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IS 9537-2 (1981): Conduits for electrical installations,  
Part 2: Rigid steel conduits (superseding IS:1653) [ETD 14:  
Electrical Wiring Accessories]



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**IS : 9537 (Part II) - 1981**

**(Reaffirmed 2007)**

**Edition 1.3**

**(2002-03)**

*Indian Standard*

**SPECIFICATION FOR  
CONDUITS FOR ELECTRICAL INSTALLATIONS**

**PART II RIGID STEEL CONDUITS**

**(Incorporating Amendment Nos 1, 2 & 3)**

**UDC 621.315.671.1[669.14]**

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**BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002**

**Price Group 4**

IS : 9537 (Part II) - 1981

*Indian Standard*  
**SPECIFICATION FOR  
CONDUITS FOR ELECTRICAL INSTALLATIONS |  
PART II RIGID STEEL CONDUITS**

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( Continued on page 2 )

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( Continued from page 1 )

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IS : 9537 (Part II) - 1981

*Indian Standard*  
**SPECIFICATION FOR  
CONDUITS FOR ELECTRICAL INSTALLATIONS |  
PART II RIGID STEEL CONDUITS**

**0. FOREWORD**

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 25 November 1981, after the draft finalized by the Electrical Wiring Accessories Sectional Committee had been approved by the Electrotechnical Division Council

**0.2** The requirements of rigid steel conduits were previously covered in IS . 1653-1972\*. In order to align with international practice, a new series of Indian Standards on different types of conduits is being prepared. Since many properties and test methods relevant to different types of conduits are similar, these have been covered in IS . 9537 (Part I)-1980† with the intention of covering specific requirements of individual types of conduits in subsequent parts. This standard (Part II) is, thus, one of this series.

**0.3** Apart from the change in format, the other important features of this standard are,

- a) Substitution of tensile test by compression test,
- b) Modification of the test for protective coating, and
- c) Inclusion of details of a bending tool for performing bending test.

**0.4** This standard is to be read in conjunction with IS 9537 (Part I)-1980† to which reference has been given regarding general requirements as well as test methods. Should, however, any deviations exist between IS . 9537 (Part I)-1980† and this standard, the provisions of the latter shall apply. Sequence of clauses used in this standard is the same as in IS : 9537 (Part I)-1980† for easy reference. Wherever a particular requirement is not applicable to this type of conduit, the same has been indicated accordingly.

**0.5** For ensuring safety in electrical installations, use of conduits as earth continuity conductors shall not be permitted.

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\*Specification for rigid steel conduits for electrical wiring ( *second revision* ).

†Specification for conduits for electrical installations Part I General requirements

## **IS : 9537 (Part II) - 1981**

**0.6** The normal trade practice, while supplying conduits, is to provide one coupler with each conduit. However, for the purpose of conformity to this standard, this is not a necessary condition of compliance.

**0.7** While preparing this standard, assistance has been derived from documents 23A (Central Office) 23 and 23A (Central Office) 29 Draft specification for conduits for electrical installations, Part 2A : Particular specification for metal conduits issued by the International Electrotechnical Commission.

**0.8** This edition 13 incorporates Amendment No. 1 (April 1984), Amendment No. 2 (May 1990) and Amendment No. 3 (March 2002). Side bar indicates modification of the text as the result of incorporation of the amendments.

**0.9** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

### **1. SCOPE**

**1.1** This specification covers the requirements and methods of test of threaded/threadable plain rigid steel conduits.

### **2. TERMINOLOGY**

**2.1** The relevant provisions of 2 of IS : 9537 (Part I)-1980† shall apply.

### **3. GENERAL REQUIREMENTS**

**3.1** The provisions of 3 of IS : 9537 (Part I)-1980† shall apply.

### **4. GENERAL NOTES ON TESTS**

**4.1** All the tests included in this standard are type as well as acceptance tests.

**4.2** The number of samples for type tests shall be 3, unless otherwise mentioned in a particular test.

**4.3** A recommended sampling plan for acceptance tests is given in Appendix A.

### **5. CLASSIFICATION**

**5.0** Rigid steel conduits shall be classified as under

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\*Rules for rounding off numerical values ( *revised* )

†Specification for conduits for electrical installations Part I General requirements



**IS : 9537 (Part II) - 1981**

**5.1 Classification according to resistance against corrosive or polluting substances shall be as follows:**

- a) Conduits with low protection,
- b) Conduits with medium protection;
- c) Conduits with high protection;
- d) Conduits with high protection on the outside and low protection inside;
- e) Conduits with medium protection outside and low protection inside; and
- f) Conduits with high protection outside and medium protection inside.

NOTE 1 — Normally, under the conditions prevalent in this country, protection mentioned at (b) and (c) are commonly used. However, other classes of protection are also included here for the sake of comprehensiveness.

NOTE 2 — Typical examples of medium protection are as under:

- i) Stove enamelling,
- ii) Air drying paint, and
- iii) Electrolytic deposits.

NOTE 3 — Typical examples of high protection are as under:

- i) Hot-dip galvanized coating, and
- ii) Sherardizing.

**5.2 For classification according to mechanical properties, the provisions of 5.1(c) of IS 9537 (Part I)-1980\* shall be applicable.**

## **6. MARKING**

**6.1 Each length of the conduit shall be marked, preferably 50 mm from one end, with the following:**

- a) Manufacturer's name or trade mark, if any;
- b) Country of manufacture, and
- c) Nominal size of the conduits.

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\*Specification for conduits for electrical installations. Part I General requirements.

## IS : 9537 (Part II) - 1981

**6.2** Each length of the conduit may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

**6.3** The durability of the markings shall be tested according to 6.4 of IS : 9537 (Part I)-1980\*

## 7. DIMENSIONS

**7.1** Dimensions of conduits shall be as given in Table 1. The conduits shall be supplied in straight lengths of 3 to 5 metres or as agreed to between the purchaser and the supplier.

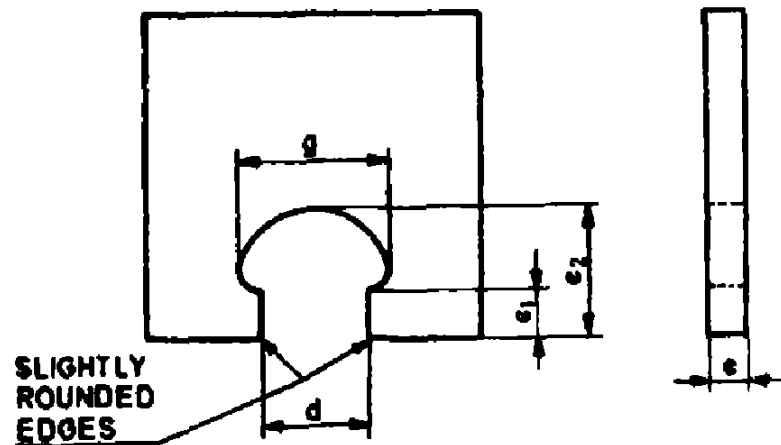
TABLE 1 DIMENSIONS OF RIGID STEEL CONDUITS

NOMINAL SIZE OF CONDUIT	OUTSIDE DIA- METER	TOLERANCE ON OUT- SIDE DIAMETER	WALL THICKNESS OF CONDUITS
(1)	(2)	(3)	(4)
mm	mm	mm	mm
16	16	0 -0.3	1.4 to 1.8
20	20	0 -0.3	1.4 to 1.8
25	25	0 -0.4	1.4 to 1.8
32	32	0 -0.4	1.4 to 1.8
40	40	0 -0.4	1.6 to 2.2
50	50	0 -0.5	1.6 to 2.2
63	63	0 -0.6	1.6 to 2.2

\*Specification for conduits for electrical installations Part I General requirements

## 7.2 Checking the Outside Diameter

7.2.1 The minimum outside diameter of the conduit shall be checked by means of the gauge as given in Fig 1



NOMINAL SIZE OF CONDUIT mm	$d$ mm	MANUFACTURING TOLERANCE mm	ADMISSIBLE WEAR mm	$e_1$ mm	$e_2$ mm	$g$ mm	$e$ mm
		0	+ 0 018	8	17	18	8
16	15 70	- 0 018	0				
		0	+ 0 022	10	23	27	9
20	19 70	- 0 022	0				
		0	+ 0 022	10	23	27	9
25	24 60	- 0 022	0				
		0	+ 0 025	12	19	31	10
32	31 60	- 0 025	0				
		0	+ 0 030	14	35	42	10
40	39 60	- 0 030	0				
		0	+ 0 030	16	42	52	12
50	49 50	- 0 030	0				
		0	+ 0 030	18	49	65	12
63	62 40	- 0 030	0				

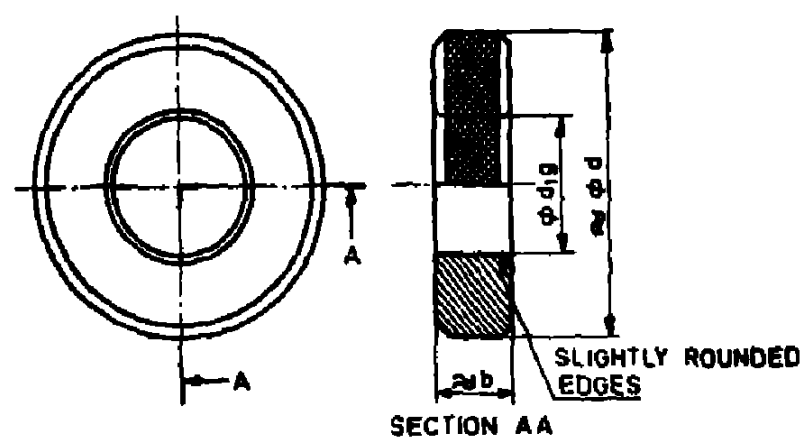
Material Steel

It shall not be possible to pass the appropriate gauge over the conduit, in any position, without undue force

FIG 1 GAUGE FOR CHECKING MINIMUM OUTSIDE DIAMETER OF CONDUITS

IS : 9537 (Part II) - 1981

7.2.2 The maximum outside diameter shall be checked by means of the gauge as given in Fig. 2



NOMINAL SIZE OF CONDUIT mm	$d_1$ g* mm	$b$ mm	$d$ mm
16	16.04	12	45
20	20.04	12	45
25	25.04	16	60
32	32.04	18	70
40	40.04	18	70
50	50.04	20	85
63	63.04	20	100

\*Manufacturing tolerance 0  
- 0.01

Admissible wear + 0.01 mm

Material Steel

It shall be possible to slide the appropriate gauge completely over the conduit, under its own weight

FIG. 2 GAUGE FOR CHECKING MAXIMUM OUTSIDE DIAMETER  
OF CONDUITS

### 7.3 Measurement of Thickness of the Conduits

**7.3.1** The test specimens each of approximately 25 mm shall be cut, one from each of the manufactured lengths. The threaded portion of the conduits shall not be used for thickness measurement. The ends of the specimens shall be cut at right angles to the longitudinal axis of the conduits and shall have cleanly finished edges.

**7.3.2** The thickness shall be measured by a suitable method having an accuracy equal to or better than 0.02 mm. Three measurements of wall thickness, approximately 120° apart, shall be made at each end of the specimen. The average of these readings shall be taken as the wall thickness.

NOTE — In no case, the measurement of wall thickness shall be taken at the welded portion.

**7.3.3 Uniformity of the Wall Thickness** — In case of doubt with regard to the uniformity of the wall thickness of conduits, three samples, each taken from different lengths, shall be cut along a plane perpendicular to the axis. The wall thickness at each cut edge shall be measured at four places as far as possible equally spaced around the circumference, one of the measurement being made at the thinnest place. In no case shall the difference between the values measured and the average of the twelve values obtained for the three samples exceed 0.1 mm  $\pm 10$  percent of the average value.

### 7.4 Screw Threads

**7.4.1** The screw threads shall be the ISO metric screw threads [ see IS : 4218 (Part I)-1976\* ]. The profile and other details shall be as given in Appendix B.

#### 7.4.2 Test for Screw Threads

**7.4.2.1** The screw threads of the samples selected shall be checked by means of suitable gauges chosen in accordance with IS : 4211-1967† and Appendix B.

## 8. CONSTRUCTION

**8.0** The relevant provisions of IS : 9537 (Part I)-1980‡ shall apply in addition to those specified in 8.1.

**8.1** The conduits shall be solid drawn or seam joined by welding.

## 9. MECHANICAL PROPERTIES

**9.1** Conduits shall have adequate mechanical strength. Compliance shall be checked by the tests specified in 9.2 and 9.3.

\*ISO metric screw threads Part I Basic and design profiles ( first revision )

†Thread pitch gauges for ISO metric screw threads (pitch range 0.25 to 6.00 mm)

‡Specification for conduits for electrical installations Part I General requirements

IS : 9537 (Part II) - 1981

9.2 Bending Test

9.2.1 Conduits of nominal sizes 16, 20 and 25 mm shall be subjected to bending test by means of a device shown in Fig. 3

9.2.2 Samples having a length equal to 30 times the outside diameter shall be bent through 90°, so that the inside of the bend is equal to 6 times the nominal diameter.

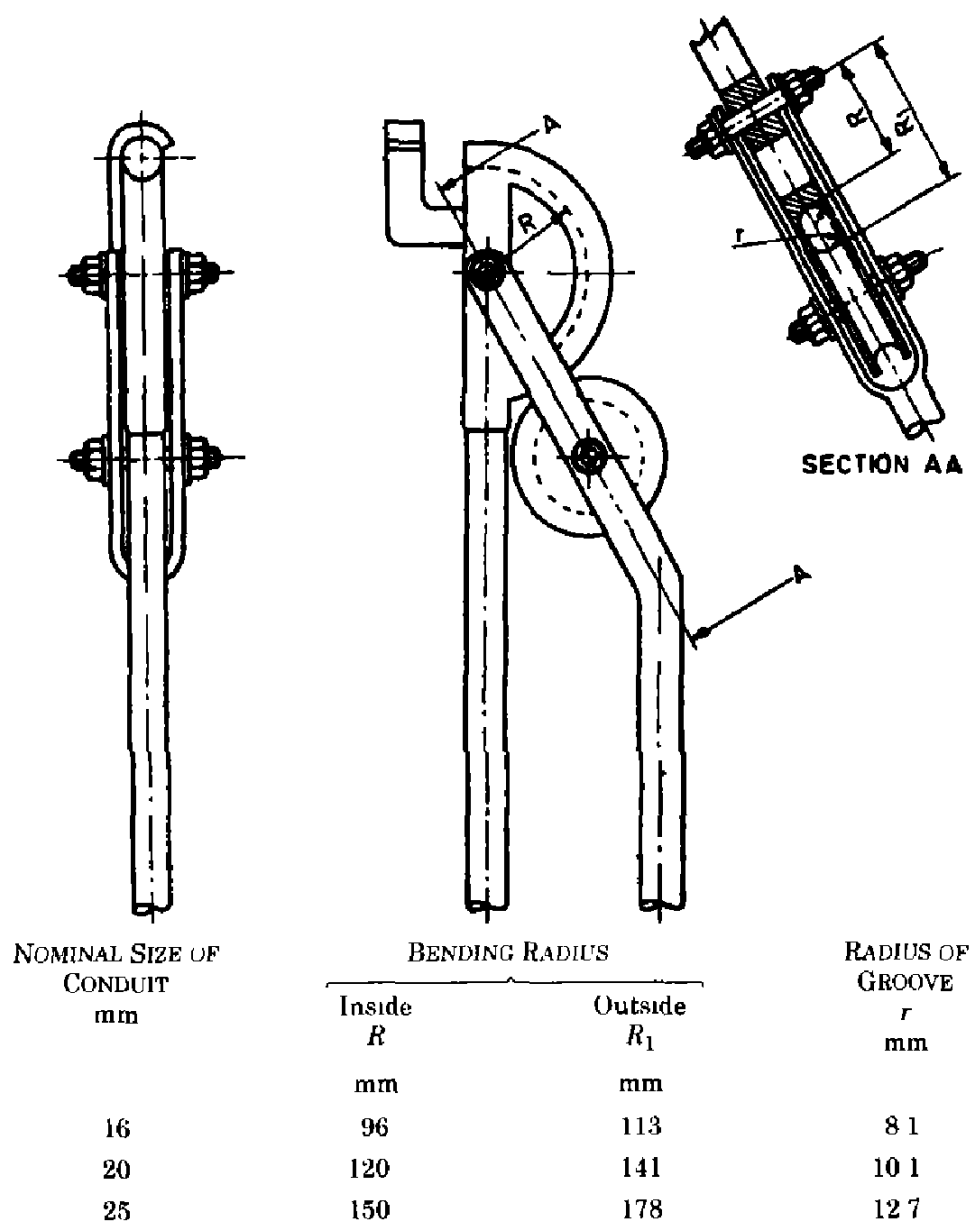


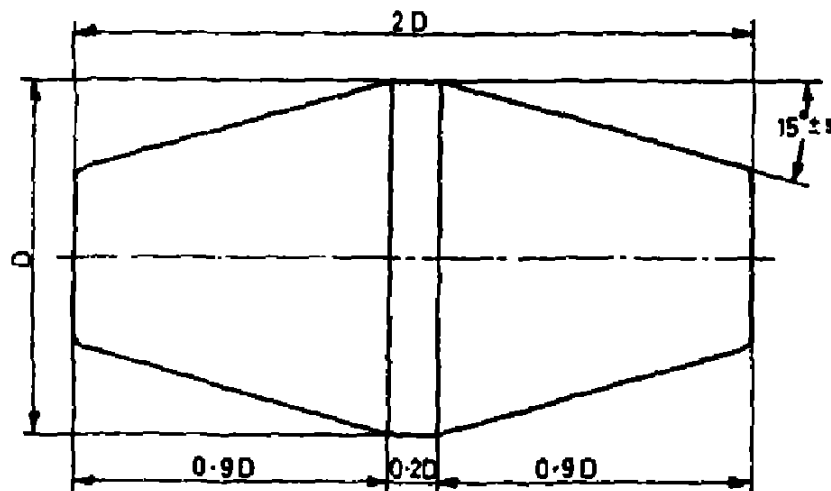
FIG. 3 BENDING TOOL

IS : 9537 (Part II) - 1981

9.2.3 For conduits with welded seams, approximately half the number of samples are tested with the seam on the outside of the bend and the remaining half with the seam on the flank.

9.2.4 After the test, neither the basic material nor the protective coating of the conduits shall show any cracks visible by normal or corrected vision without magnification. Seams, if any, shall not have opened, and the section of the conduit shall not have distorted unduly. The distortion of the section shall be checked as given in 9.2.5

9.2.5 The bent conduit is then held in such a position that the straight portions are at  $45^\circ$  to the vertical. It shall then be possible to pass the appropriate gauge with a diameter as specified in Fig 4.



NOMINAL SIZE OF CONDUIT mm	DIAMETER OF GAUGE 'D'	TOLERANCE
16	9	$\pm 0.02$
20	13	$\pm 0.02$
25	16	$\pm 0.02$

Material Steel, hardened and ground, edges slightly rounded

Tolerances on axial dimension  $\pm 0.2$  mm

It shall be possible to pass the appropriate gauge through the conduit under its own weight and without any initial speed

FIG. 4 GAUGE FOR CHECKING MINIMUM INSIDE DIAMETER OF CONDUITS AFTER BENDING

## **IS : 9537 (Part II) - 1981**

### **9.3 Compression Test**

**9.3.1** The relevant provision of **9.3** of IS : 9537 (Part I)-1980\* shall apply except that the sample shall not be conditioned at a temperature of  $27 \pm 2^{\circ}\text{C}$  for 10 hours.

**9.3.2** The difference between the initial diameter and the diameter of the flattened sample shall not exceed 10 percent

### **10. RESISTANCE TO HEAT**

**10.1** The provisions given in **10** of IS : 9537 (Part I)-1980\* are not applicable

### **11. RESISTANCE TO BURNING**

**11.1** The provisions given in **11** of IS : 9537 (Part I)-1980\* are not applicable.

### **12. ELECTRICAL CHARACTERISTICS**

**12.1** The provisions given in **12** of IS : 9537 (Part I)-1980\* are not applicable

### **13. EXTERNAL INFLUENCES**

**13.1** The relevant provisions given in **13** of IS : 9537 (Part I)-1980\* shall be applicable with the modifications given below in **13.2** and **13.3**.

**13.2** *For conduits having different classes of protection inside and outside [ see 5.1 (d), (e) and (f) ], double the number of samples are taken ( see 4.2 and 4.3 ) Half of the samples so taken are tested for protection inside and the remaining half for protection outside.*

**13.3** In case of conduits having nominal size of 32 mm and above, bending of samples in accordance with **9.2** is not required.

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\*Specification for conduits for electrical installations Part I General requirements



**APPENDIX A**

( Clause 4.3 )

**SAMPLING AND CRITERIA FOR CONFORMITY OF  
RIGID STEEL CONDUITS****A-1. LOT**

**A-1.1** In any consignment, all the manufactured lengths of conduits of the same type and size manufactured by the same factory during the same period shall be grouped together to constitute a lot.

**A-1.2** The number of conduits to be selected from each lot shall depend upon the size of the lot and shall be in accordance with col 1 and 3 of Table 2

**TABLE 2 SAMPLE SIZE, ACCEPTANCE AND REJECTION NUMBER**

LOT SIZE	STAGE OF SAMPLE	FOR DIMENSIONAL REQUIREMENTS			FOR OTHER ACCEPTANCE TESTS		
		Sample Size	Accep- tance Number	Rejection Number	Sample Size	Accep- tance Number	Rejection Number
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Up to 300	First	8	0	2	3	0	2
	Second	8	1	2	3	1	2
301 to 500	First	13	0	2	5	0	2
	Second	13	1	2	5	1	2
501 to 1 000	First	20	0	3	8	0	2
	Second	20	3	4	8	1	2
1 001 and above	First	32	1	5	13	0	3
	Second	32	4	4	13	3	4

**A-1.2.1** These conduits shall be selected from the lot at random. In order to ensure the randomness of selection, procedure given in IS : 4905-1968\* may be followed.

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\*Methods for random sampling

**IS : 9537 (Part II) - 1981**

**A-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY**

**A-2.1** All the conduits selected in the first sample at random according to col 1 and 3 of Table 2 shall be examined for dimensional requirements. A conduit failing to satisfy any of these requirements shall be termed as 'defective'. The lot shall be considered as conforming to these requirements if the number of defectives found in the first sample is less than or equal to the corresponding acceptance number ( see col 4 ) If the number of defectives is greater than or equal to the corresponding rejection number ( see col 5 ), the lot shall be deemed as not conforming to the requirements. If the number of defectives is greater than the acceptance number but less than the rejection number, a second sample of the same size as the first shall be taken to determine the conformity or otherwise of the lot. The number of defectives found in the first and second samples shall be combined and if the combined number of defectives is less than or equal to the corresponding acceptance number of the second sample, the lot shall be declared as conforming to these requirements; otherwise not.

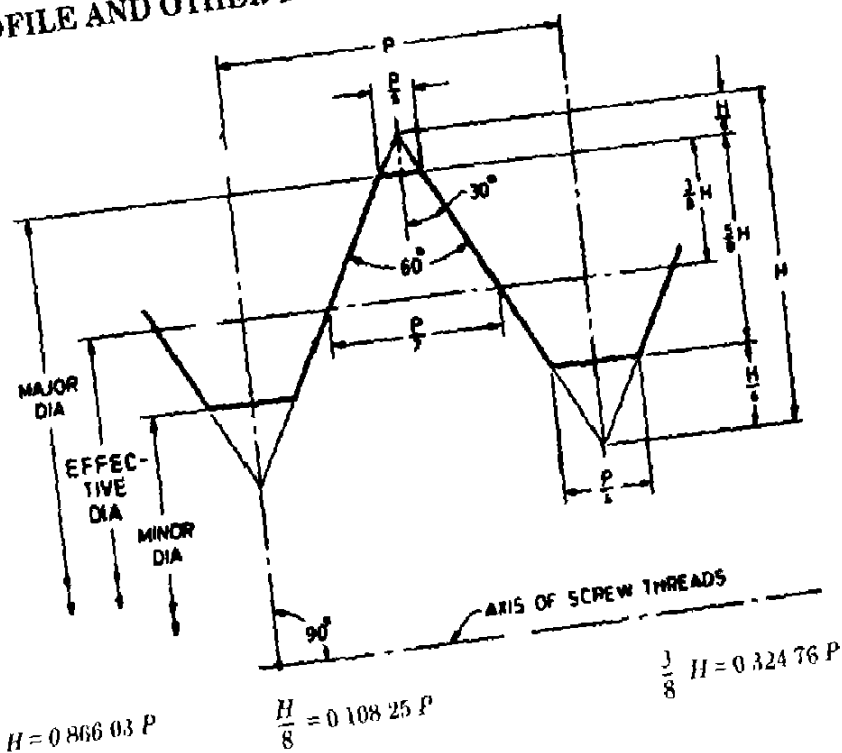
**A-2.2** The lot which is found conforming to the dimensional requirements, shall then be tested for other acceptance tests. For this purpose, sample size, acceptance number and rejection number are given in col 6, 7 and 8 of Table 2 respectively.

**A-2.3** The lot shall be considered as conforming to the requirements of acceptance tests if A-2.1 and A-2.2 are satisfied.

# APPENDIX B

(Clauses 7.4.1 and 7.4.2.1)

## PROFILE AND OTHER DETAILS OF ISO SCREW THREADS



$$H = 0.86603 P$$

$$\frac{H}{8} = 0.10825 P$$

$$\frac{3}{8} H = 0.32476 P$$

$$P = 1.5$$

$$\frac{H}{4} = 0.21651 P$$

$$\frac{5}{8} H = 0.54127 P$$

All dimensions in millimetres

NOMINAL SIZE OF CONDUIT (1)	MAJOR DIA- METER, $d$		EFFECTIVE DIA- METER, $d_2$		MINOR DIA- METER, $d_1$		LENGTH OF SCREW THREAD (8)
	Max (2)	Min (3)	Max (4)	Min (5)	Max (6)	Min (7)	
16	15 968	15 593	14 994	14 770	14 127	13 795	12.5
20	19 968	19 593	18 994	18 770	18 127	17 795	15.0
25	24 968	24 593	23 994	23 758	23 127	22 783	19.0
32	31 968	31 593	30 994	30 758	30 127	29 783	19.0
40	39 968	39 593	38 994	38 758	38 127	37 783	19.0
50	49 968	49 593	48 994	48 744	48 127	47 769	22.0
63	62 968	62 593	61 994	61 744	61 127	60 769	22.0

± 1 mm

FIG. 5 BASIC PROFILE OF ISO METRIC SCREW THREADS

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This Indian Standard has been developed by Technical Committee ETDC 44 and amended by ETD 14

### **Amendments Issued Since Publication**

<b>Amend No.</b>	<b>Date of Issue</b>
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Amd No 2	May 1990
Amd No 3	March 2002

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