

ZZ-I-550E
November 30, 1973
SUPERSEDING
Fed. Spec. ZZ-I-550D
December 11, 1970

FEDERAL SPECIFICATION
INNER TUBE, PNEUMATIC TIRE

This specification was approved by the Commissioner,
Federal Supply Service, General Services Administration,
for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers inner tubes for pneumatic tires used on automobiles, trucks, motorcycles, agricultural, industrial, and other ground vehicles operated by the Federal Government (see 6.1).

1.2 Classification. Inner tubes covered by this specification shall be of the following groups and sizes as specified (see 6.2).

1.2.1 Groups.

- 1 - Passenger car, motorcycle.
- 2 - Light truck, truck-bus, trailer.
- 3 - Road grader, heavy industrial vehicles.
- 4 - Earthmoving equipment.
- 5 - Agricultural (except group 6), industrial, motor scooter.
- 6 - Agricultural tractor, drive wheel.

1.2.2 Sizes. The inner tubes shall be of the sizes listed in appendix A.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bid or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

- ZZ-T-381 - Tires, Pneumatic-, Vehicular (Highway).
- ZZ-T-410 - Tire, Pneumatic. Industrial.
- ZZ-T-1083 - Tires, Pneumatic, Low-Speed, Off Highway.
- ZZ-T-1619 - Tires, Pneumatic, Agricultural.
- ZZ-V-25 - Valves and Valve Spuds, Caps, and Cores, Pneumatic Tire.
- PPP-B-636 - Box, Fiberboard.

Federal Standards:

- Fed. Std. No. 123 - Marking for Domestic Shipment (Civil Agencies).
- Fed. Std. No. 308 - Inner Tube, Pneumatic Tire.
- Fed. Test Method Std. No. 601 - Rubber: Sampling and Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.)

ZZ-I-550E

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D.C., Atlanta, Chicago, Kansas City, MO., Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, Washington.)

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specifications:

- MIL-T-4 - Tire, Pneumatic, and Inner Tube, Pneumatic Tire: Tire with Flap; Packaging and Packing of.
- MIL-T-12459 - Tire, Pneumatic: For Military Ground Vehicles.
- MIL-T-52583 - Tire, Pneumatic: Large Size, Off the Road, General Specification for,

Military Standards:

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

- D 746-70 - Test for Brittleness Temperature of Plastics and Elastomers by Impact.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103.)

The Tire and Rim Association, Inc. Yearbook:

(Copies may be obtained from the Tire and Rim Association, Inc., Command Bldg., 3200 West Market St., Akron, Ohio 44313.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., Agent, 1616 P St., N.W. Washington, D.C. 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Tariff Publishing Officer, Room 202 Union Station, 516 W. Jackson Blvd., Chicago, III. 60606.)

3. REQUIREMENTS

3.1 Materials.

3.1.1 Compound. The contractor shall furnish test results or other verifiable information relating to the rubber-hydrocarbon content of the inner tubes furnished under this specification. Rubber-hydrocarbon content shall be not less than 45 percent by volume for butyl blends of synthetic rubber or 55 percent by volume for natural rubber (see 3.1.2).

3.1.2 Material option. Unless otherwise specified (see 6.2), inner tubes in sizes under 16.00 shall be made from butyl synthetic rubber or butyl synthetic blends. Unless otherwise specified (see 6.2), sizes 16.00 and above shall be made from either natural or butyl synthetic rubber blends in accordance with the manufacturers standard practice.

3.2 Form and fit. The inner tube shall be cured to a ring shape and shall properly fit a tire of corresponding nominal size of the dimensions shown in ZZ-T-381, Z3-T-410, ZZ-T-1083, ZZ-T-1619, MIL-T-12459, and MIL-T-S2583.

3.3 Dimensions.

3.3.1 Length. Length shall conform to appendix A when measured as specified in 4.4.1.1.

3.3.2 Outside cross-sectional periphery. Inner tube outside cross-sectional periphery (girth) shall conform to appendix A when measured as specified in 4.4.1.2.

3.3.3 volume . The volume of rubber shall conform to appendix A when measured as specified in 4.4.3 . A 5 percent manufacturing tolerance is permitted.

3.3.4 Minimum permissible thickness. The thickness of the inner tube at any point shall be not less than 65 percent of the average gauge of the 16 readings as taken in 4.4.2.1.

3.3.5 Thickness uniformity. Except for laps and splices, the thickness of the inner tube as represented by the samples obtained in 4.4.2 shall not vary by more than + 17-1/2 percent from the average as determined in 4.4.2.2 for each location; crown center, base center, and right and left sidewall centers.

3.4 Valve. Inner tubes shall be equipped with valves or valve spuds as designated in Fed. Std. 308. Valves, caps, cores, and spuds shall conform to the performance requirements of ZZ-V-25. When specified (see 6.2), inner tubes in sizes 16.00 and larger, shall be furnished with valve stems as specified.

3.4.1 Valve spud. unless otherwise specified (see 6.2), valve spuds shall be either TR-SP-1000 or TR-SP-4000 in accordance with manufacturers standard practice. When TR-SP-1000 spud is used, it shall be furnished with an adapter capable for conversion to TR-SP-4000.

3.4.2 Valve cap. Unless otherwise specified (see 6.2), polyethylene caps TR VC-8 (dust cap) may be furnished on all valves except those with bare metal stems, and rubber covered stems of CW type valves. When specified, screwdriver type (TR VC-2) valve caps or dome type (TR VC-3) valve caps shall be furnished.

3.4.2.1 Valve cap finish. When specified (see 6.2), valve cap (TR VC-2 or TR VC-3) outer surfaces shall be finished in a dull black color.

ZZ-I-550E

3.4.3 Value bushing. When Group 5 tubes are furnished with TR 13, TR 13CW, TR 87, TR 87A, or TR 87S valves, one TR B-6 bushing shall be furnished with each tube.

3.4.4 Alternate valves. When TR 15 or TR 15CW valves are designated in Fed, Std. 308, TR 13 or TR 13CW valves may be substituted in accordance with manufacturer's current practice. TR 13 shall not be substituted for TR 15CW. TR 150A may be substituted for TR 150.

3.5 Physical properties.

3.5.1 Tensile strength. The inner tube shall have a tensile strength of not less than 1,200 pounds per square inch (p.s.i.) for butyl; 1,000 p.s.i. for butyl blends (heat resistant); and 2,100 p.s.i. for natural rubber when tested as specified in 4.4.4.

3.5.2 Ultimate elongation. The inner tube shall have an ultimate elongation of not less than 450 percent for butyl, 350 percent for butyl blends (heat resistant), and 550 percent for natural rubber when tested as specified in 4.4.5.

3.5.3 Set after aging. After being subjected to the test specified in 4.4.6, the inner tube set after aging shall be less than 25 percent when made of natural rubber and less than 35 percent when made of butyl or butyl blends.

3.5.4 Strength of splice. When tested as specified in 4.4.7, the butt, or lap-spliced, inner tube shall have a tensile strength at splice of not less than 500 p.s.i. at each location for butyl, 400 p.s.i. for butyl blends, and 1,200 p.s.i. for natural rubber.

3.5.5 Extreme temperature ability.

3.5.5.1 Low temperature brittleness. When tested as specified in 4.4.8.1, using the liquid heat transfer medium, test samples of inner tubes shall show no cracks, fissures, craze, or ruptures. Samples shall be tested at a temperature of minus 40° F.

3.5.5.2 For storage. Inner tubes shall have the capability of storage in ambient air temperatures ranging from plus 125° to minus 65° F. for 3 years from date of manufacture.

3.5.5.3 For performance. Inner tubes shall have the capability of acceptable performance in ambient air temperatures ranging from 125° to minus 40° F.

3.6 Airtightness. The inner tube, when inflated and tested as specified in 4.4 .9, shall evidence no leakage or any defects in material or workmanship.

3.7 Marking. Each inner tube shall be permanently marked with the manufacturer's name or trademark and with the inner tube size (see 3.7.1). Each butyl synthetic rubber inner tube shall be marked with one or more blue stripes (one to be not less than 3/16-inch wide) around the inner periphery of the tube. Each heat resistant (butyl synthetic rubber blend) tube shall be permanently marked with the words "heat resistant". This marking may be made on the body of the tube near the manufacturer's identification or on the valve,

3.7.1 Passenger tire tubes. Tubes for passenger car tires shall be size marked by tire size and by tube group size (see appendix A). Tube group size may be designated alphanumerically as shown in appendix "A" or numerically, using four numerals. When designated numerically, the first two numerals shall represent the nominal rim diameter followed by two numerals representing cross sectional equivalent diameter as follows: The tube group size shown as F-13 may be size marked 1305, the G-13 may be size marked 1307, etc. The tube supplied with a numerical designation shall be designed to fit, as a minimum, each of the tire sizes shown in the column titled "Fits tire sizes" on the appropriate line.

ZZ-I-550E

3.8 Age (at time of shipment). The date of shipment of an inner tube shall be not greater than 12 months after its date of manufacture. This requirement does not apply when the lot is less than 100 tubes, shipped from a manufacturer's warehouse or field supply point, provided that such tubes are shipped under provisions of the Federal Supply schedule, FSC Group 26, Part II.

3.09 Workmanship. Workmanship shall be of the quality necessary to produce an inner tube free from any defects which affect the appearance or impair its service-ability such as separation of bond or adhesion around the valve stem, air pockets or visible lack of adhesion in butt or lap splices, incorrect or damaged valves, and air bubbles, cracks, or other faults in its outer surface when installed in the proper size tire which, in turn, is used for its intended purpose.

3.9.1 Acceptable blemishes. The following blemishes are not to be considered as defects:

- (a) Bloom.
- (b) Hairline cracks at splice, valve base, or patch.
- (c) Die marks but not die cuts.

3.9.2 Maximum acceptance repairs. Maximum acceptable repairs to any one given tube shall be limited to one of the following types:

- (a) Two repairs, each not exceeding:

- 1 square inch - tube size under 8.25.
- 2 square inches - 8.25 to 16.00 tube size.
- 4 square inches - 16.00 and up tube size.

(b) For sizes 2.00 and over, tubes may be reinforced as necessary in thin areas, provided they are recured in original molds.

(c) One revalve and one resplice or banded splice.

(d) One revalve and one repair.

(e) One resplice or banded splice and one repair.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and service conform to prescribed requirements.

4.2 Acceptance inspection.

4.2.2 Examination inspection.

4.2.2.1 Sampling for visual examination. Samples for visual examination shall be selected in accordance with level II of MIL-STD-105.

ZZ-1-550E

4.2.2.2 Acceptable quality levels. Acceptable quality levels for samples selected in accordance with 4.2.2.1 shall be on the basis of percent defective as follows:

<u>Classification</u>	AQL
Major	2.5
Minor	6.5

4.2.2.3 Classification of defects. For examination inspection purposes, defects shall be classified as follows:

<u>Categories</u>	<u>Defects</u>	<u>Method of inspection</u>
Critical	None defined	
Major:	AQL - 2.5 percent defective	
101	Incorrect form and fit (see 3.2)	Visual
102	Separation of bond or adhesion around valve stem (see 3.9)	Visual
103	Air pockets or visible lack of adhesion in butt or lap splices (see 3.9)	Visual
104	Incorrect or damaged valves (see 3.4 and 3.9)	Visual
105	Excessive repairs (see 3.9)	Visual
106	Incorrect size marking (see 3.7)	Visual
Minor:	AQL - 6.5 percent defective	
201	Incorrect marking (except size marking) (see 3.7)	Visual
202	Cracks or other faults in outer surface of inner tube (see 3.9)	Visual

4.2.3 Testing inspection.

4.2.3.1 Sampling for testing inspection. Unless otherwise specified (see 6.2), a minimum sample of three tubes shall be furnished by the contractor for testing inspection. When more than one size is represented in the lot, one tube of each size shall be tested. Inspection shall be conducted by the supplier and shall consist of testing as specified in table 1 using an AQL of 6.5 on the basis of percent defective.

Table I. Applicable tests

Paragraph	Test	Inspection	Control
4.4.1.1	Length	X	X
4.4.1.2	Outside cross-sectional periphery	X	X
4.4.2	Thickness uniformity	X	X
4.4.3	Volume	X	X
4.4.4	Tensile strength	X	X
4.4.5	Ultimate elongation	X	X
4.4.6	Set after aging	X	
4.4.7	Strength of splice	X	X
4.4.8.1	Low temperature brittleness	X	
4.4.9	Airtightness	X	X

4.3 Control tests.

4.3.1 Control test sample. The control test sample shall consist of two tubes of 1 single size and group. Samples shall be selected at the following rates:

Tubes produced under contract
(Government tubes per plant)
(each group)

Control test

Up to 500

None

501 and up

One sample for each 500, but not more than one sample per month.

4.3.1.1 Examination and tests. Tubes selected in accordance with 4.3.1 shall be subjected to the examination for the defects listed in 4.2.2.3 and the tests specified in table I. Unless otherwise specified (see 6.2), control testing shall be accomplished by the supplier. Unless otherwise specified (see 6.2), test results shall be retained by the contractor and shall be kept complete and available to the Government for the duration of the contract.

4.3.2 Failure. Failure of a control test sample to pass any specified examination or test may be cause for the Government to refuse to accept subsequent lots until it has been proved to the satisfaction of the Government that the faults revealed by the tests have been corrected.

4.4 Test procedures.

4.4.1 Dimensions.

ZZ-I-550E

4.4.1.1 Length. Sample tube shall be inflated only to "round out." Girth of the cross-section of this tube shall be not more than 4 percent greater than the outside cross-sectional periphery as determined in 4.4.1.2. To determine conformance to 3.3.1, the inside and outside circumferences of this rounded-out tube shall then be measured with a tape and the average of these measurements shall be taken as the length of the tube.

4.4.1.2 Outside cross-sectional periphery. To determine conformance to 3.3.2 avoiding splice and vent areas, four specimens, each 1 inch wide, shall be cut squarely across the tube. The first shall be cut some distance away from the valve and the other three shall be cut at 90° intervals therefrom. Each of the four 1-inch wide rings shall be laid on a flat surface in the original molded shape of the tube cross section and measured with a flat steel tape around the outside of the section. The average of four measurements shall be taken as the outside cross-sectional periphery.

4.4.1.2.1. Optional methods. Each of the four specimens obtained as in 4.4.1.2 shall be cut squarely across the width away from the center of the base or center of the crown. They shall be laid on a flat surface with what was part of the outside of the inner tube uppermost. These four surfaces shall be measured for length and their average taken as the outside cross-sectional periphery. Acceptance shall be based on either method.

4.4.2 Thickness. Using four specimens obtained as specified in 4.4.1.2, each specimen shall be gauged for thickness at each of four points; crown center, base center, right sidewall center, and left sidewall center.

4.4.2.1 Thickness at any point. An average of the sixteen readings (see 4.4.2), shall be taken to determine conformance to 3.3.4.

4.4.2.2 Thickness uniformity. An average of the readings at each of the four afore specified points; i.e., four points in the crown center, averaged; four points in the base center, averaged; four points in the right sidewall center, averaged; and four points in the left sidewall center, averaged, shall be taken to determine conformance to 3.3.5.

4.4.3 Volume. To determine conformance to 3.3.3, the volume of rubber in an inner tube shall be determined as follows:

- (a) Remove valve, valve pad, and valve base from the inner tube.
- (b) Weigh inner tube on a scale graduated in ounces, hundredths of pounds, or grams. The tube may be cut into sections to remain within scale limits.
- (c) Make allowance for the area of the tube from which the valve pad base was removed, and add this allowance to inner tube weight.
- (d) Determine the specific gravity of the inner tube in hundredths.
- (e) Calculate inner tube volume in cubic inches using either of the two following formulas, as applicable:

$$\text{Volume in cubic inches} = \frac{\text{Weight of tube in pounds}}{\text{Specific gravity}} \times \frac{1728 \text{ cu. in.}}{62.37 \text{ pounds}}$$

Which reduces to:

$$= \frac{\text{Weight of tube in pounds}}{\text{Specific gravity}} \times 27.71$$

ZZ-I-550E

Volume in cubic inches - $\frac{\text{Weight of tube in grams}}{\text{Specific gravity} \times 453.6 \text{ grams}} \times \frac{1728 \text{ cu. in.}}{62.37 \text{ pounds}}$

Which reduces to:

$$= \frac{\text{Weight of tube in grams}}{\text{Specific gravity}} \times .061$$

(f) Test is to be conducted at ambient room temperature.

NOTE: When the weights of the valve, valve pad, and valve base are known, deduct their combined weight from that of the complete inner tube assembly to obtain the liner tube rubber net weight needed to perform (e) above.

4.4.4 Tensile strenght. To determine conformance to 3.5.1, tensile strenght shall be determined accordance with method 4111 of Fed. Test Method Std. No. 601.

4.4.5 Ultimate elongation. Ultimate elongation of the inner tube shall be determined in accordance with method 4121 of Fed. Test Method Std. No. 601 to determine conformance to 3.5.2,

4.4.6 Set after aging.

4.4.6.1 Condition. The conditions of test for set after aging shall be as follows:

Type of oven	Air
Temperature	220° to 230° F.
Time in oven	5 hours
Dimensions of test piece	1/4-inch wide, 1-inch length, measured on a 1/4-inch dumbbell test piece.
Stretch of test piece during aging	50 percent

4.4.6.2 Determination of set. The test pieces shall be removed from the oven and allowed to cool under tension for 2 hours. The tension shall then be released and the set measured after a rest of not less than 8 hours or more than 24 hours to determine conformance to 3,5.3.

4.4.7 Strength of splice. Tensile strength of the butt or lap splice shall be determined on 1/4- or 1/2-inch dumbbell test pieces at four places around the splice: one at the base, one at the crown, and one at each side of the tube. Calculation shall be based upon the thickness of the tube immediately adjacent to the splice and shall be tested in accordance with method 4111 of Fed. Test Method Std. No. 601 to determine conformance to 3.5.4.

4.4.8 Extreme temperature ability.

4.4.8.1 Low temperature brittleness. To determine conformance to 3.5.5.1, samples of inner tubes shall be tested as specified either in Method D 746-70 of ASTM Standards or Method 5311 of Fed. Test Method Std. No. 601 with the following exceptions:

ZZ-I-550E

- (a) The width of figure 2, Modified T-50 Specimen of ASTM D 746-70, shall be 0.075 inch.
- (b) Die-out of the modified T-50 specimen shall be circumferentially from the tube (with grain).
- (c) Under "Routine Inspection and Acceptance", Paragraph 8 (b), Procedure B of ASTM D 746-70, none shall fail at minus 400 F,

4.4.9 Airtightness. Each inner tube, with valve attached, shall be inflated to "round-out" and water-tested for evidence of any leakage of air, to determine conformance to 3.6. An alternate vacuum-leak or pressure lose detection method in accordance with manufacturer's commercial practice may be used in lieu of water-test method,

4.5 Inspection of preparation for delivery. Inspection of preservation, packaging, packing, and marking shall be in accordance with the applicable procedures outlined in MIL-T-4 (see 5.1).

4.5.1 Materials and processes. The Government inspector at unscheduled intervals shall inspect all materials and processes involved in the preparation for delivery to determine conformance to the requirements of section 5 and specifications referenced therein.

4.6 Testing inspection for packaging and packing,

4.6.1 Quality Ccmformance test. Samples shall be selected as prescribed for sampling in MIL-T-4. Samples shall be subjected to the packaging and packing tests specified in MIL-T-4.

4.6.2 Failure. Failure of the package or pack to pass any specified tests may be cause for the Government to refuse to accept the lot until it has been proved to the satisfaction of the Government that the faults revealed by the tests have been corrected.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A, B, or C as specified (see 6.2).

5.1.1 Level A. The level A preservation and packaging shall be in accordance with the level A requirements of MIL-T-4.

5.1.2 Level B. (Tubes weighing 30 lbs. or less.) Tubes weighing 30 lbs. or less shall be individually packaged in close-fitting boxes conforming to PPP-B-636, class-domestic, Closure of boxes shall be in accordance with the appendix to PPP-B-636.

5.1.3 Level C. Tubes shall be packaged in accordance with the manufacturer's standard practice, providing that it insures protection for the tube or tubes during shipment and safe delivery to their destination.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. The level A packing shall be in accordance with the level A requirements of MIL-T-4.

5.2.2 Level B.

5.2.2.1 Tubes weighing 30 lbs. or less. Tubes packaged as specified in 5.1.2 shall be packed in a close-fitting box conforming to PPP-B-636, class-domestic. Not more than six unit packages shall be packed in the shipping container. Closure Of the boxes shall be in accordance with the appendix to PFP-B-636.

5.2.2.2 Tubes weighing more than 30 lbs. Tubes weighing more than 30 lbs. shall be individually pecked in close-fitting boxes conforming to PPP-B-636, class-domestic. Closure of the boxes shall be in accordance with the appendix to PPP-B-636.

5.2.3 Level C. Tubes packaged as specified in 5.1.3 shall be packed in container that will assure carrier acceptance and safe arrival at destination in compliance with the Uniform Freight Classification or the National Motor Freight Claesification.

5.3 Marking. Marking shall be in accordance with 5.3.1 or 5.3.2 as specified (see 6.2 . The requirements of this paragraph do not apply when the total shipment is less then 100 tubes, shipped.frgsn a manufacturer's warehouse or field supply point, provided; that such tubes-are shipped under provisions of the Federal Supply Schedule, FSC Group 26, Part II.

5.3.1 Civil agencies. In addition to any special marking required by the contract or order, all interior packages and shipping containers shall be marked in accordance with Tad. Std. No. 123.

5.3.2 Military agencies. In addition to any special marking required by the contract or order, all interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The inner tubes covered by this specification are intended for use on wheeled vehicles equipped with pneumatic tires.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Classification (group and size) of inner tube required (see 1.2.1 and 1.2.2).
- (c) When inner tube material is to be other than specified (see 3.1.2).
- (d) When inner tubes sizes 16.00 and larger are to be equipped with valve stems (see 3,4).
- (e) When TR SP-1000 or TR SP-4000 valve spud Is required (see 3.4.1).
- (f) When dome type valve caps (TR VC-3) are required (see 3.4.2).
- (g) When screwdriver type valve caps (TR VC-2) are required (see 3.4.2).
- (h) When dull black finish on valve cap is required (see 3.4.2.1).
- (i) When inspection requirements are to be performed by other than the supplier (see 4.1).
- (j) When test inspection sample is to be other than specified in 4.2.3.1.

ZZ-I-550E

- (k) When control testing is not to be performed by the supplier (see 4.3.1.).
- (l) When control test report is to be forwarded and to whom (see 4.3.1.1).
- (m) Selection of applicable level of preservation, packaging, and packing (see 5.1 and 5.2).
- (n) Marking required (see 5.3).

6.3 Material furnished for tests. Inner tubes used for or in tests shall be furnished by the manufacturer without cost to the Government

6.4 ~~Statement of Origin or Bill of Sale.~~ **Bill of Sale showing the applicable Delivery** A manufacturer's Statement of Origin or Order Number is required for each vehicles procured under this specification. Unless otherwise specified, such documents shall be forwarded to the consignee.

MILITARY INTERESTS:

CIVIL AGENCY COORDINATING ACTIVITIES:

Custodians:

DOT - ACO, MVP

Army - AT
Navy - YD
Air Force - 84

PREPARING ACTIVITY: GSA-FSS

Tubes for passenger car tires

(1) Tube group size	Fits tire sizes	Periphery (minimum) inches	Length (min.) inches	Volume of rubber (minimum) cu. inches
F-13	5.20-13, 5.60-13, 6.00-13	11.8	51	33
G-13	5.90-13, 6.40-13, 6.50-13	13.7	52	39
K-13	6.70-13, 7.00-13	14.5	54	43
F-14	5.00-14, 5.20-14, 5.60-14, 5.90-14, 6.00-14, 6.45-14	11.6	53.5	33.2
G-14	6.40-14, 6.50-14, 6.95-14	13.7	55	40.5
K-14	7.00-14, 7.35-14, 7.50-14, 7.75-14	14.9	57	48
M-14	8.00-14, 8.25-14, 8.50-14, 8.55-14	16.3	58	49
P-14	8.85-14, 9.00-14, 9.50-14	16.4	61.5	68
G-15	5.50-15, 5.90-15, 6.00-15, 6.40-15, 6.50-15, 6.85-15, 7.35-15	14.7	59	44
K-15	6.70-15, 7.10-15, 7.75-15, 8.15-15, 8.25-15	14.9	59	48
M-15	7.00-15, 7.50-15, 7.60-15, 8.00-15, 8.20-15, 8.45-15, 8.55-15, 8.85-15, 9.00-15, 9.15-15	16.8	62	60
8.90-15	8.90-15	18	63	78
G-16	5.50-16, 6.00-16	14.1	63	48.1
K-16	6.50-16, 6.70-16, 7.00-16, 7.60-16	15.7	64	62
M-16	7.50-16, 8.20-16, 8.25-16	18.8	68	73

GROUP 1 (continued) Tubes for motorcycle tires

V18-19	3.25-18, 3.50-18, 3.25-19, 3.50-19, 3.75-19, MM90-19	7.5	65	27
4.00-12	4.00-12	7.9	46.5	25
W18-19	4.00-18, 4.25-18, 4.50-18, 4.00-19	9.8	65	36
5.10-16	5.00-16	11	61	42

Note (1) Tube group size designation is the designation of an individual tube. The tube shall be designed to properly fit each of the tires sizes shown in the column titled "Fits tire size" (see paragraph 3.7.1).

APPENDIX A
ZZ-I-550E

GROUP 2

Truck tubes for tires used on drop center, semi-drop center, full tapered bead seat and flat base rims (light truck, truck-bus, trailer and some special service tires)

Tube size	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
*6.70/7.10-15	15.7	60	57
6.00-16	14.1	63	61
6.50-16	14.9	64	61
6.50-20	13.4	77	86
7.00-14	14.7	58	52
7.00-15 DC	15.7	62	68
7.00-15 FB	14.1	60	80
7.00-16	15.7	65	71
7.00-17	14.9	69	81
7.00-18	14.9	72	90
7.00-20	14.1	78	86
7.50-15 DC	17.3	63	80
7.50-15 FB	15.7	63	87
7.50-16	17.3	66	84
7.50-17	16	71	81
7.50-18	16	73	90
7.50-20	16	79	119
8.25-15	18	64	125
8.25-16	18.9	68	128
8.25-17	18	73	130
8.25-18	18	77	140
8.25-20	18	81	144
9.00-15	19.6	67	125

*Fits tire sizes 6.70-15, 7.10-15.

APPENDIX A
ZZ-I-550E

Tube size	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
9.00-16	18.6	72	135
9.00-18	19.6	80	180
9.00-20	19.6	83	175
10.00-15	21.2	68	161
10.00-20	21.2	84	215
10.00-22	21.2	91	233
10.00-24	21.2	97	302
10.3-20	22.3	83	188
*10.50/11.00-18	23.5	80	250
11.00-15	22.6	72	180
11.00-16	24.5	75	207
11.00-20	22.8	86	208
11.00-22	22.8	93	221
11.00-24	22.8	99	291
12.00-20/21	24.3	90	294
12.00-22	24.3	96	320
12.00-24/25	24.3	102	340
13.00-20	26.7	92	373
13.00-24/25	26.7	99	422
14.00-20/21	28.3	94	360
14.00-24/25	28.3	104	428

*Fits tire sizes 10.50-18, 11.00-18.

Tubes for wide base tires

8.00-16.5	14.1	62	57
8.75-16.5	15	62	66
9.50-16.5	15	62	66
10-16.5	20.4	63.1	120
12-16.5	22	67	122

APPENDIX A
ZZ-I-550E

GROUP 2 (continued)

Tube size	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
14-17.5	22.5	73	192
15-19.5	28.3	80	252
15-22.5	28.3	90	280
18-19.5	34.5	85	375
18-22.5	34.5	94	416
19.5-19.5	36.4	86	376

Tubes for truck tires used on
drop center rims w/15° bead seat

(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
7/8-14.5	7-14.5 8-14.5	14.9	58.5	70
7/8-17.5	7-17.5 8-17.5	14.1	67	86
8/9-19.5	8-19.5 9-19.5	17.3	75	110
7-22.5	7-22.5	14.1	78	92
8/9-22.5	8-22.5 9-22.5	17.3	84.2	143
10-22.5	10-22.5 10.3-22.5	20.3	88	173
11/12-22.5	11-22.5 12-22.5	22.6	90	225
11/12-24/5	11-24.5 12-24.5	22.6	96	235

GROUP 3 Tubes for special service tires
Used on road grader and heavy industrial vehicles

7.00-24	14.9	90	179
7.50-24	17.2	92	132
8.25-24			212

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

APPENDIX A
ZZ-I-550E

(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
9.00-24		20.7	96	204
10.00-20		21.2	84	208
10.00-24		22.6	96	195
11.00/12.00-24	11.00-24 12.00-24	26.2	99	212
13.00/14.00-20	13.00-20 14.00-20	31.4	92	326
13.00/14.00-24	13.00-24 14.00-24	31.4	104	362
13.00/14.00-32	13.00-32 14.00-32	31.4	129	435
14.00-28		32.9	115	450
16.00-20		39.7	100	500
16.00-24		37.7	114	560
18.00-26		48.7	122	690
GROUP 4				
Used on earthmoving equipment with full tapered bead seat rims				
16.00-20/21	16.00-20 16.00-21	32.2	96	500
16.00-24/25	16.00-24 16.00-25	32.5	112	560
18.00-24/25	18.00-24 18.00-25	37.5	113	720
18.00-32/33	18.00-32 18.00-33	40.9	130	1000
18.00-49		42.7	190	1350
21.00-24/25	21.00-24 21.00-25	44.4	114	900
21.00-29		46.3	124	1050
21.00-35		48.7	144	1495
21.00-49		42.7	195	1500

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

APPEDIX A
ZZ-I-550E

GROUP 4 (Continued)

(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
24.00-25		48.7	130	1030
24.00-29		48.7	138	1130
24.00-32/33	24.00-32 24.00-33	50.7	141	1340
24.00-35		50.7	144	1495
24.00-49		51.8	192	1900
27.00-33		51.9	165	2100
27.00-49		55	198	2600
30.00-33		65.9	170	2500
36.00-41		81.6	208	3500
36.00-51	37.5-51	82.9	231	3700

GROUP 4 (Continued)

Used on earthmoving equipment
with semi-drop center rims

15.5-25		31	106	500
17.5-25		31.9	109	542
20.5-25		43.5	114	800
23.5-25		49	117	1100
26.5-25		52	126	1250
26.5-29		52	140	1700
29.5-25		62	133	1800
29.5-29		62	144	1950
29.5-35	33.25-35	62	163	2500
33.5-33	37.5-33	67.1	162	2450
33.5-39	37.5-39	69	180	2750

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

APPENDIX A
ZZ-I-550E

Tubes for special service tires

(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
GROUP 5 (2)	For agricultural (except rear tractor), industrial, and motor scooter tires			
2.80/2.50-4	2.50-4 2.80-4	5.2	18	6
3.40/3.00-5	3.00-5 3.40-5	6.5	22.4	8
3.40/3.00-7	3.00-7 3.40-7	6.5	28	11
3.50-12	3.00-12	7.9	44.5	22
4.00-8		7.9	32	17
4.00-9		9	34	21.4
4.00-12		9	46	26
4.00-15		9.4	56	29
4.00-18		9.4	64	33
4.00-19	4-19	9.8	68.1	35.6
4.00-36		10.6	114	65
4.10/3.50-4	3.50-4 4.10-4	6.3	20	9
4.10/3.50-5	3.50-5 4.10-5	6.3	23	10.6
4.10/3.50-6	3.50-6 4.10-6	6.3	26	12
4.80/4.00-7	4.00-7 4.80-7	7.9	31	15
4.80/4.00-8	4.00-8 4.30-8 4.80-8	7.9	32	17
4.80/4.00-9	4.00-9 4.80-9	9	34	21.4
4.80/4.00-12	4.00-12 4.80-12	9	46	26
5-8		9.7	34	20

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

Note (2) See 3.4.3

APPENDIX A
ZZ-I-550E

Tubes for special service tires				
(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
GROUP 5 (continued) (2)	For agricultural (except rear tractor), industrial, and motor scooter tires			
5-12		9	44	24
5.00-15		11.9	54.8	35.5
5.00-16		11.8	61	38
5.30/4.50-6	4.50-6 5.30-6	9.1	27.1	20
5.30/4.50-7	4.50-7 5.30-7	9.1	32.3	23
5.30/4.50-12	4.50-12 5.30-12	9.4	48.5	29.7
5.50-16		13.4	62	42
5.70/5.00-8	5.00-8 5.70-8	11.6	36.8	30
5.90/6.40-15	5.90-15 6.40-15	13.4	59	44
6-12		11.9	48	34
6-16		13.9	61.4	49
6.00-14		14.7	57.4	41
6.00-16		14.1	61.5	51
6.00-21	6.00-20	14.7	76.9	64
6.50-10		15.7	46	52.5
6.50-16		14.9	65.4	60
6.50-36		17	121	135
6.70-15		15.7	62.4	53
6.90/6.00-6	6.00-6 6.90-6	13	29.6	28
6.90/6.00-9	6.00-9 6.90-9	13.3	42	40

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

Note (2) See 3.4.3.

Tubes for special service tires

(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
GROUP 5 (continued) (2)	For agricultural (except rear tractor), industrial, and motor scooter tires			
6.90/6.00-12	6.00-12 6.00-12	15	50	45
7-16		17	62.3	64
7.00-10		15	48	55
7.00-12		14.5	55	57.4
7.50-10		16	48	60
7.50-18		17.1	71.5	79.5
7.50-20		16	78.2	89.5
7.60-15		17.2	63	69
9.00-10		18	48.4	89
9.00-16		18.6	64	91.8
9.50-20		20.9	81	150
10.00-15		20.8	67	118
10.00-16		22.6	71.6	107.1
11.00-16		22.6	72	135
11.25-24		27.2	100	200
11.25-28		26.9	108	241
13.50-16.1		31.7	79	208
16.00-16		38	77	290
GROUP 5 (continued) (2)	For low section height tires			
11 x 4.00-5		7.9	21.6	11
16 x 6.50-8		13.6	32	27.6
18 x 9.50-8		17.9	36	47
23 x 8.50-12		16.9	46	48
27 x 8.50-15		17.8	58	65

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

Note (2) See 3.4.3.

APPENDIX A
ZZ-I-550E

Tubes for special service tires				
Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
GROUP 5 (continued)				
(2) For low section height tires				
7.5L-15	7.50L-15	18	64.3	62
8.5L-14		18	59	63
9.5L-14	9.50L-14	19.2	59	64.5
9.5L-15	9.50L-15	19.2	60.9	64.5
11L-14	11.00L-14	20.3	58	86
11L-15	11.00L-15	22	61	95
11L-16	11.00L-16	22	64	100
12.5L-15		24.8	66.1	104
12.5L-16		22.6	72	135
14L-16.1	14L-16A	25.7	72	168
16.5L-16.1		31.7	75.3	208
GROUP 6 For agricultural tractor drive wheel tires				
6.2-30	6-30	14.5	107.7	85
7.2-24	7-24	16.5	86.1	80
8.3-24	8-24	16.6	89	95
9.5-16	9-16	18.8	64	87
9.5-24	7.50-24 9-24	18.8	87	122
9.5-32	9-32	20	113.5	156
9.5-36	7.50-36 9-36	20	125	170
11.2-24	10-24	22.3	95	159
11.2-28	10-28	22.3	107	180
11.2-34	10-34	22.3	124	211

Note (1) Tires size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

Note (2) See 3.4.3.

Tubes for special service tires				
(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
GROUP 6 (continued) For agricultural tractor drive wheel tires				
11.2-36	10-36	22.3	127	212.9
11.2-38	10-38	22.3	130	225
12.4-16	11-16	27	75	160
12.4-24	11-24	27	87	175
12.4-26	11-26	28.4	102.9	215
12.4-28	11-28	24.2	108	198
12.4-36	11-36	25.1	133	243
12.4-38	11-38	25.1	138	255
13.6-24	12-24	28.3	97.1	218
13.6-26	12-26	28.3	102.9	230
13.6-28	12-28 12.00-28	28.3	110	235
13.6-36	12-36	28.4	126.3	300
13.6-38	12-38	28.3	140	303
13.9-36		29	133	310
14.9-24	13-24	31.1	100	260
14.9-26	13-26	28.4	107	275
14.9-28	13-28	30.1	110	287
14.9-30	13-30	30.1	120	300
14.9-38	13-38	30.2	140	365
15.5-38		30.1	139	394
16.9-24	14-24	33.2	100	290
16.9-26	14-26	33.2	105.9	315
16.9-28	14-28	34.6	104.2	330
16.9-30	14-30	35.5	121.3	354

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

APPENDIX A
ZZ-I-550E

Tubes for special service tires				
(1) Tube size	Fits tire sizes	Periphery (minimum) inches	Length (minimum) inches	Volume of rubber (minimum) cu. inches
GROUP 6 (continued)	For agricultural tractor drive wheel tires			
16.9-34	14-34	35.5	135	430
16.9-38	14-38	34	136	440
18.4-16.1	15-16A	36	76.1	280
18.4-24	15-24	37.7	106.3	338
18.4-26	15-26	35.9	112	357
18.4-28	15-28	35.9	118	377
18.4-30	15-30	35.9	124	397
18.4-34	15-34	35.9	130	435
18.4-38		35.9	144.9	465
20.8-38		41.1	145	580
23.1-26	18-26 18.00-26	48.3	120	700
23.1-30	18-30	48.3	132	776
23.1-34	18-34	48.3	144.7	830
24.5-32		52	140	830
28.1-26		53.1	117	720

Note (1) Tire size designation is same as tube size designation excepting tire sizes shown in column titled "Fits tire sizes."

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GENERAL SERVICES ADMINISTRATION - FEDERAL SUPPLY SERVICE
SPECIFICATION COMMENT SHEET

BUDGET BUREAU NO.
29-R0175

INSTRUCTIONS

This form provides a way for users of this specification to inform the originator of problems encountered in its use. It is not to be used to request changes to accommodate proprietary features. All comments will be considered and appreciated, but please do not expect a reply. To comment detach, complete, and mail to: General Services Admin., (FSS) (FMA), Wash.DC 20406
 NOTE: Comments on this form do not constitute or imply authorization to waive any part of the document or serve to amend contractual requirements.

1. SPECIFICATION

ZZ-I-550E: INNER TUBE, PNEUMATIC TIRE

2. CONTRACT NO (If any)

3. QUANTITY ON CONTRACT (Optional)

4. DOLLAR VALUE (Optional)

5. GENERAL NATURE OF PROBLEM (e.g., inspection difficulties, manufacturers unable to meet tolerances, containers collapse under normal warehousing conditions, etc.)

6. SPECIFIC REQUIREMENTS AFFECTED (Include paragraph number and lines of wording)

7. SPECIFIC PROBLEMS (e.g. tests in 4.2.2 will not assure that the battery will last required time, temperature ranges in table 2 do not conform to commercially available items.)

8. RECOMMENDATIONS

9. NAME OF MANUFACTURER ASSOCIATION GOVT AGENCY ETC

10. ADDRESS (Number, Street, City, State and Zip Code)

11. NAME AND TITLE OF SUBMITTER

12. DATE

**GENERAL SERVICES ADMINISTRATION - FEDERAL SUPPLY SERVICE
SPECIFICATION COMMENT SHEET**

BUDGET BUREAU NO.
29-R0175

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NOTE: Comments on this form do not constitute or imply authorization to waive any part of the document or serve to amend contractual requirements.

1. SPECIFICATION

Amendment -4 to Fed. Spec. ZZ-I-550E, Inner Tube, Pneumatic Tire

2. CONTRACT NO. (If any)

3. QUANTITY ON CONTRACT (Optional)

4. DOLLAR VALUE (Optional)

5. GENERAL NATURE OF PROBLEM (e.g., inspection difficulties, manufacturers unable to meet tolerances, containers collapse under normal warehousing conditions, etc.)

6. SPECIFIC REQUIREMENTS AFFECTED (Include paragraph number and lines of wording)

7. SPECIFIC PROBLEMS (e.g. tests in 4.2.2 will not assure that the battery will last required time; temperature ranges in table 2 do not conform to commercially available items.)

8. RECOMMENDATIONS

9. NAME OF MANUFACTURER, ASSOCIATION, GOVT., AGENCY, ETC.

10. ADDRESS (Number, Street, City, State and Zip Code)

11. NAME AND TITLE OF SUBMITTER

12. DATE