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BRITISH STANDARD 449 : 1959

(Incorporating British Standard Code of Practice CP 113)

[UDC 669.14 : 624 : 693.814]

+ 8 Amds

THE USE OF STRUCTURAL STEEL IN BUILDING

BRITISH STANDARDS INSTITUTION

BRITISH STANDARD SPECIFICATION

THE USE OF STRUCTURAL STEEL IN BUILDING

(incorporating British Standard Code of Practice CP 113, The structural use of steel in buildings)

B.S. 449 : 1959

Price 15/- net

BRITISH STANDARDS INSTITUTION

INCORPORATED BY ROYAL CHARTER

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THIS BRITISH STANDARD, having been approved by the Building Divisional Council and the Council for Codes of Practice, was published by the authority of the General Council on 27th May, 1959.

First published, April, 1932.
First revision, December, 1935.
Second revision, July, 1937.
Third revision, July, 1948.
Fourth revision (incorporating B.S. C.P. 113), May, 1959

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.

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

B.S. 4 Dimensions and properties of channels and beams for structural purposes.
B.S. 15 Structural steel for bridges, etc., and general building construction.
B.S. 153 Steel girder bridges.
B.S. 275 Dimensions of rivets (½ in. to 1¾ in. diameter).
B.S. 499 Glossary of terms (with symbols) relating to the welding and cutting of metals.
B.S. 548 High tensile structural steel for bridges, etc., and general building construction.
B.S. 592 Carbon steel castings for 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. 648 Schedule of unit weights of building materials.
B.S. 693 Oxy-acetylene welding as applied to steel structures.
B.S. 785 Rolled steel bars and hard drawn steel wire for concrete reinforcement.
B.S. 916 Black bolts, screws and nuts.
B.S. 938 General requirements for the metal arc welding of structural steel tubes.

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. 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. 1775 Steel tubes for mechanical, structural and general engineering purposes.
B.S. 1856 General requirements for the metal-arc welding of mild steel.
B.S. 1881 Methods of testing concrete.
B.S. 2466 Black taper washers.
B.S. 2549 Covered electrodes for the metal-arc welding of medium-high tensile structural steel.
B.S. 2642 General requirements for the metal-arc welding of medium tensile weldable structural steels to B.S. 968, Type a.
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. 3139 High strength friction grip bolts for structural engineering.
CP.3. Chapter IV. Precautions against fire.
CP.3. Chapter V. Loading.

In course of preparation.

British Standards are revised, when necessary, by the issue either of amendment slips or 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 B/20 Draft for comment CT(B) 9926

CONTENTS

CO-OPERATING ORGANIZATIONS

The Technical Committee of the Building Divisional Council responsible for the revision of this British Standard (now incorporating the British Standard Code of Practice CP 113: 1948—'The structural use of steel in buildings'), consists of representatives from the following departments and scientific and industrial organizations, and of additional members nominated to represent the Institution of Structural Engineers Committee, under whose supervision CP 113: 1948 was prepared (see Appendix F):—

Admiralty
Air Ministry
Association of Municipal Corporations
British Constructional Steelwork Association
British Iron and Steel Federation
British Railways, The British Transport Commission
British Welding Research Association
Building Committee in Scotland
Crown Agents for Oversea Governments and Administrations
Department of Scientific and Industrial Research
District Surveyors Association
Institute of Builders
Institute of Welding
Institution of Civil Engineers
Institution of Municipal Engineers
Institution of Structural Engineers
London County Council
Ministry of Housing and Local Government
Ministry of Works
National Federation of Building Trades Employers
Royal Institute of British Architects
War Office
Individual manufacturers and consultants

BRITISH STANDARD SPECIFICATION FOR

THE USE OF STRUCTURAL STEEL IN BUILDING

(incorporating British Standard Code of Practice CP 113, 'The structural use of steel in buildings')

FOREWORD

B.S. 449 was first issued in 1932 and was revised in December 1935, July 1937 and July 1948. Reconsideration of the standard has since led to numerous amendments which are embodied in the present revised standard, now published under the authority of the Building Divisional Council and the Council for Codes of Practice.

When a programme of Codes of Practice for Buildings was drawn up in 1942 under the aegis of the Ministry of Works, a Code of Practice for the structural use of steel in buildings was included in a series for all types of building construction: this was later (1948) issued as CP 113. Much of the information given in B.S. 449 and in CP 113 was the same and with the formation of the Codes of Practice Council within the B.S.I. it was decided that the two documents should be amalgamated and issued as a single publication under the main reference B.S. 449.

Apart from the alterations necessitated by amalgamation with CP 113, the main differences between the present revised standard and the 1948 issue can be summarized as follows:

(1) The clauses of Part 3 on dead and imposed loads have been omitted, and reference made to the Code of Practice CP 3 : Ch. V—Loading, which covers the loading requirements recommended for structures of all types. This Code of Practice has now been amended to include wind loads on unclad structures.

(2) In Part 4, 'Design and details of construction', the clauses for members subject to *bending*, *axial compression* and *axial tension* have been rearranged in separate groups, each containing the basic information necessary for design.

(3) The use of tubular members in building, covered by Addendum No. 1, PD 1953, is now dealt with within the text of the standard.

(4) The design clauses for welds and welding have been curtailed, and reference has been made instead to the appropriate British Standards. An important addition consists of a section, based on B.S. 2645, specifying the tests to be used for the approval of welders for general and special structural work.

Users of this British Standard should satisfy themselves that effective compliance is secured with local bye-laws and regulations and, for insurance purposes, with any requirements of insurance companies.

The attention of users is also called to the importance of making provision, where necessary, for water, gas, electricity and other services, having particular regard to Clause 21 *e* of this standard for cased beams and Clause 30 *c* (iv) for cased struts.

ECONOMY IN DESIGN

This British Standard stipulates limits of stress and gives rules for design, with the twofold purpose of ensuring normal safety and economy in the use of structural steel. While the stresses and other requirements are to be regarded as limiting values, the purpose in design should be to reach these limits in as many parts of the structure as possible and to adopt a layout such that maximum structural efficiency is attained for a minimum use of steel. Careful consideration should therefore be given to the semi-rigid basis and fully rigid basis of design.

METRIC CONVERSIONS

For the convenience of countries using the metric system, the following conversion factors are provided.

They are calculated from the basic factors:

1 inch (in.)	=	25·4 millimetre (mm) (exactly)
1 pound (lb)	=	0·453 592 37 kilogramme (kg)

and have been rounded to enable converted metric values of sufficient accuracy for general purposes to be obtained.

Conversion tables of greater accuracy are given in B.S. 350, 'Conversion factors and tables'.

1 inch (in.)	=	25·4 millimetre (mm) (exactly)
1 foot (ft)	=	0·3048 metre (m) (exactly)
1 pound (lb)	=	0·4536 kilogramme (kg)
1 ton = 2240 lb	=	1·016 metric tonne
	=	1016 kg
1 lb/sq.in.	=	0·070 kg/mm^2
1 ton/sq.in.	=	1·575 kg/mm^2

Moment of inertia (inch^4) × 41·62 = Moment of inertia (cm^4)

Modulus of section (inch^3) × 16·39 = Modulus of section (cm^3)

SPECIFICATION

SCOPE

1. This British Standard relates primarily to the use in building of hot rolled steel sections and plates, and normalized tubular shapes. ~~An extension to the standard, now in course of preparation, will relate to the use in building of cold rolled sections in light gauge sheet and strip steel.~~ See Amd No 2

The provisions of this standard are not deemed to apply to transmission towers and farm buildings; nor to structures which are designed on an experimental basis, except in so far as provided by Clause 9 *c* and Appendix A.

Part 1: Definitions

2. For the purposes of this British Standard the following definitions apply:

Beam or girder	Any structural member which supports load primarily by its internal resistance to bending.
Dead load	The weight of all permanent construction.
Effective lateral restraint	Restraint which will produce sufficient resistance in a plane perpendicular to the plane of bending to restrain a loaded beam from buckling to either side at the point of application of restraint.
Filler joists	Rolled steel I-beams or other suitable flanged sections used in combination with structural concrete and forming the skeleton of a floor or roof slab.
Foundation	That part of the building the function of which is to distribute loading direct to the ground. It may include any retaining or other wall, based upon the ground, of sufficient strength and stability to carry its own weight together with the loads and forces imposed upon it.
High strength friction grip bolts	High strength friction grip bolts are bolts of high tensile steel, used in conjunction with high strength nuts and hardened steel washers, which are tightened to a pre-determined shank tension in order that the clamping action thus afforded will transfer loads in the connected members by friction between the parts in contact and not by shear or bearing in the bolts. (See footnote to Clause 48.)

Imposed load	In respect of a building: all loads other than the dead load.
Load factor	The numerical value by which the load which would cause failure of the structure is divided to give the permissible working load on the structure.
Panel wall	A wall built between pillars, stanchions or other members and supported by the steel framework or foundations.
Partition	An internal vertical structure which is employed solely for the purpose of subdividing any storey of a building into sections, and which supports no load other than its own weight.
Strut	A steel pillar, stanchion, column or other compression member.
The 'Engineer'	The person responsible for the design and satisfactory completion of the structure, as covered by this specification.
Welding terms	Except as otherwise defined in this British Standard, the terms used in the welding clauses have the meanings given in B.S. 499, 'Glossary of terms (with symbols) relating to the welding and cutting of metals'.
Wheel loads	The static weights imposed by the wheels when the appliance of which the wheels form part is fully loaded.
Yield stress	The yield stress in tension.