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Cable trunking —

Part 4: Specification for cable trunking made of insulating material

UDC 621.315.671:621.315.2:621.315.61:696.6

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The Power Electrical Engineering Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

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This British Standard, having been prepared under the direction of the Power Electrical Engineering Standards Committee, was published under the authority of the Board of BSI and comes into effect on 29 January 1982

The following BSI references relate to the work on this standard:
Committee reference PEL/80
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Amendments issued since publication

Amd. No.	Date of issue	Comments
4948	December 1985	Indicated by a sideline in the margin

Contents

Foreword

This Part of this British Standard has been prepared under the direction of the Power Electrical Engineering Standards Committee. It specifies requirements for cable trunking made of insulating material.

Other Parts of this standard are as follows.

— *Part 1: Steel surface trunking;*

— *Part 2: Steel underfloor (duct) trunking;*

— *Part 3: Steel lighting trunking (in course of preparation).*

The definitions of "basic insulation" and "supplementary insulation" given in **3.5** and **3.6** are identical with those given in BS 2754, as amended by Amendment No. 1, in accordance with the strong recommendation of that standard. The fire tests specified in clauses **10** and **11** are based on tests specified in BS 6099.

An additional clause dealing with "external influences", e.g. the presence of water, oil, building materials or corrosive or polluting substances, is currently under consideration and is expected to be added by the issue of an amendment in due course.

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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 this British Standard specifies dimensions and performance requirements for non-flame propagating cable trunking made of insulating material. It also specifies a system of classification for cable trunking according to its material and properties.

2 References

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

3 Definitions

For the purposes of this Part of this British Standard the following definitions apply.

3.1
cable trunking

a system of enclosures for the protection of conductors or cables, assembled together by means of couplers and allowing cables or conductors to be laid in

3.2
coupler

a device for joining together lengths of cable trunking

3.3
insulating trunking

a trunking that consists of insulating material and that has no conductive components

3.4
non-flame propagating trunking

a trunking that is liable to ignite as a result of applied flame, but in which the flame does not propagate and is extinguished within a limited time after the applied flame is removed

3.5
basic insulation

insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.6
supplementary insulation

independent insulation applied in addition to basic insulation in order to provide protection against electric shock in the event of failure of basic insulation

NOTE to **3.5** and **3.6** These definitions of "basic insulation" and "supplementary insulation" are identical with those given in BS 2754, as amended by Amendment No. 1 and in IEC Report 536, published by the International Electrotechnical Commission (IEC).

4 Classification

When compliance with the requirements of clauses **8** to **12** has been established, cable trunking shall be classified under the following headings, as appropriate.

a) *According to material.*

b) *According to mechanical properties:*

1) trunking for medium mechanical stresses;

2) trunking for heavy mechanical stresses;

c) *According to temperature tolerance* (see Table 1).

d) *According to electrical characteristics:*

1) trunking without electrical insulating characteristics;

2) trunking with electrical insulating characteristics.

e) *According to resistance against ingress of solid objects:*

1) non-protected trunking;

2) trunking protected against solid objects greater than 1.0 mm (IP4X);

3) dust-protected trunking (IP5X);

4) dust-tight trunking (IP6X).

f) *According to resistance against ingress of water:*

1) non-protected trunking;

2) trunking protected against dripping water (IPX2);

3) trunking protected against spraying water (IPX3);

4) trunking protected against splashing water (IPX4);

5) trunking protected against water jets (IPX5).

NOTE The categories of items e) and f) are taken from BS 5490:1977.

g) *According to resistance against corrosive or polluting substances:*

1) non-protected trunking;

2) trunking with low protection;

3) trunking with medium protection;

4) trunking with high protection.

h) *According to resistance against flame propagation:*

1) non-flame propagating trunking;

2) flame propagating trunking.

Table 1 — Temperature classification
[see clause **4** c)]

Temperature classification	Temperature normally not less than		Permanent application temperature range
	Storage and transport	Use and installation	
	°C	°C	°C
– 5	– 5	– 5	– 5 to + 60
– 25	– 25	– 15	– 15 to + 60

5 Dimensions

The nominal external dimensions (i.e. the width and the height), in millimetres, of rectilinear cable trunking shall be selected from any of the following numbers:

12.5, 16.0, 20.0, 25.0, 32.0, 37.5, 40.0, 50.0, 75.0, 100, 150.

6 General performance requirements

Cable trunking shall be so designed and constructed that it ensures reliable mechanical protection to the conductors and/or cables contained in it. Cable trunking shall also provide adequate electrical protection.

Cable trunking shall withstand the stresses likely to occur during transport, storage, recommended installation practice and usage.

Compliance shall be checked by carrying out all the tests specified in this standard.

7 General conditions for tests

7.1 The tests specified in this standard shall be type tests.

7.2 Type tests shall not commence until 10 days after manufacture.

7.3 Samples of cable trunking for the various tests shall be taken from different lengths of cable trunking. Two sets of samples shall be provided.

7.4 Cable trunking shall be deemed to comply with the requirements of this standard if there are no failures in any of the tests.

If one sample fails in a test, that test and those preceding it, which may have influenced the result of that test, shall be repeated on another set of samples of the number specified.

If there are no failures in any of the repeated tests, the cable trunking shall be deemed to comply with the requirements of this standard.

8 Construction

8.1 The inside and outside surface of the trunking shall be reasonably free from burrs, flash and similar defects. In addition, any edges shall not be liable to damage the conductors or cables.

Compliance shall be checked by inspection, if necessary after cutting the samples apart.

8.2 If screws or studs are used to secure the cover, the dividers or the coupler, or to provide means of connection for electrical continuity, they shall not be liable to damage the conductors or cables.

Screws shall have isometric threads.

Where provision is made in cable trunking for partitions or dividers for the segregation of circuits, such partitions or dividers shall be adequately secured to the main body of the cable trunking.

9 Mechanical properties

9.1 Requirement. Cable trunking shall have adequate mechanical strength.

Compliance shall be checked by the tests specified in **9.2** and **9.3**.

After the cable supporting test (**9.2**) the distortion measured shall not exceed 5 % of the nominal horizontal dimension of the sample, and the cover shall not become detached from the body so as to invalidate the classifications made in accordance with items e) and f) of clause **4**.

After the impact test (**9.3**) the samples shall show no signs of disintegration nor shall there be any cracks visible to the naked eye. Any cracks in internal dividers shall be ignored.

9.2 Cable supporting test. Carry out the test on three samples, with the covers secured in position, at a temperature of 20 ± 5 °C.

Securely fix each sample in turn to the test apparatus as shown in Figure 1 and Figure 2.

With the sample in position A, subject it to a load of 0.13 kg per square centimetre of trunking cross-sectional area per metre length. The load shall comprise single-stranded uninsulated copper cables. After the load has been applied for 2 h measure the distortion.

Then place the sample in position B and again subject it to a load of 0.13 kg per square centimetre of trunking cross-sectional area per metre length. The load shall again be single-stranded uninsulated copper cables. After the load has been applied for 2 h measure the length.

Table 2 deleted

9.3 Impact test. Carry out the test on samples each approximately 250 mm long.

Before the test condition the samples at a temperature of 60 ± 2 °C for 240 h.

Place the test apparatus shown in Figure 3 on a pad of sponge rubber 40 mm thick, and put this, together with the samples, into a refrigerator, within which the temperature shall be maintained at – 5 ± 1 °C for trunking classified as – 5, and at – 25 ± 1 °C for trunking classified as – 25 (see Table 1).

When the samples have attained the temperature of the air within the refrigerator, or after 2 h, whichever is the longer period, place each sample in turn in the apparatus with the cover uppermost so that blows can be applied, firstly to the centre of the cover and secondly to the edge of the cover. Allow the hammer to fall so that it imparts the appropriate impact energy as specified in Table 3. The mass of the hammer shall be as specified in Table 3.

Table 3 — Impact test data

Mechanical classification of trunking [see clause 4 b)]	Impact energy	Mass of hammer	Fall height
	J	kg	mm
Medium	2.0	2.0	100 ± 1
Heavy	6.0	2.0	300 ± 1

10 Resistance to heat

10.1 Requirement. Cable trunking shall have adequate resistance to heat.

Compliance shall be checked by the ball pressure test specified in **10.2**. The diameter of the impression made by the steel ball shall not exceed 2 mm.

10.2 Ball pressure test. Prepare three samples by cutting flat portions from the trunking and place them in the horizontal position on a steel support, as shown in Figure 5. Place the support and sample in a heating cabinet at a temperature of 60 ± 2 °C.

As soon as the support and the sample have attained the temperature specified, press a steel ball of 5 mm diameter against the surface of the sample with a force of 20 N.

After 1 h, remove the ball and take the sample out of the heating cabinet. When the sample has attained room temperature, measure the diameter of the impression made by the ball.

11 Resistance to flame propagation

11.1 Requirement. Non-flame propagating cable trunking with the cover secured in position either shall not ignite or, if ignited, shall not continue to burn when the source of ignition is removed.

Compliance shall be checked by the test specified in **11.2**.

If the sample burns during the test, it shall do so slowly and the flame shall not spread appreciably; any flame shall have died out in less than 30 s after the removal of the burner.

11.2 Test

11.2.1 *General.* The test shall be made on three samples, each having a length of 600 mm.

Carry out the test in still air with a Bunsen burner having a nozzle with an internal diameter of 9 mm ± 1 mm. The gas used for the test shall be such that, with the diameter of the flame as specified, the theoretic heat output of the burner is not less than 900 W.

11.2.2 *Procedure.* While the burner is still in the vertical position, adjust the flame so that its overall length is 100 mm and the length of the inner blue cone is 50 mm. Then support the burner so that its axis is at an angle of 45° to the vertical.

Hold the sample in such a position that the part above the flame is vertical and that the tip of the inner cone of the flame touches the surface of the sample at a distance of approximately 100 mm from the lower end, as far as it is practicable.

Expose the sample to the flame for the time given in Table 4.

Table 4 — Flame application time

Material thickness	Flame application time
mm	
Up to 2.5	Three times successively, each time for 25 s, with an interval of 5 s between each of the applications
Over 2.5 up to 3	Once for 80 s
Over 3 up to 5	Once for 125 s
Over 5	Once for 180 s

12 Insulating characteristics

[see clause **4** d)]

12.1 Requirements. Trunking shall have an adequate electrical insulating strength and insulation resistance in order to provide supplementary insulation.

Compliance shall be checked by the tests specified in **12.2** and **12.3**.

No breakdown shall occur during the tests. The insulation resistance shall be not less than 100 MΩ.

12.2 Electrical insulating strength test. Where the trunking has partitions or dividers, test each compartment as a separate trunking and apply the test voltage also to the partitions or dividers.

Coat three samples on the inside and the outside with a non-ferrous foil or gauze, as shown in Figure 6. Take care to place the foil or gauze so that no flashover occurs at the edges.

Apply a voltage of 2 500 V of substantially sine-wave form, having a frequency of 50 Hz and with a characteristic that enables it to supply 200 mA at 1 000 V, to the foil or gauze as shown in Figure 6. Apply initially not more than half the voltage and then raise the voltage to 2 500 V as rapidly as possible consistent with its accurate attainment without transient overvoltage. Maintain the voltage at 2 500 V for 1 min.

12.3 Insulation resistance test. After carrying out the electrical insulating strength test (**12.2**), measure the insulation resistance of the samples by the application of a d.c. voltage of 500 V. Make measurements 1 min after the application of the voltage.

13 Marking

13.1 Each length of trunking shall be marked in a durable and easily legible manner with:

a) the name, trade mark or other identifying symbol of the manufacturer or responsible vendor;

b) a classification code in accordance with Appendix A.

NOTE Marking may be applied by stamping, printing, adhesive labels, waterslide transfers or by moulding.

13.2 Flame-propagating trunking shall be manufactured from orange-coloured material. It shall not be coloured orange by painting, etc. Non-flame propagating trunking shall be any colour except yellow, orange or red.

13.3 Marking shall be checked by inspection and by rubbing the marking by hand, suitably protected, for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

Appendix A Trunking marking classification codes

A.1 Mandatory marking code. Insulating trunking shall be marked with a three digit code, the first digit denoting mechanical properties, the second and third digits denoting the temperature classification, as follows.

First digit: mechanical properties

1: Very light mechanical stresses

2: Light mechanical stresses

3: Medium mechanical stresses

4: Heavy mechanical stresses

5: Very heavy mechanical stresses

Second and third digits: temperature classification

05: – 5 trunking

25: – 25 trunking

A.2 Additional marking code. If it is desired to mark trunking with an additional code denoting properties other than mechanical or temperature classification, the additional code shall follow immediately after the code marking required by **A.1** and shall be separated from it by an oblique stroke (/).

The additional code shall consist of four digits, as follows. If code markings in respect of any of the additional properties are not required they shall be replaced by a zero in the four digit sequence.

First additional digit: electrical properties

1: Trunking suitable for use as supplementary insulation

Second additional digit: resistance against ingress of solid objects

1: Trunking protected against solid objects greater than 1 mm

2: Dust-protected trunking

3: Dust-tight trunking

Third additional digit: resistance against ingress of water

1: Trunking protected against dripping water

2: Trunking protected against spraying water

3: Trunking protected against splashing water

4: Trunking protected against water jets

Fourth additional digit: resistance against corrosion

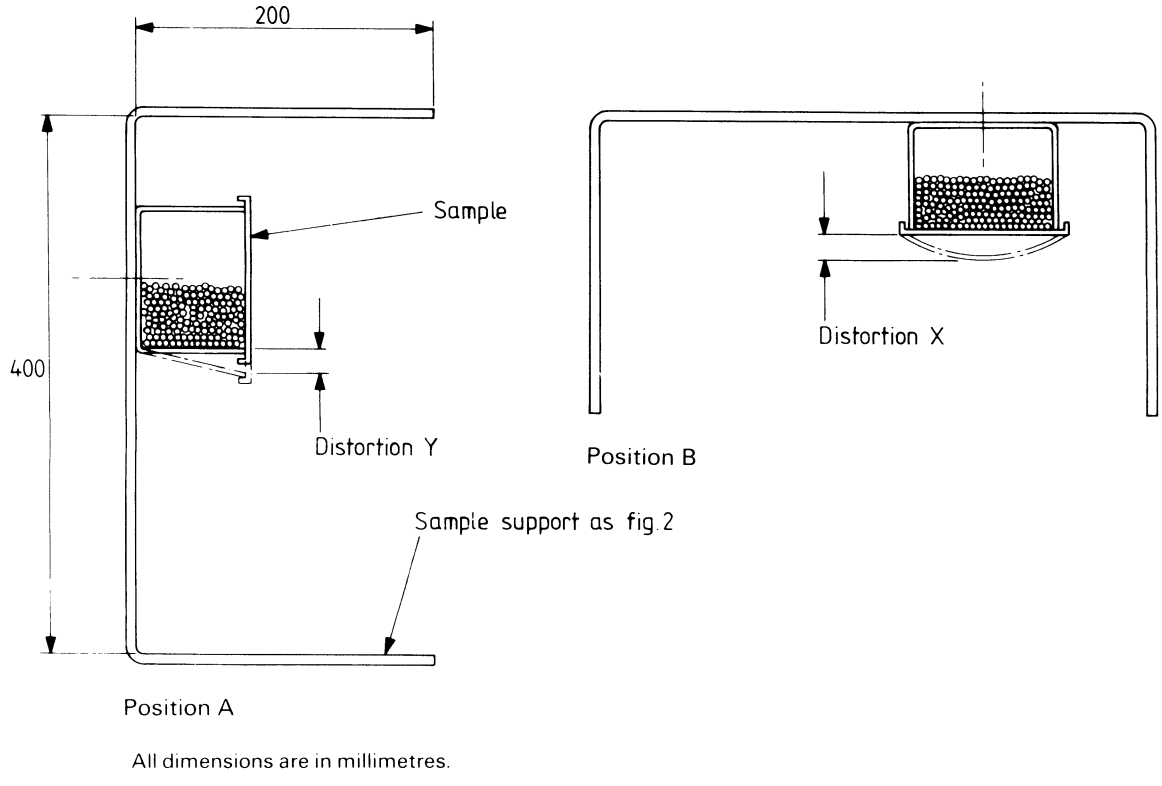
1: Trunking with low protection

2: Trunking with medium protection

3: Trunking with high protection

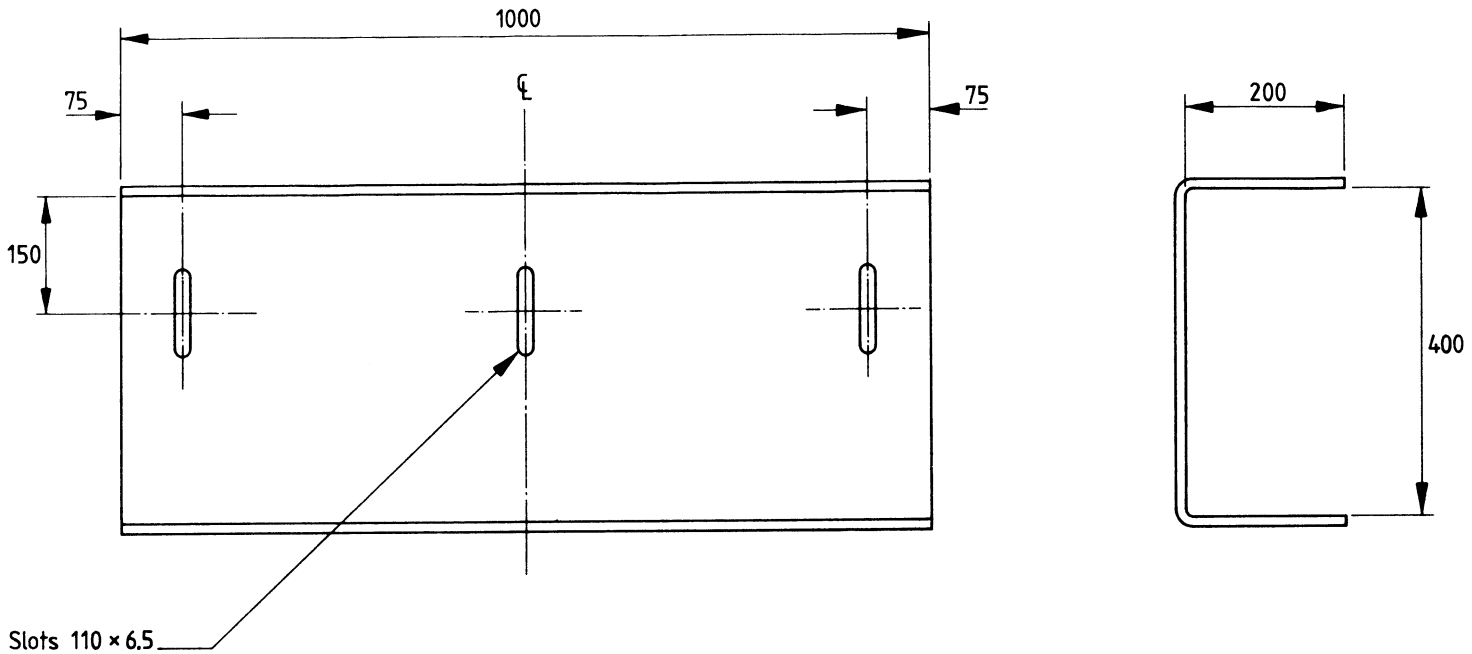
A.3 Examples of code markings. A marking of 225 denotes a trunking suitable for light mechanical stress, with a temperature classification of – 25, no other property being claimed.

A marking of 305/1242 denotes a trunking suitable for medium mechanical stress, with a temperature classification of – 5, suitable for use as supplementary insulation, dust-protected, protected against water jets and of medium protection against corrosion.



NOTE The distortion measurement is to be taken at the centre fixing.

Figure 1 — Cable supporting test apparatus



NOTE The support is to be made of steel.

Figure 2 — Cable supporting test sample support

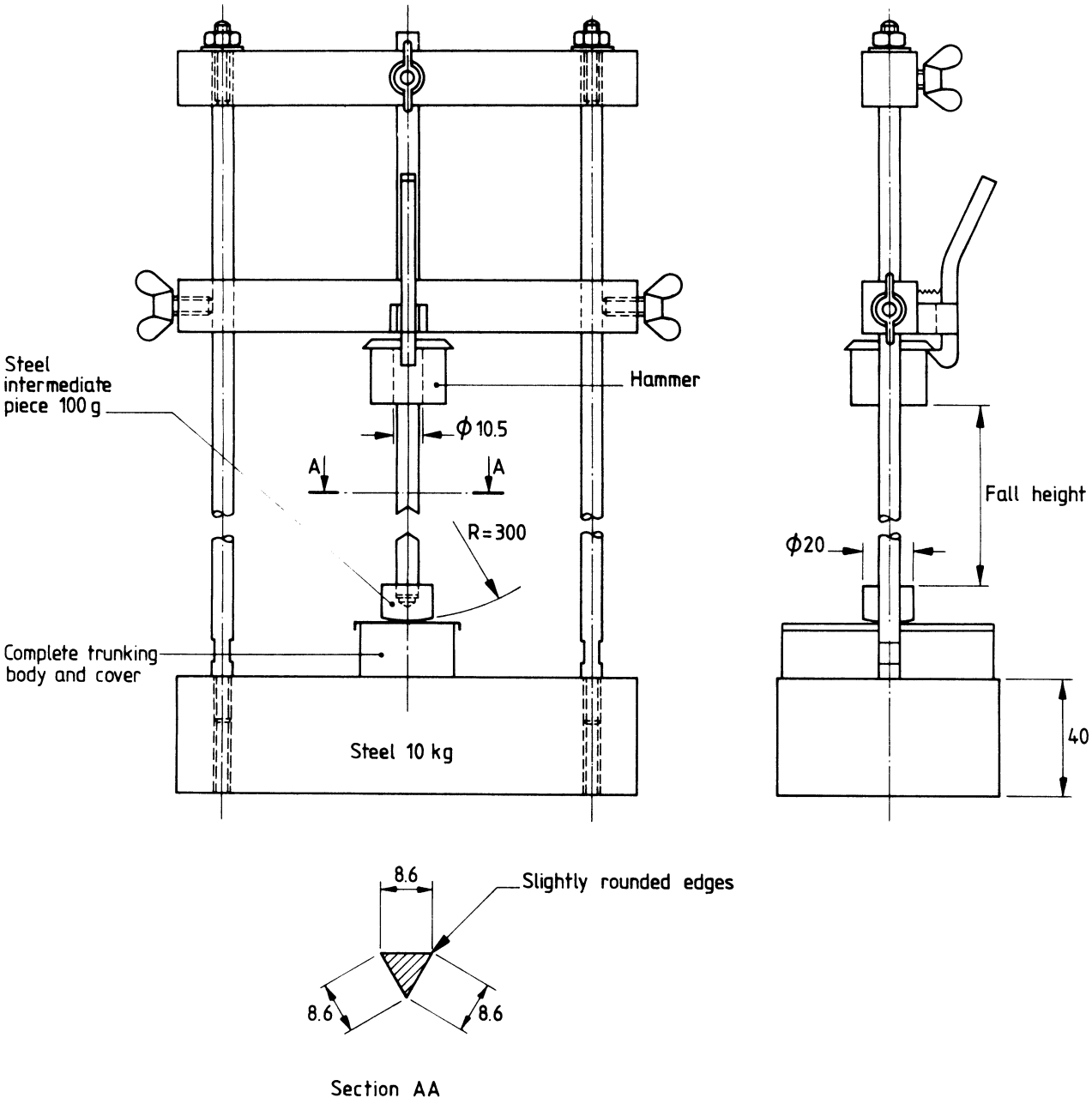
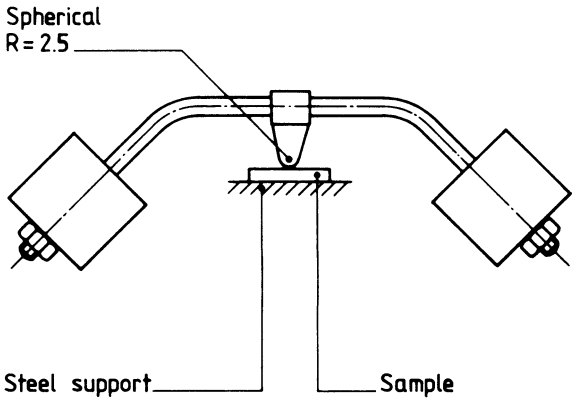


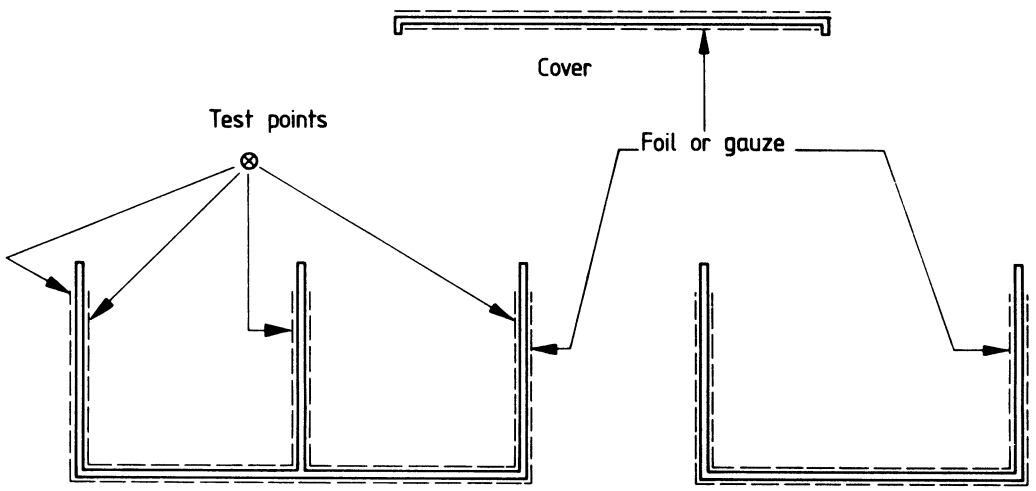
Figure 3 — Impact test apparatus

Figure 4 Deleted.



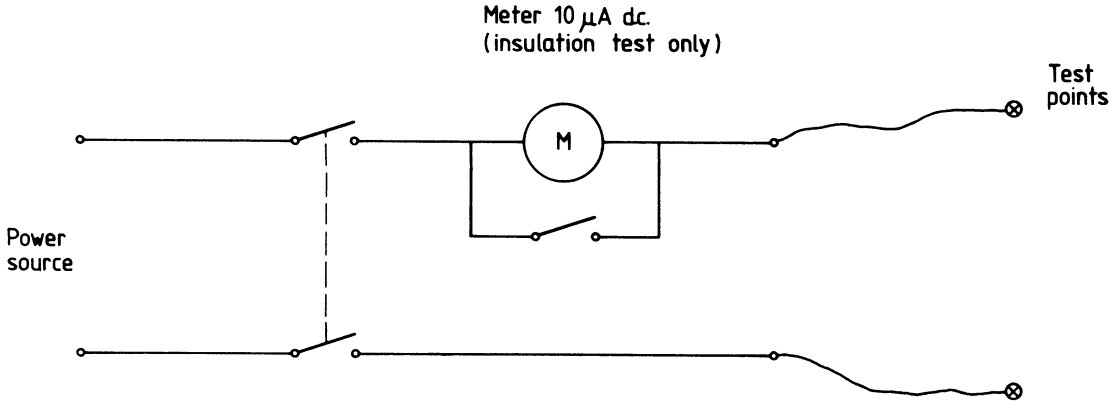
The dimension is in millimetres.

Figure 5 — Ball pressure apparatus



(a) Compartmented trunking

(b) Single trunking



(c) Typical circuit diagram for test of electrical insulating strength

Figure 6 — Electrical insulating test apparatus

Publications referred to

BS 2754, *Memorandum. Construction of electrical equipment for protection against electric shock.*
BS 5490, *Specification for degrees of protection provided by enclosures.*
BS 6099, *Conduits for electrical installations*[1)].

[1)] Referred to in the foreword only.

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