	85	5.0	2,000	725	10
C.....	80	5.0	2,500	600	15

<sup>1</sup> Based on the weight of rubber as compounded.

4. AGING TEST.—After samples cut from the tube have been subjected to an accelerated aging test in air for 144 hours at a temperature of 70° C. the minimum requirements shall be, as follows: Tensile strength, 1,000 pounds per square inch, elongation 600 per cent for class A and B tubes, 500 per cent for class C tubes.

5. RUBBER BY VOLUME.—See Table 10.

VII. INFLATION TEST

1. BY MANUFACTURER.—Each tube with valve attached shall be subjected to an air-inflation test by the manufacturer to disclose any defects in material or workmanship. No tube showing any leakage after being inflated with air shall be offered for sale under this specification.

2. BY PURCHASER.—The tube shall be laid on a horizontal surface and inflated with air as indicated in Table 11. The tube shall expand uniformly at all points except at the splice and shall show no leakage after 24 hours.

TABLE 11.—Diameters of tubes when inflated

Nominal tube diameter in inches	Diameter of inflated tube	Nominal tube diameter in inches	Diameter of inflated tube
	<i>Inches</i>		<i>Inches</i>
1½-----	1¾	5-----	4½
3-----	2¾	6-----	4¾
3½-----	2¾	7-----	5¾
4-----	3¼	8-----	6½
4½-----	3½		

VIII. SPLICE

The splice shall be as strong as the body of the tube. The spliced ends shall be properly skived, so as to avoid an abrupt or unnecessary increase in the thickness of the tube at the splice, which shall be made in a neat and thoroughly workmanlike manner.

The splice shall not fail when longitudinal strips one-half inch in width are gripped one-half inch from the splice edge on either side thereof and elongated to failure of the tube wall.

IX. GENERAL SPECIFICATION

The purchaser reserves the right to make any inspection, tests, or analyses necessary to insure that the product meets the requirements of the specification.

All tests and analyses shall be made in accordance with the methods described in United States Government general specifications for rubber goods in effect on date of request for bids (Federal Specifications Board specification No. 59).

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













