



Manhole steps —

Part 3: Specification for aluminium manhole steps

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Road Engineering Standards Policy Committee (RDB/-) to Technical Committee RDB/35, upon which the following bodies were represented:

Association of London Borough Engineers and Surveyors
 British Foundry Association
 British Precast Concrete Federation Ltd.
 British Telecommunications plc
 Consumer Policy Committee of BSI
 County Surveyors' Society
 Department of Transport (Engineering Policy and Programme Division)
 Ductile Iron Pipe Committee
 Electricity Supply Industry in United Kingdom
 Institute of British Foundrymen
 Institute of Building Control
 Institution of Water and Environmental Management
 Institution of Works and Highways Management
 Water Services Association of England and Wales

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Institution of Civil Engineers
 Institution of Mechanical Engineers

This British Standard, having been prepared under the direction of the Road Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 28 June 1991

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The following BSI references relate to the work on this standard:
 Committee reference RDB/35
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Foreword

This Part of BS 1247 has been prepared under the direction of the Road Engineering Standards Policy Committee and it supplements BS 1247-1 and BS 1247-2.

Previous editions of this British Standard specified rigid dimensions for steps. This Part specifies performance criteria, based on test requirements, and only key dimensions have been included.

As in BS 1247-1, double steps (also known as rung irons) have been included and this Part deals with aluminium steps with plastics fixings.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 1247 specifies the essential dimensions and general requirements for aluminium manhole steps with plastics fixings.

Aluminium manhole steps are for use in structures such as concrete manholes and inspection chambers.

NOTE 1 This Part of BS 1247 is not intended to cover steps which may be subject to exposure to concentrated acids or alkalis.

NOTE 2 A summary of items to be agreed between the manufacturer and purchaser is given in Appendix A.

NOTE 3 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Materials

2.1 Plastics

The plastics used for fixings shall be a polyolefin specified in accordance with BS 3412 or BS 5139.

2.2 Aluminium

The aluminium used in steps shall comply with grade 6082 of BS 1474.

3 Design features

3.1 Design and dimensions

Steps shall comply with the appropriate dimensions given in Figure 1 and Figure 2.

The minimum outside diameter of the aluminium section of steps shall be 25 mm with a minimum wall thickness of 3 mm.

3.2 Treads

The aluminium tubing extrusion shall be ribbed to a minimum depth of 1.5 mm.

Steps shall have an upstand of at least 20 mm high and 25 mm long on each end of the tread to act as a boot stop.

NOTE The steps shown in Figure 1 and Figure 2 are examples only of typical configurations and are not intended to fix design.

4 Finish

Steps shall be protected from corrosion by anodizing in accordance with grade AA25 of BS 1615.

Steps shall be free from projections or sharp edges likely to cause injury.

5 Design tests

Steps shall be designed to satisfy the test requirements specified in clause 7.

6 Quality control tests

Sample steps shall be tested for compliance with the requirements given in 7.1, 7.2, and 7.4. Sampling procedures shall be in accordance with BS 6001-1 or BS 6002 with a minimum AQL of 1.

7 Test requirements

7.1 Twist

When supported on three props of equal height on a level surface, as shown in Figure 3, the height (H) of the front edge of the tread from that surface shall not vary along its length by more than 3 mm for a single step or more than 5 mm for a double step.

7.2 Bending

When tested in accordance with Appendix B the step shall support a load of 2.5 kN without visible cracking and the deflection shall not exceed 5 mm. After removal of the load, the residual deflection shall not exceed 1 mm.

NOTE The residual deflection is intended to allow for a bedding in factor and not for yield in the material. The graphical plots of load against deflection should exhibit a straight line relationship, i.e. loading is within the elastic range of the materials.

7.3 Pull out test

When tested in accordance with Appendix C steps shall resist a force of 7.5 kN.

7.4 Impact test

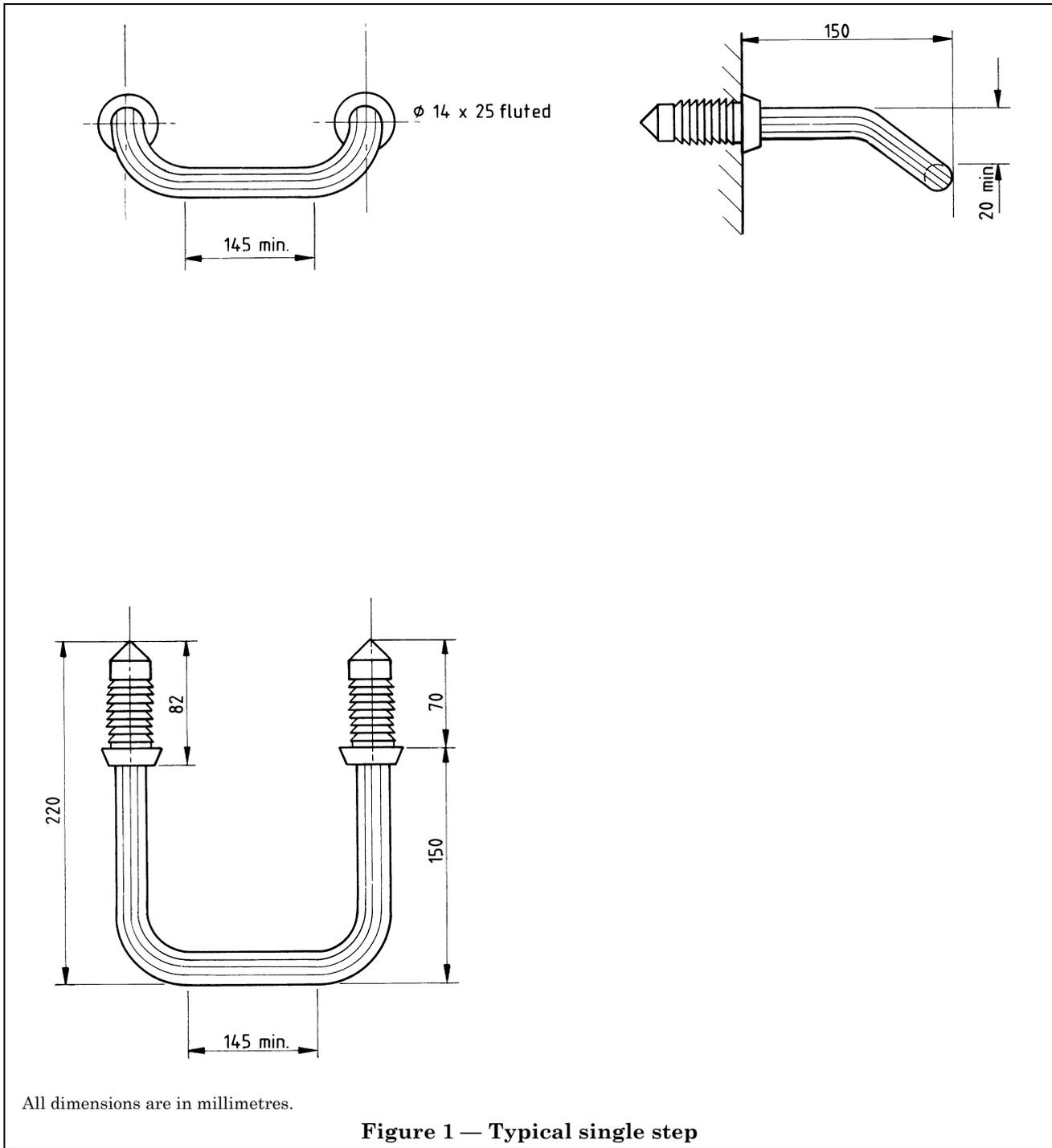
When tested in accordance with Appendix D steps shall absorb an impact from a striker of mass 20 kg dropped from a height of 1 m without fracture.

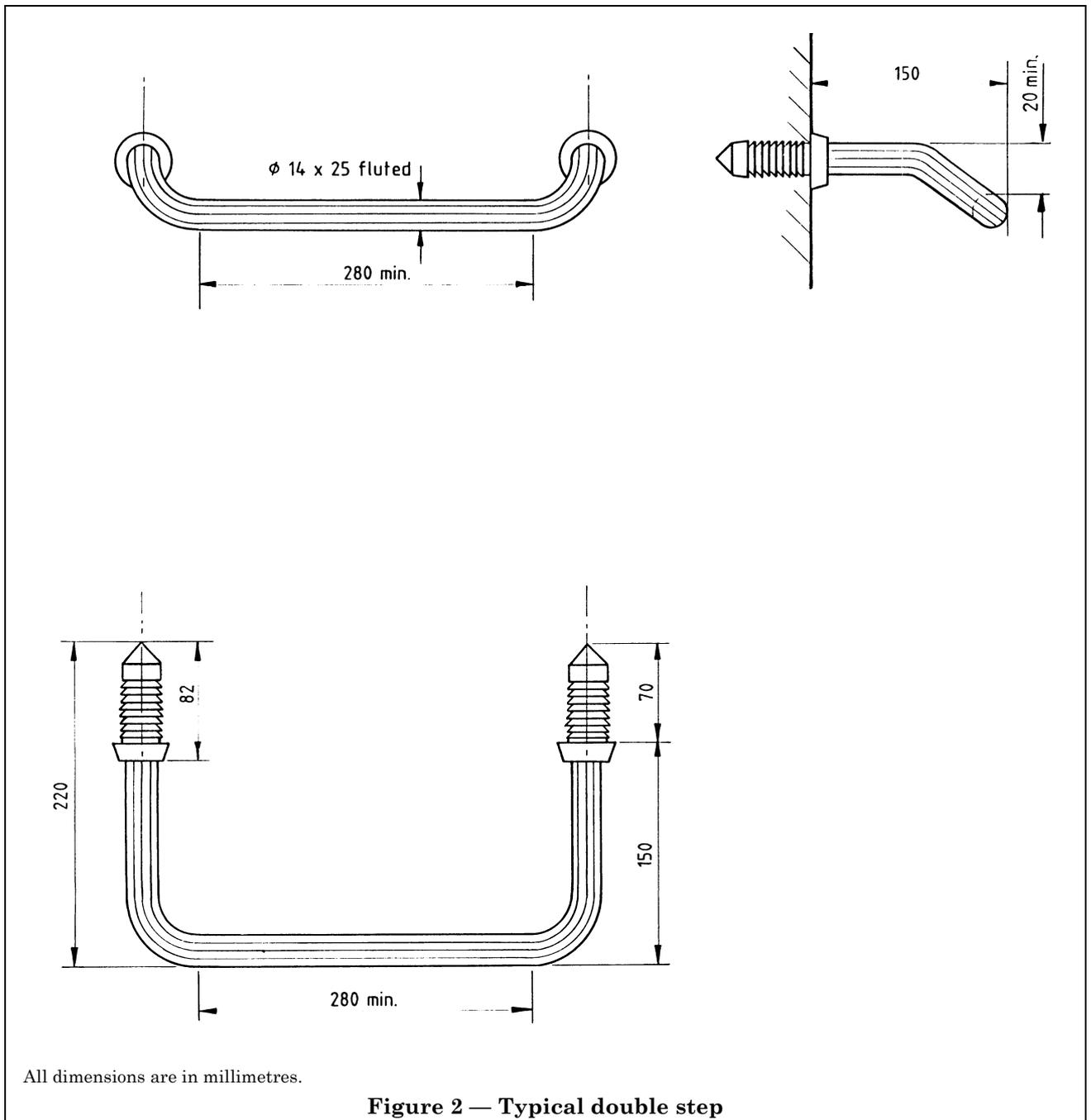
8 Marking

Each step shall be clearly and permanently marked with the following identification in a manner which is visible after installation:

- a) the number and date of this British Standard, i.e. BS 1247-3:1991¹⁾;
- b) the manufacturer's identification;
- c) the year and month of manufacture;
- d) length in millimetres.

¹⁾ Marking BS 1247-3:1991 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.





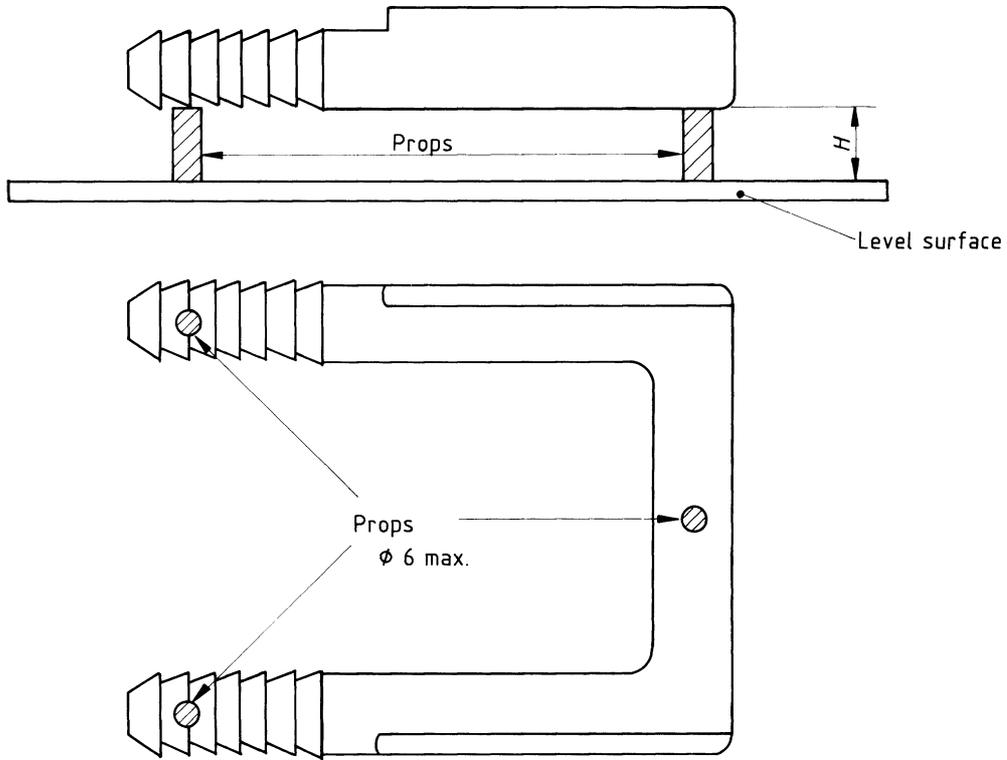


Figure 3 — Test for twist

Appendix A Information to be given by the purchaser in his enquiry and order

The following information should be given by the purchaser in his enquiry and order:

- a) type of step;
- b) length and type of tail where applicable;
- c) if a manufacturer's test certificate is required;
- d) materials.

Appendix B Bending test

B.1 Apparatus

B.1.1 *A test block*, 75 mm in diameter, faced with hard rubber or other resilient material.

B.1.2 *A device capable of applying a load*, of at least 25 % greater than the appropriate load specified in 7.2. Testing devices should comply with the accuracy requirements for grade 1 or grade 2 testing machines given in BS 1610.

If applicable the calibration of the testing device should be checked in accordance with BS 5781-1.

B.1.3 *A clamping device*, for holding the tail of the step, (a typical apparatus is shown in Figure 4).

NOTE Clamping blocks should be shaped to the profile of the tail of the step.

B.1.4 *A device suitable for measuring deflection*.

B.2 Procedure

Clamp the test sample firmly so as to leave the design projection acting as a cantilever.

Apply the load centrally and normal to the tread as shown in Figure 4 at a rate of 2.5 kN/min.

Apply the initial load up to 2.5 kN and hold for 1 min. Remove the load and take a reading at the centre of the tread to establish a datum from which to measure deflection.

Repeat the test for two cycles and for each cycle note the deflection at each 0.5 kN increment up to the maximum of 2.5 kN. Maintain the load for 1 min.

Remove load and record the residual deflection.

Appendix C Pull out test

C.1 Apparatus

C.1.1 *Hydraulic or mechanical equipment*, capable of exerting a force in excess of 20 kN and with a means of measuring the load.

C.1.2 *Concrete mould*, capable of producing test blocks either 100 mm × 100 mm × 250 mm long or 100 mm × 100 mm × 500 mm long.

C.2 Procedure

C.2.1 Cast step into a mortar block (see C.2.2) and allow to cure for at least 10 days before testing.

The block for a single step should be 100 mm × 100 mm × 250 mm long.

The block for a double step should be 100 mm × 100 mm × 500 mm long.

NOTE Tails longer than 100 mm are permitted to protrude from the bottom of the mortar block or may be cut off.

C.2.2 Use a mortar mix having a 3 : 1 ratio by weight of Leighton Buzzard sand, Fraction A, (see BS 4550-5) to OPC²⁾ Standard blend cement. The free water/cement ratio shall be 0.40.

C.2.3 Apply the force between the test block (C.1.2) at the centre of the front tread of step and mortar block. Apply this force gradually and without shock and sustain load for period of 1 min.

NOTE If failure occurs by a fracture or by a shear cone failure of the block this does not necessarily constitute failure of the step and a re-test may be required.

Appendix D Impact test

D.1 Apparatus

D.1.1 *A vertical tube*, with a bore of 102 mm to 104 mm, at least 1.2 m long and with a means of indicating a minimum release height of 1 m above the step.

D.1.2 *A steel striker*, 99 mm to 101 mm diameter with a hemispherical nose 30 mm radius. The length of the striker shall be such as to ensure a minimum mass of 20 kg.

D.1.3 *Impact rig*, a typical impact rig as shown in Figure 5.

D.2 Procedure

D.2.1 Cast step in a concrete block as described in Appendix C, or fit to a block in accordance with manufacturer's recommendations.

D.2.2 Locate the block so that step faces vertically upwards.

D.2.3 Drop a striker of mass 20 kg from a height of 1 m on the centre of the step.

²⁾ Ordinary Portland cement.

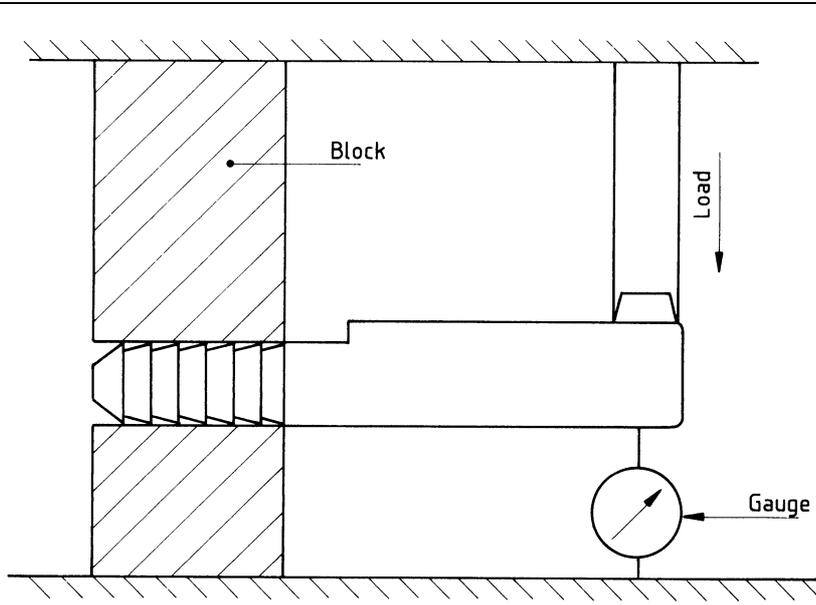
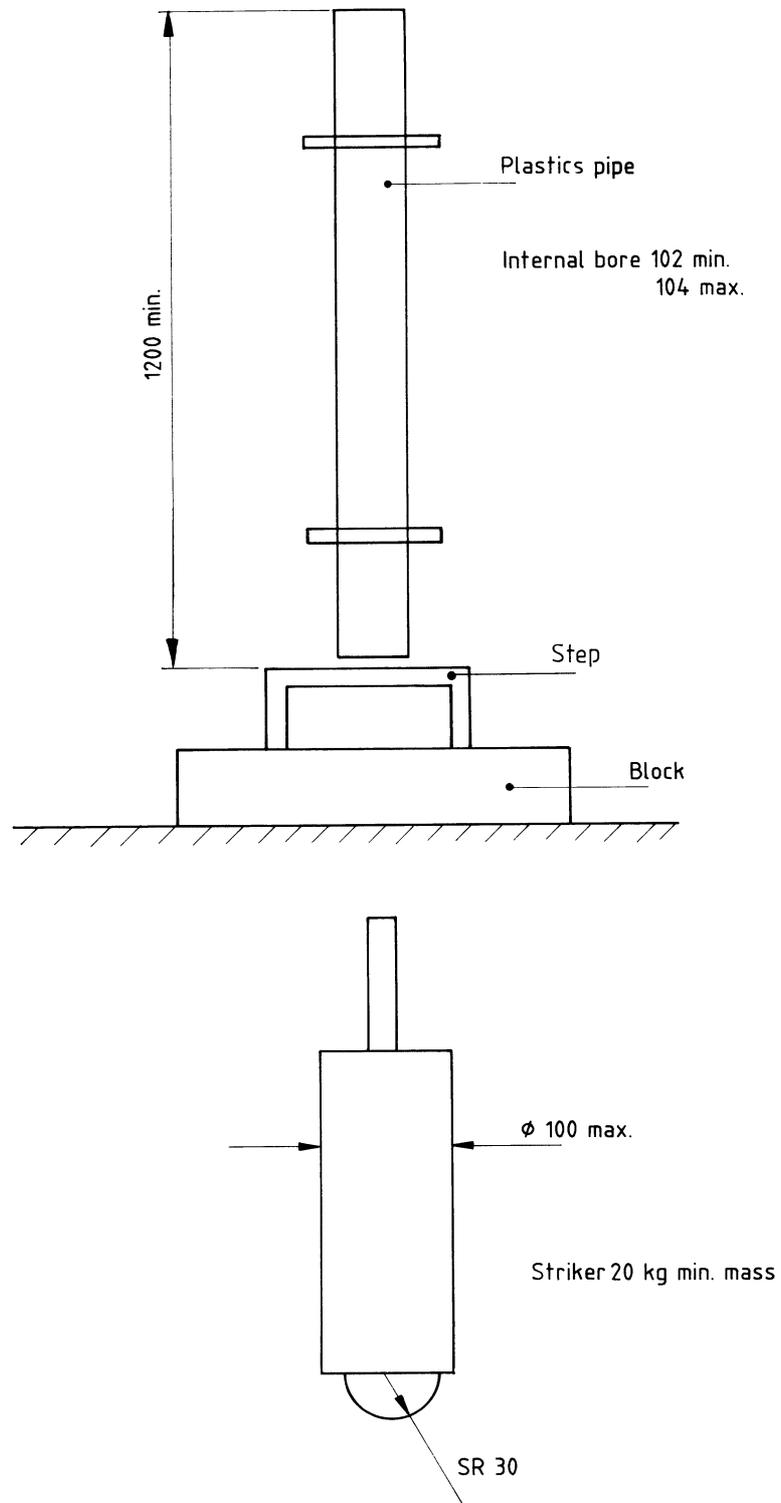


Figure 4 — Test for bending



All dimensions are in millimetres.

Figure 5 — Typical impact rig and striker

Publication(s) referred to

BS 1474, *Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections.*

BS 1610, *Materials testing machines and force verification equipment.*

BS 1615, *Method for specifying anodic oxidation coatings on aluminium and its alloys.*

BS 3412, *Specification. Polyethylene materials for moulding and extrusion.*

BS 4550, *Methods of testing cement.*

BS 4550-5, *Standard sand for concrete cubes.*

BS 5139, *Classification for polypropylene plastics materials for moulding and extrusion.*

BS 5781, *Measurement and calibration systems.*

BS 5781-1, *Specification for system requirements.*

BS 6001, *Sampling procedures for inspection by attributes.*

BS 6001-1, *Specification for sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.*

BS 6002, *Specification for sampling procedures and charts for inspection by variables for percent defective.*

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