

**SPECIFICATION FOR**  
**Circular flanges for pipes, valves and**  
**fittings (Class designated)**

Part 2. Specification for steel pipe flanges (nominal sizes ½ in to 24 in)  
Metric dimensions



**BS 1560 : Part 2 : 1970**

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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, price £1. The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

BS 1501-6. Steels for use in the chemical, petroleum and allied industries.

BS 1503. Steels for fired and unfired pressure vessels. Forgings.

BS 1600. Dimensions of steel pipe for the petroleum industry.

BS 1640. Steel butt-welding pipe fittings for the petroleum industry.

BS 1750. Bolting for the petroleum industry.

BS 3351. Piping systems for the petroleum industry.

BS 3381. Metallic spiral-wound gaskets for the petroleum and petrochemical industry.

Reference is also made to the following American National Standards Institute, American Petroleum Institute and American Society for Testing of Materials standards (obtainable through BSI):

ANSI Std. B2.1. Pipe threads (except Dryseal).

ANSI Std. B16.20. Ring-joint gaskets and grooves for steel pipe flanges.

ANSI Std. B36.10. Wrought steel and wrought iron pipe.

ANSI Std. B36.19. Stainless steel pipe.

API Std. 5B. Threading, gauging and thread inspection of casing, tubing and line pipe threads.

API Std. 5LS. Spiral-weld line pipe.

ASTM Std. Part 1. Steel piping, tubing and fittings.

ANSI B16.5. Steel pipe flanges and flanged fittings.

*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 BSI references relate to the work on this standard:

Committee reference PBE/2

Draft for comment 67/11512

## CO-OPERATING ORGANIZATIONS

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

British Rubber Manufacturers' Association  
Ltd.

\*British Steel Industry

\*Council of British Manufacturers of  
Petroleum Equipment

Gas Council

Ministry of Power

\*Oil Companies Materials Association

The 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 standard:

British Valve Manufacturers' Association

Confederation of British Industry

Engineering Equipment Users' Association

Manufacturers of Flanges and Fittings

National Association of Drop Forgers and

Stampers

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## CONTENTS

|                                                                                       | Page |                                                                                                                                                                 | Page |
|---------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Foreword . . . . .                                                                    | 5    | 5. Dimensions of ring-joint facings, Class 400 . . . . .                                                                                                        | 15   |
| <b>SPECIFICATION</b>                                                                  |      | 6. Dimensions of ring-joint facings, Class 600 . . . . .                                                                                                        | 16   |
| <b>1. GENERAL</b>                                                                     |      | 7. Dimensions of ring-joint facings, Class 900 . . . . .                                                                                                        | 17   |
| 1.1 Scope . . . . .                                                                   | 5    | 8. Dimensions of ring-joint facings, Class 1500 . . . . .                                                                                                       | 18   |
| 1.2 Pressure ratings . . . . .                                                        | 5    | 9. Dimensions of ring-joint facings, Class 2500 . . . . .                                                                                                       | 19   |
| 1.3 Flange facings and gaskets . . . . .                                              | 5    | 10. Numbers and dimensions of ring-joint gaskets . . . . .                                                                                                      | 21   |
| 1.4 Nominal sizes . . . . .                                                           | 5    | 11. Dimensions of flanges, Class 150 . . . . .                                                                                                                  | 22   |
| 1.5 Definitions . . . . .                                                             | 6    | 12. Drilling and bolting for flanges, Class 150 . . . . .                                                                                                       | 23   |
| <b>2. MATERIALS</b>                                                                   |      | 13. Dimensions of flanges, Class 300 . . . . .                                                                                                                  | 24   |
| 2.1 Materials for flanges . . . . .                                                   | 6    | 14. Drilling and bolting for flanges, Class 300 . . . . .                                                                                                       | 25   |
| 2.2 Bolting materials . . . . .                                                       | 7    | 15. Dimensions of flanges, Class 400 . . . . .                                                                                                                  | 26   |
| <b>3. DIMENSIONS</b>                                                                  |      | 16. Drilling and bolting for flanges, Class 400 . . . . .                                                                                                       | 27   |
| 3.1 Sizes of flanges . . . . .                                                        | 7    | 17. Dimensions of flanges, Class 600 . . . . .                                                                                                                  | 28   |
| 3.2 Flange dimensions . . . . .                                                       | 7    | 18. Drilling and bolting for flanges, Class 600 . . . . .                                                                                                       | 29   |
| 3.3 Facing dimensions for other than lapped-type joints . . . . .                     | 7    | 19. Dimensions of flanges, Class 900 . . . . .                                                                                                                  | 30   |
| 3.4 Facing dimensions for lapped-type joints . . . . .                                | 7    | 20. Drilling and bolting for flanges, Class 900 . . . . .                                                                                                       | 31   |
| 3.5 Tolerances on flange facings . . . . .                                            | 7    | 21. Dimensions of flanges, Class 1500 . . . . .                                                                                                                 | 32   |
| 3.6 Flange bolting . . . . .                                                          | 7    | 22. Drilling and bolting for flanges, Class 1500 . . . . .                                                                                                      | 33   |
| 3.7 Spot-facing and back-facing of flanges . . . . .                                  | 8    | 23. Dimensions of flanges, Class 2500 . . . . .                                                                                                                 | 34   |
| 3.8 Screwed flanges . . . . .                                                         | 8    | 24. Drilling and bolting for flanges, Class 2500 . . . . .                                                                                                      | 35   |
| 3.9 Slip-on welding, socket-welding and lapped-type flanges . . . . .                 | 8    |                                                                                                                                                                 |      |
| 3.10 Welding-neck flanges . . . . .                                                   | 8    | <b>APPENDICES</b>                                                                                                                                               |      |
| 3.11 Concentric reducing screwed flanges . . . . .                                    | 9    | A. Pressure-temperature ratings . . . . .                                                                                                                       | 37   |
| 3.12 Concentric reducing slip-on welding and socket-welding flanges . . . . .         | 9    | Notes on Tables PE-1 to PE-12 . . . . .                                                                                                                         | 37   |
| 3.13 Concentric reducing welding-neck flanges . . . . .                               | 9    | Table PE-1. Forged and cast carbon steel . . . . .                                                                                                              | 38   |
| 3.14 Blank (blind) flanges . . . . .                                                  | 9    | Table PE-2. Forged and cast carbon-molybdenum steel . . . . .                                                                                                   | 39   |
| <b>4. TESTS</b>                                                                       |      | Table PE-3. Forged 1 % chromium-½ % molybdenum steel . . . . .                                                                                                  | 40   |
| 4.1 Testing . . . . .                                                                 | 9    | Table PE-4. Forged and cast 1 ¼ % chromium-½ % molybdenum steel . . . . .                                                                                       | 41   |
| <b>5. INSPECTION</b>                                                                  |      | Table PE-5. Forged and cast 2 ¼ % chromium-1 % molybdenum steel . . . . .                                                                                       | 42   |
| 5.1 Inspection . . . . .                                                              | 9    | Table PE-6. Forged and cast 5 % chromium-½ % molybdenum steel . . . . .                                                                                         | 43   |
| 5.2 Repair of defects . . . . .                                                       | 9    | Table PE-7. Forged and cast 9 % chromium-1 % molybdenum steel . . . . .                                                                                         | 44   |
| <b>6. MARKING</b>                                                                     |      | Table PE-8. Forged and cast austenitic chromium-nickel steel . . . . .                                                                                          | 45   |
| 6.1 Marking . . . . .                                                                 | 10   | Table PE-9. Forged austenitic chromium-nickel (low carbon) steel . . . . .                                                                                      | 46   |
| <b>7. PREPARATION AND DESPATCH</b>                                                    |      | Table PE-10. Forged austenitic chromium-nickel (titanium stabilized) steel, and forged and cast austenitic chromium-nickel (niobium-stabilized) steel . . . . . | 47   |
| 7.1 Preparation . . . . .                                                             | 10   | Table PE-11. Forged and cast austenitic chromium-nickel-molybdenum steel . . . . .                                                                              | 48   |
| 7.2 Despatch . . . . .                                                                | 10   | Table PE-12. Forged austenitic chromium-nickel-molybdenum (low carbon) steel . . . . .                                                                          | 49   |
| <b>TABLES</b>                                                                         |      |                                                                                                                                                                 |      |
| 1. Reducing screwed flanges, Classes 150 to 2500 . . . . .                            | 11   |                                                                                                                                                                 |      |
| 2. Facing dimensions for flanges other than ring-joint, Classes 150 to 2500 . . . . . | 12   |                                                                                                                                                                 |      |
| 3. Dimensions of ring-joint facings, Class 150 . . . . .                              | 13   |                                                                                                                                                                 |      |
| 4. Dimensions of ring-joint facings, Class 300 . . . . .                              | 14   |                                                                                                                                                                 |      |

BS 1560 : Part 2 : 1970

CONTENTS—*continued*

|                                                                                                                                          | Page |                                                   | Page |
|------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------|------|
| B. Requirements for marking of steel pipe flanges . . . . .                                                                              | 50   | Table 28. Dimensions of Group 1 gaskets . . . . . | 56   |
| Table 25. Materials designation . . . . .                                                                                                | 50   | Table 29. Dimensions of Group 2 gaskets . . . . . | 57   |
| C. Table 26. Dimensions of seamless and welded steel pipe . . . . .                                                                      | 51   | Table 30. Dimensions of Group 2 gaskets . . . . . | 58   |
| D. Threading of pipe for standard steel flanges . . . . .                                                                                | 52   | Table 31. Dimensions of Group 3 gaskets . . . . . | 59   |
| Table 27. Additional length of effective thread on pipe . . . . .                                                                        | 52   | Table 32. Dimensions of Group 3 gaskets . . . . . | 60   |
| E. Determination of bolt lengths for lapped joints . . . . .                                                                             | 53   |                                                   |      |
| F. Recommendations for the choice of gaskets for flanged joints employing raised, male/female and tongue/groove flange facings . . . . . | 54   |                                                   |      |

## FIGURES

|                                                                                           |    |
|-------------------------------------------------------------------------------------------|----|
| 1a. Flange facings, Classes 150 and 300 only, for other than lapped type-joints . . . . . | 61 |
| 1b. Flange facings, Classes 400 to 2500, for other than lapped-type joints . . . . .      | 62 |
| 2. Facings for lapped-type joints . . . . .                                               | 63 |
| 3. Details of welding ends of welding-neck flanges . . . . .                              | 64 |

# BRITISH STANDARD SPECIFICATION FOR Circular flanges for pipes, valves and fittings (Class designated)

## Part 2. Specification for steel pipe flanges (nominal sizes ½ in to 24 in) Metric dimensions

### FOREWORD

This British Standard has been prepared under the authority of the Petroleum Equipment Industry Standards Committee. It is the metric version of the flanges of BS 1560, and is based on the agreements reached in ISO/TC 67/WG2. French Standards FD M87-300 to 340 and ANSI Std. B16.5-1968 have also been taken into account. Certain measurements, notably pipe sizes, bolt sizes and class designations, have not been converted into metric units, since the use of imperial units in such cases follows established international practice in the petroleum industry.

This standard gives the service pressures permissible on the basis of stated grades of material and service temperature. Pending the completion of international agreement in ISO/TC 5/SC 10, Co-ordination of existing flange standards for pipeline systems, and having regard to the 1977 issue of ANSI B16.5, there may be advantages in applying the dimensional clauses of BS 1560 : Part 2 but adopting the pressure/temperature ratings of ANSI B16.5. BS 1560 : Part 2 will be completely reviewed at the earliest opportunity.

Obsolescent (by Amendment No. 2)

This British Standard has been declared obsolescent and is not recommended for use in new equipment but needs to be retained for a period of 12 months after the date of publication of BS 1560 : Section 3.1 which replaces this standard. At the end of the 12 months period it is the intention to withdraw this British Standard.

### SPECIFICATION

#### 1. GENERAL

##### 1.1 SCOPE

This British Standard specifies requirements for cast and forged steel pipe flanges of the screwed, slip-on welding, socket-welding, lapped, blind and welding-neck types for use in the petroleum industry for oil, water, steam, air, gas and chemical services. The flange dimensions are also applicable to integral flanges, for example end flanges of valves.

The various types of flange are not necessarily applicable to all pressure and size ranges. Reference should be made to the appropriate tables for details.

Seven classes are provided for, namely:

Classes 150, 300, 400, 600, 900, 1500 and 2500, the numerals representing their respective primary service pressure ratings in pounds-force per square inch.

NOTE. This standard does not specify limitations on the use of various methods of attachment of flanges to pipe or other equipment. The adequacy for operating conditions of any method of attachment specified should be determined by the designer of the piping or equipment, who should consult the appropriate standards or codes.

##### 1.2 PRESSURE RATINGS

The maximum service temperature at which it is permissible to use a flange of a given class, when subjected to its primary service pressure, depends on the type of steel from which it is made.

Tables PE-1 to PE-12 in Appendix A give the service pressures permissible, at various service temperatures, for flanges made from the different types of steel listed in 2.1. The steels to which each table applies are named in the heading, and each table is applicable to all of the 7 classes of flanges.

Primary service pressures are shown in the tables in bold type, the corresponding temperatures in the left hand column of any table being the maximum service temperatures permissible at those pressures.

It will be observed that a flange to this standard may be used at a service pressure higher than its primary service pressure, but at a lower corresponding service

temperature, or at a pressure lower than its primary service pressure and at a higher corresponding service temperature. In this context 'service temperature' refers to the temperature of the fluid on the inside of the pressure-retaining component.

Where it is required to use the flanges in this standard at temperatures below  $-30^{\circ}\text{C}$  reference should be made to BS 3351, 'Piping systems for the petroleum industry'.

##### 1.3 FLANGE FACINGS AND GASKETS

The types of flange facings specified in this standard are defined in 3.3 and illustrated in Figs. 1 and 2.

The satisfactory operation, under the pressure-temperature ratings referred to in 1.2, of flanged joints employing any of these facings, depends on the use of gaskets of appropriate materials and dimensions.

For the facings defined, the following gaskets are recommended. The user is, however, responsible in all cases for the choice of gaskets suitable for the service required:

(1) *Ring-joint facings.* Ring-joint gaskets to ANSI Std. B16.20\*. Dimensions of gaskets to this standard are given in Table 10.

(2) *Raised facings.*

(3) *Large and small male/female facings.*

(4) *Large and small tongue/groove facings.*

Group 1, Group 2 or Group 3 gaskets as defined in Appendix F.

##### 1.4 NOMINAL SIZES

The nominal size of a flange shown in the tables is the same as the corresponding nominal pipe size. (See Appendix C.)

\* American National Standards Institute Standard B16.20, 'Ring-joint gaskets and grooves for steel pipe flanges' (obtainable through BSI).

## BS 1560 : Part 2 : 1970

## 1.5 DEFINITIONS

For the purposes of this British Standard, the following definitions apply. (See Fig. 1 and, where appropriate, Fig. 2.)

**Flange edge.** The reference plane, coincident with the front of a flange, from which the height of any type of flange facing and also the minimum flange thickness is measured.

**Flange thickness.** The distance from the flange edge to the back face of a flange or, if the bolt holes are spot-faced, from the flange edge to the spot-facing.

**Flange facing.** The profile of the connecting end of a flange. It is beyond the flange edge, except for a flange of Class 150 or 300 having a 1.6 mm high raised facing, in which case the raised facing is formed by cutting into the minimum flange thickness.

**Contact surface.** That part of a flange facing upon which the gasket is actually compressed. In the case of flanges of Classes 150 and 300 having 1.6 mm high raised facings, and in all classes having female and groove facings, the contact surface is coincident with the flange edge as defined above.

'Contact surface' is not applicable to ring-joint facings.

**Full-faced.** Applies only to female, groove, and ring-joint facings and defines the resultant profile when the raised portion of such facings is extended to the full diameter of the flange.

NOTE. In such cases the 'flange edge', as defined above, remains unchanged, being coincident with the 'contact surface' of female and groove type facings and with the bottom of the groove of ring-joint facings.

## 2. MATERIALS

## 2.1 MATERIALS FOR FLANGES

The flanges specified in this standard shall be either steel forgings or steel castings made to one of the following BS or ASTM specifications. When ordering, the purchaser shall specify the grade or grades of steel from which the flanges are to be made.

| Steel                                              | Forgings                             |                       | Castings               |                  |
|----------------------------------------------------|--------------------------------------|-----------------------|------------------------|------------------|
|                                                    | British Standards                    | ASTM Standards*       | British Standards      | ASTM Standards*  |
| Carbon                                             | †BS 1503-161, Grade 28, Class A or B | A105, Grade I         | §BS 1504-161, Grade B  | A216, Grade WCB  |
|                                                    | †BS 1503-161, Grade 32, Class A or B | A105, Grade II        | —                      | —                |
|                                                    | —                                    | ‡A181, Grades I or II | —                      | —                |
| Carbon-molybdenum                                  | —                                    | A182, Grade F1        | §BS 1504-240           | A217, Grade WC1  |
| 1 % chromium, ½ % molybdenum                       | †BS 1503-620                         | A182, Grade F12       | —                      | —                |
| 1¼ % chromium ½ % molybdenum                       | †BS 1503-621                         | A182, Grade F11       | §BS 1504-621           | A217, Grade WC6  |
| 2¼ % chromium 1 % molybdenum                       | †BS 1503-622                         | A182, Grade F22       | §BS 1504-622           | A217, Grade WC9  |
| 5 % chromium ½ % molybdenum                        | †BS 1503-625                         | A182, Grade F5a       | §BS 1504-625           | A217, Grade C5   |
| 9 % chromium 1 % molybdenum                        | —                                    | A182, Grade F9        | §BS 1504-629           | A217, Grade C12  |
| Austenitic chromium nickel                         | †BS 1503-801                         | A182, Grade F304      | §BS 1504-801           | A351, Grade CF8  |
|                                                    | —                                    | A182, Grade F304H     | —                      | —                |
| Austenitic chromium-nickel (low carbon)            | —                                    | A182, Grade F304L     | —                      | —                |
| Austenitic chromium-nickel (titanium stabilized)   | †BS 1503-821, Grade Ti               | A182, Grade F321      | —                      | —                |
|                                                    | —                                    | A182, Grade F321H     | —                      | —                |
| Austenitic chromium-nickel (niobium stabilized)    | †BS 1503-821, Grade Nb               | A182, Grade F347      | §BS 1504-821, Grade Nb | A351, Grade CF8C |
|                                                    | —                                    | A182, Grade F347H     | —                      | —                |
| Austenitic chromium-nickel-molybdenum              | †BS 1503-845, Grade B                | A182, Grade F316      | §BS 1504-845, Grade B  | —                |
|                                                    | —                                    | A182, Grade F316H     | —                      | —                |
| Austenitic chromium-nickel-molybdenum (low carbon) | —                                    | A182, Grade F316L     | —                      | —                |

\* Book of ASTM Standards, Part 1, 'Steel piping, tubing and fittings'.

† BS 1503 : 1969, 'Steels for fired and unfired pressure vessels. Forgings'.

‡ Classes 150 and 300 only.

§ BS 1501-6 : (1958), 'Steels for use in the chemical, petroleum and allied industries'.

## 2.2 BOLTING MATERIALS

All bolting material shall comply with BS 1750\*.

For pressures and temperatures higher than 19 bar† and 260°C, bolts shall be of alloy steel in conformity with Part 1 of the above standard, and nuts shall be of carbon

or alloy steel in conformity with Part 2 thereof.

For pressures and temperatures up to and including 19 bar† and 260°C, carbon steel bolts and nuts complying with Part 3 of the above standard may be used.

## 3. DIMENSIONS

### 3.1 SIZES OF FLANGES

Pipe flanges of the following nominal sizes are specified:  
 $\frac{3}{4}$  1 1 $\frac{1}{4}$  1 $\frac{1}{2}$  2 2 $\frac{1}{2}$  3 3 $\frac{1}{2}$  4 5 6 8 10 12 14 16 18  
 20 and 24 inches.

NOTE. The 3 $\frac{1}{4}$  in size is not specified for Classes 900, 1500 and 2500.

Sizes over 12 in are not specified for Class 2500.

The use of sizes 1 $\frac{1}{4}$ , 2 $\frac{1}{2}$ , 3 $\frac{1}{2}$  and 5 in should be avoided where possible.

### 3.2 FLANGE DIMENSIONS

The dimensions of flanges of the various types and pressure classes included in this standard, other than the flange facing dimensions referred to in 3.3, shall be as specified in Tables 11, 13, 15, 17, 19, 21 and 23.

### 3.3 FACING DIMENSIONS FOR OTHER THAN LAPPED-TYPE JOINTS

This standard applies to flange facings of the 1.6 mm and 6.4 mm high raised types, the large and small male/female and large and small tongue/groove types and the ring-joint type. (See Fig. 1.) The 1.6 mm high raised facing is the regular type of facing for flanges of Classes 150 and 300, and the 6.4 mm high raised facing is the regular type of facing for flanges of Classes 400, 600, 900, 1500 and 2500.

When ordering flanges to this standard, the purchaser shall specify the type of facing to be provided.

Flange facings shall be machine finished overall and shall comply with the following requirements.

**3.3.1 Raised facings.** Raised facings shall be machined to the outside diameters listed in Table 2.

Gasket contact surfaces shall be finished as follows:

(1) *For nominal sizes 12 in and smaller.* A continuous spiral groove generated by a 1.6 mm radius round-nosed tool at a feed of approximately 0.8 mm per revolution.

(2) *For nominal sizes above 12 in.* A continuous spiral groove generated by a 3.2 mm radius round-nosed tool at a feed of approximately 1.2 mm per revolution.

If another type of finish is required this shall be specified by the purchaser in his order.

**3.3.2 Male/female and tongue/groove facings.** The dimensions of large and small male/female and large and small tongue/groove facings shall be as given in Table 2.

All contact surfaces shall be finished smooth, except that large male facings may, as an alternative, be finished as described in 3.3.1.

Female and groove facings may be full-faced at the option of the manufacturer unless otherwise specified by the purchaser. (See Table 2, Note 4.)

**3.3.3 Ring-joint facings.** The dimensions of ring-joint facings shall be as given in Tables 3 to 9. Dimensions of ring-joint gaskets, correlated by ring numbers, shall be as given in Table 10.

Ring grooves shall be machined true and concentric with the flanges. They shall be finished smooth and shall be free from ridges and chatter marks.

\* BS 1750, 'Bolting for the petroleum industry'.

† 1 bar = 10<sup>5</sup> N/m<sup>2</sup>.

Ring-joint facings may be full-faced at the option of the manufacturer unless otherwise specified by the purchaser. (See the relevant Note in Tables 3 to 9.)

**3.3.4 Minimum flange thickness.** In no case, regardless of the type of facing and the tolerances permitted, shall the minimum thickness of a flange, as specified in this standard, be reduced at any point in order to provide adequate height for the facing or adequate depth for the groove, except for Classes 150 and 300 flanges with 1.6 mm raised facings, in which case this 1.6 mm shall be included in the specified minimum thickness of the flanges.

**3.3.5** When a steel flange is required for bolting to a cast iron flange, the steel flange shall be plain (flat) faced. The thickness of such a flange shall be equal to the minimum thickness specified in the appropriate table or, if a 1.6 mm raised face has to be removed to obtain the plain (flat) face, equal to the minimum thickness specified less 1.6 mm.

NOTE. Where a 1.6 mm raised face has to be removed to obtain a plain (flat) face, the length through the hub of a flange will be non-standard.

### 3.4 FACING DIMENSIONS FOR LAPPED-TYPE JOINTS

Facings for lapped joints shall be one of the following types as specified by the purchaser (see Fig. 2):

- (1) Raised face.
- (2) Large male/female.
- (3) Large or small tongue/groove.
- (4) Ring-joint.

The facings shall comply with the requirements of 3.3. The dimension *t*, as indicated in Fig. 2, shall be not less than the minimum thickness of the barrel of the stub-end, except that in the case of a large male facing the dimension *t* shall be not less than 6.4 mm.

For details of the stub-ends required where lapped joints are used, reference should be made to BS 1640\*.

### 3.5 TOLERANCES ON FLANGE FACINGS

The tolerance on the inside and outside diameters of all facings other than the ring-joint type is  $\pm 0.4$  mm.

The tolerances on ring-joint facings are given in Tables 3 to 9.

### 3.6 FLANGE BOLTING

For each class and size of flange included in this standard, the number of bolts, their size and the bolt circle diameter shall be as given in Tables 12, 14, 16, 18, 20, 22 and 24.

Bolt holes shall be evenly pitched around the bolt circle, and where flanges constitute the end connections of fabricated fittings, pipe bends, or the permanent connections of other pieces of equipment, the holes shall be pitched evenly off the centre lines.

All bolt holes shall be drilled 3.2 mm ( $\frac{1}{8}$  in) larger in diameter than the nominal size of the respective bolts.

\* BS 1640, 'Steel butt-welding pipe fittings for the petroleum industry'.

### 3.7 SPOT-FACING AND BACK-FACING OF FLANGES

All cast and forged steel flanges need not be spot-faced or back-faced, provided the bearing surfaces for the nuts are parallel to the flange face within 1°. Any back-facing or spot-facing required to accomplish this shall not reduce the flange thickness to less than the minimum specified in this standard. The finished thickness may exceed the specified minimum by not more than 3.2 mm for any flange up to and including 18 in nominal size and by not more than 4.8 mm for any flange above 18 in nominal size.

The diameter of a spot-facing shall be not less than the dimension across the corners of the appropriate nut plus 3.2 mm. When a spot-facing cuts into the fillet of a flange its diameter shall not exceed the dimension across the corners of the nut by more than 4.8 mm.

When a flange is back-faced, the fillet may be reduced but shall not be eliminated entirely. A sharp corner at the junction of a flange and its hub shall not be permitted.

### 3.8 SCREWED FLANGES

Screwed flanges shall have dimensions in accordance with Tables 11, 13, 15, 17, 19, 21 and 23. The threads of screwed flanges shall conform to API Std. 5B\* or ANSI B2.1†. Threads shall extend to the flange face in order to provide for the length of pipe thread specified in Appendix D. Threads shall be concentric with the axis of the flange. Variations in alignment shall not exceed 5 mm/m.

The hubs of the flanges shall be cylindrical or, alternatively, shall have a draft of not more than 7° on the outside surface for forging purposes.

Class 150 flanges shall be made without a counterbore, but to ensure easy entrance when making a joint and to protect the threads, the latter shall be chamfered, at the back of the flange, to an angle of approximately 45°. The chamfer shall be concentric with the thread, shall have a major diameter approximately equal to the major diameter of the thread, and shall be included in the measurement of the thread length.

Class 300, 400, 600, 900, 1500 and 2500 flanges shall be provided with a counterbore as indicated in the tables, and to ensure easy entrance when making a joint, the thread shall be chamfered to an angle of approximately 45° at the bottom of the counterbore. The chamfer shall be concentric with the thread and shall have a major diameter equal to that of the counterbore.

For reducing screwed flanges see 3.11.

The following are the tolerances on screwed flanges:

#### (1) On the counterbore diameter (dimension *Q*)

|                                 |                 |
|---------------------------------|-----------------|
| Nominal sizes 10 in and smaller | + 0.8 mm<br>— 0 |
| Nominal sizes 12 in and larger  | + 1.6 mm<br>— 0 |

#### (2) On the flange thickness (dimension *C*)

|                                 |                 |
|---------------------------------|-----------------|
| Nominal sizes 18 in and smaller | + 3.2 mm<br>— 0 |
| Nominal sizes 20 in and larger  | + 4.8 mm<br>— 0 |

\* American Petroleum Institute Standards 5B, 'Threading, gauging and thread inspection of casing, tubing and line pipe threads', (obtainable through BSI).

† ANSI B2.1, 'Pipe threads (except Dryseal)' (obtainable through BSI).

### 3.9 SLIP ON WELDING, SOCKET-WELDING AND LAPPED-TYPE FLANGES

Slip-on welding, socket-welding and lapped-type flanges shall have dimensions in accordance with Tables 11, 13, 15, 17, 19, 21 and 23.

The hubs of the flanges shall be cylindrical or, alternatively, shall have a draft of not more than 7° on the outside surface for forging purposes.

The following are the tolerances on slip-on welding, socket-welding and lapped-type flanges:

#### (1) On the flange bore and socket diameter (dimension *B*)

|                                 |                 |
|---------------------------------|-----------------|
| Nominal sizes 10 in and smaller | + 0.8 mm<br>— 0 |
| Nominal sizes 12 in and larger  | + 1.6 mm<br>— 0 |

#### (2) On the flange thickness (dimension *C*)

|                                 |                 |
|---------------------------------|-----------------|
| Nominal sizes 18 in and smaller | + 3.2 mm<br>— 0 |
| Nominal sizes 20 in and larger  | + 4.8 mm<br>— 0 |

Stub-ends for use with lapped-type flanges are specified in BS 1640\*, to which reference should be made.

### 3.10 WELDING-NECK FLANGES

Welding-neck flanges shall have dimensions in accordance with Tables 11, 13, 15, 17, 19, 21 and 23.

The welding ends of the hubs shall conform to the contours given in Fig. 3 and shall be cylindrical or, alternatively, shall have a draft of not more than 7° on the outside surface for forging purposes.

The following are the tolerances on welding-neck flanges:

#### (1) On the flange bore (dimension *B*)

|                                        |                      |
|----------------------------------------|----------------------|
| Nominal sizes 10 in and smaller        | ± 0.8 mm             |
| Nominal sizes 12 in to 18 in inclusive | ± 1.6 mm             |
| Nominal sizes 20 in and larger         | + 3.2 mm<br>— 1.6 mm |

#### (2) On the flange thickness (dimension *C*)

|                                 |                 |
|---------------------------------|-----------------|
| Nominal sizes 18 in and smaller | + 3.2 mm<br>— 0 |
| Nominal sizes 20 in and larger  | + 4.8 mm<br>— 0 |

#### (3) On the outside diameter of the welding end of the hub (dimension *A*)

|                                |                      |
|--------------------------------|----------------------|
| Nominal sizes 5 in and smaller | + 2.4 mm<br>— 0.8 mm |
| Nominal sizes 6 in and larger  | + 4.0 mm<br>— 0.8 mm |

#### (4) On the overall length through the hub (dimension *Y*)

|                                 |          |
|---------------------------------|----------|
| Nominal sizes 10 in and smaller | ± 1.6 mm |
| Nominal sizes 12 in and larger  | ± 3.2 mm |

Regardless of the tolerances specified under (1) and (3) above, the thickness of the welding end of a hub shall be not less than 87½ % of the nominal thickness of the pipe to which the flange is to be attached.

\* BS 1640, 'Steel butt-welding pipe fittings for the petroleum industry'.

**3.11 CONCENTRIC REDUCING SCREWED FLANGES**

A concentric reducing screwed flange shall be designated by the nominal size of the reduced bore, the outside diameter of the flange and the pressure class, e.g. 2 in  $\times$  318 mm—Class 300.

The facing and flange dimensions and the bolting of such a flange shall be the same as those applicable to a normal standard flange of the same outside diameter and pressure class.

The minimum effective thread length ( $T$  in Table 1) shall be at least equal to that of a normal standard flange of the same bore and pressure class, but the thread need not necessarily extend to the face of the flange as is required for a standard flange.

The hub dimensions shall be the same as those of a normal standard flange of the next size smaller in outside diameter in the same pressure class.

A hub need not be supplied where the reduced bore is small relative to the outside diameter of the flange, and Table 1 gives for each nominal size of standard flange the smallest nominal size of reduced bore for which a hub is required. Where reduced bores smaller than those given in Table 1 are required, blank (blind) flanges, with or without hub and suitably tapped, may be used.

Class 150 reducing screwed flanges need not be counter-bored but shall be chamfered as provided for in 3.8. Classes 300 and higher flanges, whether of the hub type or blank (blind) type, shall be counterbored as specified in 3.8 for corresponding normal standard flanges, except that the depth of counterbore shall be 6.4 mm for a tapping of 2 in nominal size or smaller and 9.5 mm for a tapping of  $2\frac{1}{2}$  in nominal size or larger. The tolerances applicable to normal standard flanges apply also to the reducing flanges.

**3.12 CONCENTRIC REDUCING SLIP-ON WELDING AND SOCKET-WELDING FLANGES**

A concentric reducing slip-on welding flange or a concentric reducing socket-welding flange shall be designated by the nominal size of the reduced bore, the outside diameter of the flange and the pressure class.

The facing and flange dimensions and the bolting of a

flange of either of these types shall be the same as those of a normal standard flange of the same outside diameter and pressure class. The hub dimensions shall be the same as those applicable to a normal standard flange of the next size smaller in outside diameter in the same pressure class. The dimensions of the reduced bore shall correspond in all respects with those of a normal standard flange of the same bore and pressure class.

The tolerances applicable to normal standard flanges also apply to the reducing flanges referred to in this clause.

**3.13 CONCENTRIC REDUCING WELDING-NECK FLANGES**

A concentric reducing welding-neck flange shall be designated by the nominal size of the reduced bore, the outside diameter of the flange and the pressure class.

The facing and flange dimensions and the bolting of such a flange shall be the same as those of a normal standard flange of the same outside diameter and pressure class. The hub dimensions and bore shall correspond in all respects with those applicable to a normal standard welding-neck flange of the same (reduced) bore and pressure class.

The tolerances applicable to normal standard welding-neck flanges also apply to the reducing flanges referred to in this clause.

**3.14 BLANK (BLIND) FLANGES**

Blank flanges shall have dimensions in accordance with Tables 11, 13, 15, 17, 19, 21 and 23. They may be supplied with or without hubs at the manufacturers' option.

When the centre part of the face of a blank flange is recessed, at no point shall the recess reduce the thickness of the flange below the minimum given in Tables 11, 13, 15, 17, 19, 21, and 23. The bottom of the recess need not be machined.

When the centre part of the face of a blank flange is raised, the raised part shall have a diameter at least 25 mm smaller than the diameter specified for the recess in Tables 11, 13, 15, 17, 19, 21, and 23. The raised part need not be machined.

**4. TESTS****4.1 TESTING**

This standard does not make provision for the pressure testing of loose flanges. These may be tested after attachment to pipe or equipment. The test pressure will then

depend on the requirements of the appropriate standard or code to which the equipment has been fabricated.

Test pressures for integral flanges, for example end flanges of valves, shall be in accordance with those specified in the relevant British Standard.

**5. INSPECTION****5.1 INSPECTION**

The purchaser or his representative shall have free access, at all reasonable times, to those parts of the manufacturer's works actually engaged upon his contract and shall be at liberty to inspect, at any stage of manufacture, the materials covered by such contract. He shall be at liberty to reject any material which does not comply with the requirements of this standard.

When the purchaser or his representative desires to witness the specified tests on the materials covered by his contract, the manufacturer shall notify him sufficiently in advance of the tests to enable him to be present.

**5.2 REPAIR OF DEFECTS**

Defects which do not impair the strength of the flanges may be welded by a procedure approved by the purchaser. They shall be cleaned out to sound metal before welding, and shall be submitted to the purchaser's inspector for approval in this condition, after which they may be welded if the purchaser so agrees. After welding, flanges shall be heat-treated, except that welds required only for finish and appearance need not be heat-treated, when this is approved by the purchaser. When the welding of defects is permitted, the welding rod shall be such as to produce a weld having characteristics similar to the parent metal.

BS 1560 : Part 2 : 1970

## 6. MARKING

### 6.1 MARKING

Each steel flange produced in conformity with this

standard shall be marked in accordance with the requirements of Appendix B.

## 7. PREPARATION AND DESPATCH

### 7.1 PREPARATION

After inspection, and before despatch, flanges shall if necessary, be dried and cleaned. Painting of finished flanges shall be optional to the manufacturer, unless otherwise specified by the purchaser.

Threaded and machined surfaces shall be well covered with an approved rust-inhibiting composition.

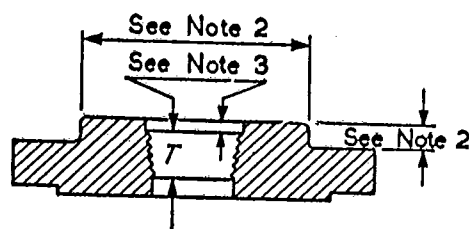
Exposed faces of flanges shall be protected over their entire surface with a suitable close-fitting protector securely attached at not less than 4 points. The type of protector

and method of attachment shall be approved by the purchaser.

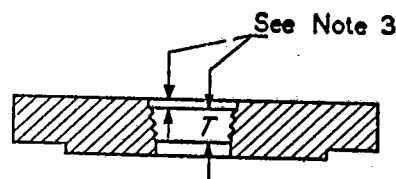
### 7.2 DESPATCH

Flanges shall be bundled by bolting them together or securing them with wire of suitable strength passed through the bolt holes in such a manner that the flanges are paired and no flange facings remain exposed.

Other methods of preparation for despatch shall be subject to agreement between the purchaser and the manufacturer.



Hub type flange

Blank (blind) flange  
(Screwed as allowed by Note 2)TABLE 1. REDUCING SCREWED FLANGES,  
CLASSES 150 TO 2500

| Nominal pipe size appropriate to the diameter of the flange | Smallest nominal size of reduced bore requiring hub (see Note 2) |
|-------------------------------------------------------------|------------------------------------------------------------------|
| in                                                          | in                                                               |
| 1                                                           | $\frac{3}{4}$                                                    |
| * $1\frac{1}{4}$                                            | $\frac{3}{4}$                                                    |
| $1\frac{1}{2}$                                              | $\frac{3}{4}$                                                    |
| 2                                                           | 1                                                                |
| * $2\frac{1}{2}$                                            | $1\frac{1}{4}$                                                   |
| 3                                                           | $1\frac{1}{4}$                                                   |
| * $3\frac{1}{2}$                                            | $1\frac{1}{2}$                                                   |
| 4                                                           | $1\frac{1}{2}$                                                   |
| *5                                                          | $1\frac{1}{2}$                                                   |
| 6                                                           | $2\frac{1}{4}$                                                   |
| 8                                                           | 3                                                                |
| 10                                                          | $3\frac{1}{4}$                                                   |
| 12                                                          | $3\frac{1}{2}$                                                   |
| 14                                                          | $3\frac{1}{2}$                                                   |
| 16                                                          | 4                                                                |
| 18                                                          | 4                                                                |
| 20                                                          | 4                                                                |
| 24                                                          | 4                                                                |

NOTE 1. This table shall be read in conjunction with 3.11.

NOTE 2. A hub is required if the nominal size of the reduced bore is equal to or greater than the size given in the above table against the nominal pipe size appropriate to the outside diameter of the flange. Otherwise a blank (blind) flange suitably tapped may be used.

The nominal pipe size appropriate to a flange of a given outside diameter and pressure class may be found by reference to the table of standard flanges of the same pressure class. (See Tables 11, 13, 15, 17, 19, 21 and 23.)

Hub dimensions shall conform to the provisions of 3.11.

NOTE 3. The threading and counterbore, etc., shall conform to the provisions of 3.8 and 3.11.

\* The use of these sizes should be avoided.

BS 1560 : Part 2 : 1970

TABLE 2. FACING DIMENSIONS FOR FLANGES OTHER THAN RING-JOINT, CLASSES 150 TO 2500  
(See Notes 1 and 2)

| 1                       | 2                                                                          | 3             | 4               | 5                                                                        | 6                                                         | 7               | 8               | 9                                                                        | 10                                           | 11                                                                                                                          | 12                                 | 13                                                            | 14                                                           |
|-------------------------|----------------------------------------------------------------------------|---------------|-----------------|--------------------------------------------------------------------------|-----------------------------------------------------------|-----------------|-----------------|--------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|
| Nominal<br>pipe<br>size | Outside diameter<br>(see Note 3)                                           |               |                 | Inside<br>diameter<br>of large<br>and small<br>tongue<br>(see Note<br>3) | Outside diameter of recess<br>or groove (see Note 3)      |                 |                 | Inside<br>diameter<br>of large<br>and small<br>groove<br>(see Note<br>3) | Height                                       |                                                                                                                             | Depth of<br>female<br>or<br>groove | Minimum outside<br>diameter of raised<br>portion (see Note 4) |                                                              |
|                         | Raised<br>face,<br>large<br>male and<br>large<br>tongue<br>(see Note<br>5) | Small<br>male | Small<br>tongue |                                                                          | Large<br>female<br>and large<br>groove<br>(see Note<br>5) | Small<br>female | Small<br>groove |                                                                          | Raised<br>face,<br>Classes<br>150 and<br>300 | Raised<br>face,<br>Classes<br>400 to<br>2500<br>Large<br>and small<br>male and<br>tongue,<br>all classes<br>(see Note<br>5) |                                    | Small<br>female<br>and<br>small<br>groove                     | Large<br>female<br>and<br>large<br>groove<br>(see Note<br>5) |
|                         | R                                                                          | S             | T               |                                                                          | W                                                         | X               | Y               |                                                                          | Z                                            |                                                                                                                             |                                    | K                                                             | L                                                            |
| In                      | mm                                                                         | mm            | mm              | mm                                                                       | mm                                                        | mm              | mm              | mm                                                                       | mm                                           | mm                                                                                                                          | mm                                 | mm                                                            | mm                                                           |
| 1/2                     | 35                                                                         | 18.3          | 34.9            | 25.4                                                                     | 36.5                                                      | 19.8            | 36.5            | 23.8                                                                     | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 45.0                                                          | 46.0                                                         |
| 3/4                     | 43                                                                         | 23.8          | 42.9            | 33.3                                                                     | 44.4                                                      | 25.4            | 44.4            | 31.7                                                                     | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 52.0                                                          | 54.0                                                         |
| 1                       | 51                                                                         | 30.2          | 47.6            | 38.1                                                                     | 52.4                                                      | 31.7            | 49.2            | 36.5                                                                     | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 57.0                                                          | 62.0                                                         |
| *1 1/4                  | 64                                                                         | 38.1          | 57.1            | 47.6                                                                     | 65.1                                                      | 39.7            | 58.7            | 46.0                                                                     | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 67.0                                                          | 75.0                                                         |
| 1 1/2                   | 73                                                                         | 44.4          | 63.5            | 54.0                                                                     | 74.6                                                      | 46.0            | 65.1            | 52.4                                                                     | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 73.0                                                          | 84.0                                                         |
| 2                       | 92                                                                         | 57.1          | 82.5            | 73.0                                                                     | 93.7                                                      | 58.7            | 84.1            | 71.4                                                                     | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 92.0                                                          | 103.0                                                        |
| *2 1/2                  | 105                                                                        | 68.3          | 95.2            | 85.7                                                                     | 106.4                                                     | 69.8            | 96.8            | 84.1                                                                     | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 105.0                                                         | 116.0                                                        |
| 3                       | 127                                                                        | 84.1          | 117.5           | 107.9                                                                    | 128.6                                                     | 85.7            | 119.1           | 106.4                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 127.0                                                         | 138.0                                                        |
| *3 1/2                  | 140                                                                        | 96.8          | 130.2           | 120.6                                                                    | 141.3                                                     | 98.4            | 131.8           | 119.1                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 140.0                                                         | 151.0                                                        |
| 4                       | 157                                                                        | 109.5         | 144.5           | 131.8                                                                    | 158.8                                                     | 111.1           | 146.0           | 130.2                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 157.0                                                         | 168.0                                                        |
| *5                      | 186                                                                        | 136.5         | 173.0           | 160.3                                                                    | 187.3                                                     | 138.1           | 174.6           | 158.7                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 186.0                                                         | 197.0                                                        |
| 6                       | 216                                                                        | 161.9         | 203.2           | 190.5                                                                    | 217.5                                                     | 163.5           | 204.8           | 188.9                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 216.0                                                         | 227.0                                                        |
| 8                       | 270                                                                        | 212.7         | 254.0           | 238.1                                                                    | 271.5                                                     | 214.3           | 255.6           | 236.5                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 270.0                                                         | 281.0                                                        |
| 10                      | 324                                                                        | 266.7         | 304.8           | 285.7                                                                    | 325.4                                                     | 268.3           | 306.4           | 284.1                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 324.0                                                         | 335.0                                                        |
| 12                      | 381                                                                        | 317.5         | 361.9           | 342.9                                                                    | 382.6                                                     | 319.1           | 363.5           | 341.3                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 381.0                                                         | 392.0                                                        |
| 14                      | 413                                                                        | 349.2         | 393.7           | 374.6                                                                    | 414.3                                                     | 350.8           | 395.3           | 373.1                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 413.0                                                         | 424.0                                                        |
| 16                      | 470                                                                        | 400.0         | 447.7           | 425.4                                                                    | 471.5                                                     | 401.6           | 449.2           | 423.9                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 470.0                                                         | 481.0                                                        |
| 18                      | 533                                                                        | 450.8         | 511.2           | 488.9                                                                    | 535.0                                                     | 452.4           | 512.8           | 487.4                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 533.0                                                         | 545.0                                                        |
| 20                      | 584                                                                        | 501.6         | 558.8           | 533.4                                                                    | 585.8                                                     | 503.2           | 560.4           | 531.8                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 584.0                                                         | 595.0                                                        |
| 24                      | 692                                                                        | 603.2         | 666.8           | 641.3                                                                    | 693.7                                                     | 604.8           | 668.3           | 639.8                                                                    | 1.6                                          | 6.4                                                                                                                         | 4.8                                | 692.0                                                         | 703.0                                                        |

NOTE 1. This table shall be read in conjunction with 3.3, 3.4 and 3.5, and Figs. 1 and 2.

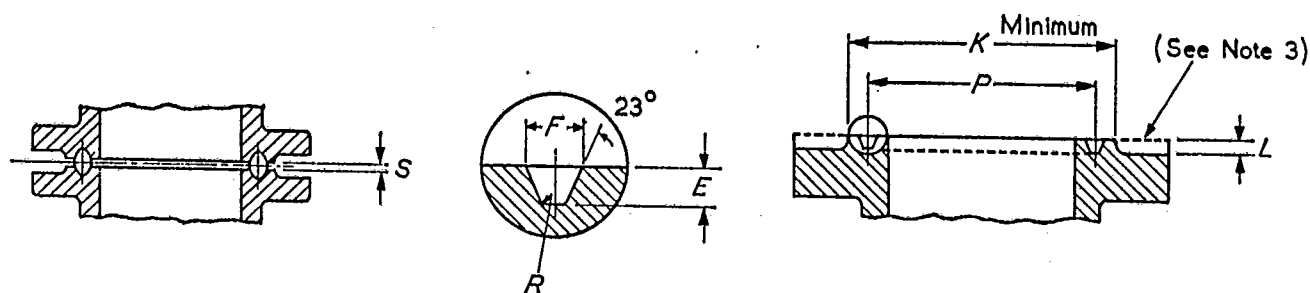
NOTE 2. For ring-joint facing dimensions see Tables 3 to 9.

NOTE 3. For tolerances see 3.5.

NOTE 4. A flange with a large or small female or a large or small groove facing may be supplied with the outside diameter of the raised portion to dimensions K or L in Column 13 or 14 above as appropriate, or full faced, i.e. with the raised portion extending to the full diameter of the flange, at the option of the manufacturer, unless otherwise specified by the purchaser.

NOTE 5. Large male and female faces are not applicable to Class 150 because of potential dimensional conflicts.

\* The use of these sizes should be avoided.



## TOLERANCES

On  $E$  (Depth)  $+ 0.4$  mm  
 $- 0$   
 On  $F$  (Width)  $\pm 0.2$  mm  
 On  $P$  (Pitch dia.)  $\pm 0.13$  mm  
 On  $R$  (Radius at bottom) max.  
 On  $23^\circ$  (Angle)  $\pm \frac{1}{4}^\circ$

TABLE 3. DIMENSIONS OF RING-JOINT FACINGS, CLASS 150  
 (See Note 1)

| 1                 | 2                               | 3                      | 4                                                                                  | 5                                                 | 6                                 | 7                             | 8                                                                                    |
|-------------------|---------------------------------|------------------------|------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|-------------------------------|--------------------------------------------------------------------------------------|
| Nominal pipe size | Pitch diameter of groove<br>$P$ | Width of groove<br>$F$ | Depth of groove $E$<br>Height of raised portion $L$<br>(see Note 4)<br>$E$ and $L$ | Diameter of raised portion<br>(see Note 3)<br>$K$ | Radius at bottom of groove<br>$R$ | Ring number<br>(see Table 10) | Approximate distance between flanges when ring is compressed.<br>(see Note 2)<br>$S$ |
| in                | mm                              | mm                     | mm                                                                                 | mm                                                | mm                                |                               | mm                                                                                   |
| 1                 | 47.6                            | 8.7                    | 6.4                                                                                | 63.5                                              | 1.0                               | R.15                          | 4.0                                                                                  |
| *1½               | 57.2                            | 8.7                    | 6.4                                                                                | 73.0                                              | 1.0                               | R.17                          | 4.0                                                                                  |
| 1½                | 65.1                            | 8.7                    | 6.4                                                                                | 82.6                                              | 1.0                               | R.19                          | 4.0                                                                                  |
| 2                 | 82.6                            | 8.7                    | 6.4                                                                                | 101.6                                             | 1.0                               | R.22                          | 4.0                                                                                  |
| *2½               | 101.6                           | 8.7                    | 6.4                                                                                | 120.6                                             | 1.0                               | R.25                          | 4.0                                                                                  |
| 3                 | 114.3                           | 8.7                    | 6.4                                                                                | 133.4                                             | 1.0                               | R.29                          | 4.0                                                                                  |
| *3½               | 131.8                           | 8.7                    | 6.4                                                                                | 154.0                                             | 1.0                               | R.33                          | 4.0                                                                                  |
| 4                 | 149.2                           | 8.7                    | 6.4                                                                                | 171.4                                             | 1.0                               | R.36                          | 4.0                                                                                  |
| *5                | 171.4                           | 8.7                    | 6.4                                                                                | 193.7                                             | 1.0                               | R.40                          | 4.0                                                                                  |
| 6                 | 193.7                           | 8.7                    | 6.4                                                                                | 219.1                                             | 1.0                               | R.43                          | 4.0                                                                                  |
| 8                 | 247.6                           | 8.7                    | 6.4                                                                                | 273.0                                             | 1.0                               | R.48                          | 4.0                                                                                  |
| 10                | 304.8                           | 8.7                    | 6.4                                                                                | 330.2                                             | 1.0                               | R.52                          | 4.0                                                                                  |
| 12                | 381.0                           | 8.7                    | 6.4                                                                                | 406.4                                             | 1.0                               | R.56                          | 4.0                                                                                  |
| 14                | 396.9                           | 8.7                    | 6.4                                                                                | 425.4                                             | 1.0                               | R.59                          | 3.0                                                                                  |
| 16                | 454.0                           | 8.7                    | 6.4                                                                                | 482.6                                             | 1.0                               | R.64                          | 3.0                                                                                  |
| 18                | 517.5                           | 8.7                    | 6.4                                                                                | 546.1                                             | 1.0                               | R.68                          | 3.0                                                                                  |
| 20                | 558.8                           | 8.7                    | 6.4                                                                                | 596.9                                             | 1.0                               | R.72                          | 3.0                                                                                  |
| 24                | 673.1                           | 8.7                    | 6.4                                                                                | 711.2                                             | 1.0                               | R.76                          | 3.0                                                                                  |

NOTE 1. This table shall be read in conjunction with 3.3 and 3.4, and Figs. 1 and 2.

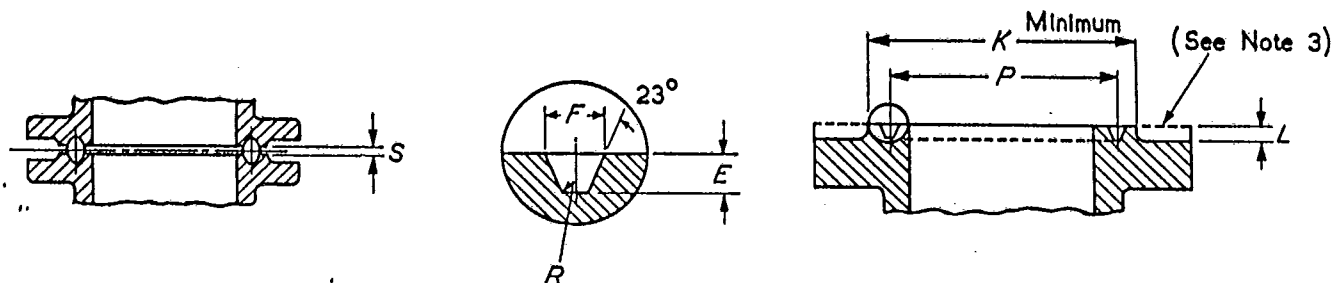
NOTE 2. When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

NOTE 3. Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

NOTE 4. Height  $L$  is equal to depth  $E$  but not subject to the tolerance on  $E$ .

\* The use of these sizes should be avoided.

BS 1560 : Part 2 : 1970



## TOLERANCES

On  $E$  (Depth)  $+ 0.4$  mm  
 $- 0$   
 On  $F$  (Width)  $\pm 0.2$  mm  
 On  $P$  (Pitch dia.)  $\pm 0.13$  mm  
 On  $R$  (Radius at bottom) max.  
 On  $23^\circ$  (Angle)  $\pm \frac{1}{2}^\circ$

TABLE 4. DIMENSIONS OF RING-JOINT FACINGS, CLASS 300  
 (See Note 1)

| 1                 | 2                               | 3                      | 4                                                                                  | 5                                                 | 6                                 | 7                                        | 8                                                                                   |
|-------------------|---------------------------------|------------------------|------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|------------------------------------------|-------------------------------------------------------------------------------------|
| Nominal pipe size | Pitch diameter of groove<br>$P$ | Width of groove<br>$F$ | Depth of groove $E$<br>Height of raised portion $L$<br>(see Note 4)<br>$E$ and $L$ | Diameter of raised portion<br>(see Note 3)<br>$K$ | Radius at bottom of groove<br>$R$ | Ring number<br>(see Note 5 and Table 10) | Approximate distance between flanges when ring is compressed<br>(see Note 2)<br>$S$ |
| in                | mm                              | mm                     | mm                                                                                 | mm                                                | mm                                |                                          | mm                                                                                  |
| $\frac{1}{2}$     | 34.1                            | 7.1                    | 5.6                                                                                | 50.8                                              | 1.0                               | R.11                                     | 3.2                                                                                 |
| $\frac{3}{4}$     | 42.9                            | 8.7                    | 6.4                                                                                | 63.5                                              | 1.0                               | R.13                                     | 4.0                                                                                 |
| 1                 | 50.8                            | 8.7                    | 6.4                                                                                | 69.8                                              | 1.0                               | R.16                                     | 4.0                                                                                 |
| * $1\frac{1}{4}$  | 60.3                            | 8.7                    | 6.4                                                                                | 79.4                                              | 1.0                               | R.18                                     | 4.0                                                                                 |
| $1\frac{1}{2}$    | 68.3                            | 8.7                    | 6.4                                                                                | 90.5                                              | 1.0                               | R.20                                     | 4.0                                                                                 |
| 2                 | 82.6                            | 11.9                   | 7.9                                                                                | 108.0                                             | 1.0                               | R.23                                     | 5.6                                                                                 |
| * $2\frac{1}{2}$  | 101.6                           | 11.9                   | 7.9                                                                                | 127.0                                             | 1.0                               | R.26                                     | 5.6                                                                                 |
| 3                 | 123.8†                          | 11.9                   | 7.9                                                                                | 146.0                                             | 1.0                               | R.31†                                    | 5.6                                                                                 |
| * $3\frac{1}{2}$  | 131.8                           | 11.9                   | 7.9                                                                                | 158.8                                             | 1.0                               | R.34                                     | 5.6                                                                                 |
| 4                 | 149.2                           | 11.9                   | 7.9                                                                                | 174.6                                             | 1.0                               | R.37                                     | 5.6                                                                                 |
| *5                | 181.0                           | 11.9                   | 7.9                                                                                | 209.6                                             | 1.0                               | R.41                                     | 5.6                                                                                 |
| 6                 | 211.1                           | 11.9                   | 7.9                                                                                | 241.3                                             | 1.0                               | R.45                                     | 5.6                                                                                 |
| 8                 | 269.9                           | 11.9                   | 7.9                                                                                | 301.6                                             | 1.0                               | R.49                                     | 5.6                                                                                 |
| 10                | 323.8                           | 11.9                   | 7.9                                                                                | 355.6                                             | 1.0                               | R.53                                     | 5.6                                                                                 |
| 12                | 381.0                           | 11.9                   | 7.9                                                                                | 412.8                                             | 1.0                               | R.57                                     | 5.6                                                                                 |
| 14                | 419.1                           | 11.9                   | 7.9                                                                                | 457.2                                             | 1.0                               | R.61                                     | 5.6                                                                                 |
| 16                | 469.9                           | 11.9                   | 7.9                                                                                | 508.0                                             | 1.0                               | R.65                                     | 5.6                                                                                 |
| 18                | 533.4                           | 11.9                   | 7.9                                                                                | 574.7                                             | 1.0                               | R.69                                     | 5.6                                                                                 |
| 20                | 584.2                           | 13.5                   | 9.5                                                                                | 635.0                                             | 2.0                               | R.73                                     | 5.6                                                                                 |
| 24                | 692.2                           | 16.7                   | 11.1                                                                               | 749.3                                             | 2.0                               | R.77                                     | 6.3                                                                                 |

NOTE 1. This table shall be read in conjunction with 3.3 and 3.4, and Figs. 1 and 2.

NOTE 2. When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

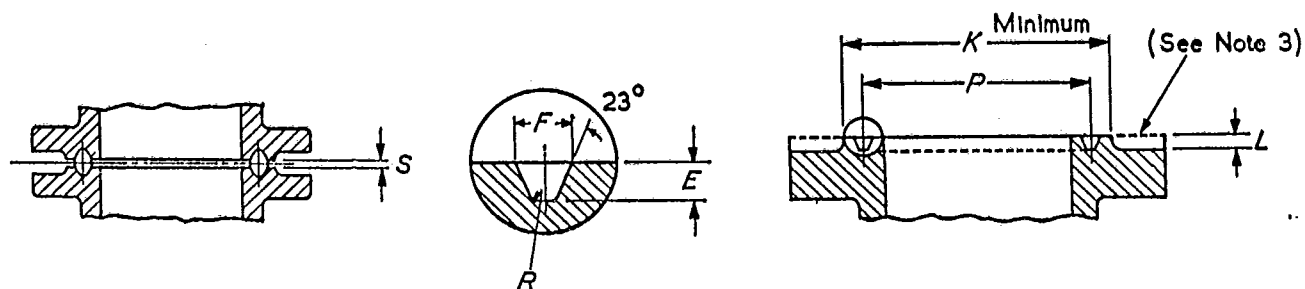
NOTE 3. Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

NOTE 4. Height  $L$  is equal to depth  $E$  but not subject to the tolerance on  $E$ .

NOTE 5. In the 3 in nominal pipe size, for ring-joints with lapped flanges, the pitch diameter of the ring shall be 117.5 mm instead of 123.8 mm and the ring number shall be R.30 instead of R.31.

\* The use of these sizes should be avoided.

† See Note 5.



## TOLERANCES

- On  $E$  (Depth)  $+ 0.4$  mm  
 $- 0$   
 On  $F$  (Width)  $\pm 0.2$  mm  
 On  $P$  (Pitch dia.)  $\pm 0.13$  mm  
 On  $R$  (Radius at bottom) max.  
 On  $23^\circ$  (Angle)  $\pm \frac{1}{4}^\circ$

TABLE 5. DIMENSIONS OF RING-JOINT FACINGS, CLASS 400

(See Note 1)

| 1                                                                                                                            | 2                               | 3                      | 4                                                                                  | 5                                                 | 6                                 | 7                             | 8                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------|------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| Nominal pipe size                                                                                                            | Pitch diameter of groove<br>$P$ | Width of groove<br>$F$ | Depth of groove $E$<br>Height of raised portion $L$<br>(see Note 4)<br>$E$ and $L$ | Diameter of raised portion<br>(see Note 3)<br>$K$ | Radius at bottom of groove<br>$R$ | Ring number<br>(see Table 10) | Approximate distance between flanges when ring is compressed<br>(see Note 2)<br>$S$ |
| in                                                                                                                           | mm                              | mm                     | mm                                                                                 | mm                                                | mm                                |                               | mm                                                                                  |
| $\frac{1}{2}$<br>$\frac{3}{4}$<br>1<br>*1 $\frac{1}{4}$<br>1 $\frac{1}{2}$<br>2<br>*2 $\frac{1}{4}$<br>3<br>*3 $\frac{1}{2}$ |                                 |                        | For these sizes Class 600 flanges are used                                         |                                                   |                                   |                               |                                                                                     |
| 4                                                                                                                            | 149.2                           | 11.9                   | 7.9                                                                                | 174.6                                             | 1.0                               | R.37                          | 5.6                                                                                 |
| *5                                                                                                                           | 181.0                           | 11.9                   | 7.9                                                                                | 209.6                                             | 1.0                               | R.41                          | 5.6                                                                                 |
| 6                                                                                                                            | 211.1                           | 11.9                   | 7.9                                                                                | 241.3                                             | 1.0                               | R.45                          | 5.6                                                                                 |
| 8                                                                                                                            | 269.9                           | 11.9                   | 7.9                                                                                | 301.6                                             | 1.0                               | R.49                          | 5.6                                                                                 |
| 10                                                                                                                           | 323.8                           | 11.9                   | 7.9                                                                                | 355.6                                             | 1.0                               | R.53                          | 5.6                                                                                 |
| 12                                                                                                                           | 381.0                           | 11.9                   | 7.9                                                                                | 412.8                                             | 1.0                               | R.57                          | 5.6                                                                                 |
| 14                                                                                                                           | 419.9                           | 11.9                   | 7.9                                                                                | 457.2                                             | 1.0                               | R.61                          | 5.6                                                                                 |
| 16                                                                                                                           | 469.9                           | 11.9                   | 7.9                                                                                | 508.0                                             | 1.0                               | R.65                          | 5.6                                                                                 |
| 18                                                                                                                           | 533.4                           | 11.9                   | 7.9                                                                                | 574.7                                             | 1.0                               | R.69                          | 5.6                                                                                 |
| 20                                                                                                                           | 584.2                           | 13.5                   | 9.5                                                                                | 635.0                                             | 2.0                               | R.73                          | 5.6                                                                                 |
| 24                                                                                                                           | 692.2                           | 16.7                   | 11.1                                                                               | 749.3                                             | 2.0                               | R.77                          | 6.3                                                                                 |

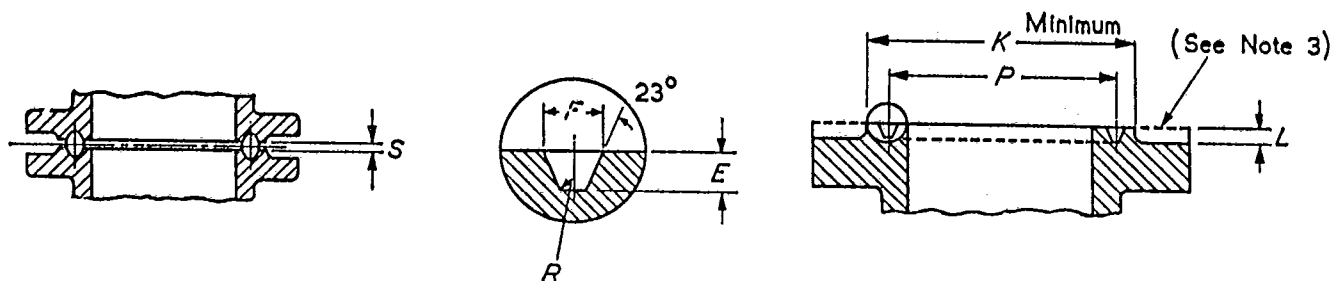
NOTE 1. This table shall be read in conjunction with 3.3 and 3.4, and Figs. 1 and 2.

NOTE 2. When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

NOTE 3. Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

NOTE 4. Height  $L$  is equal to depth  $E$  but not subject to the tolerance on  $E$ .

\* The use of these sizes should be avoided.



## TOLERANCES

- On  $E$  (Depth)  $+0.4$  mm  
 $-0$   
 On  $F$  (Width)  $\pm 0.2$  mm  
 On  $P$  (Pitch dia.)  $\pm 0.13$  mm  
 On  $R$  (Radius at bottom) max.  
 On  $23^\circ$  (Angle)  $\pm \frac{1}{2}^\circ$

TABLE 6. DIMENSIONS OF RING-JOINT FACINGS, CLASS 600  
 (See Note 1)

| 1                 | 2                               | 3                      | 4                                                                                  | 5                                                 | 6                                 | 7                                               | 8                                                                                   |
|-------------------|---------------------------------|------------------------|------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------|
| Nominal pipe size | Pitch diameter of groove<br>$P$ | Width of groove<br>$F$ | Depth of groove $E$<br>Height of raised portion $L$<br>(see Note 4)<br>$E$ and $L$ | Diameter of raised portion<br>(see Note 3)<br>$K$ | Radius at bottom of groove<br>$R$ | Ring number<br>(see Note 5 and Table 10)<br>$R$ | Approximate distance between flanges when ring is compressed<br>(see Note 2)<br>$S$ |
| in                | mm                              | mm                     | mm                                                                                 | mm                                                | mm                                |                                                 | mm                                                                                  |
| $\frac{1}{2}$     | 34.1                            | 7.1                    | 5.6                                                                                | 50.8                                              | 1.0                               | R.11                                            | 3.2                                                                                 |
| $\frac{3}{4}$     | 42.9                            | 8.7                    | 6.4                                                                                | 63.5                                              | 1.0                               | R.13                                            | 4.0                                                                                 |
| 1                 | 50.8                            | 8.7                    | 6.4                                                                                | 69.8                                              | 1.0                               | R.16                                            | 4.0                                                                                 |
| *1 $\frac{1}{4}$  | 60.3                            | 8.7                    | 6.4                                                                                | 79.4                                              | 1.0                               | R.18                                            | 4.0                                                                                 |
| 1 $\frac{1}{2}$   | 68.3                            | 8.7                    | 6.4                                                                                | 90.5                                              | 1.0                               | R.20                                            | 4.0                                                                                 |
| 2                 | 82.6                            | 11.9                   | 7.9                                                                                | 108.0                                             | 1.0                               | R.23                                            | 4.8                                                                                 |
| *2 $\frac{1}{2}$  | 101.6                           | 11.9                   | 7.9                                                                                | 127.0                                             | 1.0                               | R.26                                            | 4.8                                                                                 |
| 3                 | 123.8†                          | 11.9                   | 7.9                                                                                | 146.0                                             | 1.0                               | R.31†                                           | 4.8                                                                                 |
| *3 $\frac{1}{2}$  | 131.8                           | 11.9                   | 7.9                                                                                | 158.8                                             | 1.0                               | R.34                                            | 4.8                                                                                 |
| 4                 | 149.2                           | 11.9                   | 7.9                                                                                | 174.6                                             | 1.0                               | R.37                                            | 4.8                                                                                 |
| *5                | 181.0                           | 11.9                   | 7.9                                                                                | 209.6                                             | 1.0                               | R.41                                            | 4.8                                                                                 |
| 6                 | 211.1                           | 11.9                   | 7.9                                                                                | 241.3                                             | 1.0                               | R.45                                            | 4.8                                                                                 |
| 8                 | 269.9                           | 11.9                   | 7.9                                                                                | 301.6                                             | 1.0                               | R.49                                            | 4.8                                                                                 |
| 10                | 323.8                           | 11.9                   | 7.9                                                                                | 355.6                                             | 1.0                               | R.53                                            | 4.8                                                                                 |
| 12                | 381.0                           | 11.9                   | 7.9                                                                                | 412.8                                             | 1.0                               | R.57                                            | 4.8                                                                                 |
| 14                | 419.1                           | 11.9                   | 7.9                                                                                | 457.2                                             | 1.0                               | R.61                                            | 4.8                                                                                 |
| 16                | 469.9                           | 11.9                   | 7.9                                                                                | 508.0                                             | 1.0                               | R.65                                            | 4.8                                                                                 |
| 18                | 533.4                           | 11.9                   | 7.9                                                                                | 574.7                                             | 1.0                               | R.69                                            | 4.8                                                                                 |
| 20                | 584.2                           | 13.5                   | 9.5                                                                                | 635.0                                             | 2.0                               | R.73                                            | 4.8                                                                                 |
| 24                | 692.2                           | 16.7                   | 11.1                                                                               | 749.3                                             | 2.0                               | R.77                                            | 5.6                                                                                 |

NOTE 1. This table shall be read in conjunction with 3.3 and 3.4, and Figs. 1 and 2.

NOTE 2. When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

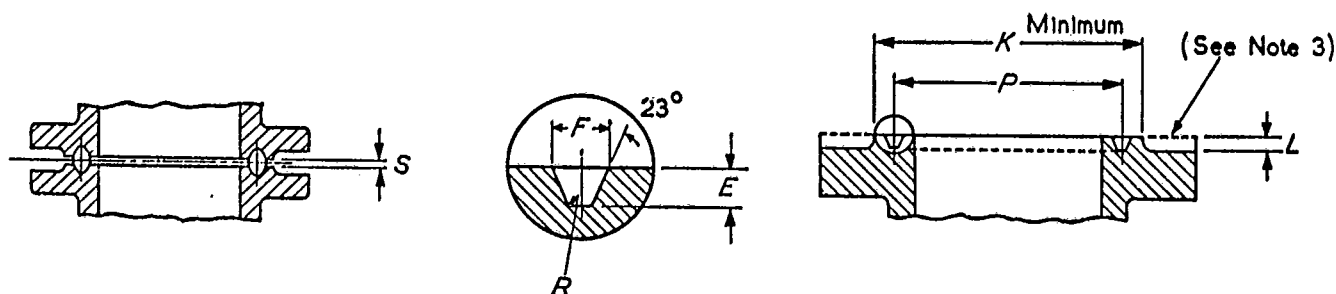
NOTE 3. Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

NOTE 4. Height  $L$  is equal to depth  $E$  but not subject to the tolerance on  $E$ .

NOTE 5. In the 3 in nominal pipe size, for ring-joints with lapped flanges, the pitch diameter of the ring shall be 117.5 mm instead of 123.8 mm and the ring number shall be R.30 instead of R.31.

\*The use of these sizes should be avoided.

† See Note 5.



## TOLERANCES

- On *E* (Depth)  $+ 0.4$  mm  
 $- 0$   
 On *F* (Width)  $\pm 0.2$  mm  
 On *P* (Pitch dia.)  $\pm 0.13$  mm  
 On *R* (Radius at bottom) max.  
 On  $23^\circ$  (Angle)  $\pm \frac{1}{4}^\circ$

TABLE 7. DIMENSIONS OF RING-JOINT FACINGS, CLASS 900

(See Note 1)

| 1                                                                                                  | 2                                    | 3                           | 4                                                                                                      | 5                                                      | 6                                      | 7                             | 8                                                                                        |
|----------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------|-------------------------------|------------------------------------------------------------------------------------------|
| Nominal pipe size                                                                                  | Pitch diameter of groove<br><i>P</i> | Width of groove<br><i>F</i> | Depth of groove <i>E</i><br>Height of raised portion <i>L</i><br>(see Note 4)<br><i>E</i> and <i>L</i> | Diameter of raised portion<br>(see Note 3)<br><i>K</i> | Radius at bottom of groove<br><i>R</i> | Ring number<br>(see Table 10) | Approximate distance between flanges when ring is compressed<br>(see Note 2)<br><i>S</i> |
| in                                                                                                 | mm                                   | mm                          | mm                                                                                                     | mm                                                     | mm                                     |                               | mm                                                                                       |
| $\frac{1}{2}$<br>$\frac{3}{4}$<br>1<br>* $1\frac{1}{4}$<br>$1\frac{1}{2}$<br>2<br>* $2\frac{1}{2}$ |                                      |                             | For these sizes Class 1500 flanges are used                                                            |                                                        |                                        |                               |                                                                                          |
| 3                                                                                                  | 123.8                                | 11.9                        | 7.9                                                                                                    | 155.6                                                  | 1.0                                    | R.31                          | 4.0                                                                                      |
| 4                                                                                                  | 149.2                                | 11.9                        | 7.9                                                                                                    | 181.0                                                  | 1.0                                    | R.37                          | 4.0                                                                                      |
| *5                                                                                                 | 181.0                                | 11.9                        | 7.9                                                                                                    | 215.9                                                  | 1.0                                    | R.41                          | 4.0                                                                                      |
| 6                                                                                                  | 211.1                                | 11.9                        | 7.9                                                                                                    | 241.3                                                  | 1.0                                    | R.45                          | 4.0                                                                                      |
| 8                                                                                                  | 269.9                                | 11.9                        | 7.9                                                                                                    | 308.0                                                  | 1.0                                    | R.49                          | 4.0                                                                                      |
| 10                                                                                                 | 323.8                                | 11.9                        | 7.9                                                                                                    | 362.0                                                  | 1.0                                    | R.53                          | 4.0                                                                                      |
| 12                                                                                                 | 381.0                                | 11.9                        | 7.9                                                                                                    | 419.1                                                  | 1.0                                    | R.57                          | 4.0                                                                                      |
| 14                                                                                                 | 419.1                                | 16.7                        | 11.1                                                                                                   | 466.7                                                  | 2.0                                    | R.62                          | 4.0                                                                                      |
| 16                                                                                                 | 469.9                                | 16.7                        | 11.1                                                                                                   | 523.9                                                  | 2.0                                    | R.66                          | 4.0                                                                                      |
| 18                                                                                                 | 533.4                                | 19.8                        | 12.7                                                                                                   | 593.7                                                  | 2.0                                    | R.70                          | 4.8                                                                                      |
| 20                                                                                                 | 584.2                                | 19.8                        | 12.7                                                                                                   | 647.7                                                  | 2.0                                    | R.74                          | 4.8                                                                                      |
| 24                                                                                                 | 692.2                                | 27.0                        | 15.9                                                                                                   | 771.5                                                  | 2.0                                    | R.78                          | 5.6                                                                                      |

NOTE 1. This table shall be read in conjunction with 3.3 and 3.4, and Figs. 1 and 2.

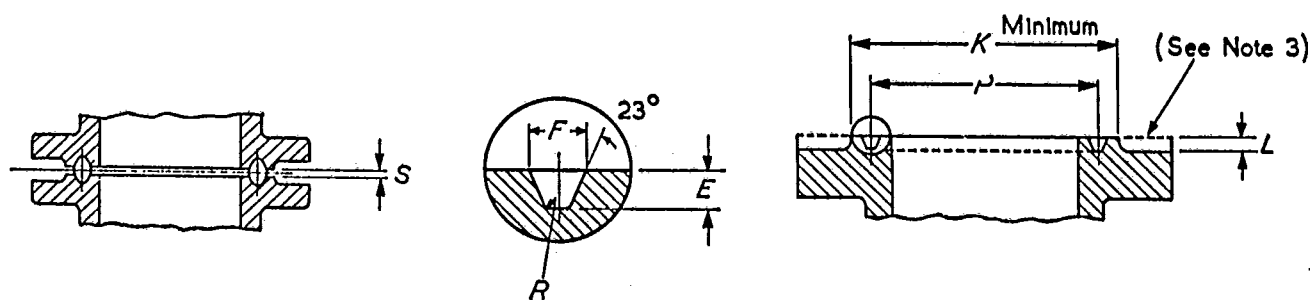
NOTE 2. When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

NOTE 3. Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

NOTE 4. Height *L* is equal to depth *E* but not subject to the tolerance on *E*.

\* The use of these sizes should be avoided.

BS 1560 : Part 2 : 1970



## TOLERANCES

- On  $E$  (Depth)  $+ 0.4$  mm  
 $- 0$   
 On  $F$  (Width)  $\pm 0.2$  mm  
 On  $P$  (Pitch dia.)  $\pm 0.13$  mm  
 On  $R$  (Radius at bottom) max.  
 On  $23^\circ$  (Angle)  $\pm \frac{1}{4}^\circ$

TABLE 8. DIMENSIONS OF RING-JOINT FACINGS, CLASS 1500

(See Note 1)

| 1                 | 2                               | 3                      | 4                                                                                  | 5                                                 | 6                                 | 7                             | 8                                                                                   |
|-------------------|---------------------------------|------------------------|------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| Nominal pipe size | Pitch diameter of groove<br>$P$ | Width of groove<br>$F$ | Depth of groove $E$<br>Height of raised portion $L$<br>(see Note 4)<br>$E$ and $L$ | Diameter of raised portion<br>(see Note 3)<br>$K$ | Radius at bottom of groove<br>$R$ | Ring number<br>(see Table 10) | Approximate distance between flanges when ring is compressed<br>(see Note 2)<br>$S$ |
| in                | mm                              | mm                     | mm                                                                                 | mm                                                | mm                                |                               | mm                                                                                  |
| $\frac{1}{4}$     | 39.7                            | 8.7                    | 6.4                                                                                | 60.3                                              | 1.0                               | R.12                          | 4.0                                                                                 |
| $\frac{3}{4}$     | 44.4                            | 8.7                    | 6.4                                                                                | 66.7                                              | 1.0                               | R.14                          | 4.0                                                                                 |
| 1                 | 50.8                            | 8.7                    | 6.4                                                                                | 71.4                                              | 1.0                               | R.16                          | 4.0                                                                                 |
| * $1\frac{1}{4}$  | 60.3                            | 8.7                    | 6.4                                                                                | 81.0                                              | 1.0                               | R.18                          | 4.0                                                                                 |
| $1\frac{1}{2}$    | 68.2                            | 8.7                    | 6.4                                                                                | 92.1                                              | 1.0                               | R.20                          | 4.0                                                                                 |
| 2                 | 95.2                            | 11.9                   | 7.9                                                                                | 123.8                                             | 1.0                               | R.24                          | 3.2                                                                                 |
| * $2\frac{1}{2}$  | 108.0                           | 11.9                   | 7.9                                                                                | 136.5                                             | 1.0                               | R.27                          | 3.2                                                                                 |
| 3                 | 136.5                           | 11.9                   | 7.9                                                                                | 168.3                                             | 1.0                               | R.35                          | 3.2                                                                                 |
| 4                 | 161.9                           | 11.9                   | 7.9                                                                                | 193.7                                             | 1.0                               | R.39                          | 3.2                                                                                 |
| *5                | 193.7                           | 11.9                   | 7.9                                                                                | 228.6                                             | 1.0                               | R.44                          | 3.2                                                                                 |
| 6                 | 211.1                           | 13.5                   | 9.5                                                                                | 247.6                                             | 2.0                               | R.46                          | 3.2                                                                                 |
| 8                 | 269.9                           | 16.7                   | 11.1                                                                               | 317.5                                             | 2.0                               | R.50                          | 4.0                                                                                 |
| 10                | 323.8                           | 16.7                   | 11.1                                                                               | 371.5                                             | 2.0                               | R.54                          | 4.0                                                                                 |
| 12                | 381.0                           | 23.0                   | 14.3                                                                               | 438.1                                             | 2.0                               | R.58                          | 4.0                                                                                 |
| 14                | 419.1                           | 27.0                   | 15.9                                                                               | 488.9                                             | 2.0                               | R.63                          | 5.6                                                                                 |
| 16                | 469.9                           | 30.2                   | 17.5                                                                               | 546.1                                             | 2.0                               | R.67                          | 7.9                                                                                 |
| 18                | 533.4                           | 30.2                   | 17.5                                                                               | 612.8                                             | 2.0                               | R.71                          | 7.9                                                                                 |
| 20                | 584.2                           | 33.3                   | 17.5                                                                               | 673.1                                             | 2.0                               | R.75                          | 9.5                                                                                 |
| 24                | 692.2                           | 36.5                   | 20.6                                                                               | 793.7                                             | 2.0                               | R.79                          | 11.1                                                                                |

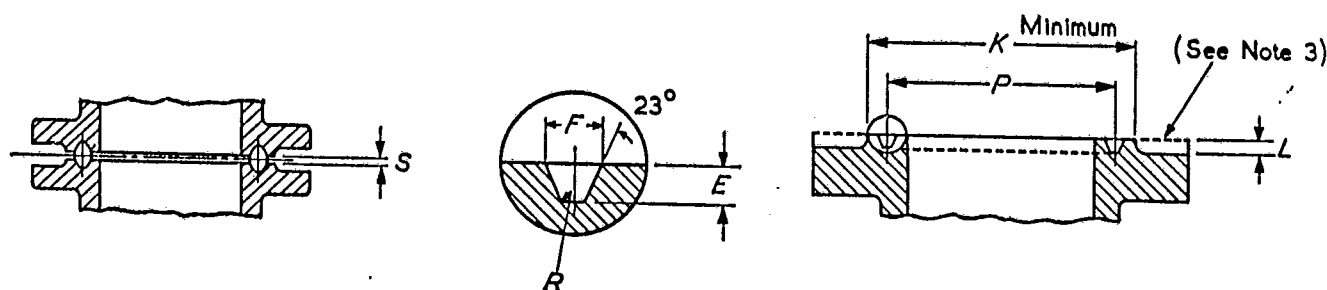
NOTE 1. This table shall be read in conjunction with 3.3 and 3.4, and Figs. 1 and 2.

NOTE 2. When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

NOTE 3. Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

NOTE 4. Height  $L$  is equal to depth  $E$  but not subject to the tolerance on  $E$ .

\* The use of these sizes should be avoided.



## TOLERANCES

- On  $E$  (Depth)  $\pm 0.4$  mm  
 — 0  
 On  $F$  (Width)  $\pm 0.2$  mm  
 On  $P$  (Pitch dia.)  $\pm 0.13$  mm  
 On  $R$  (Radius at bottom) max.  
 On  $23^\circ$  (Angle)  $\pm \frac{1}{4}^\circ$

TABLE 9. DIMENSIONS OF RING-JOINT FACINGS, CLASS 2500  
 (See Note 1)

| 1                 | 2                               | 3                      | 4                                                                                  | 5                                                 | 6                                 | 7                             | 8                                                                                   |
|-------------------|---------------------------------|------------------------|------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| Nominal pipe size | Pitch diameter of groove<br>$P$ | Width of groove<br>$F$ | Depth of groove $E$<br>Height of raised portion $L$<br>(see Note 4)<br>$E$ and $L$ | Diameter of raised portion<br>(see Note 3)<br>$K$ | Radius at bottom of groove<br>$R$ | Ring number<br>(see Table 10) | Approximate distance between flanges when ring is compressed<br>(see Note 2)<br>$S$ |
| in                | mm                              | mm                     | mm                                                                                 | mm                                                | mm                                |                               | mm                                                                                  |
| $\frac{1}{2}$     | 42.9                            | 8.7                    | 6.4                                                                                | 65.1                                              | 1.0                               | R.13                          | 4.0                                                                                 |
| $\frac{3}{4}$     | 50.8                            | 8.7                    | 6.4                                                                                | 73.0                                              | 1.0                               | R.16                          | 4.0                                                                                 |
| 1                 | 60.3                            | 8.7                    | 6.4                                                                                | 82.6                                              | 1.0                               | R.18                          | 4.0                                                                                 |
| *1 $\frac{1}{4}$  | 72.2                            | 11.9                   | 7.9                                                                                | 101.6                                             | 1.0                               | R.21                          | 3.2                                                                                 |
| 1 $\frac{1}{2}$   | 82.6                            | 11.9                   | 7.9                                                                                | 114.3                                             | 1.0                               | R.23                          | 3.2                                                                                 |
| 2                 | 101.6                           | 11.9                   | 7.9                                                                                | 133.4                                             | 1.0                               | R.26                          | 3.2                                                                                 |
| *2 $\frac{1}{2}$  | 111.1                           | 13.5                   | 9.5                                                                                | 149.2                                             | 2.0                               | R.28                          | 3.2                                                                                 |
| 3                 | 127.0                           | 13.5                   | 9.5                                                                                | 168.3                                             | 2.0                               | R.32                          | 3.2                                                                                 |
| 4                 | 157.2                           | 16.7                   | 11.1                                                                               | 203.2                                             | 2.0                               | R.38                          | 4.0                                                                                 |
| *5                | 190.5                           | 19.8                   | 12.7                                                                               | 241.3                                             | 2.0                               | R.42                          | 4.0                                                                                 |
| 6                 | 228.6                           | 19.8                   | 12.7                                                                               | 279.4                                             | 2.0                               | R.47                          | 4.0                                                                                 |
| 8                 | 279.4                           | 23.0                   | 14.3                                                                               | 339.7                                             | 2.0                               | R.51                          | 4.8                                                                                 |
| 10                | 342.9                           | 30.2                   | 17.5                                                                               | 425.4                                             | 2.0                               | R.55                          | 6.3                                                                                 |
| 12                | 406.4                           | 33.3                   | 17.5                                                                               | 495.3                                             | 2.0                               | R.60                          | 7.9                                                                                 |

NOTE 1. This table shall be read in conjunction with 3.3 and 3.4, and Figs. 1 and 2.

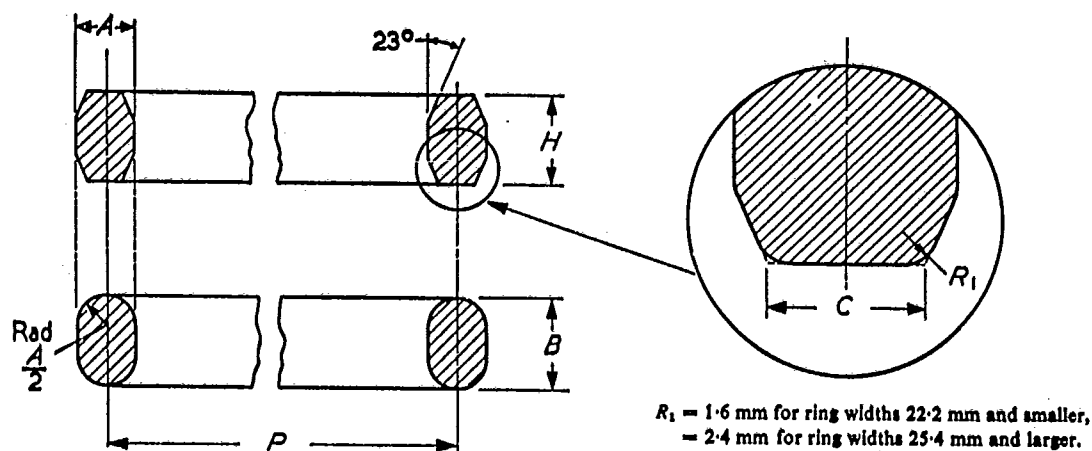
NOTE 2. When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

NOTE 3. Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

NOTE 4. Height  $L$  is equal to depth  $E$  but not subject to the tolerance on  $E$ .

\* The use of these sizes should be avoided.

BS 1560 : Part 2 : 1970



The presence of a small forging fin, located so that it does not prevent the ring from seating properly in the groove, is not objectionable.

## TOLERANCES

|              |                                   |                         |
|--------------|-----------------------------------|-------------------------|
| $P$          | (average pitch diameter of ring)  | $\pm 0.18 \text{ mm}$   |
| $A$          | (width of ring)                   | $\pm 0.2 \text{ mm}$    |
| $*B$ and $H$ | (height of ring)                  | $\pm 0.4 \text{ mm}$    |
| $C$          | (width of flat of octagonal ring) | $\pm 0.2 \text{ mm}$    |
| $23^\circ$   | (angle)                           | $\pm \frac{1}{2}^\circ$ |
| $R_1$        | (radius of ring)                  | $\pm 0.4 \text{ mm}$    |

\* A plus tolerance of  $1.2 \text{ mm}$  for heights  $B$  and  $H$  is permitted provided the variation in the height of any given ring does not exceed  $0.4 \text{ mm}$  throughout its entire circumference.