

BRITISH STANDARD 4504 : Part 1 : 1969

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**SPECIFICATION FOR
FLANGES AND BOLTING FOR
PIPES, VALVES AND FITTINGS
METRIC SERIES**

Part 1. Ferrous

**DECLARED
OBSCOLESCENT
AUG 1989**

BRITISH STANDARDS INSTITUTION

BS 4504 : 1969

THIS BRITISH STANDARD, having been approved by the Mechanical Engineering Industry Standards Committee, was published under the authority of the Executive Board on 23 September, 1969.

SBN: 580 05742 9

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 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook. The BS Year-book may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- BS 21. Pipe threads.
- BS 309. Whiteheart malleable iron castings.
- BS 310. Blackheart malleable iron castings.
- BS 970. Wrought steels in the form of bars, billets, and forgings, up to 6 in ruling section, for automobile and general engineering purposes. En series.
- BS 1400. Schedule of copper alloy ingots and copper and copper alloy castings.
- BS 1452. Grey iron castings.
- BS 1501. Steels for fired and unfired pressure vessels. Plates.
- BS 1501-6. Steels for use in the chemical, petroleum and allied industries.
- BS 1821. Class I oxy-acetylene welding of steel pipelines and pipe assemblies for carrying fluids.
- BS 2633. Class I arc welding of ferritic steel pipework for carrying fluids.
- BS 2640. Class II oxy-acetylene welding of steel pipelines and pipe assemblies for carrying fluids.
- BS 2789. Iron castings with spheroidal or nodular graphite.
- ~~BS 2872. Copper and copper alloys. Forging stock and forgings.~~
- ~~BS 2874. Copper and copper alloys. Rods and sections (other than forging stock).~~
- BS 2971. Class II metal-arc welding of steel pipelines and pipe assemblies for carrying fluids.
- BS 3643. ISO metric screw threads. Part 2. Limits and tolerances for coarse pitch series threads.
- BS 3692. ISO metric precision hexagon bolts, screws and nuts.
- BS 4190. ISO metric black hexagon bolts, screws and nuts.
- BS 4320. Metal washers for general purposes.
- BS 4772. Ductile iron pipes and fittings.
- BS 4622. Grey cast iron pipes and fittings (metric dimensions).

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.

- BS 4439. Screwed studs for general purposes.
- BS 4882. Bolting for flanges and pressure containing purposes.

* In course of preparation.

The following BSI references relate to the work on this standard:
Committee reference MEE/11, MEE/11/1 Draft for comment 67/7402.

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CO-OPERATING ORGANIZATIONS

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

- | | |
|---|---|
| *Associated Offices' Technical Committee | *Institution of Civil Engineers |
| *Association of Consulting Engineers | *Institution of Gas Engineers |
| Association of Mining Electrical and Mechanical Engineers | *Institution of Heating and Ventilating Engineers |
| Board of Trade | *Institution of Mechanical Engineers |
| British Chemical Plant Manufacturers' Association | Institution of Mechanical Engineers (Automobile Division) |
| *British Compressed Air Society | Institution of Production Engineers |
| *British Electrical and Allied Manufacturers' Association | Locomotive and Allied Manufacturers' Association of Great Britain |
| British Gear Manufacturers' Association | London Transport Board |
| British Internal Combustion Engine Manufacturers' Association | Machine Tool Trades Association |
| *British Mechanical Engineering Federation | Ministry of Defence |
| British Pump Manufacturers' Association | Ministry of Defence, Army Department |
| *British Steel Industry | Ministry of Power |
| Crown Agents for Oversea Governments and Administrations | Ministry of Public Building and Works |
| Department of Employment and Productivity (H.M. Factory Inspectorate) | Ministry of Technology |
| *Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales | *Ministry of Technology—National Engineering Laboratory |
| *Engineering Equipment Users' Association | Ministry of Transport |
| Gas Council | National Coal Board |
| Institute of Marine Engineers | National Physical Laboratory (Ministry of Technology) |
| | Royal Institute of British Architects |

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:

- | | |
|---|--|
| Black Bolt & Nut Association of Great Britain | Ministry of Defence, Navy Department |
| British Malleable Tube Fittings Association | National Association of Drop Forgers and Stampers |
| British Valve Manufacturers' Association | North East Coast Institution of Engineers and Shipbuilders |
| British Waterworks Association | Tank and Industrial Plant Association |
| Copper Development Association | The Welding Institute |
| Institute of British Foundrymen | Water-Tube Boilermakers' Association |
| Institution of Water Engineers | Manufacturers of Pipes and Flanges |
| Lloyd's Register of Shipping | |
| Metropolitan Water Board | |

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BRITISH STANDARD SPECIFICATION FOR FLANGES AND BOLTING FOR PIPES, VALVES AND FITTINGS. METRIC SERIES

FOREWORD

IT SHOULD BE NOTED THAT, AT THE TIME OF ISSUING THIS AMENDMENT, PROPOSALS ARE UNDER CONSIDERATION WITHIN CEN/WG 74, FLANGES, EFFECTIVELY RECOMMENDING THAT THE USE OF DIN-BASED FLANGES IN BS 4504 BE LIMITED TO A MAXIMUM PRESSURE OF 40 BAR. IF THESE PROPOSALS ARE AGREED AND RESULT IN THE PUBLICATION OF A EUROPEAN STANDARD, BS 4504 WILL BE AMENDED ACCORDINGLY.

This British Standard has been prepared under the direction of the Mechanical Engineering Industry Standards Committee and is one of those intended for use by industry as it adopts the metric system.

Before 1939 the I.S.A. (International Federation of the National Standardization Associations) prepared bulletins for European Standardization and in 1940, Bulletin 5a, 'Pipes and connections', was circulated, and this has been reflected in the national standards of European countries since that time.

On the formation of the ISO (International Organization for Standardization) Technical Committee 5, 'Pipes and fittings', set up sub-committees to deal with pipes and flanges and recommendations have been published for pipes as follows:

- ISO/R 7. Pipe threads for gas list tubes and screwed fittings where pressure-tight joints are made on the threads ($\frac{1}{8}$ in to 6 in). (BS 21 is in accord.)
- ISO/R 13. Cast iron pipes, special castings and cast iron parts for pressure main lines.
- ISO/R 64. Steel tubes. Outside diameters. (The appendices to BS 3601-4 are in accord.)
- ISO/R 65. Steel tubes suitable for screwing in accordance with ISO Recommendation R 7. (BS 1387 is in accord.)
- ISO/R 134. Non-screwed steel tubes for general purposes (2nd edition).
- ISO/R 221. Steel tubes. Thicknesses. (The appendices to BS 3601-4 are in accord.)
- ISO/R 228. Pipe threads where pressure-tight joints are not made on the threads ($\frac{1}{8}$ in to 6 in).
- ISO/R 336. Plain end steel tubes, welded or seamless. General table of dimensions and masses per unit length.

The ISO TC5 sub-committee concerned with the standardization of flange dimensions was unable to come to any agreement as the ISA, ASA and BS 10 flange dimensions were not compatible.

Since the publication of the ISO recommendations mentioned above European national standards organizations have been revising their flange standards to bring the flange to pipe connecting dimensions into accord with Recommendations R/64 and R/336. The German Standards Association (DNA) has made much progress in this field.

The BSI committee reviewed the ISA flange tables and particularly the German DIN standards and has modelled this British Standard on them. Acknowledgement is here made for the co-operation extended by the DNA. The mating dimensions in this standard are therefore in accord with European practice. However, the pressure/temperature ratings given in Table A1 have been adjusted to take advantage of the long term testing and long experience of the BS 10* ratings for carbon steel flanges.

It is the practice in Europe to use steel welding neck flanges for all pressure/temperature ranges. Plate flanges are more commonly used in the UK and are therefore included in this standard.

This British Standard incorporates current European practice. It should be noted that there are some European standards for cast iron pipes based on ISO/R 13, 'Cast iron pipes, special castings and cast iron parts for pressure lines', the flange dimensions of which differ marginally from those given in Tables 10/11 and 16/11 but these differences do not affect mating dimensions. It is intended to develop ductile cast iron flanges to the ISA bulletin mating dimensions and to add them to this standard in due course.

*NOTE 1. Pressures in this standard are given in bar (gauge) 1 bar = 10 N/m².

NOTE 2. All dimensions throughout this standard are in millimetres unless otherwise stated.

* BS 10, 'Flanges and bolting for pipes, valves and fittings'.



As altered
January 1972



As altered
March, 1971

SPECIFICATION



As added
January 1972
and
February 1972

Details for ductile iron pipes and ductile iron pipe fittings are specified in BS 4772.
Immediately after this new sentence insert the following new paragraph:
Details of flanges for grey iron pipes and grey iron pipe fittings are specified in BS 4622.

1.1 SCOPE

This British Standard specifies requirements for circular flanges of the following types and materials with the appropriate bolting:

Integral: steel, cast iron, malleable cast iron

Welding neck: steel.

Plate: steel.

Screwed boss: steel and malleable cast iron:

Slip-on boss: steel.

Loose for welded on lapped pipe ends: steel.

Blank: steel.

6-A

The types and materials of gaskets used shall be agreed between the purchaser and the manufacturer.

For the purpose of interchangeability in the mating of flanges, the dimensions which relate to the outside diameter of the flange, pitch circle diameter of drilled holes, and the number and size of bolts, shall apply regardless of the materials from which the flanges are manufactured. It should be noted, however, that full face gaskets are necessary for copper alloy integral flanges up to 100 mm nominal diameter.

NOTE 1. The term 'plate flange' indicates the shape of the flange. Such flanges are not necessarily made from steel plate but may be made from forged or cast steel.

NOTE 2. The term 'integral flange' applies to flanges integral with pipes, valves and fittings.

1.2 DEFINITION



Nominal size (DN). A numerical designation of size which is common to all components in a piping system other than those using valves, fittings, couplings or tubes which are designated by the outside diameter. It is a convenient round number for reference purposes and it is normally only loosely related to manufacturing dimensions.

2. DESIGN TEMPERATURE AND PRESSURE

The temperature and pressure ratings given in Table A1 and A2 are design pressures and temperatures for the materials listed. Where there is an appropriate application standard it is the responsibility of the purchaser to ensure that the design pressure and temperature stated comply with the requirements of that standard.

The pressure ratings for materials other than grey cast iron are applicable to installations subject to moderate shock such as may occur in well designed and efficiently operated boiler feed mains. Where a system may be subject to severe shock it is the responsibility of the purchaser to make a suitable allowance when stating the design pressure.

The pressure rating for grey cast iron flanges, where such are used in pipelines containing water, are for non-shock conditions. Where moderate shock (such as may occur in an efficiently designed and operated boiler feed main) is likely to be present, the pressure and temperature rating should be reduced by 25%.

3. DESIGNATION

The flanges shall be designated by the nominal size and flange table reference.

The first part of the table reference is the nominal pressure (PN).

The second part of the table reference indicates the material and type of flange as follows:

1. Steel-integral.
2. Steel-welding neck.
3. Steel-plate for welding.
4. Steel-screwed boss.
5. Steel-slip-on boss.
6. Steel-loose for welded-on lapped pipe ends.
8. Steel-blank plate.

11. ~~Grey~~ cast iron-integral.
12. Malleable cast iron-integral.
13. Malleable cast iron-screwed boss.

4. FLANGES

4.1 Materials. Materials shall be those given in Tables A1 and A2 except that alternative materials may be used provided that their mechanical properties are not inferior at the operating temperature. Where there is an appropriate application standard it is the responsibility of the purchaser to ensure that the materials comply with the requirements of that standard. In this respect attention is drawn to BS 806 and BS 759.

Certified materials are specified for carbon steel flanges for use at temperatures in excess of 400°C and recommended for alloy steel flanges for use at temperatures in excess of 475°C. Representative elevated temperature tests at the temperature or temperatures specified by the purchaser shall not be required for material specified to the order provided the manufacturer has obtained certification approval for the supply of material covered by the relevant material specification, following the procedure described in BS 3920, which lays down conditions under which he shall demonstrate that the steel in question consistently has the properties specified in the relevant material specification.

4.2 Machining of flanges.

4.2.1 All flanges shall be free from laminations and surface defects.

4.2.2 Flanges shall be finished as follows.

(1) All flanges shall have their jointing surfaces machine finished. The finish of jointing surfaces up to and including PN 40 shall not be coarser than given in the following table appropriate to the method of machining. For flanges above PN 40 it is recommended that the surface finish should comply with the requirements of BS 1560.

Method of machining	R_a	R_z	R_z	BS 1134 Grade ref.
Turning	μm 12.5	μin 500	μm 50 to 87.5	N.10
Other than turning	3.2	125	12.5 to 21.85	N.8

NOTE. The term 'turning' includes any method of machining producing concentric or spiral grooves.

(2) Flange outside diameters may be unmachined unless a machine finish is specified by the purchaser.

(3) Unless otherwise specified by the purchaser, all bolt holes shall be drilled, shall be equally spaced on the pitch circle diameter and, in the case of integral flanges, shall be drilled off-centre.

(4) Bearing surfaces for nuts shall be parallel to the flange jointing face within 1° .

4.3 Tolerances on flange diameter, thickness and length of welding necks. Flanges shall be subject to the following tolerances.

4.3.1 Outside diameter (D)

	Machined	Not machined
Up to 200 inclusive	± 1	± 2
Over 200 to 300 inclusive	± 1.5	± 2
Over 300 to 400 inclusive	± 2	± 3
Over 400	± 2	± 5

4.3.2 Thickness (b)

4.3.2.1 Flanges integral with valves and fittings (other than forged steel)

Thickness	Machined at back	Not machined at back
Up to 10	+1.5 -0	+2.5 -0
Over 10 up to 20 inclusive	+2.0 -0	+3.5 -0
Over 20 up to 30 inclusive	+2.5 -0	+4.5 -0
Over 30 up to 50 inclusive	+3.0 -0	+6.5 -0
Over 50 up to 70 inclusive	+4.0 -0	+8.5 -0
Over 70 up to 100 inclusive	+5.0 -0	+10.5 -0
Over 100	+7.0 -0	+14.5 -0

As altered
January 1972

4.3.2.2 Flanges not integral with valves and fittings and forged steel integral with valves and fittings.

Thickness	Machined at back	Not machined at back
Up to 35 inclusive	+1.5 -0	+3 -0
Over 35	+3 -0	+5 -0

As added
February 1972

* Ductile iron pipe fittings and accessories for pressure pipelines. (In course of preparation.)

For tolerances on grey cast iron pipes with flanges see BS 4622

* Grey cast iron pipes and fittings (metric dimensions).

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4.3.3 Length of welding neck flange (h_1)

	Machined
Up to 80 nominal size inclusive	± 1.5
Over 80 to 250 nominal size inclusive	± 2
Over 250 nominal size	± 3

4.4 Joint faces

4.4.1 The standard form of joint face for flanges covered by this specification shall be as follows:

- (1) cast iron integral flanges shall have raised joint faces as shown in the tables unless specified otherwise by the purchaser.
- (2) Malleable cast iron screwed flanges shall have flat joint faces.
- (3) Steel flanges shall have raised joint faces except that blank flanges may be flat faced or have a spigot at the option of the manufacturer.

4.4.2 Where it is impractical for the manufacturer to provide a raised joint face on cast iron or steel flanges the flange may be flat faced, its thickness being in accordance with the values specified for dimension 'b' elsewhere in this standard.

4.4.3 It is the responsibility of the user to select gasket material which is suitable for the fluid at the intended working temperature and pressure conditions.

5. BOLTING

Materials and threads. The design temperature and pressure ratings given in Tables A1 and A2 are for the bolting materials listed. Alternative materials may be used provided their mechanical properties are not inferior at the operating temperature.

5.1.2 The dimensions and finish of studs and hexagon headed bolts with hexagon nuts shall comply with the requirements of BS 3692, BS 4190 or BS 4439 as appropriate.

5.1.3 The dimensions and finish of stud bolts with hexagon nuts shall comply with the requirements of BS 4882:1973, Sections 1 and 2.

5.1.4 Stud bolts may be of the forms shown in BS 4882 except that form 'b' applies only to stud bolts of other than alloy steel.

5.1.5 Free cutting steels for studs, bolts, stud bolts and nuts shall only be permitted when specified by the purchaser, and their use shall be restricted to the temperature range -10°C to 100°C for nominal pressures up to and including 16 bar.

5.1.6 Where washers are used they shall be of an appropriate material and their dimensions shall comply with the requirements of Table 3 of BS 4320:1968.

Standard black normal series washers complying with the requirements of BS 4320 may be used for the temperature range -30°C to 260°C .

6. ATTACHMENT OF FLANGES

6.1 The method of securing flanges (other than integral flanges) to pipes and fittings shall be in accordance with the appropriate application standard. Where there is no application standard the method of attachment shall be the subject of agreement between the purchaser and the manufacturer.

6.2 Flanges shall be prepared for attachment to pipes as follows.

6.2.1 Screwed flanges. Screwed flanges shall be screwed in accordance with the appropriate table (see Clause 8, item (5)).

6.2.2 Steel plate and steel slip-on boss flanges. Steel plate and steel slip-on boss flanges shall be machined in the bore to a diameter to be specified by the purchaser and suitable for welding to form one of the types in the appropriate application standard as required by the purchaser. The purchaser shall specify the weld preparation required.

6.2.3 Welding neck flanges. Welding neck flanges shall be machined in the bore to a diameter to be specified by the purchaser, and suitably prepared for welding to pipes and fittings. The thickness of the portion of the flange which connects it to the pipe shall be not less than the pipe thickness nor more than 3 mm thicker.

6.2.4 Loose flanges. Loose flanges shall be machined in accordance with the appropriate table.

- * BS 3692, 'ISO metric precision hexagon bolts, screws and nuts'
- † BS 4190, 'ISO metric black hexagon bolts, screws and nuts'
- ‡ BS 3643, 'ISO metric series threads', Part 2, 'Limits and tolerances for coarse pitch series threads'
- § BS 4320, 'Metal washers for general engineering purposes'

7. HYDRAULIC TESTING OF FLANGES

This standard does not specify the hydraulic test pressures for flanged pipes or components, details of which should be obtained from the appropriate standards which specify test pressures for pipes or components, but the test pressure applied to the joint shall not exceed 1.5 times the nominal pressure for the flanges.

**8. DETAILS TO BE SUPPLIED BY THE PURCHASER WHEN ORDERING FLANGES AND/OR BOLTING**

The following information shall be supplied by the purchaser when placing an order or making an enquiry:

(1) Nominal size, nominal pressure, type of flange (see flange tables) and material (see Tables A1 and A2).

Figs. 1, 2 & 3 deleted 

(2) Whether test certificates of the material are required.

(3) Details of bolting (if required) (see Clause 5).

(4) Details of the machining for the attachment of flanges (see Clause 6).

(5) Whether taper or parallel screwing is required (see 6.2).

(6) Whether flanges are to be machined (see 4.2&4.3)

**9. MARKING**

Flanges made of alloy steel shall be clearly marked so that the material from which the flange is made can be identified, except that integral flanges need not be marked where the component itself is marked.

TABLE A1. PRESSURE/TEMPERATURE RATINGS FOR STEEL FLANGES

As altered February 1972

Nominal pressure		Materials					Design pressure at temperature °C†																							
		Flanges			Bolting																									
		Plates	Forgings	Castings	Bolts or stud bolts	Nuts	-100 to -51	-50 to -31	-30 to -11	-10 to 120	200	250	300	350	400	425	450	475	500	510	520	530	540	550						
2.5	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	2.5	2.5	2.5	2.5															1						
	BS1501-224Gr26A	BS1503-224Gr26A	BS1504-161A*	BS1506-621A LT50	BS1506-240	2.5	2.5	2.5	2.5															2						
	LT50	LT50																						3						
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111		2.5	2.5	2.5															4						
	BS970-070M20†	BS1503-161Gr26A	BS1504-161A	4-6	4				2.5	2	1.8													5						
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	6	6	6	6															6						
6	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT50	BS1506-240	6	6	6	6															7						
	BS1501-224Gr26A	BS1503-224Gr26A	BS1504-161A*	BS1506-621A LT50	BS1506-240																			8						
	LT50	LT50																						9						
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111		6	6	6															10						
	BS970-070M20†	BS1503-161Gr26A	BS1504-161A	4-6	4				6	5	4.5													11						
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	4-6	4				6	6	5.5	5												12						
10	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	10	10	10	10															13						
	BS1501-224Gr26A	BS1503-224Gr26A	BS1504-161A*	BS1506-621A LT50	BS1506-240		10	10	10															14						
	LT50	LT50																						15						
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111		10	10	10															16						
	BS970-070M20†	BS1503-161Gr26A	BS1504-161A	4-6	4				10	8	7													17						
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	4-6‡	4‡				10	10	9	8	6	4										18						
16	BS1501-151Gr26A	BS1503-161Gr26A	BS1504-161B	6-6‡	6‡				10	10	9	8	7	6										19						
	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	16	16	16	16															20						
	BS1501-224Gr26A	BS1503-224Gr26A	BS1504-161A*	BS1506-621A LT50	BS1506-240		16	16	16															21						
	LT50	LT50																						22						
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111		16	16	16															23						
	BS970-070M20†	BS1503-161Gr26A	BS1504-161A	4-6	4				16	14	13													24						
A	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	4-6‡	4‡				16	16	14	12	9	6																
	BS1501-151Gr26A	BS1503-161Gr26A	BS1504-161B	6-6‡	6‡				16	16	15	13	11	9																

† For temperatures in excess of 475°C it is recommended that certified alloy steel materials be specified. See Clause 4.1.

NOTE 1. See page 2 for the titles of British Standards referred to in this table.

NOTE 2. For an explanation of 4, 4.6, 6, 6.6, 8 and 8.8 see BS 4190 or BS 3692.

NOTE 3. Material of stud bolts and nuts to be chromium molybdenum or chromium molybdenum vanadium steel with creep relaxation and impact properties adequate for the design temperature and shall be agreed between the purchaser and the manufacturer.

* These specifications for castings do not as yet cover for impact tests. In the meantime the impact testing of the castings shall be the subject of special agreement between the purchaser and the manufacturer. Alternatively castings with specified impact properties may be selected from BS 1631 or BS 4242.

† This is currently known as BS 970 EN 3.

‡ For design temperatures over 300°C not more than 0.050 per cent sulphur or phosphorus.

§ Not currently included in BS 1503:1969. Reference should be made to BS 1501-6:1958.

TABLE A1. PRESSURE/TEMPERATURE RATINGS FOR STEEL FLANGES—Continued

As altered February 1972

Nominal pressure	Materials				Design pressure at temperature °C																					
	Plates	Flanges Forgings	Castings	Bolting		Nuts																				
				Bolts or stud bolts			-100 to -51	-50 to -31	-30 to -11	-10 to 120	200	250	300	350	400	425	450	475	500	510	520	530	540	550		
25	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100		25	25	25	25															25	
	BS1501-224Gr26A	BS1503-224Gr28A	BS1504-161A*	BS1506-621A LT50	BS1506-240			25	25	25															26	
	LT50	LT50																								
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111			25	25	25															27	
	BS970-070M20†			4-6	4					25	20	18													28	
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	4-6‡	4‡					25	25	22	18	14	10										29	
	BS1501-151Gr26A	BS1503-161Gr28A	BS1504-161B	6-6‡	6‡					25	25	24	21	17	14										30	
	BS1501-151Gr26B	BS1503-161Gr28B	BS1504-161B	BS1506-621B(T)	BS1506-162					25	24	21	17	14	12	9	6								31	
		BS1503-240GrB§	BS1504-240	BS1506-621B(T)	BS1506-162						25	22	20	19	18	17	14								32	
		BS1503-240GrB§	BS1504-240	BS1506-661	BS1506-240(Q)						25	22	20	19	18	17	14	10	9						33	
40	BS1501-620Gr27	BS1503-620	BS1504-621	BS1506-661	BS1506-240(Q)						25	24	23	22	21	20	18	15							34	
	BS1501-620Gr27	BS1503-620	BS1504-621	See Note 3	See Note 3						25	24	23	22	21	20	18	15	12	9					35	
	BS1501-503 LT100	BS1503-503	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100		40	40	40	40															37	
	BS1501-224Gr26A	BS1503-224Gr28A	BS1504-161A*	BS1506-621A LT50	BS1506-240		40	40	40	40															38	
	LT50	LT50																								
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111			40	40	40															39	
	BS970-070M20†			4-6	4					40	32	28													40	
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	4-6‡	4‡					40	40	34	28	22	15										41	
	BS1501-151Gr26A	BS1503-161Gr28A	BS1504-161B	6-6‡	6‡					40	40	38	35	28	23										42	
	BS1501-151Gr26B	BS1503-161Gr28B	BS1504-161B	BS1506-621B(T)	BS1506-162					40	40	38	33	28	23	20	15	10							43	
A		BS1503-240GrB§	BS1504-240	BS1506-621B(T)	BS1506-162						40	35	31	30	29	28	22								44	
	BS1501-620Gr27	BS1503-240GrB§	BS1504-240	BS1506-661	BS1506-240(Q)						40	35	31	30	29	28	22	17	15						45	
	BS1501-620Gr27	BS1503-620	BS1504-621	BS1506-661	BS1506-240(Q)							40	38	36	35	34	33	29	24					46		
		BS1503-620	BS1504-621	See Note 3	See Note 3								40	38	36	35	34	33	29	24	19	15			47	
																									48	

* These specifications for castings do not as yet cover for impact tests. In the meantime the impact testing of the castings shall be the subject of special agreement between the purchaser and the manufacturer. Alternatively castings with specified impact properties may be selected from BS 1631 or BS 4242.

† This is currently known as BS 970 EN 3.

‡ For design temperatures over 300°C not more than 0.050 per cent sulphur or phosphorus.

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|| For temperatures in excess of 475°C it is recommended that certified alloy steel materials be specified. See Clause 4.1.

NOTE 1. See page 2 for the titles of British Standards referred to in this table.

NOTE 2. For an explanation of 4, 6, 6.6, 8 and 8.8 see BS 4190 or BS 3692.

NOTE 3. Material of stud bolts and nuts to be chromium molybdenum or chromium molybdenum vanadium steel with creep relaxation and impact properties adequate for the design temperature and shall be agreed between the purchaser and the manufacturer.

TABLE A1. PRESSURE/TEMPERATURE RATINGS FOR STEEL FLANGES—Continued

Materials										Design pressure at temperature °C†																					
Nominal pressure	Flanges			Bolting		Nuts	Design pressure at temperature °C†																								
	Plates	Forgings	Castings	Bolts or stud bolts	-100 to -51		-50 to -31	-30 to -11	-10 to 0	0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100	100 to 110	110 to 120	120 to 130	130 to 140	140 to 150	150 to 160	160 to 170	170 to 180	180 to 190	190 to 200		
64	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	
	BS1501-224Gr26A	BS1503-224Gr28A	BS1504-161A*	BS1506-621A LT50	BS1506-240	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	
	LT50	LT50																													
	BS1501-151Gr23A	BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111																										
	BS1501-151Gr26A	BS1503-161Gr28A	BS1504-161B	6-6†	6†																										
	BS1501-151Gr26B	BS1503-161Gr28B	BS1504-161B	BS1506-621B(T)	BS1506-162																										
		BS1503-240GrB§	BS1504-240	BS1506-621B(T)	BS1506-162																										
		BS1503-240GrB§	BS1504-240	BS1506-661	BS1506-240(Q)																										
	BS1501-620Gr27	BS1503-620	BS1504-621	BS1506-661	BS1506-240(Q)																										
	BS1501-620Gr27	BS1503-620	BS1504-621	See Note 3	See Note 3																										
	100	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
BS1501-224Gr26A		BS1503-224Gr28A	BS1504-161A*	BS1506-621A LT50	BS1506-240	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
LT50		LT50																													
BS1501-151Gr23A		BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111																										
BS1501-151Gr26A		BS1503-161Gr28A	BS1504-161B	6-6†	6†																										
BS1501-151Gr26B		BS1503-161Gr28B	BS1504-161B	BS1506-621B(T)	BS1506-162																										
		BS1503-240GrB§	BS1504-240	BS1506-621B(T)	BS1506-162																										
		BS1503-240GrB§	BS1504-240	BS1506-661	BS1506-240(Q)																										
BS1501-620Gr27		BS1503-620	BS1504-621	BS1506-661	BS1506-240(Q)																										
BS1501-620Gr27		BS1503-620	BS1504-621	See Note 3	See Note 3																										

† For temperatures in excess of 475°C it is recommended that certified alloy steel materials be specified. See Clause 4.1.

NOTE 1. See page 2 for the titles of British Standards referred to in this table.

NOTE 2. For an explanation of 4, 6, 6, 6, 8 and 8.8 see BS 4190 or BS 3692.

NOTE 3. Material of stud bolts and nuts to be chromium molybdenum or chromium molybdenum vanadium steel with creep relaxation and impact properties adequate for the design temperature and shall be agreed between the purchaser and the manufacturer.

* These specifications for castings do not as yet cover for impact tests. In the meantime the impact testing of the castings shall be the subject of special agreement between the purchaser and the manufacturer. Alternatively castings with specified impact properties may be selected from BS 1631 or BS 4242.

† This is currently known as BS 970 EN 3.

‡ For design temperatures over 300°C not more than 0.050 per cent sulphur or phosphorus.

§ Not currently included in BS 1503:1969. Reference should be made to BS 1501-6:1958.

TABLE A1. PRESSURE/TEMPERATURE RATINGS FOR STEEL FLANGES—Continued

As altered February 1972

Nominal pressure	Materials				Design pressure at temperature °C ¹																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	Flanges		Bolting		Nuts																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	Plates	Forgings	Castings	Bolts or stud bolts																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
160	BS1501-503 LT100	BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	

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‡ For design temperatures over 300°C not more than 0.050 per cent sulphur or phosphorus.

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NOTE 1. See page 2 for the titles of British Standards referred to in this table.

NOTE 2. For an explanation of 4, 4.6, 6, 6.6, 8 and 8.8 see BS 4190 or BS 3692.

NOTE 3. Material of stud bolts and nuts to be chromium molybdenum or chromium molybdenum vanadium steel with creep relaxation and impact properties adequate for the design temperature and shall be agreed between the purchaser and the manufacturer.

TABLE A1. PRESSURE/TEMPERATURE RATINGS FOR STEEL FLANGES—Continued

As altered February 1972

		Materials					Design pressure at temperature °C ¹																	
Nominal pressure	Flanges			Bolting		Nuts	-100 to -51	-50 to -31	-30 to -11	-10 to 120	200	250	300	350	400	425	450	475	500	510	520	530	540	550
	Plates	Forgings	Castings	Bolts or stud bolts																				
320		BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	320	320	320	320															97
		BS1503-224Gr28A	BS1504-161A*	BS1506-621A LT50	BS1506-240		320	320	320															98
		LT50																						99
		BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111		320	320	320															100
		BS1503-161Gr28A	BS1504-161B	8-8	8				320	320	305	264	222	180										101
		BS1503-161Gr28B	BS1504-161B	BS1506-621B(T)	BS1506-162				320	305	264	222	180	160	120	80								102
		BS1503-240GrB§	BS1504-240	BS1506-621B(T)	BS1506-162				320	278	250	236	230	222	176									103
		BS1503-240GrB§	BS1504-240	BS1506-661	BS1506-240(Q)				320	278	250	236	230	222	176	131	113							104
		BS1503-620	BS1504-621	BS1506-661	BS1506-240(Q)					320	304	292	285	278	264	237	200							105
		BS1503-620	BS1504-621	See Note 3	See Note 3					320	304	292	285	278	264	237	200	158	124	93	69			106
400		BS1503-622	BS1504-622	See Note 3	See Note 3																			107
																								108
																								109
		BS1503-503 LT100	BS1504-503*	BS1506-621A LT100	BS1506-240 LT100	400	400	400	400															110
		BS1503-224Gr28A	BS1504-161A*	BS1506-621A LT50	BS1506-240		400	400	400															111
		LT50																						112
		BS1503-161Gr26A	BS1504-161A	BS1506-111	BS1506-111		400	400	400															113
		BS1503-161Gr28A	BS1504-161B	8-8	8				400	382	330	278	226	200	150	100								114
		BS1503-161Gr28B	BS1504-161B	BS1506-621B(T)	BS1506-162				400	382	330	278	226	200	150	100								115
		BS1503-240GrB§	BS1504-240	BS1506-621B(T)	BS1506-162				400	348	312	296	286	278	222									116
A		BS1503-240GrB§	BS1504-240	BS1506-661	BS1506-240(Q)				400	348	312	296	286	276	222	166	143							117
		BS1503-620	BS1504-621	BS1506-661	BS1506-240(Q)				400	380	364	356	348	330	295	250								118
		BS1503-620	BS1504-621	See Note 3	See Note 3				400	380	364	356	348	330	295	250	198	155	116	87				119
		BS1503-622	BS1504-622	See Note 3	See Note 3				400	380	364	356	348	330	295	250	198	174	151	130				120

¹ For temperatures in excess of 475°C it is recommended that certified alloy steel materials be specified. See Clause 4.1.

NOTE 1. See page 2 for the titles of British Standards referred to in this table.

NOTE 2. For an explanation of 4, 4.6, 6, 6.6, 8 and 8.8 see BS 4190 or BS 3692.

NOTE 3. Material of stud bolts and nuts to be chromium molybdenum or chromium molybdenum vanadium steel with creep relaxation and impact properties adequate for the design temperature and shall be agreed between the purchaser and the manufacturer.

* These specifications for castings do not as yet cover for impact tests. In the meantime the impact testing of the castings shall be the subject of special agreement between the purchaser and the manufacturer. Alternatively castings with specified impact properties may be selected from BS 1631 or BS 4242.

† This is currently known as BS 970 EN 3.

‡ For design temperatures over 300°C not more than 0.050 per cent sulphur or phosphorus.

§ Not currently included in BS 1503:1969. Reference should be made to BS 1501-6:1958.

TABLE A2. PRESSURE/TEMPERATURE RATINGS FOR GREY AND MALLEABLE CAST IRON

FLANGES*

As altered February 1972

Typical materials for										Design pressure (bar gauge) at temperature °C									
Nominal pressure (bar gauge)	Flanges			Copper alloy	Bolting		Nuts	-200 to -101	-100 to -51	-50 to -31	-30 to -11	-10 to 120	150	180	200	220	250	260	300
	Cast iron	Malleable cast iron	Bolts and stud bolts																
2.5	BS 1452 Grade 12				4.6		4					2.5							
	BS 1452 Grade 14				4.6		4					2.5	2.3	2	2	2	1.8	1.7	1.5
	BS 1452 Grade 12				4.6		4					6							
	BS 1452 Grade 14				4.6		4					6	5.6	5.2	5	5	4.5	4.3	3.6
6		BS 309 Grade W 22/4			6.6		6					6	5.8	5.6	5.5	5.5	5	5	5
		BS 310 Grade B 20/10			6.6		6					6	5.8	5.6	5.5	5.5	5	5	5
	BS 1452 Grade 12				4.6		4					10							
	BS 1452 Grade 14				4.6		4					10	9.2	8.5	8	8	7	6.8	6
10	BS 1452 Grade 14				4.6		4					16	14.8	13.9	13	13	11	10.8	10
		BS 309 Grade W 22/4			6.6		6					16	15.6	15.2	15	14	14	13.8	13
		BS 310 Grade B 20/10			6.6		6					16	15.6	15.2	15	14	14	13.8	13
16							BS 2872 & 2874 CA103	16	16										
							BS 1506-240 LT 100		16										
							BS 1506-240			16									
							BS 1506-111				16								
					4.6		4					16	16	16	13.5	11.3	8	7	
					4.6		4					25	23	21.2	20	19	18	17.5	16
					6.6		6					25	24.2	23.5	23	22	21	20.8	20
					6.6		6					25	24.2	23.5	23	22	21	20.8	20
25	BS 1452 Grade 14						BS 2872 & 2874 CA103	25	25										
		BS 309 Grade W 22/4					BS 1506-240 LT 100		25										
		BS 310 Grade B 20/10					BS 1506-240			25									
							BS 1506-111				25								
							6												
							BS 2872 & 2874 CA103	40	40										
							BS 1506-240 LT 100		40										
							BS 1506-240			40									
							BS 1506-111				40								
							6												
							BS 2872 & 2874 CA103					25	25	25	21.2	17.5	12.2	10.5	
							BS 1400 LG 2 C												
							BS 1400 LG 2 C												

NOTE 1. See page 2 for the titles of British Standards referred to in this table.

NOTE 2. Intermediate values can be obtained by linear interpolation.

NOTE 3. Free cutting steels shall not be used for bolts, stud bolts or nuts.

*The tensile strength of the cast iron selected for the appropriate standard flange thickness shall not fall below:

(1) for nominal pressures up to and including 16 bar: 180 N/mm²;(2) for nominal pressures greater than 16 bar: 220 N/mm².

NOTE 4. For an explanation of 4, 4-6, 6 and 6-6. See BS 3692.

NOTE 5. For aluminium bronze bolting material see BS 2872 and BS 2874.

BS 4504 : 1969

TABLE B. SUMMARY OF CONTENTS

As altered March, 1971

Nominal size mm	2.5			6									10					16										
	Table 2.5/2	2.5/3	2.5/11	6/2	6/3	6/4	6/5	6/6	6/8	6/11	6/12	6/13	10/2	10/3	10/5	10/6	10/8	10/11	16/1	16/2	16/3	16/4	16/5	16/8	16/11	16/12	16/13	16/21
6						X	X					X										X	X					X
8					X	X	X					X										X	X					X
10				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
15				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
20				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
25				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
32				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
40				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
50				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
65				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
80				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
100				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
125				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
150				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
175				X	X	X	X	X	X	X	X	X				X					X	X	X	X	X	X	X	X
200				X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
250				X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
300				X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
350				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
400				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
450				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
500				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
600				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
700				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
800				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
900				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
1000				X	X		X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X
1200	X	X	X	X	X		X			X			X	X					X	X	X	X						
1400	X	X	X	X	X					X			X						X	X	X							
1600	X	X	X	X	X					X			X						X	X	X							
1800	X	X	X	X	X					X			X						X	X	X							
2000	X	X	X	X	X					X			X						X	X	X							
2200			X							X									X	X								
2400			X							X									X									
2600			X							X									X									
2800			X							X									X									
3000			X							X									X									
3200			X							X									X									
3400			X							X									X									
3600			X							X									X									
3800			X																X									
4000			X																X									

NOMINAL PRESSURE (bar)

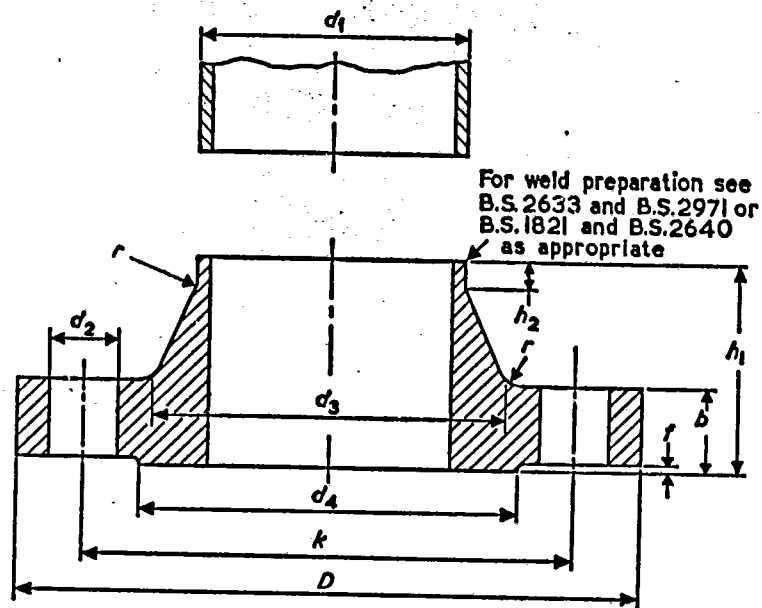
* Use Table 320/2.

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TABLE 2.5/2. STEEL WELDING NECK FLANGES

Nominal pressure 2.5 bar (1 bar = 10^5 N/m²)

NOTE. For nominal sizes 10 to 1000 use Table 6/2.



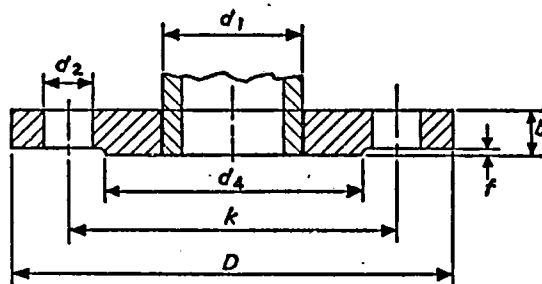
Nom. size	Pipe o.d. d_1	Flange			Raised face		Bolting	Drilling			Neck		
		D	b	h_1	d_4	f		No.	d_1	k	d_3	$h_2 \approx$	r
1 200	1 220	1 375	26	70	1 280	5	M27	32	30	1 320	1 245	16	16
1 400	1 420	1 575	26	70	1 480	5	M27	36	30	1 520	1 445	16	16
1 600	1 620	1 790	26	80	1 690	5	M27	40	30	1 730	1 645	20	16
1 800	1 820	1 990	26	80	1 890	5	M27	44	30	1 930	1 845	20	16
2 000	2 020	2 190	26	80	2 090	5	M27	48	30	2 130	2 045	22	16

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TABLE 2.5/3. STEEL PLATE FLANGES FOR WELDING

Nominal pressure 2.5 bar (1 bar = 10^5 N/m²)

NOTE. For nominal sizes 10 to 1000 use Table 6/3.



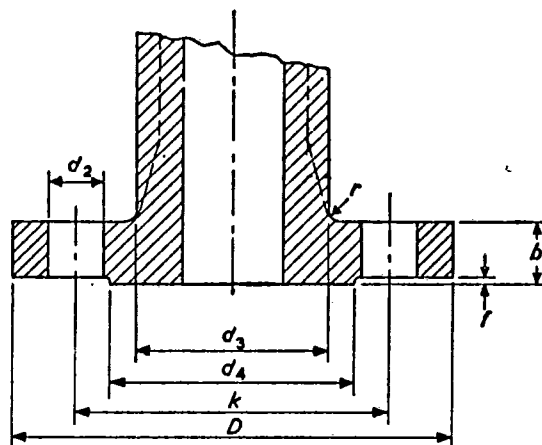
Nom. size	Pipe o.d. d_1	Flange		Raised face		Bolting	Drilling		
		D	b	d_4	f		No.	d_4	k
1 200	1 220	1 375	36	1 280	5	M27	32	30	1 320
1 400	1 420	1 575	42	1 480	5	M27	36	30	1 520
1 600	1 620	1 790	46	1 690	5	M27	40	30	1 730
1 800	1 820	1 990	52	1 890	5	M27	44	30	1 930
2 000	2 020	2 190	58	2 090	5	M27	48	30	2 130

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TABLE 2.5/11. INTEGRAL GREY CAST IRON FLANGES

Nominal pressure 2.5 bar (1 bar = 10^5 N/m²)

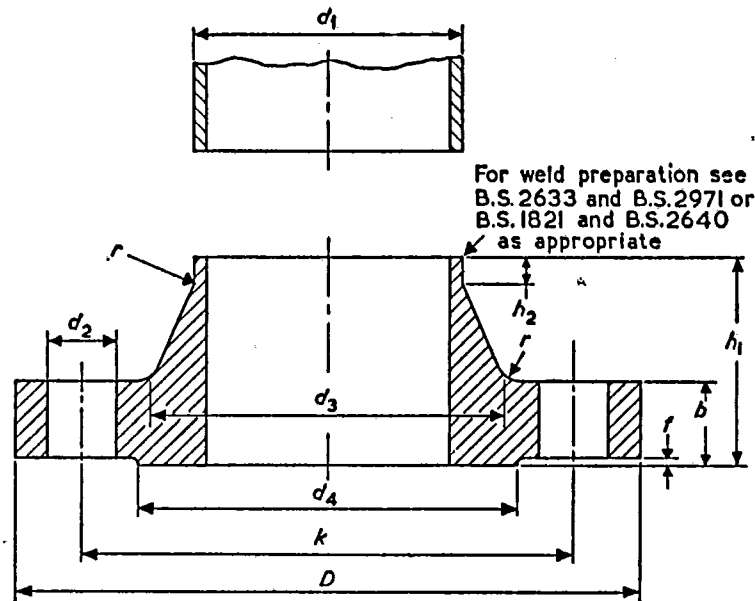
NOTE. For nominal sizes 10 to 1000 use Table 6/11.



Nom size	Flange		Raised face		Bolting	Drilling			Neck	
	D	b	d_1	f_{max}		No.	d_2	k	d_3	r
1 200	1 375	30	1 280	5	M27	32	30	1 320	1 250	8
1 400	1 575	30	1 480	5	M27	36	30	1 520	1 452	8
1 600	1 790	32	1 690	5	M27	40	30	1 730	1 654	10
1 800	1 990	34	1 890	5	M27	44	30	1 930	1 856	10
2 000	2 190	34	2 090	5	M27	48	30	2 130	2 056	10
2 200	2 405	36	2 295	6	M30	52	33	2 340	2 260	10
2 400	2 605	38	2 495	6	M30	56	33	2 540	2 464	10
2 600	2 805	40	2 695	6	M30	60	33	2 740	2 668	10
2 800	3 030	42	2 910	6	M33	64	36	2 960	2 868	12
3 000	3 230	42	3 110	6	M33	68	36	3 160	3 068	12
3 200	3 430	44	3 310	6	M33	72	36	3 360	3 268	12
3 400	3 630	46	3 510	6	M33	76	36	3 560	3 472	12
3 600	3 840	48	3 720	6	M33	80	36	3 770	3 676	12
3 800	4 045	48	3 920	6	M36	80	39	3 970	3 876	12
4 000	4 245	50	4 120	6	M36	84	39	4 170	4 076	12

NOTE. Alternative neck form, shown dotted, to have a maximum draft angle of 12°

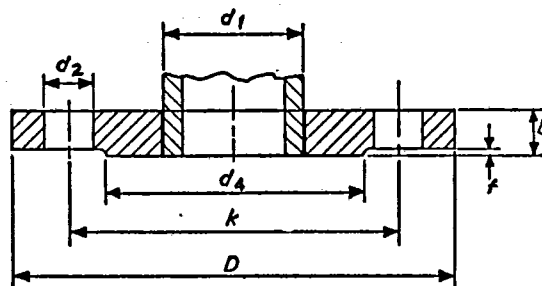
TABLE 6/2. STEEL WELDING NECK FLANGES

Nominal pressure 6 bar (1 bar = 10^5 N/m²)As altered
March, 1971

Nom. size	Pipe o.d. d_1	Flange			Raised face		Bolting	Drilling			Neck		
		D	b	h_1	d_4	f		No.	d_2	k	d_3	$h_1 \approx$	r
10	17.2	75	12	28	35	2	M10	4	11	50	26	6	4
15	21.3	80	12	30	40	2	M10	4	11	55	30	6	4
20	26.9	90	14	32	50	2	M10	4	11	65	38	6	4
25	33.7	100	14	35	60	2	M10	4	11	75	42	6	4
32	42.4	120	14	35	70	2	M12	4	14	90	55	6	6
40	48.3	130	14	38	80	3	M12	4	14	100	62	7	6
50	60.3	140	14	38	90	3	M12	4	14	110	74	8	6
65	76.1	160	14	38	110	3	M12	4	14	130	88	9	6
80	88.9	190	16	42	128	3	M16	4	18	150	102	10	8
100	114.3	210	16	45	148	3	M16	4	18	170	130	10	8
125	139.7	240	18	48	178	3	M16	8	18	200	155	10	8
150	168.3	265	18	48	202	3	M16	8	18	225	184	12	10
200	219.1	320	20	55	258	3	M16	8	18	280	236	15	10
250	273	375	22	60	312	3	M16	12	18	335	290	15	12
300	323.9	440	22	62	365	4	M20	12	22	395	342	15	12
350	355.6	490	22	62	415	4	M20	12	22	445	385	15	12
400	406.4	540	22	65	465	4	M20	16	22	495	438	15	12
450	457.2	595	24	65	520	4	M20	16	22	550	492	15	12
500	508	645	24	68	570	4	M20	20	22	600	538	15	12
600	609.6	755	24	70	670	5	M24	20	26	705	640	16	12
700	711.2	860	24	70	775	5	M24	24	26	810	740	16	12
800	812.8	975	24	70	880	5	M27	24	30	920	842	16	12
900	914.4	1 075	26	70	980	5	M27	24	30	1 020	942	16	12
1 000	1 016	1 175	26	70	1 080	5	M27	28	30	1 120	1 045	16	16
1 200	1 220	1 405	28	90	1 295	5	M30	32	33	1 340	1 248	20	16
1 400	1 420	1 630	32	90	1 510	5	M33	36	36	1 560	1 452	20	16
1 600	1 620	1 830	34	90	1 710	5	M33	40	36	1 760	1 655	20	16
1 800	1 820	2 045	36	100	1 920	5	M36	44	39	1 970	1 855	20	16
2 000	2 020	2 265	38	110	2 125	5	M39	48	42	2 180	2 058	25	16

BS 4504 : 1969

TABLE 6/3. STEEL PLATE FLANGES FOR WELDING
Nominal pressure 6 bar (1 bar = 10^5 N/m²)



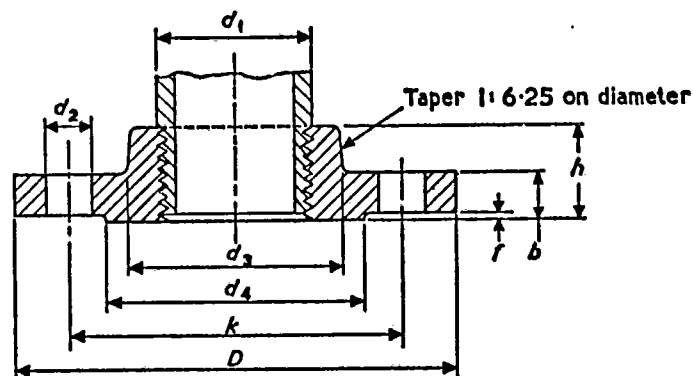
As altered
March, 1971

Nom. size	Pipe o.d. d_1	Flange		Raised face		Bolting	Drilling		
		D	b	d_4	f		No.	d_4	k
10	17.2	75	12	35	2	M10	4	11	50
15	21.3	80	12	40	2	M10	4	11	55
20	26.9	90	14	50	2	M10	4	11	65
25	33.7	100	14	60	2	M10	4	11	75
32	42.4	120	16	70	2	M12	4	14	90
40	48.3	130	16	80	3	M12	4	14	100
50	60.3	140	16	90	3	M12	4	14	110
65	76.1	160	16	110	3	M12	4	14	130
80	88.9	190	18	128	3	M16	4	18	150
100	114.3	210	18	148	3	M16	4	18	170
125	139.7	240	20	178	3	M16	8	18	200
150	168.3	265	20	202	3	M16	8	18	225
200	219.1	320	22	258	3	M16	8	18	280
250	273	375	24	312	3	M16	12	18	335
300	323.9	440	24	365	4	M20	12	22	395
350	355.6	490	26	415	4	M20	12	22	445
400	406.4	540	28	465	4	M20	16	22	495
450	457.2	595	30	520	4	M20	16	22	550
500	508	645	30	570	4	M20	20	22	600
600	609.6	755	32	670	5	M24	20	26	705
700	711.2	860	34	775	5	M24	24	26	810
800	812.8	975	38	880	5	M27	24	30	920
900	914.4	1 075	42	980	5	M27	24	30	1 020
1 000	1 016	1 175	46	1 080	5	M27	28	30	1 120
1 200	1 220	1 405	56	1 295	5	M30	32	33	1 340
1 400	1 420	1 630	66	1 510	5	M33	36	36	1 560
1 600	1 620	1 830	74	1 710	5	M33	40	36	1 760
1 800	1 820	2 045	84	1 920	5	M36	44	39	1 970
2 000	2 020	2 265	92	2 125	5	M39	48	42	2 180

TABLE 6/4. STEEL SCREWED BOSS FLANGES

Nominal pressure 6 bar (1 bar = 10^5 N/m²)

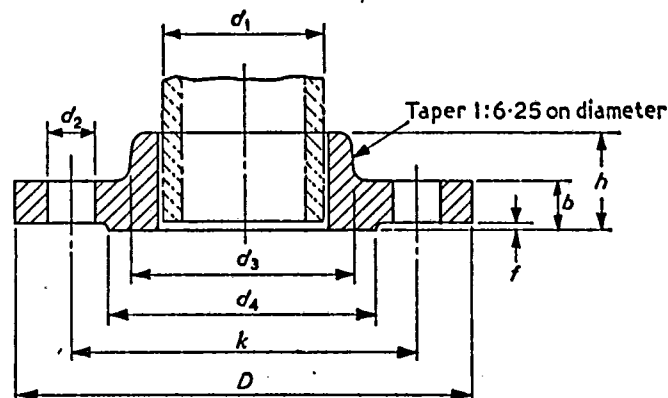
All dimensions are in millimetres (except the inch nominal size column). Screwed to BS 21, 'Pipe threads'.



Nominal size		Pipe o.d. d_1 ≈	Flange			Raised face		Bolting	Drilling			Boss d_1
in	mm		D	b	h	d_4	f		No.	d_1	k	
1/8	6	10.2	65	10	18	25	2	M10	4	11	40	18
1/4	8	13.5	70	10	18	30	2	M10	4	11	45	22
3/8	10	17.2	75	12	20	35	2	M10	4	11	50	25
1/2	15	21.3	80	12	20	40	2	M10	4	11	55	30
3/4	20	26.9	90	14	24	50	2	M10	4	11	65	40
1	25	33.7	100	14	24	60	2	M10	4	11	75	50
1 1/4	32	42.4	120	14	26	70	2	M12	4	14	90	60
1 1/2	40	48.3	130	14	26	80	3	M12	4	14	100	70
2	50	60.3	140	14	28	90	3	M12	4	14	110	80
2 1/2	65	76.1	160	14	32	110	3	M12	4	14	130	100
3	80	88.9	190	16	34	128	3	M16	4	18	150	110
4	100	114.3	210	16	40	148	3	M16	4	18	170	130
5	125	139.7	240	18	44	178	3	M16	8	18	200	160
6	150	165.1	265	18	44	202	3	M16	8	18	225	185

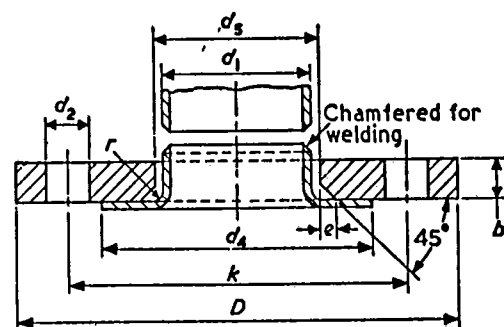
BS 4504 : 1969

TABLE 6/5. STEEL SLIP-ON BOSS FLANGES FOR WELDING
 Nominal pressure 6 bar (1 bar = 10^5 N/m²)



Nom. size	Pipe o.d. $d_1 \approx$	Flange			Raised face		Bolting	Drilling			Boss d_1
		D	b	h	d_4	f		No.	d_2	k	
6	10.2	65	10	18	25	2	M10	4	11	40	18
8	13.5	70	10	18	30	2	M10	4	11	45	22
10	17.2	75	12	20	35	2	M10	4	11	50	25
15	21.3	80	12	20	40	2	M10	4	11	55	30
20	26.9	90	14	24	50	2	M10	4	11	65	40
25	33.7	100	14	24	60	2	M10	4	11	75	50
32	42.4	120	14	26	70	2	M12	4	14	90	60
40	48.3	130	14	26	80	3	M12	4	14	100	70
50	60.3	140	14	28	90	3	M12	4	14	110	80
65	76.1	160	14	32	110	3	M12	4	14	130	100
80	88.9	190	16	34	128	3	M16	4	18	150	110
100	114.3	210	16	40	148	3	M16	4	18	170	130
125	139.7	240	18	44	178	3	M16	8	18	200	160
150	168.3	265	18	44	202	3	M16	8	18	225	185
200	219.1	320	20	44	258	3	M16	8	18	280	240
250	273	375	22	44	312	3	M16	12	18	335	295
300	323.9	440	22	44	365	4	M20	12	22	395	355

TABLE 6/6. STEEL LOOSE FLANGES FOR WELDED ON LAPPED PIPE ENDS
 Nominal pressure 6 bar (1 bar = 10^5 N/m²)



As altered
 March, 1971

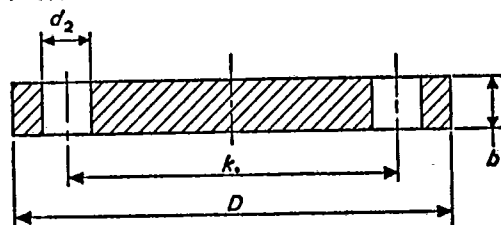
Nom. size	Pipe o.d. d_1	Flange				Bolting	Drilling			Pipe end	
		D	b	d_2	e		No.	d_4	k	d_5 max.	r
10	17.2	75	10	20	5	M10	4	11	50	35	3
15	21.3	80	10	24	5	M10	4	11	55	40	3
20	26.9	90	10	30	5	M10	4	11	65	50	3
25	33.7	100	12	37	6	M10	4	11	75	60	4
32	42.4	120	12	46	6	M12	4	14	90	70	4
40	48.3	130	12	52	6	M12	4	14	100	80	4
50	60.3	140	12	65	6	M12	4	14	110	90	5
65	76.1	160	12	81	6	M12	4	14	130	110	5
80	88.9	190	14	94	6	M16	4	18	150	128	5
100	114.3	210	14	119	6	M16	4	18	170	148	5
125	139.7	240	14	145	6	M16	8	18	200	178	5
150	168.3	265	14	174	6	M16	8	18	225	202	5
200	219.1	320	18	225	8	M16	8	18	280	258	5
250	273	375	20	279	8	M16	12	18	335	312	5
300	323.9	440	24	330	8	M20	12	22	395	365	5
350	355.6	490	26	362	8	M20	12	22	445	415	6
400	406.4	540	30	426	8	M20	16	22	495	465	6
450	457.2	595	32	465	8	M20	16	22	550	520	6
500	508	645	32	516	8	M20	20	22	600	570	6
600	609.6	755	36	618	8	M24	20	26	705	670	6
700	711.2	860	40	720	8	M24	24	26	810	775	6
800	812.8	975	44	822	8	M27	24	30	920	880	6
900	914.4	1 075	48	926	8	M27	24	30	1 020	980	6
1 000	1 016	1 175	52	1 028	8	M27	28	30	1 120	1 080	6
1 200	1 220	1 405	60	1 232	10	M30	32	33	1 340	1 295	8

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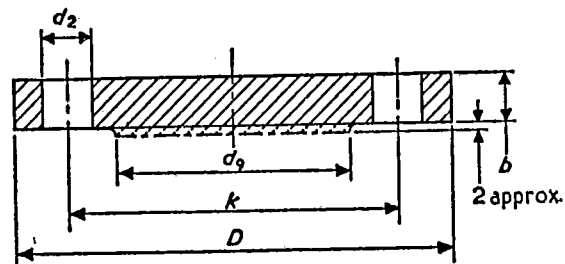
TABLE 6/8. STEEL PLATE BLANK FLANGES
Nominal pressure 6 bar (1 bar = 10^5 N/m²)

NOTE. The two types of flanges shown are alternatives at the option of the manufacturer.

Form B



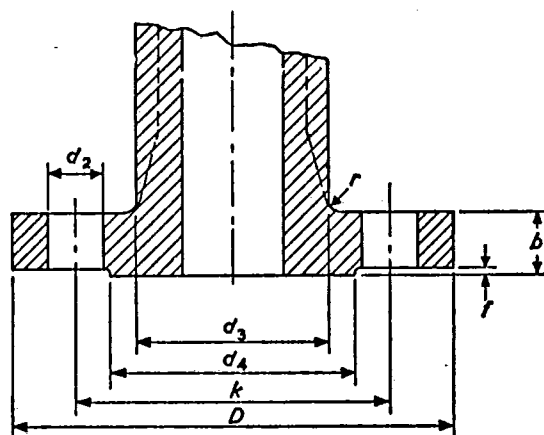
Form C



As altered
March, 1971

Nom. size	Flange		Spigot d_0	Bolting	Drilling		
	D	b			No.	d_1	k
10	75	12	—	M10	4	11	50
15	80	12	—	M10	4	11	55
20	90	14	—	M10	4	11	65
25	100	14	—	M10	4	11	75
32	120	14	—	M12	4	14	90
40	130	14	—	M12	4	14	100
50	140	14	—	M12	4	14	110
65	160	14	55	M12	4	14	130
80	190	16	70	M16	4	18	150
100	210	16	90	M16	4	18	170
125	240	18	115	M16	8	18	200
150	265	18	140	M16	8	18	225
175	295	20	165	M16	8	18	255
200	320	20	190	M16	8	18	280
250	375	22	237	M16	12	18	335
300	440	22	285	M20	12	22	395
350	490	22	332	M20	12	22	445
400	540	22	380	M20	16	22	495
450	595	24	428	M20	16	22	550
500	645	24	475	M20	20	22	600

TABLE 6/11. INTEGRAL GREY CAST IRON FLANGES
Nominal pressure 6 bar (1 bar = 10^5 N/m²)



As altered
March, 1971

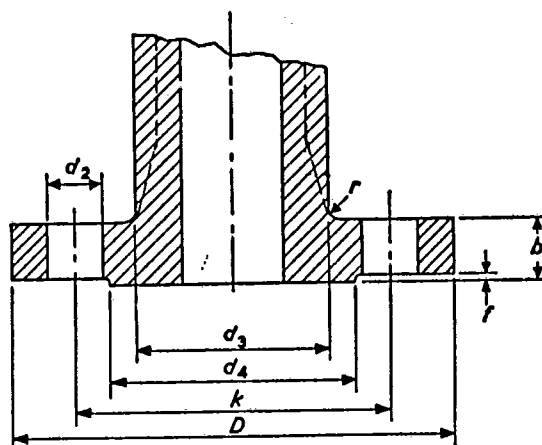
Nom. size	Flange		Raised face		Bolting	Drilling			Neck	
	D	b	d ₄	f _{max}		No.	d ₁	k	d ₂	r
10	75	12	35	2	M10	4	11	50	26	3
15	80	12	40	2	M10	4	11	55	31	3
20	90	14	50	2	M10	4	11	65	38	4
25	100	14	60	2	M10	4	11	75	47	4
32	120	16	70	2	M12	4	14	90	56	4
40	130	16	80	3	M12	4	14	100	64	4
50	140	16	90	3	M12	4	14	110	74	4
65	160	16	110	3	M12	4	14	130	89	4
80	190	18	128	3	M16	4	18	150	108	5
100	210	18	148	3	M16	4	18	170	128	5
125	240	20	178	3	M16	8	18	200	155	5
150	265	20	202	3	M16	8	18	225	180	5
200	320	22	258	3	M16	8	18	280	234	6
250	375	24	312	3	M16	12	18	335	286	6
300	440	24	365	4	M20	12	22	395	336	6
350	490	26	415	4	M20	12	22	445	390	8
400	540	28	465	4	M20	16	22	495	442	8
450	595	30	520	4	M20	16	22	550	492	8
500	645	30	570	4	M20	20	22	600	546	8
600	755	30	670	5	M24	20	26	705	646	8
700	860	32	775	5	M24	24	26	810	748	10
800	975	34	880	5	M27	24	30	920	852	10
900	1 075	36	980	5	M27	24	30	1 020	954	10
1 000	1 175	36	1 080	5	M27	28	30	1 120	1 054	10
1 200	1 405	40	1 295	5	M30	32	33	1 340	1 260	10
1 400	1 630	44	1 510	5	M33	36	36	1 560	1 466	12
1 600	1 830	48	1 710	5	M33	40	36	1 760	1 672	12
1 800	2 045	50	1 920	5	M36	44	39	1 970	1 876	15
2 000	2 265	54	2 125	5	M39	48	42	2 180	2 082	15
2 200	2 475	60	2 335	6	M39	52	42	2 390	2 290	15
2 400	2 685	62	2 545	6	M39	56	42	2 600	2 494	18
2 600	2 905	64	2 750	6	M45	60	48	2 810	2 696	18
2 800	3 115	68	2 960	6	M45	64	48	3 020	2 902	18
3 000	3 315	70	3 160	6	M45	68	48	3 220	3 106	18
3 200	3 525	76	3 370	6	M45	72	48	3 430	3 314	18
3 400	3 735	80	3 580	6	M45	76	48	3 640	3 520	20
3 600	3 970	84	3 790	6	M52	80	56	3 860	3 726	20

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NOTE. Alternative neck form, shown dotted, to have a maximum draft angle of 12°.

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TABLE 6/12. MALLEABLE CAST IRON INTEGRAL FLANGES
Nominal pressure 6 bar (1 bar = 10^5 N/m²)



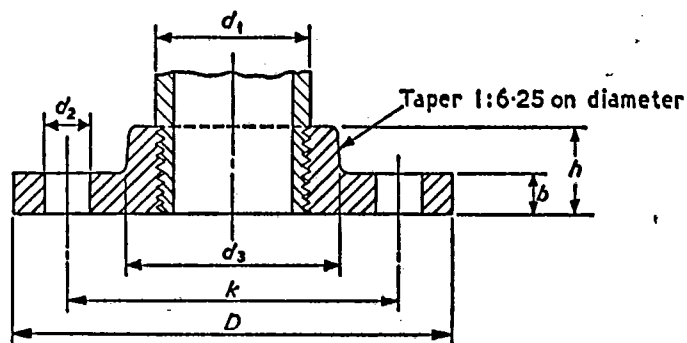
Nom. size	Flange		Raised face		Bolting	Drilling			Neck	
	D	b	d_1	f		No.	d_1	k	d_1	r
10	75	9	35	2	M10	4	11	50	26	3
15	80	10	40	2	M10	4	11	55	31	3
20	90	10	50	2	M10	4	11	65	38	4
25	100	11	60	2	M10	4	11	75	47	4
32	120	11	70	2	M12	4	14	90	56	4
40	130	12	80	3	M12	4	14	100	64	4
50	140	12	90	3	M12	4	14	110	74	4
65	160	13	110	3	M12	4	14	130	89	4
80	190	13	128	3	M16	4	18	150	108	5
100	210	15	148	3	M16	4	18	170	128	5
125	240	17	178	3	M16	8	18	200	155	5
150	265	17	202	3	M16	8	18	225	180	5

5 NOTE. Alternative neck form, shown dotted, to have a maximum draft angle of 12°

TABLE 6/13. MALLEABLE CAST IRON SCREWED BOSS FLANGES

Nominal pressure 6 bar (1 bar = 10^5 N/m²)

All dimensions are in millimetres (except the inch nominal size column). Screwed to BS 21, 'Pipe threads'.

As altered
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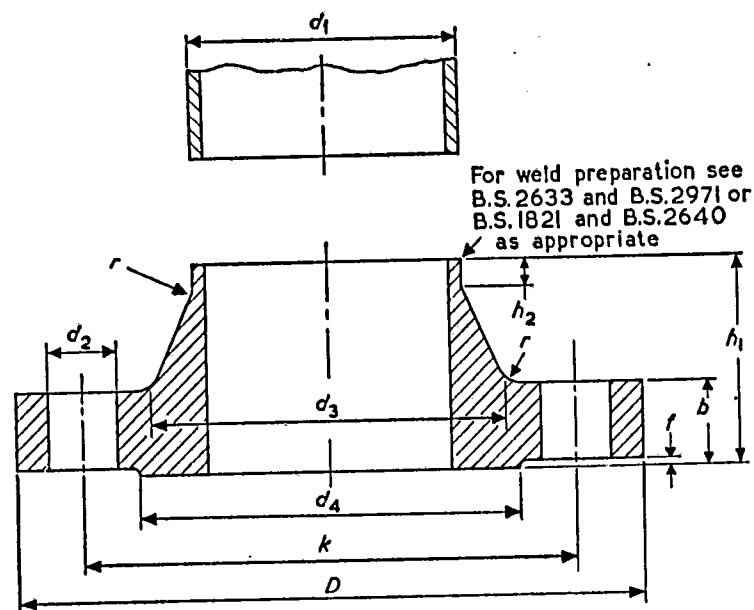
Nominal size		Pipe o.d. d_1 $\approx$	Flange			Bolting	Drilling			Boss d_1
in	mm		D	b	k		No.	d_1	k	
$\frac{1}{8}$	6	10.2	65	8	15	M10	4	11	40	18
$\frac{1}{4}$	8	13.5	70	8	15	M10	4	11	45	22
$\frac{3}{8}$	10	17.2	75	9	17	M10	4	11	50	26
$\frac{1}{2}$	15	21.3	80	10	17	M10	4	11	55	32
$\frac{3}{4}$	20	26.9	90	10	19	M10	4	11	65	38
1	25	33.7	100	11	20	M10	4	11	75	46
$1\frac{1}{4}$	32	42.4	120	11	22	M12	4	14	90	56
$1\frac{1}{2}$	40	48.3	130	12	22	M12	4	14	100	63
2	50	60.3	140	12	26	M12	4	14	110	77
$2\frac{1}{2}$	65	76.1	160	13	31	M12	4	14	130	92
3	80	88.9	190	13	34	M16	4	18	150	106
4	100	114.3	210	15	40	M16	4	18	170	132
5	125	139.7	240	17	44	M16	8	18	200	160
6	150	165.1	265	17	44	M16	8	18	225	185

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TABLE 10/2. STEEL WELDING NECK FLANGES

Nominal pressure 10 bar (1 bar = 10^5 N/m²)

NOTE. For nominal sizes 10 to 175 use Table 16/2.



Nom. size	Pipe o.d. d_1	Flange			Raised face		Bolting	Drilling			Neck		
		D	b	h_1	d_4	f		No.	d_2	k	d_3	$h_2 \approx$	r
200	219.1	340	24	62	268	3	M20	8	22	295	235	16	10
250	273	395	26	68	320	3	M20	12	22	350	292	16	12
300	323.9	445	26	68	370	4	M20	12	22	400	344	16	12
350	355.6	505	26	68	430	4	M20	16	22	460	385	16	12
400	406.4	565	26	72	482	4	M24	16	26	515	440	16	12
450	457.2	615	28	72	532	4	M24	20	26	565	492	16	12
500	508	670	28	75	585	4	M24	20	26	620	542	16	12
600	609.6	780	28	80	685	5	M27	20	30	725	642	18	12
700	711.2	895	30	80	800	5	M27	24	30	840	745	18	12
800	812.8	1 015	32	90	905	5	M30	24	33	950	850	18	12
900	914.4	1 115	34	95	1 005	5	M30	28	33	1 050	950	20	12
1 000	1 016	1 230	34	95	1 110	5	M33	28	36	1 160	1 052	20	16
1 200	1 220	1 455	38	115	1 330	5	M36	32	39	1 380	1 255	25	16
1 400	1 420	1 675	42	120	1 535	5	M39	36	42	1 590	1 460	25	16
1 600	1 620	1 915	46	130	1 760	5	M45	40	48	1 820	1 665	25	16
1 800	1 820	2 115	50	140	1 960	5	M45	44	48	2 020	1 868	30	16
2 000	2 020	2 325	54	150	2 170	5	M45	48	48	2 230	2 072	30	16

As added
January 1972