Designation: A 3 – 01 (Reapproved 2006)

Standard Specification for Steel Joint Bars, Low, Medium, and High Carbon (Non-Heat-Treated)[1]

This standard is issued under the fixed designation A 3; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers steel joint bars for connecting steel rails in mine, industrial, and standard railroad track.

1.2 Three grades of joint bars are defined for applications where non-heat treated bars are suitable:

1.2.1 Grade 1, low-carbon, primarily for industrial and mine use.

1.2.2 Grade 2, medium-carbon, primarily for industrial and mine use.

1.2.3 Grade 3, high-carbon, for general use in standard railroad track. They may be used in the production of insulated track joints.

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

2. Referenced Documents

2.1 *ASTM Standards:* [2]

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

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment

3. Ordering Information

3.1 Orders for joint bars under this specification shall include the following information as appropriate:

3.1.1 *Quantity*—number of pairs of bars,

3.1.2 *Type*—design or type bar along with section designation and weight of rails being joined,

TABLE 1 Chemical Requirements

Elements	Composition, %		
	Grade 1	Grade 2	Grade 3
Carbon, min	...	0.30	0.45
Phosphorus, max	0.05	0.05	0.04

3.1.3 *Grade*—in accordance with 1.2 and Table 1 and Table 2,

3.1.4 *Dimension*—overall length,

3.1.5 *Punching*—type (elliptical, oval, round, or combinations), size, number, location, spacing, and elevation of punched holes, with dimensional drawing if necessary,

3.1.6 *Special Requirements*—notching, shearing, bundling, etc., including details, and

3.1.7 *Certification and Test Report Requirements*—(Section 11).

4. Manufacture

4.1 The steel shall be made by one or both of the following processes: basic-oxygen or electric-furnace.

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

4.2 Grade 2, medium-carbon, joint bars may be punched, slotted, and shaped in the case of special designs, either hot or cold. Joint bars that are punched, slotted, or shaped cold shall be subsequently annealed.

4.3 Grade 3, high-carbon, joint bars shall be uniformly heated for punching, slotting, and shaping.

5. Chemical Requirements

5.1 The steel shall conform to the requirements as to chemical composition prescribed in Table 1.

5.2 *Heat or Cast Analysis*—An analysis of each heat or cast shall be made by the manufacturer to determine the percentages of carbon, manganese, phosphorus, and sulfur. The analysis shall be made from a test sample taken preferably

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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TABLE 2 Product Analysis

	Allowance Beyond Limits of Specified Chemical Analysis	
	Percent under min limit	Percent over max limit
Carbon	0.04	0.04
Phosphorus	. . .	0.008

during the pouring of the heat or cast. The chemical composition thus determined shall conform to the requirement in Table 1. Manganese and sulfur determinations are for information only.

5.3 *Product Analysis*—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.

5.3.1 An analysis may be made by the purchaser from a sample taken from a finished joint bar representing each heat or cast. The chemical composition thus determined shall conform to the requirements in Table 1.

6. Tensile Requirements

6.1 *Properties*—The material as represented by a tension test specimen shall conform to the tensile properties prescribed in Table 3.

6.2 *Test Specimen*—The tension test specimen shall be taken from the middle of the head at the center of a finished joint bar. The specimen shall be machined to the form and dimensions for a standard round tension test specimen with 2-in. or (50- mm) gage length, as described in Test Methods and Definitions A 370.

6.3 *Number of Tests*—One tension test shall be made from each heat or cast of steel.

6.4 *Retests*—If the results of the tension test fail to meet the requirements specified, a retest shall be permitted on two random specimens from the lot. Both shall conform to the requirements specified in Table 3.

6.4.1 If any test specimen fails because of mechanical reasons such as failure of testing equipment or improper specimen preparation, it may be discarded and another specimen taken.

7. Dimensions and Permissible Variations

7.1 The joint bars shall be true to template, and shall accurately fit the rails for which they are intended.

7.2 The joint bars shall be either sheared or sawed to length, punched to the dimensions specified by the purchaser and alignment adjusted, all subject to the permissible variations prescribed in 7.3, 7.4, and Table 4.

7.3 Any variation from a straight line in a vertical plane shall be such as will make the bars high in the center.

7.4 For girder rail applications only, any variation from a straight line in a horizontal plane shall be such as will make the bars convex towards the web of the rail.

TABLE 3 Tensile Requirements

	Grade 1		Grade 2		Grade 3	
	ksi	MPa	ksi	MPa	ksi	MPa
Tensile strength, min	55	380	68	470	85	585
Elongation in 2 in. or 50 mm, min	22		20		15	

8. Workmanship, Finish, and Appearance

8.1 The joint bars shall be straight, subject to the variations prescribed in 7.3, 7.4, and Table 4.

8.2 The general appearance with respect to soundness and surface finish shall be consistent with good commercial practice as determined by visual inspection.

9. Inspection

9.1 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 upon.

10. Rejection and Rehearing

10.1 Material that fails to conform to the requirements of this specification may be rejected. Rejections shall be reported to the manufacturer or supplier promptly and in writing. In case of dissatisfaction with the test results, the manufacturer or supplier may make claim for a rehearing.

11. Certification and Test Report

11.1 When specified in the purchase order or contract, a manufacturer's certification shall be furnished to the purchaser that the material was produced and tested in accordance with this specification and has been found to meet the requirements.

11.2 When specified in the purchase order or contract, a report of the chemical and mechanical test results shall be furnished.

11.3 A Material Test Report, Certificate of Inspection, or similar document printed from or used in electronic form from an electronic data interchange (EDI) transmission shall be regarded as having the same validity as a counterpart printed in the certifier's facility. The content of the EDI transmitted document must meet the requirements of the invoked ASTM standard(s) and conform to any existing EDI agreement between the purchaser and the supplier.

11.4 Notwithstanding the absence of a signature, the organization submitting either a printed document (Material Test Report, Certificate of Inspection or similar document) or an EDI transmission is responsible for the content of the report.

12. Product Marking

12.1 The name or brand of the manufacturer and the year of manufacture shall be rolled in raised letters and figures on the side of the rolled bars, and a portion of this marking shall appear on each finished joint bar.

12.2 In addition to the markings in 12.1, the following markings shall appear on Grade 3, high-carbon joint bars:

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12.2.1 The section designation shall be included with the rolled raised characters.

12.2.2 A serial number representing the heat or cast shall be hot-stamped on the outside of the web of each bar, near one end.

12.3 *Bar Coding*:

12.3.1 The Automotive Industry Action Group (AIAG) Bar Code Standard for Primary Metals for Steel Products may be considered as a possible auxiliary method of identification. Use of this method shall be by agreement between purchaser and supplier.

13. U.S. Government Procurement

13.1 When specified in the contract or purchase order, material shall be prepared for shipment and storage in accordance with the requirements of Practices A 700.

14. Keywords

14.1 rail; railway applications; steel joint bars

TABLE 4 Permissible Variations in Dimensions

Specified size of holes	±1/32 in. (0.8 mm)	
Specified location of holes	±1/16 in. (1.6 mm)	
Specified length of bar	±1/8 in. (3.2 mm)	
Maximum camber in either plane—tee rail applications (see 7.3)		
	Grades 1, 2	Grade 3
24-in. (610-mm) bars	1/16 in. (1.6 mm)	1/32 in. (0.8 mm)
36-in. (914-mm) bars	1/8 in. (3.2 mm)	1/16 in. (1.6 mm)
Maximum vertical camber-girder rail applications (see 7.3) (Grades 1 and 2 only)		
24-in. (610-mm) bars	3/64 in. (1.2 mm)	
36-in. (914-mm) bars	3/32 in. (2.4 mm)	
Maximum horizontal camber-girder rail applications (see 7.4) (Grades 1 and 2 only)		
24-in. (610-mm) bars	1/16 in. (1.6 mm)	
36-in. (914-mm) bars	1/8 in. (3.2 mm)	

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