Designation: A 502 – 03

Standard Specification for Rivets, Steel, Structural[1]

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1. Scope

1.1 This specification covers three grades of steel rivets in diameters from ½ to 1½ in. inclusive, for structural fabricating purposes. The grades are as follows:

Grade	Description
1	Carbon steel rivets for general purpose use
2	Carbon manganese steel rivets for use with high strength carbon and high strength low alloy structural steels
3	Weathering steel rivets

1.2 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products[2]

D 3951 Practice for Commercial Packaging[3]

F 606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets[4]

F 1470 Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection[4]

G 101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels[5]

2.2 *ASME Standard:*

B 18.1.2 Large Rivets (½ Inch Nominal Diameter and Larger)[6]

3. Ordering Information

3.1 Orders for rivets under this specification shall include:

3.1.1 Quantity (number of pieces of rivets),

3.1.2 Name of product, including head type,

3.1.3 Dimensions including nominal diameter and length,

3.1.4 Supplementary Requirement S1, if required (see 8.1.2),

3.1.5 Test report, if required (see 14.1),

3.1.6 Additional package marking, if required (see 17.2),

3.1.7 ASTM designation, including grade and date of issue, and

3.1.8 Any special requirements.

Example—10 000 pieces, Steel Button Head Rivets, ½ × 1 in., Test Report Required, ASTM A 502, Grade 1, dated_____ .

4. Materials and Manufacture

4.1 *Process*—The steel for rivets shall be made by the open-hearth, basic-oxygen, or electric-furnace process.

4.2 *Heading*—Rivets shall be made by the hot or cold heading process. It is expected that these rivets ordinarily will be hot driven.

5. Chemical Composition

5.1 Grade 1 and Grade 2 rivets shall conform to the heat analysis requirements given in Table 1.

5.2 Grade 3 rivets shall be weathering steel and shall conform to Class A or Class B chemical composition specified in Table 1. The selection of the composition, A or B, shall be at the option of the rivet manufacturer. See Guide G 101 for methods of estimating the atmospheric corrosion resistance of low alloy steels.

5.3 Application of heats of steel to which bismuth, selenium, tellurium, or lead has been intentionally added shall not be permitted. Compliance with this requirement shall be based on a statement on the steel certificate indicating that these elements were not intentionally added.

5.4 Product analysis made on finished rivets representing each lot shall conform to the product analysis requirements specified in Table 1, as applicable. Product Analysis is not applicable to Grade 1 rivets made from rimmed steel or merchant quality bars.

6. Mechanical Properties

6.1 The rivets shall conform to the hardness requirements shown in Table 2.

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[1] This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.02 on Steel Bolts, Nuts, Rivets, and Washers.

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[2] *Annual Book of ASTM Standards*, Vol 01.01 through 01.05.

[3] *Annual Book of ASTM Standards*, Vol 15.09.

[4] *Annual Book of ASTM Standards*, Vol 01.08.

[5] *Annual Book of ASTM Standards*, Vol 03.02.

[6] Available from ASME International, Information Central, 22 Law Drive, PO Box 2300, Fairfield, NJ 07007-2300.

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TABLE 1 Chemical Requirements

	Grade 1		Grade 2		Grade 3[A,B]			
					Class A		Class B	
	Heat Analysis, %	Product Analysis,[C] %	Heat Analysis, %	Product Analysis, %	Heat Analysis, %	Product Analysis, %	Heat Analysis, %	Product Analysis, %
Carbon	0.13–0.25	0.11–0.27	0.19–0.30	0.16–0.33	0.10–0.19	0.09–0.20	0.20 max	0.21 max
Manganese	0.30–0.90	0.27–0.93	1.20–1.65	1.14–1.71	0.90–1.25	0.86–1.29	0.75–1.25	0.71–1.29
Phosphorus, max								
acid	0.06	0.070	0.06	0.070	. . .	. . .	. . .	. . .
basic	0.04	0.048	0.04	0.048	0.04	0.045	0.04	0.045
Sulfur, max	0.05	0.058	0.05	0.058	0.05	0.055	0.05	0.055
Silicon	. . .	. . .	0.10–0.35	0.08–0.37	0.15–0.35	0.13–0.37	0.15–0.35	0.13–0.37
Nickel	. . .	. . .	. . .	. . .	. . .	. . .	0.25–0.50	0.22–0.53
Chromium	. . .	. . .	. . .	. . .	0.40–0.65	0.37–0.68	0.40–0.70	0.37–0.73
Copper	. . .	. . .	. . .	. . .	0.25–0.40	0.22–0.43	0.20–0.40	0.17–0.43
Copper, when copper bearing steel is specified, min	0.20	0.18	0.20	0.18	. . .	. . .	. . .	. . .
Vanadium	. . .	. . .	. . .	. . .	0.02–0.10	0.01–0.11	0.01–0.10	0.11 max

[A] A and B are classes of material used for Grade 3 rivets. Selection of a class shall be at the option of the rivet manufacturer.
[B] See 5.2.
[C] Product analysis is not applicable to rivets made from rimmed steel or merchant quality bars.

TABLE 2 Hardness Requirements

	Grade 1		Grade 2		Grade 3	
	Min	Max	Min	Max	Min	Max
Rockwell, B	55	72	76	85	76	93
Brinell, 500-kgf (4900-N), 10-mm ball	103	126	137	163	137	197

6.2 Brinell hardness shall be measured at only one point. Rockwell hardness shall be measured at three points, equally spaced about the axis of the rivet, and the hardness shall be taken as the arithmetic average of the three measurements.

7. Dimensions

7.1 Dimensions of rivets, unless otherwise specified, shall conform to those of one of the head types provided in ASME B 18.1.2.

8. Number of Tests and Retests

8.1 *Hardness*:

8.1.1 The requirements of this specification shall be met in continuous mass production for stock, and the manufacturer shall make sample inspections to ensure that the product conforms to the specified hardness requirements. Additional tests of individual shipments of material are not ordinarily contemplated. Individual heats of steel are not necessarily identified in the finished product.

8.1.2 Additional hardness tests of individual shipments of rivets are not ordinarily required. When required, Supplementary Requirement S1 shall be specified.

8.2 *Head Bursts and Duds*:

8.2.1 From each lot, the number of tests and the acceptance/rejection criteria for cracks (bursts) and duds shall be in accordance with Guide F 1470 using the sampling level characteristic specified for Surface Discontinuities.

9. Specimen Preparation

9.1 Rivets used for testing shall be heat treated in the following manner prior to testing:

9.1.1 *Grade 1*—Normalize by air cooling from above the transformation range.

9.1.2 *Grade 2*—Anneal by heating to 1450°F (790°C), holding for 30 min at temperature and cooling in the furnace.

9.1.3 *Grade 3*—Normalizing test samples shall be at the option of the manufacturer.

9.2 If any test specimen shows defective preparation, it shall be discarded and another specimen substituted.

10. Visual Inspection for Head Bursts and Duds

10.1 The rivets shall be inspected for cracks (bursts) and duds. Sampling and inspection shall be in accordance with 8.2. Rivets having an opening at the periphery of the head wider than 0.020 inch plus −0.05 times the rivet diameter shall be considered nonconforming (see Note 1).

NOTE 1—Crack and burst are two names for the same thing. Each designates an abrupt interruption of the periphery of a rivet head by separation of the metal. Such interruptions do not adversely affect structural strength, corrosion resistance, or other functional requirements of the rivet, but are unsightly if they are large.

11. Test Methods

11.1 Hardness tests shall be conducted in accordance with Test Methods F 606.

11.2 Chemical analyses shall be conducted in accordance with Test Methods A 751.

12. Inspection

12.1 If the inspection described in 12.2 is required by the purchaser, it shall be specified in the inquiry and contract or order.

12.2 The purchaser's representative shall have free entry to all parts of the manufacturer's works or supplier's place of business that concern the manufacture or supply of the rivets ordered. The manufacturer or supplier shall afford the purchaser's representative all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All tests and inspections required by the specification that are requested by the purchaser's representative shall be made before shipment, and shall be conducted as not to

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interfere unnecessarily with the operation of the manufacturer's works or supplier's place of business.

13. Rejection and Rehearing

13.1 Disposition of nonconforming rivets shall be in accordance with the Guide F 1470 section entitled "Disposition of Nonconforming Lots."

14. Certification

14.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the rivets were manufactured and tested in accordance with this specification, together with a report of the latest hardness tests of each stock size in each shipment, shall be furnished at the time of shipment.

14.2 When Supplementary Requirement S1 has been specified, and when specified on the purchase order, the manufacturer or supplier, whichever is the responsible party as defined in Section 15, shall furnish the purchaser a test report(s) that includes the following:

14.2.1 Heat analysis, heat number, and a statement certifying heats having the elements listed in 5.3 intentionally added were not used to produce the rivets,

14.2.2 Results of hardness tests,

14.2.3 Results of visual inspection for head bursts and duds,

14.2.4 Statement of compliance with dimensional requirements,

14.2.5 Lot number and purchase order number,

14.2.6 Complete mailing address of responsible party, and

14.2.7 Title and signature of the individual assigned certification responsibility by the company officers;

14.2.8 Failure to include all the required information on the test report shall be cause for rejection.

15. Responsibility

15.1 The party responsible for the fastener shall be the organization that supplies the fastener to the purchaser and certifies that the fastener was manufactured, sampled, tested and inspected in accordance with this specification and meets all of its requirements.

16. Product Marking

16.1 All rivets shall be marked with a symbol to identify the manufacturer or private label distributor, as appropriate.

16.2 In addition, the rivets shall be marked as follows to identify the grade.

Grade	Grade Marking
1	none required[A]
2	2
3	3

[A] The numeral 1 shall be used at the manufacturer's option.

16.3 The marking shall appear on the rivet head and shall be raised or depressed at the manufacturer's option.

16.4 Grade and manufacturer's or private label distributor's identification shall be separate and distinct. The two identifications shall preferably be in different locations and, when on the same level, shall be separated by at least two spaces.

17. Packaging and Package Marking

17.1 *Packaging*:

17.1.1 Unless otherwise specified, packaging shall be in accordance with Practice D 3951.

17.1.2 When special packaging requirements are required, they shall be defined at the time of the inquiry and order.

17.2 *Package Marking*:

17.2.1 Each shipping unit shall include or be plainly marked with the following information:

17.2.1.1 ASTM designation and grade,

17.2.1.2 Size,

17.2.1.3 Name and brand or trademark of the manufacturer,

17.2.1.4 Number of pieces,

17.2.1.5 Purchase order number, and

17.2.1.6 Country of origin.

18. Keywords

18.1 carbon steel; rivets; steel; structural; weathering steel

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirement shall apply only when specified in the purchase order or contract.

S1. Additional Hardness Tests on Individual Shipments

S1.1 When additional hardness tests on individual shipments are required, sampling and acceptance/rejection criteria shall be in accordance with Guide F 1470.

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