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Standard Specification for Steel Tires[1]

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1. Scope

1.1 This specification covers seven classes of carbon steel tires for railway and rapid transit use.

1.1.1 *Class A*—For untreated driving tires for locomotives in passenger service.

1.1.2 *Class AHT*—For heat-treated driving tires for locomotives in passenger service.

1.1.3 *Class B*—For untreated driving tires for freight locomotives and tires for locomotive-truck, tender-truck, trailer and car wheels, and miscellaneous service.

1.1.4 *Class BHT*—For heat-treated driving tires for freight locomotives and tires for trailer wheels.

1.1.5 *Class C*—For untreated tires for switching locomotives.

1.1.6 *Class CHT*—For heat-treated driving tires and switching locomotives and tires for locomotive-trucks, tender-trucks, trailer and car wheels, and miscellaneous service.

1.1.7 *Class DHT*—For heat-treated driving tires for locomotives with light braking conditions, heavily loaded trailer tires, and car wheels where off-tread brakes are employed.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

2. Referenced Documents

2.1 *ASTM Standards:*

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products[2]

E 350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron[3]

E 415 Method for Optical Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy Steel[4]

NOTE 1—References to these standards are for guidance only; other methods of equivalent accuracy may be used.

3. Ordering Information

3.1 The inquiry, order or contract for material under this specification shall include the following information:

3.1.1 Quantity,

3.1.2 Class,

3.1.3 Full identification of tread and flange contour with dimensional drawings as required,

3.1.4 Inside diameter to be rough machined or finished,

3.1.5 Intended service,

3.1.6 ASTM designation and year of issue, and

3.1.7 Supplementary requirements, if any.

4. Manufacture

4.1 *Melting Process*—The steel shall be made by one or more of the following processes: open-hearth, basic-oxygen, or electric-furnace.

4.2 *Discard*—Sufficient discard shall be made from each ingot to assure freedom from piping and undue segregation.

4.3 *Cooling and Heating*:

4.3.1 All tires, immediately after being rolled, shall be slow cooled in a manner to accomplish proper transformation without damage.

4.3.2 Classes AHT, BHT, CHT, and DHT shall be heated to and held at the proper temperature for a sufficient time to effect the desired transformation and then shall be immersed in a suitable quenching medium.

4.3.3 Following quenching, the tires shall be charged into a furnace for tempering to meet the hardness requirements of 6.1.1, and then cooled under suitable conditions.

5. Chemical Requirements

5.1 *Chemical Composition*—The steel shall conform to the requirements for chemical composition specified in Table 1 or to the composition agreed upon by the manufacturer and the purchaser.

5.2 *Heat or Cast Analysis*—An analysis of each heat or cast of steel shall be made by the manufacturer to determine the percentages of the elements specified in Table 1. The analysis shall be made from a test sample taken preferably during the

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[2] *Annual Book of ASTM Standards,* Vol 01.03.

[3] *Annual Book of ASTM Standards,* Vol 03.05.

[4] *Annual Book of ASTM Standards,* Vol 03.06.

TABLE 1 Chemical Requirements

Element	Composition, %
Carbon	
Classes A and AHT	0.50–0.65
Classes B and BHT	0.60–0.75
Classes C, CHT and DHT	0.70–0.85
Manganese	0.60–0.90
Phosphorus, max	0.050
Sulfur, max	0.050
Silicon	0.15–0.35

pouring of the heat. The chemical composition thus determined shall be reported to the purchaser or the purchaser's representative, and shall conform to the requirements in Table 1.

5.3 *Product Analysis*—An analysis to represent each heat may be made by the purchaser from turnings taken from a tire. The chemical composition thus determined shall not vary from the requirements by more than the limits in Table 2.

6. Hardness Requirement

6.1 Classes AHT, BHT, CHT, and DHT shall be accepted on the basis of a Brinell hardness test on the front face of 10 % of the tires from each heat at a location approximately 1 in. (25 mm) below the tread.

6.1.1 The tires shall conform to the following limits:

Class	AHT	BHT	CHT	DHT
Brinell hardness	223 to 277	255 to 302	285 to 331	321 to 363

6.1.2 Where continuous heat-treating furnaces are used, should any of the tested tires fail to meet the hardness requirements of 6.1.1, the manufacturer may offer for individual hardness measurements, all of the tires of that heat in the lot for inspection. Those meeting the hardness requirements of 6.1.1 shall be accepted.

6.1.3 Where batch heat-treating furnaces are used, should any of the tires fail to meet the requirements of 6.1.1, the manufacturer may offer all of the tires in the heat treatment lot for individual hardness measurement. Those meeting the hardness requirements of 6.1.1 shall be accepted.

7. Retreatments

7.1 Any tires failing to meet the specified hardness may be retreated and tested in accordance with Section 6.

8. Mating

8.1 The tires shall be grouped according to outside diameter and shipped in sets.

8.2 The variation in outside diameters in each set shall not exceed 1⁄16 in. (1.6 mm) for tires 33 in. (838 mm) or under in outside diameter, nor exceed 3⁄32 in. (2.4 mm) for tires over 33 in. (838 mm) in outside diameter.

TABLE 2 Product Analysis Requirements

Element	Over Maximum Limit, %	Under Minimum Limit, %
Carbon	0.03	0.02
Manganese	0.04	...
Phosphorus	0.010	...
Sulfur	0.010	...

9. Permissible Variations in Dimensions

9.1 Tires may be furnished with all surfaces as-rolled, and shall conform to the dimensions specified, subject to the following variations:

9.1.1 *Height of Flange*—The flange height shall not be less, but may be 1⁄16 in. (1.6 mm) more, than that specified.

9.1.2 *Thickness of Flange*—The flange thickness shall not vary more than 1⁄16 in. (1.6 mm) from that specified.

9.1.3 *Radius of Throat*—The throat radius shall not vary more than 1⁄8 in. (3.2 mm) over, nor more than 1⁄16 in. (1.6 mm) under, that specified.

9.1.4 *Width of Tires*—The tire width shall not be less, but may be 1⁄16 in. (4.8 mm) more, than that specified.

9.1.5 *Inside Diameter*—The rough inside diameter shall not be more, but may be 1⁄4 in. (6.4 mm) less, than that specified. When the finished inside diameter only is specified, the rough diameter shall be from 3⁄16 to 7⁄16 in. (4.8 to 11.1 mm) less than this diameter.

9.1.6 *Outside Diameter*—Unless otherwise specified, the outside diameter, when 54 in. (1370 mm) or under, shall not be less, but may be 1⁄2 in. (12.7 mm) more than that specified; and when over 54 in. (1370 mm), shall not vary more than 1⁄8 in. (3.2 mm) under, nor more than 3⁄8 in. (9.5 mm) over that specified.

9.1.7 *Rotundity*—Tires shall not be out-of-round more than 1⁄16 in. (1.6 mm) for tires 33 in. (838 mm) or under in outside diameter, nor more than 3⁄32 in. (2.4 mm) for tires over 33 in. (838 mm) in outside diameter.

10. Workmanship, Finish, and Appearance

10.1 The tire shall be free of injurious imperfections and shall have a good, workmanlike appearance.

11. Marking

11.1 The name of the manufacturer or brand, the serial number, heat number, date of manufacture, and class shall be legibly stamped on each tire close to the inside edge where they will not be removed by the last turning.

11.2 In addition to the above required markings, bar code tags may be applied to the axles. If these are applied, it is recommended that bar code 39 be used. The size and location of the tags, as well as the information to be included, shall be agreed upon by the purchaser and manufacturer.

12. Inspection

12.1 The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to satisfy that the material is being produced and furnished in accordance with this specification. Mill inspection by the purchaser shall not interfere unnecessarily with the manufacturer's operations. All tests and inspections shall be made at the place of manufacture, unless otherwise agreed to.

13. Rejection

13.1 Unless otherwise specified, any rejection based on tests made in accordance with this specification shall be reported to the manufacturer within five working days from the receipt of samples by the purchaser.