Designation: A 67 – 00

Standard Specification for Steel Tie Plates, Low-Carbon and High-Carbon-Hot-Worked[1]

This standard is issued under the fixed designation A 67; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers steel tie plates for use in railroad track.

1.2 Two grades of tie plates are described: Grade 1, low-carbon, and Grade 2, high-carbon-hot-worked.

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

2. Referenced Documents

2.1 *ASTM Standards:*

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipping[2]

2.2 *American Railway Engineering and Maintenance of Way Association (AREMA):*

Specification for Steel Tie Plates[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *eccentricity*—the distance from the shoulder to the edge of the tie plate at right angles to the shoulder is larger on the field side than the gage side to compensate for the greater tendency of the field end to cut into the tie; the horizontal distance from middle of the rail seat to middle of the tie plate is the eccentricity.

3.1.2 *field side*—end of tie plate designed to be located on the opposite side of the rail from the centerline of track.

3.1.3 *gage side*—end of tie plate designed to be located closest to the centerline of track.

3.1.4 *hold down holes*—located on the plate away from the rail seat, these holes do not allow spikes to contact the edge of the rail base. Also called *anchor spike holes*.

3.1.5 *length*—overall dimension of the plate at right angles to the rail it supports.

3.1.6 *Discussion*—Tie plates of different length can be used with a given rail section with the length chosen based on the traffic density of the track on which it is to be used.

3.1.7 *line holes*—located at the edge of the rail seat, these holes allow the spikes to contact the edge of the rail base.

3.1.8 *rail seat*—the portion of the tie plate that supports the rail.

3.1.9 *rail seat cant*—tie plates are generally rolled with the rail seat not parallel to the base of the plate so that the rail head is tilted toward the centerline of track to help offset lateral thrust and provide better wheel bearing on the rail head; the AREA recommended cant is a ratio of 1:40.

3.1.10 *rolled width*—the dimension of the finished section as it leaves the rolls and is equal to the length of the tie plate.

3.1.11 *sheared length*—the dimension to which the finished section is cut and is equal to the width of the tie plate.

3.1.12 *shoulder*—a ridge parallel to the rail designed to assist in holding the rail in position.

3.1.13 *Discussion*—The height of the shoulder is about equal to the thickness of the edge of the rail base. If a plate has a *single shoulder*, the shoulder is located on the field side of the rail seat to resist the outward thrust of the rail. A *double shoulder* plate has an additional shoulder on the gage side of the rail seat. Single shoulder plates may accommodate a desired rail section by adjusting the punching of the spike holes on the gage side to match the width of the rail base. Double shoulder plates are limited to a single rail base width.

3.1.14 *tie plate*—a part of the track structure placed under the rail to distribute the wheel load to the tie, cant the rail to the desired angle, assist in maintaining the track to gage and protect the tie.

3.1.15 *Discussion*—The tie plate has a rail seat, either flat or canted, either a single or double shoulder parallel to the rail it supports, and is punched with holes for spikes or other fasteners. The bottom of the tie plate is usually flat, but ribbed or other designs may be used.

3.1.16 *width*—overall dimension of the plate parallel to the rail it supports.

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys, and is the direct responsibility of Subcommittee A01.01 on Steel Rails and Accessories.

Current edition approved September 10, 2000. Published November 2000. Originally published as A 67 – 16 T. Last previous edition A 67 – 92.

[2] *Annual Book of ASTM Standards*, Vol 01.05.

[3] *Manual of Railway Engineering*, Chapter 5, Part 1, and is available from American Railway Engineering and Maintenance of Way Assn., 8201 Corporate Drive, Suite 1125, Landover, MD 20785.

3.1.17 *Discussion*—Tie plates are generally from 7 to 8 in. wide.

4. Ordering Information

4.1 Orders for tie plates under this specification shall include the following information:

4.1.1 Quantity: number of pieces.

4.1.2 ASTM designation and year of issue.

4.1.3 Grade: 1, low-carbon, or 2, high-carbon-hot-worked (see Table 1 and Table 2).

4.1.4 Design: AREMA plan number,[3] or other design including drawings if required.

4.1.5 Any variation in location and shape of holes, etc., from the plan, with dimensional drawing if necessary.

5. Materials and Manufacture

5.1 *Melting Practice*—The steel shall be made by any of the following processes: basic-oxygen or electric-furnace.

5.2 The steel may be cast by a continuous process, or in ingots.

5.3 *Discard*—A sufficient discard shall be made to secure freedom from injurious segregation and piping.

5.4 Steel accumulated in the form of ingots or blooms, possibly from various heats, that conforms to the requirements of this specification may be used in the manufacture of either Grade 1 or Grade 2 tie plates.

5.5 Grade 1 tie plates may be sheared, punched, or slotted either hot or cold, at the option of the manufacturer.

5.6 Grade 2 tie plates shall be sheared, punched, or slotted hot, at a temperature best suited to the process, and thereafter placed into an enclosure to assure proper cooling.

6. Chemical Composition

6.1 The steel shall conform to the requirements for chemical composition specified in Table 1.

6.2 *Heat or Cast Analysis*:

6.2.1 An analysis of each heat or cast 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 pouring of the heat. The chemical composition thus determined shall conform to the requirements in Table 1.

6.2.2 Steel accumulated in the form of ingots or blooms may be applied on the basis of the original heat or cast analysis recorded in the mill records.

6.3 When ladle tests are not available, finished material representing the heat may be product tested. The product analysis allowance beyond the limits of the specified ladle analysis shall be within the limits for product analyses specified in Table 2.

TABLE 1 Chemical Requirements

	Grade 1 Low-Carbon	Grade 2 High-Carbon-Hot-Worked
Carbon	0.15 min	0.35 to 0.85
Phosphorus, max	0.040	0.040
Sulfur, max	0.050	0.050

TABLE 2 Product Analysis Allowance Beyond Limits of Specified Chemical Analysis

	Under Maximum Limit, %	Over Maximum Limit, %
Carbon	0.04	. . .
Phosphorus	. . .	0.008
Sulfur	. . .	0.008

7. Bend Requirements

7.1 *Bend Test*:

7.1.1 Grade 1 or Grade 2 bend test specimens prepared as required in 7.1.2 shall withstand the respective bend test described in Table 3 without cracking on the outside of the bent portion.

7.1.2 The specimens for bend tests specified in 7.1.1 shall be taken from finished tie plates, longitudinally with the direction of rolling. They shall be rectangular in section, not less than ½ in. (13 mm) in width between machined sides, and shall have two faces as rolled. Where the tie plate design is such that a specimen cannot be taken between the ribs or projections, the ribs or projections shall be removed to the plane of the plate surface as part of the specimen preparation.

7.2 *Optional Bend Test*:

7.2.1 If preferred by the manufacturer, the following full-size bend test may be substituted for that described in 7.1.

7.2.2 A finished Grade 1 or Grade 2 tie plate shall withstand the respective optional bend test described in Table 3 without cracking on the outside of the bent portion.

7.3 *Number of Tests*:

7.3.1 One bend test shall be made from each identified heat, or from each 25 tons (23 Mg) where heats are not identified.

7.3.2 If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

7.4 *Retest*:

7.4.1 High carbon tie plates represented by bend tests failing to meet the requirements prescribed in 7.1 or 7.2 may be annealed not more than twice and resubmitted for testing. If tie plates fail to meet the third test, they shall be rejected.

8. Permissible Variations in Dimension, Weight, and Other Physical Attributes

8.1 The tie plate shall conform to the dimensions specified by the purchaser, subject to the permissible variations indicated in Table 4.

TABLE 3 Bend Test Requirements

	Grade 1	Grade 2
Bent test, cold	180° around pin of diameter not greater than specimen thickness	30° around pin of diameter not greater than three times specimen thickness
Optional bend test, cold	90° around pin of diameter not greater than section thickness[A] at bend	30° around pin of diameter not greater than three times section thickness[A] at bend

[A] Thickness includes vertical height of ribs and shoulders where they are transverse to pin direction.