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मानक

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IS 14930-2 (2001): Conduit Systems for Electrical Installations, Part 2: Particular Requirements - Conduit Systems Buried Underground [ETD 14: Electrical Wiring Accessories]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

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भाग 2 विशेष अपेक्षाएँ — भूमि के नीचे गाढ़ी गई कन्ड्यूट प्रणाली

Indian Standard

**CONDUIT SYSTEMS FOR ELECTRICAL
INSTALLATIONS**

**PART 2 PARTICULAR REQUIREMENTS — CONDUIT SYSTEMS
BURIED UNDERGROUND**

ICS 29.120.10

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

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wiring Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

This standard (Part 2) specifies the particular requirements and tests for conduit system buried underground including conduits and conduit fittings for the protection and management of insulated conductors and/or cables in electrical installations or in communication systems. This standard applied to metallic, non-metallic and composite systems including threaded and non-threaded entries which terminate the system.

This standard (Part 2) is to be read in conjunction with Part 1 of this standard to which reference has been given regarding general requirements as well as test methods. Should however, any deviation exists between Part 1 and this standard, the provision of the latter shall apply. Sequence of clauses used in this standard is the same as in Part 1 of this standard for easy reference. Whenever a particular requirement is not applicable to this type of conduit, the same has been indicated accordingly.

Where a particular clause or subclause of Part 1 is not mentioned in this Part 2, that clause or subclause applies as far as is reasonable. Where this Part 2 states addition or replacement, the relevant text of Part 1 is to be adopted accordingly.

Clauses and table which are additional to those of part 1 are numbered starting from 101 and additional sub-clauses are numbered with the main clause number followed by 101, for example, 7.101.

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

While preparing this standard assistance has been derived from BS EN 50086-2-4 (1994) 'Specification for conduit systems for electrical installations: Part 2 Particular requirements, Section 2.4 Conduit systems buried underground' issued by British Standards Institute (BSI).

It is intended to formulate other parts of this standard on other type of conduit system in future depending upon the development at the National or International level.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

**AMENDMENT NO. 1 MAY 2002
TO
IS 14930 (PART 2) : 2001 CONDUIT SYSTEMS FOR
ELECTRICAL INSTALLATIONS
PART 2 PARTICULAR REQUIREMENTS — CONDUIT SYSTEMS
BURRIED UNDERGROUND**

(Cover page and page 1, title) — Substitute the following for the existing:

**CONDUIT SYSTEMS FOR ELECTRICAL AND
COMMUNICATION INSTALLATION
PART 2 PARTICULAR REQUIREMENTS FOR CONDUIT SYSTEM
BURRIED UNDERGROUND**

(ET 14)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 AUGUST 2011
TO
IS 14930 (PART 2) : 2001 CONDUIT SYSTEMS FOR
ELECTRICAL AND COMMUNICATION INSTALLATION*

PART 2 PARTICULAR REQUIREMENTS FOR CONDUIT
SYSTEM BURIED UNDERGROUND

(Page 1, clause 6.1) — Add the following after 6.1:

'6.1.0 Resistance to Compression

6.1.0.1 Type 450

6.1.0.2 Type 750'

[Page 1, clause 7.1(c)] — Add the following at the end:

'd) The Classification Code Type 450 or Type 750 according to 6.1.0.1 and 6.1.0.2.'

(Page 2, clauses 8.1 and 8.2, Table 101, last row) — Add the following at the end:

Nominal Size	Outside Diameter Mm	Tolerance mm	Minimum Inside Diameter mm
(1)	(2)	(3)	(4)
315	315	+5.7	237

(Page 2, clause 10.2.5, para 1) — Substitute the following for the existing matter:

'10.2.5 When reaching the deflection of 5 percent, the applied force shall be at least:

- 450 N for conduits with classification declared according to 6.1.0.1, and*
- 750 N for conduits with classification declared according to 6.1.0.2.'*

*Title changed vide Amendment No. 1 issued in May 2002.

(ETD 14)

D(5ms)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CONDUIT SYSTEMS FOR ELECTRICAL INSTALLATIONS

PART 2 PARTICULAR REQUIREMENTS — CONDUIT SYSTEMS BURIED UNDERGROUND

1 SCOPE

This clause of Part 1 is applicable except as follows:

1.1 Replacement

This standard (Part 2) specifies requirements and tests for conduit systems buried underground including conduits and conduit fittings for the protection and management of insulated conductors and/or cables in electrical installations or in communication systems. This standard applies to metallic, non-metallic and composite systems including threaded and non-threaded entries which terminate the system.

Conduit systems which are used as an integral part of other equipment shall also be tested according to the relevant specification for that equipment.

2 REFERENCE

2.1 Following Indian Standard is necessary adjunct to this standard:

<i>IS No.</i>	<i>Title</i>
4905 : 1968	Methods of random sampling

3 DEFINITIONS

This clause of Part 1 is applicable except as follows:

Addition

3.101 Multiwall Conduit

A conduit consisting of several walls which may be a combination of plain and/or corrugated walls.

4 GENERAL REQUIREMENTS

This clause of Part 1 is applicable.

5 GENERAL CONDITIONS OF TESTS

This clause of Part 1 is applicable except as follows:

5.1 Replacement

The schedule of type and acceptance tests are given in 101.

6 CLASSIFICATION

This clause of Part 1 is applicable except as follows:

6.1 According to Mechanical Properties

Replacement

6.1.1 Resistance to Impact:

- a) Normal duty
- b) Light duty

6.1.2 Resistance to Bending:

- a) Rigid
- b) Pliable

6.2.6.3 Not applicable.

Addition

6.4.101 Resistance against chemical attack:

- a) Without protection
- b) With protection

6.5.3 Not applicable

7 MARKING

This clause of Part 1 is applicable except as follows:

7.1 Addition

- c) The type of conduits N (normal duty) L (light duty)

7.1.101 Conduits shall be marked in accordance with 7.1 at regular intervals along their length of preferably 1 m but not longer than 3 m.

7.1.102 The manufacturer shall provide in his literature all information necessary for the proper and safe installation and use.

7.2 Replacement

Conduit fittings shall be marked in accordance with 7.1 on the product.

7.3. and 7.4 are not applicable.

7.5 Addition

An alternative test is under consideration.

7.101 The conduit system may also be marked with standard mark.

7.101.1 The use of Standard mark is governed by the provision of *Bureau of Indian standards Act, 1986* and the rules and regulations made thereunder. The details

of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 DIMENSIONS

This clause of Part 1 is applicable except as follows:

8.1 and 8.2 Replacement

Conduits shall be preferably according to Table 101.

Table 101 Outside Diameters-Preferred Values
(Clauses 8.1 and 8.2)

Nominal Size	Outside Diameter mm	Tolerance mm	Minimum, Inside Diameter mm
(1)	(2)	(3)	(4)
25	25	+0.5	18
32	32	+0.6	24
40	40	+0.8	30
50	50	+1.0	37
63	63	+1.2	47
75	75	+1.4	56
90	90	+1.7	67
110	110	+2.0	82
120	120	+2.2	90
125	125	+2.3	94
140	140	+2.6	106
160	160	+2.9	120
180	180	+3.3	135
200	200	+3.6	150
225	225	+4.1	170
250	250	+4.5	188

NOTES

1 Tolerance on outside diameters are given as follows:

- Outside diameter specified are nominal dimensions.
- Outside diameter maximum is nominal outside diameter + $(0.018 \times \text{nominal outside diameter values})$ rounded off to + 0.1 mm.
- Minimum inside diameter is nominal outside diameter divided by 1.33.

2 Any other sizes other than those mentioned in Table 101 shall be as per the agreement between the buyer and the seller.

Compliance of the minimum inside diameter shall be checked by measurement according to two perpendicular diameters on the same section and calculating the average value.

Compliance of the outside diameter shall be checked using a ring gauge or any suitable method.

9 CONSTRUCTION

This clause of Part 1 is applicable except as follows:

9.3 and 9.4 are not applicable.

10 MECHANICAL PROPERTIES

This clause of Part 1 is applicable except as follows:

10.1.4 Replacement

Compliance is checked by the tests of 10.2 to 10.4.

10.2 Compression Test

Replacement

10.2.1 Conduit and bends are subjected to a compression test.

The test for conduits and bends containing non-metallic materials shall not be started until 10 days after manufacture.

10.2.2 Samples shall be 200 ± 5 mm long.

10.2.3 Before the test, the outside and inside diameters of the samples shall be measured as described in 8.

10.2.4 The samples shall be compressed between two flat steel plates having minimum dimensions $(100 \times 200 \times 15 \text{ mm})$, the length 200 mm being along the length of the sample. The sample shall be compressed at a rate of $15 \pm 0.5 \text{ mm/min}$ and the load recorded at the vertical deflection equivalent to 5 percent of the average value of the original inside diameter of the sample.

10.2.5 When reaching the deflection of 5 percent, the applied force shall be at least 450 N.

NOTE — The deflection is calculated with the inner diameter but the measurement of the outside diameter may be sufficient. In case of doubt, it will be necessary to measure the inner diameter.

10.2.6 After the test, there shall be no crack allowing the ingress of light or water between the inside and the outside.

10.3 Impact Test

Replacement

10.3.1 Twelve samples of conduits each 200 ± 5 mm in length or conduit fittings are subjected to an impact test by means of the apparatus shown in Fig. 101.

Conduits are tested alone.

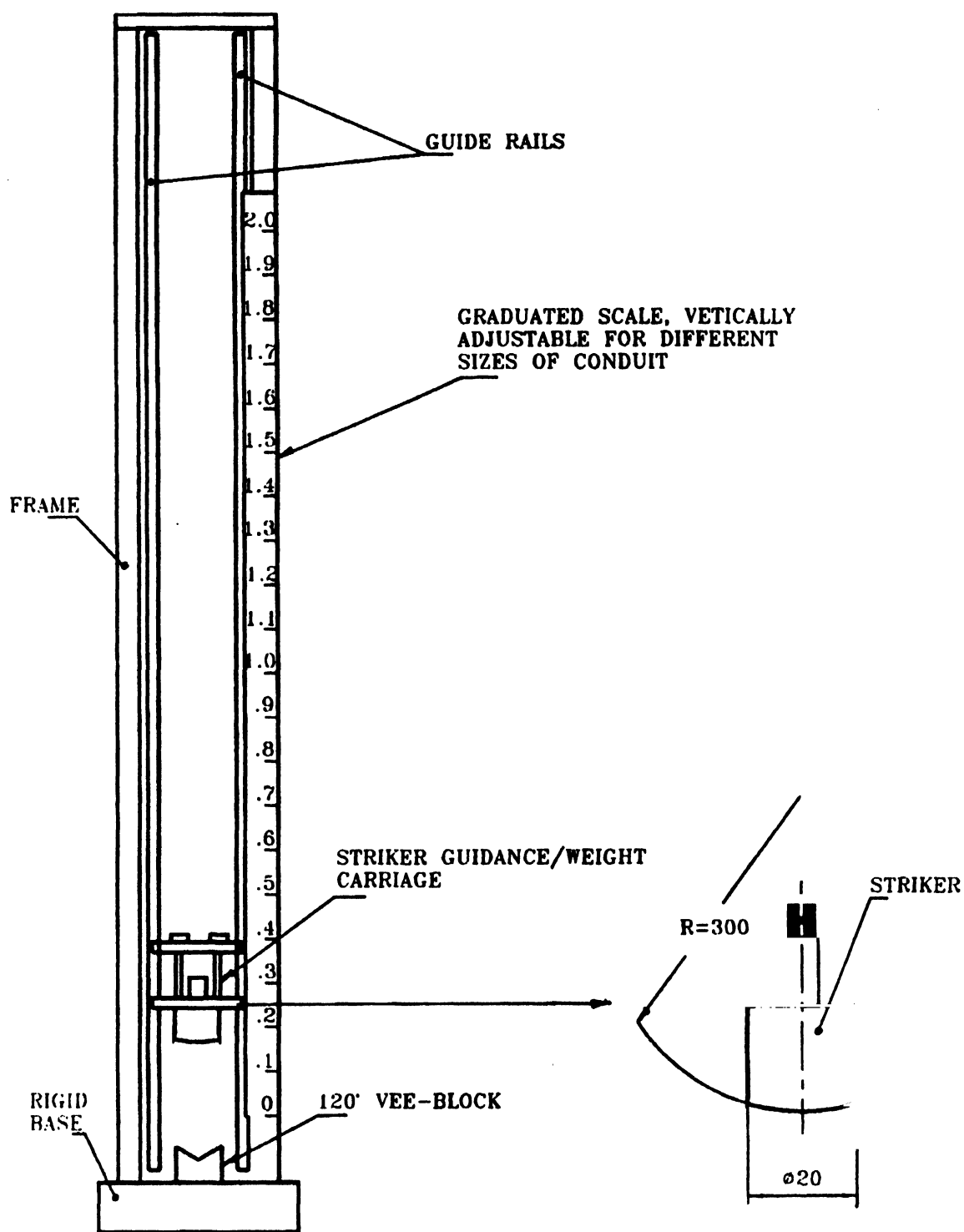
Fittings are tested when assembled with conduits by using a suitably shaped 120° veeblock.

10.3.2 The test apparatus shall be placed on a firm flat surface.

The samples shall be conditioned in a cold chamber at a temperature of $-5 \pm 1^\circ\text{C}$ for 2 h.

The samples shall be removed from the cold chamber and placed on the veeblock holder as shown in Fig. 101.

The striker shall fall once on each sample. The time between removal of the sample from the cold chamber and completion of impact shall not exceed 10 s. The energy values are specified in Table 102.



NOTE — This drawing is not intended to govern design except as regards the dimensions shown.

FIG. 101 IMPACT TEST APPARATUS

Table 102 Impact Test Energy Values
(Clause 10.3.2)

Nominal Size of Conduit	Light Duty			Normal Duty		
	Mass of Striker (+1/+0) percent	Fall Height (+0/-1) percent	Energy	Mass of Striker (+1/+0) percent	Fall Height (+0/-1) percent	Energy
	Kg (2)	mm (3)	J (4)	Kg (5)	mm (6)	J (7)
(1) Up to and including 60	3	100	3	5	300	15
61 to 90	3	200	6	5	400	20
91 to 140	3	400	12	5	570	28
above 140	3	500	15	5	800	40

The test shall be made on the weakest part of the conduit fitting except that it shall not be applied within 5 mm of any sample entry. Samples of conduit are tested on the centre of their length.

10.3.3 After the test, at least in nine of the samples, there shall be no crack allowing the ingress of light or water between the inside and the outside.

10.4 Bending Test

Replacement

10.4.1 This test shall be carried out on pliable conduits.

10.4.2 The test is made on six samples having an appropriate length. Three samples are tested at room temperature, the other three are tested at $-5 \pm 1^{\circ}\text{C}$.

For the test at -5°C , the samples shall be conditioned

in a cold chamber for 2 hours.

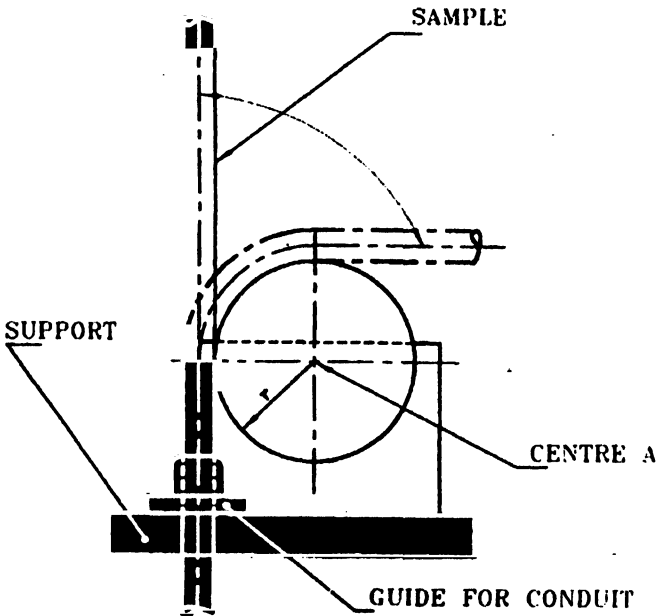
The test apparatus consists of a device as shown in Fig. 102 allowing to bend the conduit with a bending radius equal to the minimum bending radius specified by the manufacturer.

One of the ends of the samples shall be fixed on the test apparatus by means of an appropriate device. The sample is then bent to approximately 90° and hold.

10.4.3 During the test, the samples shall not flatten.

Compliance shall be checked by passing a ball having a diameter equal to the 95 percent minimum inner diameter of the sample declared by the manufacturer, through the sample whilst it is bent around the test apparatus.

10.5, 10.6, 10.7, and 10.8 are not applicable.



NOTE — This drawing is not intended to govern design except as regards the dimensions shown.

FIG. 102 BENDING TEST APPARATUS

11 ELECTRICAL PROPERTIES

This clause of Part 1 is not applicable.

12 THERMAL PROPERTIES

This clause of Part 1 is applicable except as follows:

12.2 Not applicable.

13 FIRE EFFECTS

This clause of Part 1 is not applicable.

14 EXTERNAL INFLUENCES

This clause of Part 1 is applicable except as follows:

Addition

14.101 Resistance of chemical attack

Under consideration

15 ELECTROMAGNETIC COMPATIBILITY

This clause of Part 1 is applicable.

101 TESTS

101.1 Type Tests

The following shall constitute the type tests:

- a) Dimensions (see 8);
- b) Construction (see 9);
- c) Mechanical properties (see 10);
- d) Electrical properties (see 11);
- e) Thermal properties (see 12);
- f) Fire effects (see 13);
- g) External influences (see 14); and
- h) Electromagnetic compatibility (see 15).

101.2 Acceptance Tests

The following shall constitute the acceptance test:

- a) Dimensions (see 8);
- b) Mechanical properties (see 10);
- c) Electrical properties (see 11); and
- d) Fire effects (see 12).

NOTE — Recommended sampling plan and criteria for conformity for acceptance test is given in Annex A.

ANNEX A

(Clause 101.2)

RECOMMENDED SAMPLING PLAN AND CRITERIA FOR CONFORMITY
FOR ACCEPTANCE OF LOT

A-1 LOT

A-1.1 In any consignment, all the lengths of same nominal size and class manufactured from the same material under essentially similar conditions of production shall be grouped together to constitute a lot.

A-2 SCALE OF SAMPLING

A-2.1 For judging the conformity of a lot to the requirements of the acceptance tests, sampling shall be done for each lot separately. For this purpose, the number of lengths to be selected at random from the lot shall be in accordance with Table 103.

Table 103 Scale of Sampling
(Clause A-2.1)

Lot Size	For Dimensional Requirements		Other Acceptance Tests
	Sample Size	Permissible No. of Defectives	
(1)	(2)	(3)	(4)
Up to 300	13	0	2
301 to 500	20	0	3
501 to 1 000	32	1	4
1 001 to 3 000	50	2	5
3 001 and above	80	3	7

A-2.2 These lengths shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in IS 4905 may be followed.

A-3 NUMBER OF TESTS AND CRITERIA FOR ACCEPTANCE

A-3.1 From each of the lengths selected at random according to col 2 of Table 2, suitable lengths of test samples shall be taken. Each of these test samples shall be subjected to the test given in 8. The number of test samples not fulfilling the requirements of this test shall

be less than or equal to the corresponding permissible number of defectives given in col 3 of Table 103.

A-3.2 The lots conforming to the dimensional requirements shall be further tested for other acceptance tests. The lot shall be considered to have met the requirements for these tests if none of the samples selected according to col 4 of Table 103 fails.

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