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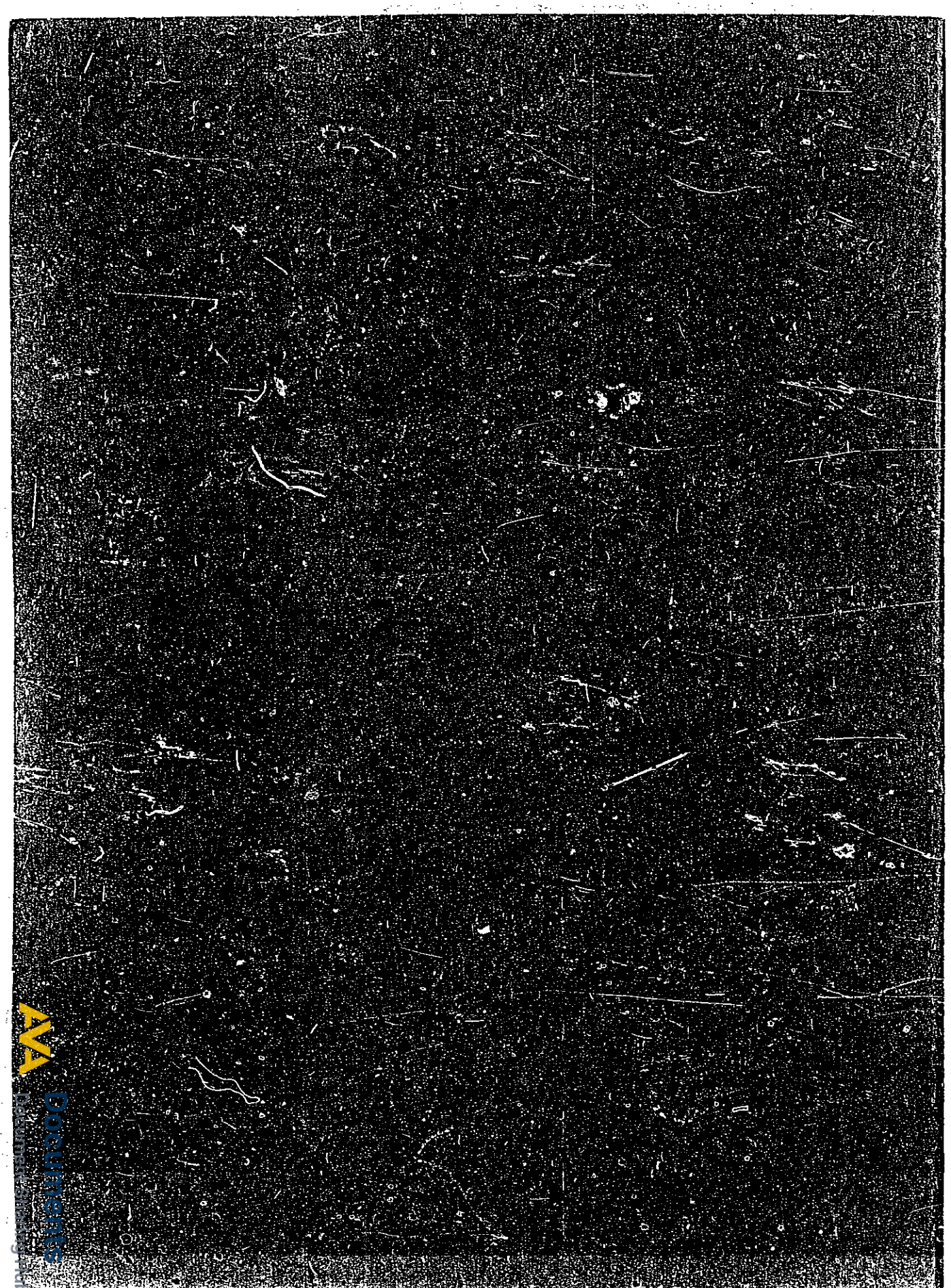

BRITISH STANDARD SPECIFICATION

STEEL GIRDER BRIDGES

Part 1. Materials, Workmanship Protection against Atmospheric Corrosion

Part 2. Weighing and Shipping Erection

B.S. 153 : Parts 1 & 2 : 1958

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BRITISH STANDARDS INSTITUTION
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THIS BRITISH STANDARD, having been approved by the Iron and Steel Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 29th December, 1958.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 4000, indexed and cross-indexed for reference, together with an abstract of each standard, will be found in the Institution's Yearbook, price 15s.

This standard makes reference to the following British Standards and Code of Practice :

B.S. 15. Structural steel for bridges, etc., and general building construction.
B.S. 29. Carbon steel forgings for ship and marine engine purposes.
B.S. 275. Dimensions of rivets (½ in. to 1¾ in. diameter).
B.S. 309. Whiteheart malleable iron castings.
B.S. 310. Blackheart malleable iron castings.
B.S. 325. Black cup and countersunk bolts, nuts and washers.
B.S. 350. Conversion factors and tables.
B.S. 548. High-tensile structural steel for bridges, etc., and general building construction.
B.S. 592. Carbon steel castings for ships and for marine engine and general engineering purposes. (Incorporated in B.S. 3100, 'Steel castings for general engineering').
B.S. 639. Covered electrodes for metal arc welding wrought iron and mild steel.
B.S. 729. Method of testing the zinc coating on galvanized articles other than wire (copper sulphate test and visual examination).
B.S. 916. Black bolts, screws and nuts.
B.S. 968. High tensile (fusion welding quality) structural steel for bridges, etc., and general building construction.

B.S. 1083. Precision hexagon bolts, screws, nuts and plain washers.
B.S. 1400. Copper alloy ingots and castings.
B.S. 1452. Grey iron castings.
B.S. 1719. Classification of covered electrodes for the metal-arc welding of mild steel and of medium-high-tensile steels of welding quality.
B.S. 1768. Unified precision hexagon bolts, screws, nuts (UNC and UNF threads) and plain washers—normal series.
B.S. 1856. General requirements for the metal-arc welding of mild steel.
B.S. 2466. Black taper washers.
B.S. 2523. Lead-based priming paints for iron and steel (Types A, B and C).
B.S. 2549. Covered electrodes for the metal-arc welding of medium-high tensile structural steel.
B.S. 2569. Sprayed metal coatings.
B.S. 2645. Tests for use in the approval of welders.
B.S. 2708. Unified black square and hexagon bolts, screws and nuts (UNC and UNF threads) and plain washers. Normal series.
B.S. 2762. Notch ductile steel for general structural purposes.
B.S. 2789. Iron castings with spherical or nodular graphite.
B.S. 3100. Steel castings for general engineering purposes.
B.S. CP. 231. Painting.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. references relate to the work on this standard:—
Committee reference ISE/55 Draft for comment CX(ISE)594.

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CO-OPERATING ORGANIZATIONS

The Iron and Steel Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations :

*Admiralty
Alloy Steels Association
British Bolt, Nut, Screw and Rivet Federation
British Cast Iron Research Association
*British Constructional Steelwork Association
British Electrical and Allied Manufacturers' Association
British Engineers' Association
*British Iron and Steel Federation
British Ironfounders Association
*British Railways, The British Transport Commission
British Steel Castings Research Association
British Steel Founders' Association
Council of Iron Foundry Associations
Council of Iron Producers
*Crown Agents for Oversea Governments and Administrations
Engineering Equipment Users Association
Federation of Civil Engineering Contractors
Institute of British Foundrymen
Institute of Iron and Steel Wire Manufacturers
Institute of Marine Engineers
*Institution of Civil Engineers
Institution of Mechanical Engineers (Automobile Division)
*Institution of Structural Engineers
Iron and Steel Board
Iron and Steel Institute
Joint Iron Council
Lloyd's Register of Shipping
Ministry of Labour and National Service (Factory Inspectorate)
*Ministry of Supply
National Association of Drop Forgers and Stampers
National Ironfounding Employers' Association
National Physical Laboratory (D.S.I.R.)
Oil Companies Materials Committee
Royal Institute of British Architects
Shipbuilding Employers' Federation
Society of British Aircraft Constructors
Society of Motor Manufacturers and Traders

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard :

British Welding Research Association
High Commission of India
Institute of Welding
Institution of Municipal Engineers
London County Council
Ministry of Transport and Civil Aviation
Ministry of Works
Office of the High Commissioner for the Union of South Africa

BRITISH STANDARD SPECIFICATION FOR

STEEL GIRDER BRIDGES

INTRODUCTION

B.S. 153 ' Girder bridges ', was first issued in the following parts in 1922 and 1923:

Part 1. Materials.
Part 2. Workmanship.
Part 3. Stresses.
Part 4. Details of construction.
Part 5. Erection.

After revision, Parts 1 and 2 were re-issued in 1933 and Parts 3, 4 and 5 in 1937.

In consequence of modifications in the loading requirements for railway and highway bridges and of advances in experimental research leading to developments in design procedure, a further revision became necessary; and agreement having been reached on loading requirements it was considered advantageous to precede the present general revision with the issue in 1954 of Part 3A, ' Loads '. This part replaced Clauses 1 to 12 of Part 3 : 1937 and Appendix No. 1 of Part 3 : 1925.

Revision of the remaining parts of B.S. 153 has been completed; and these have been re-grouped and are now published under the authority of the Iron and Steel Industry Standards Committee as two separate documents:

I	Part 1.	Materials.
		Workmanship.
		Protection against atmospheric corrosion.
	and Part 2.	Weighing and shipping.
		Erection.
II	Part 3B.	Stresses.
	and Part 4.	Design and construction.

Part 3A, ' Loads ', now obtainable separately, will eventually be included in the second document.

The previous standard has been considerably enlarged in the present revision, and design and fabrication procedure have been brought up to date with a view to ensuring consistent methods leading to maximum efficiency in the finished structure.

This standard does not deal with high strength friction grip bolts for bridge construction, although their use is not prohibited. References to bolts in the text of the specification apply to ordinary bolts.

Documents

SCOPE

This specification is primarily intended to apply to the superstructure of simply supported steel bridges of spans up to 300 ft. Where appropriate, the requirements of the specification may be adopted for larger spans or other types of steel bridges, but care should be taken, in these circumstances, to make whatever amendments are necessary for fixity at the supports, continuity and other indeterminate or special conditions, such as, for instance, may apply to opening bridges.

NOTE. Where metric equivalents are given, the figures in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in B.S. 350, ' Conversion factors and tables '.

SPECIFICATION

PART 1. MATERIALS, WORKMANSHIP, PROTECTION AGAINST ATMOSPHERIC CORROSION

Section One : Materials

STRUCTURAL AND RIVET STEELS

1. All structural and rivet steels shall comply with the following British Standards as appropriate :

B.S. 15. Structural steel for bridges, etc., and for general building construction.

B.S. 548. High tensile structural steel for bridges, etc., and general building construction.

B.S. 968. High tensile (fusion welding quality) structural steel for bridges, etc., and general building construction.

B.S. 2762. (Class B) Notch ductile steel for bridges and general building construction.

NOTE 1. Welded structures of steel to B.S. 15 are normally satisfactory, but under certain conditions they may become liable to failure due to the brittle fracture of parts subjected to tensile stress. These conditions cannot at present be defined accurately, but the possibility of this type of failure should be considered when there is a combination of low temperature with the following factors: thick plates and large unit sections, connections and details giving rise to severe stress concentrations, and the possibility of certain undetected defects in welding such as cracks, lack of fusion and lack of root penetration.

When the combination of circumstances referred to above cannot be disregarded, the use of Notch Ductile steels, series I to IV, to B.S. 2762 is recommended for parts in tension in excess of 1 in. thickness.

Although steels to B.S. 968 may be superior in notch ductility to those covered by B.S. 15, their suitability under those conditions which may give rise to brittle fracture must be given special consideration.

NOTE 2. Where high tensile steel is used for rivets, steps shall be taken to ensure that the rivets are so manufactured that they can be driven and the heads formed satisfactorily ; and that the physical properties of the steel are not impaired.

STEEL BOLTS, NUTS AND WASHERS

2. *a.* **Mild steel bolts and nuts.** All mild steel bolts and nuts shall have a tensile strength of not less than 28 ton/sq in. (44 kg/mm²) and a minimum elongation of 17 per cent as defined in Clause 2, B.S. 916 : 1953, ' Black bolts, screws and nuts,' or in B.S. 2708, ' Unified black square and hexagon bolts, screws and nuts and plain washers. Normal series '.

b. **High tensile steel bolts and nuts.**

(i) *Structural quality.* The material used for the manufacture of high tensile steel bolts and nuts to B.S. 548 or B.S. 968, for which permissible stresses are given in Clause 25, Table 3, B.S. 153, Part 3B, shall have a minimum tensile strength of 37 ton/sq. in. (58·3 kg/mm²) and other mechanical properties appropriate to B.S. 548, ' High tensile structural steel for bridges '.

(ii) *Special quality.* The material used for the manufacture of special quality high tensile steel bolts and nuts as covered by the Note in Clause 25 of B.S. 153, Part 3B, shall have the mechanical properties appropriate to the particular class of steel, as set out in Appendix A, Tables 9 and 10 of B.S. 1083, ' Precision hexagon bolts, screws, nuts (B.S.W. and B.S.F. threads) and plain washers ' ; or in B.S. 1768, ' Unified precision hexagon bolts, screws, nuts etc. Normal series ' or as specified by the Engineer.

c. **Washers.** Plain washers shall be made of steel. Taper or other specially shaped washers shall be of steel or malleable cast iron to B.S. 2466, ' Black taper washers '.

WELDING ELECTRODES

3. Welding electrodes for manual operation shall comply with B.S. 639, ' Covered electrodes for the metal-arc welding of mild steel '. Electrodes for automatic welding shall be to B.S. 1856, ' General requirements for the metal-arc welding of mild steel ', Clause 4.

High tensile steel electrodes shall comply with the requirements of B.S. 2549, ' Covered electrodes for the metal-arc welding of medium high tensile structural steel '.

STEEL FOR PINS (INCLUDING KNUCKLE PINS) AND ROLLERS

4. *a.* **Rolled steel pins and rollers,** including those made from slabs, shall comply with the requirements of B.S. 15, B.S. 548 or B.S. 968 as appropriate.

b. **Forged steel pins** shall comply with B.S. 29, ' Carbon steel forgings for ship and marine engine purposes ' and shall have a tensile strength of 28 to 32 ton/sq. in. (44 to 50·4 kg/mm²) or 36 to 40 ton/sq. in. (56·7 to 63 kg/mm²) as appropriate.

c. **Cast steel pins** shall comply with the requirements of Clause 6.

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