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C.C. (ME) 7169. *June*, 1932.

British Standards Institution.

BRITISH STANDARD SPECIFICATIONS
FOR
RAILWAY ROLLING STOCK MATERIAL.

STEEL PLATES, SECTIONS, BARS AND RIVETS
FOR
LOCOMOTIVES, CARRIAGES AND WAGONS.
(No. 24–Part 6–1929.)

ALTERATION TO PROCESS OF MANUFACTURE.

SPECIFICATION No. 17 (page 9).

Clause 1. *Quality of Material.*

For the existing clause substitute the following clause :—

"Plates other than locomotive frame plates, sections and bars shall be manufactured from steel made from selected material by the acid or basic open hearth, acid bessemer, or the electric process. Locomotive frame plates shall be made by either the acid or basic open hearth process only.

The material shall not show on analysis more than 0.06 per cent of sulphur or of phosphorus.

The Manufacturer shall supply an analysis when required to do so."

SPECIFICATIONS Nos. 17a, 18 and 18a (pages 15, 21 and 27).

Clause 1. *Quality of Material.*

For the words " . . . acid or basic open hearth process . . . " substitute the words " . . . acid or basic open hearth, acid bessemer, or the electric process . . . "

+ 1 addendum

No. 24—Part 6—1929.

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British Engineering Standards Association
Formed in 1901 as the Engineering Standards Committee.

BRITISH
STANDARD SPECIFICATIONS
FOR
RAILWAY ROLLING STOCK MATERIAL.

PART 6.

STEEL PLATES, SECTIONS, BARS AND RIVETS FOR LOCOMOTIVES, CARRIAGES AND WAGONS.

(REVISED 1929.)

LONDON:
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28, Victoria Street, London, S.W.1.
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September, 1929.

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The following Government Departments and Scientific and Industrial Organisations were officially represented upon the Committees entrusted with the revision of these Specifications :—

Admiralty.
Air Ministry.
Crown Agents for the Colonies.
General Post Office.
India Office.
Ministry of Transport.
Office of Works.
War Office.
Dominion of New Zealand.
Department of Scientific and Industrial Research.
Institution of Mechanical Engineers.
Institution of Automobile Engineers.
Institution of Gas Engineers.
Institution of Heating and Ventilating Engineers.
Railway Companies of Great Britain.
Engineering Insurance Companies.
Association of British Chemical Plant Manufacturers.
Brass and Copper Tube Association.
British Engineers' Association.
Locomotive Manufacturers' Association.
Machine Tool Trades Association.
National Federation of Iron and Steel Manufacturers.
Steel Founders' Association of Great Britain.
Railway Carriage and Wagon Builders and Financiers' Parliamentary Association.

This Specification was approved by the Mechanical Industry Committee at their meeting on May 29th, 1929, and published by the Authority of the Council of the Association as a British Standard on September 2nd, 1929.

NOTE.

In order to keep abreast of progress in the Industries concerned, the British Standard Specifications are subject to periodical review.

Suggestions for improvements, addressed to the Director, British Engineering Standards Association, 28, Victoria Street London, S.W.1, will be welcomed at all times. They will be recorded and in due course brought to the notice of the Committees charged with the revision of the Specification to which they refer.

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PART 4—1921. Steel Forgings, Blooms and Castings.

PART 5—1925. Copper Plates, Rods and Tubes, and Brass Tubes.

NOTE.—*The Association desires to call attention to the fact that this Specification is intended to include the technical provisions necessary for the supply of the material herein referred to, but does not purport to include all the necessary provisions of a contract.*

BRITISH STANDARD SPECIFICATION FOR STEEL PLATES, SECTIONS, BARS AND RIVETS FOR LOCOMOTIVE BOILERS.

(REVISED 1929.)

The figures in British measures are to be regarded as the Standard. Approximate metric equivalents are given for the convenience of users in countries in which the metric system has been generally adopted.

Quality of Material.

1. The Plates, Sections and Bars shall be manufactured from Steel made from selected material by the Acid or Basic Open Hearth process, as may be specified, and shall not show on analysis more than 0·05 per cent of Sulphur or of Phosphorus.

The Manufacturer shall supply an analysis when required to do so.

Independent Chemical Analyses.

2. The Engineer or Purchaser, before accepting the material, shall have the right, should he so desire, to make chemical analyses of each cast from the scrap margin or test pieces from at least two plates, bars or sections as rolled.

Freedom from Defects.

3. The Plates, Sections and Bars shall be free from cracks, surface flaws, laminations, and all other defects, and finished in a workmanlike manner.

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Rolling Margin.

4. No Plate, Section or Bar shall be under the specified thickness at any part, or more than 5 per cent over the calculated weight.

Branding.

5. Each Plate, Section or Bar shall be distinctly stamped with such Brands as the Engineer (or the Purchaser) may require, but not near the edge.

Rivet bars and other small bars shall be bundled and securely tagged with a metal tag bearing the required markings, in the manner specified by the Engineer (or the Purchaser).

Plates for Flanging.

6. When plates are required for flanging purposes, it shall be so stated at the time of the enquiry.

Mechanical Tests.

7. The tensile strength and ductility shall be determined from Standard test pieces cut crosswise from the rolled material in the case of Plates, and lengthwise in the case of Sections and Bars.

No test piece shall be cut from the plate, section or bar until it shall have been stamped by the representative of the Engineer (or of the Purchaser) with such identifying brands as he may require.

When material is annealed or otherwise heat treated before despatch, the test pieces shall be similarly and simultaneously heat treated with the material before testing.

Any straightening of test pieces which may be required shall be done cold.

Tensile Tests.

8. The tensile strength and elongation shall be determined from standard test pieces A, B or F (*See* Appendix, pages 35 to 38). The edges of the flat test pieces shall be draw-filed to remove roughness and sharpness. The plates, sections and bars shall show the tensile strength and elongation given in the table on page 5.

TABLE OF TENSILE TESTS.

Material.	Tensile Strength.		Minimum Elongation per cent.					
			Test Piece A.	Test Piece B*		Test Piece F†	
	Tons per square inch.	Kg. per mm.²		As Rolled.	Machined.	As Rolled.	Machined.
PLATES	26—30	40·95—47·25	22	—	—	—	—
SECTIONS, PLATS AND BARS (other than Rivet Bars).							
Sections and Flats...	26—32	40·95—50·40	20	—	—	—	—
Round and square bars (up to and including 1 in. in dia. or thickness).	26—32	40·95—50·40	—	20	20	—	—
Round and square bars (above 1 in. in dia. or thickness).	26—32	40·95—50·40	—	—	—	24	24
RIVET BARS	24—28	37·80—44·10	—	27	27	32	32

* Or in the case of square bars tested as rolled, a test piece having a gauge length 8 times the side.
† Or in the case of square bars tested as rolled, a test piece having a gauge length 4 times the side.

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Number of Tensile Tests.

9. One tensile test shall be taken from each end of each Plate as rolled, and at least two tensile tests for Sections and Bars shall be taken from each cast.

In the case of a Plate over 30 feet (9·14 m.) in length, when two or more Plates are sheared to size from it, one further tensile test shall be taken from a position as near as possible to the middle of the length of the original Plate.

Should a tensile test piece break outside the middle half of its gauge length (*See* Fig. 1), the test may, at the Manufacturer's option, be discarded, and another test may be made with a test piece taken from the same Plate, Section or Bar from which the discarded test piece was taken.

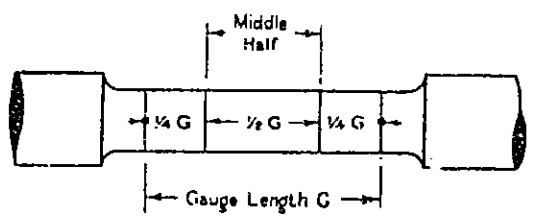

Fig. 1.—Diagram explaining the term "Middle Half" of the Gauge Length.

Cold Bend Test.

10. Test pieces shall be sheared crosswise from plates and lengthwise from sections and bars and shall be not less than 1½ inches (38·1 mm.) wide, but for small material the whole section may be used. In all bend tests the sheared edges of the test pieces may be removed by milling, planing, grinding or other methods. The edges of the test pieces shall be draw-filed to remove sharpness and roughness.

The test pieces shall not be annealed or otherwise heat treated unless the material from which they are cut is similarly annealed or heat treated, in which case the test pieces shall be similarly and simultaneously heat treated before testing.

The test pieces shall withstand without fracture the bend test described in the following table.

The bend tests may be made either by pressure or by blows.

Table of Bend Tests.

Material.	Maximum Internal Radius of Bend.	Description of Bend Test.
PLATES...	The thickness of test piece.	Doubled over until sides are parallel.
SECTIONS AND BARS (excluding Rivet Bars).	The thickness of test piece.	Doubled over until sides are parallel.
RIVET BARS	—	Doubled over and flattened on itself.

Number of Cold Bend Tests.

11. One cold bend test shall be taken from each Plate, Section or Bar as rolled.

In the case of a Plate over 30 feet (9·14 m.) in length, when two or more Plates are sheared to size from it, one further bend test shall be taken from a position as near as possible to the middle of the length of the original Plate.

Tests for Manufactured Rivets.

12. The representative of the Engineer (or of the Purchaser) may select from the bulk up to 2 per cent of the rivets, which shall withstand the following tests :—

(*a*) The Rivet shanks shall be bent cold, and hammered until the two parts of the shank touch in the manner shown in Fig. 2, without fracture on the outside of the bend.

(*b*) The Rivet heads shall be flattened, while hot, in the manner shown in Fig. 3, without cracking at the edges. The head shall be flattened until its diameter is 2½ times the diameter of the shank.

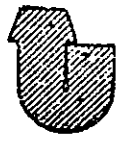

Fig. 2.

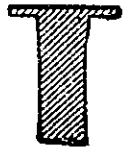

Fig. 3.

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Facilities for Inspection.

13. The Ingots shall be marked, and the Billets, Slabs, Plates, Sections and Bars shall be stamped by the Maker either with the original cast number, or, if consecutive cast numbers are not employed for all pourings, with the furnace letter and cast number. The representative of the Engineer (or of the Purchaser) shall be given every facility for tracing and checking all material to its original cast (should such a course be found necessary) and for witnessing the required tests.

Inspection.

14. The representative of the Engineer (or of the Purchaser) shall have free access to the works of the Manufacturer at all reasonable times; he shall be at liberty to inspect the manufacture at any stage, and to reject any material that does not conform to the terms of this Specification.

Testing Facilities.

15. The Manufacturer shall supply the material required for testing free of charge and shall, at his own cost, furnish and prepare the necessary test pieces, and supply labour and appliances for such testing as may be carried out on his premises in accordance with this Specification. Failing facilities at his own works for making the prescribed tests, the Manufacturer shall bear the cost of carrying out the tests elsewhere.

NOTE.—*The Association desires to call attention to the fact that this Specification is intended to include the technical provisions necessary for the supply of the material herein referred to, but does not purport to include all the necessary provisions of a Contract.*

BRITISH
STANDARD SPECIFICATION
FOR
STEEL PLATES, SECTIONS, BARS AND RIVETS
FOR
LOCOMOTIVES.

(WITH ANALYSIS.)

[THIS SPECIFICATION DOES NOT APPLY TO BOILERS.]

(REVISED 1929.)

The figures in British measures are to be regarded as the Standard. Approximate metric equivalents are given for the convenience of users in countries in which the metric system has been generally adopted.

Quality of Material.

1. The Plates, Sections and Bars shall be manufactured from Steel made from selected material by the Acid or Basic Open Hearth process, and shall not show on analysis more than 0·06 per cent of Sulphur or of Phosphorus.

The Manufacturer shall supply an analysis when required to do so.

Freedom from Defects.

2. The Plates, Sections and Bars shall be free from cracks, surface flaws, laminations, and all other defects, and finished in a workmanlike manner.

Rolling Margin.

3. No Plate, Section or Bar shall be more than $2\frac{1}{2}$ per cent over or $2\frac{1}{2}$ per cent under the calculated weight.

Branding.

4. Each Plate, Section or Bar shall be distinctly stamped with such Brands as the Engineer (or the Purchaser) may require, but not near the edge.

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