भारतीय मानक

Indian Standard

IS 3480 : 2024

बिजली के तारो के लिए लचीले स्टील कन्डुइट — विशिष्टि

(पहला पुनरीक्षण)

Flexible Steel Conduits for Electrical Wiring — Specification

(First Revision)

ICS 29.120.10

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

June 2024 **Price Group 4**

Electrical Wiring Accessories Sectional Committee, 14

FOREWORD

This Indian Standard (First Revision) is adopted by the Bureau of Indian Standards, after the draft finalized by Electrical Wiring Accessories Sectional Committee had been approved by the Electro Technical Division Council.

This Indian standard covers the requirements for flexible steel conduits intended for the protection of cables in electrical installation. The adaptors for these conduits and flexible steel conduits of the packed type will be covered in separate specifications.

Flexible steel conduits shall not be used as an earth continuity conductor. Where such conduit forms part of an earthed metal conduit system, a separate earth continuity conductor shall be installed with the tubing and connected to it at each end and in the case of long runs at suitable intervals throughout the run.

The electro-deposition of steel strip is neither designed nor intended to be other than a protection of the material during manufacture, storage, handling and transport. The onus of protecting conduits in service is on the user, who should adopt methods suited to the particular conditions prevailing.

This standard has been revised to bring it in line with IEC 61386-1 : 2008 ‘Conduit systems for cable management — Part 1: General requirements’ while preparing this standard.

The composition of the Committee, responsible for the formulation of this standard is given in Annex A.

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 test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FLEXIBLE STEEL CONDUITS FOR ELECTRICAL WIRING — SPECIFICATION

(First Revision)

1 SCOPE

This standard specifies the requirements for flexible steel conduits intended for the protection of cables in electrical installation.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards:

IS No.	*Title*
IS 277 : 2018	Galvanized steel strips and sheets (plain and corrugated) — Specification (*seventh revision*)
IS 513 (Part 1) : 2016	Cold reduced carbon steel sheet and strip: Part 1 Cold forming and drawing purpose (*sixth revision*)

3 TERMINOLOGY

3.1 For the purpose of this standard, the following definition shall apply.

3.2 Flexible Conduit — A tube into which cable or cables may be drawn mainly for the purpose of providing mechanical protection, sufficient flexibility (*see* **7.2**) to suit the purpose of its use.

3.3 Manufactured Length — A single continuous length of conduit manufactured.

3.4 Batch — In any consignment, all manufactured lengths of conduits of the same type and size, manufactured by the same factory and during the same period, shall be grouped together to constitute a batch. Each batch shall, however, consist of a maximum of 50 manufactured lengths, total length not exceeding 1 000 m of conduits

4 MATERIALS

4.1 Strip Steel

The strip steel used in the manufacture of the flexible conduit will be mild steel, bright, cold-rolled and annealed, and equivalent in quality of ordinary grade of IS 513 (Part 1). The strip shall be of uniform width and thickness throughout and all surfaces shall be free from scale or rust before the application of the protective coating. The strip shall be electro-galvanized or electro-tinned to a minimum thickness of 0.002 5 mm, or otherwise provided with an equally effective protective coating, before being formed into tubing.

5 CONSTRUCTION AND WORKMANSHIP

5.1 The conduit shall be uniform in diameter throughout its length.

5.2 The conduit shall be wound tightly and the strip so overlapped in subsequent helicis that no opening are seen in normal position.

5.3 The internal surfaces of the conduit shall be free from burrs and sharp edges which might cause abrasion to the insulation on the cables, and shall be free from obstruction that might interfere with the easy introduction of the maximum size and number of cable (s) for which the conduit is normally intended.

6 DIMENSION

6.1 The dimensions and turns per meter length shall be in accordance with Table 1.

Table 1 Requirements for Flexible Steel Conduits

(*Clauses* 6.1, 7.2, 9.3, 9.4, 9.5 *and* 9.6)

Sl No.	Normal Internal Diameter	Internal Diameter	Tolerance on Internal Diameter	External Diameter in Normal Position	Turns/ Metre in Normal Position	*Bending Diameter	$Linear Breaking Load	Bending Fracture Load
				Max	*Min*	*Min*	*Min*	*Min*
	mm	mm	mm	mm		mm	kgf	kgf
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	6.5	6.5		9.0	315	55	35	11.5
ii)	10	10.0	+ 0 5	13.0	235	63	60	18.0
iii)	16	16.0	- 0.0	20.0	200	90	110	35
iv)	25	25.0		31.0	160	150	210	45
v)	40	40.0		46.0	100	225	330	70
vi)	63	63.0	+ 1.0	70.0	100	350	430	125
vii)	100	100.0	- 0.0	108.0	100	450	500	190

6.2 The conduits shall be supplied in such lengths as may be specified by the purchaser.

7 MECHANICAL PROPERTIES

7.1 Tensile Strength

Flexible conduits shall pass the test specified in **9.4**

7.2 Flexibility

The flexibility of conduit shall be such that a specimen is capable of being bent, without opening at any point completely around a former with a diameter specified in col (7) of Table 1.

7.3 Crushing strength

The conduit shall be capable of withstanding the test specified in **9.7**.

8 MARKING

8.1 Flexible steel conduits shall be suitably marked or labeled with the following:

a) Name of the trade mark of the manufacture;

b) Nominal size of the conduit;

c) Length of the conduit; and

d) Country of manufacture.

8.2 BIS Certification Marking

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

9 TESTS

9.1 General

The test shall be made at the prevailing ambient temperature unless specified otherwise in the relevant clauses.

9.2 Samples and Criteria for Conformity

9.2.1 Each test shall be made on three samples, the samples being taken from three different manufactured lengths selected being taken from three different manufactured lengths selected from a batch for the purposes of carrying out of tests specified in **9.3** to **9.4**.

* Inner diameter of bend without straining conduit

$ Linear breaking loads- loads at which coils at adjacent bending

9.2.2 No failure shall be permitted in any of the tests in **9.3** to **9.7** for proving conformity with the standard. Should any of the test samples prove unsatisfactory, a further set of samples twice in number shall be subjected in **9.2** to **9.7** Should the second set of samples also prove unsatisfactory, the whole batch from which the samples were taken shall be rejected.

9.3 Test for Dimension

The internal diameter of each sample length of conduit shall be checked by means of suitable gauges for conformity with the values specified in Table 1.

9.4 Linear Breaking Test

A piece of conduit 300 mm long shall be placed in the jaws of a tensile testing machine, 100 mm of each end being held by the leaving 100 long mm long between the jaws. A mandrel of the proper diameter and 100 mm long shall be inserted in each end of the conduit to prevent distortion. The conduit shall show no indication of the yielding under a load less than that of specified in Table 1 maintained for a period of three minutes.

9.5 Test for Flexibility

The specimen conduit of sufficient length shall be bent complete turnaround a cylindrical former having a diameter specified in Table 1 and returned to straight position without damage , with a tension just sufficient to cause the conduit conform closely to the curved surface of the former. Checking shall be done to ensure that:

a) The outside diameter shows no crack or flows visible to the naked eye; and

b) The conduit returns to the normal position without any damage to its outer or inner diameter.

9.5.1 While the conduit is around the former , it shall be examined to see if the edges to the adjacent convolutions have separated sufficiently to expose the interior of the conduit.

9.6 Bend Fracture Test

A piece of conduit shall be bent of a U shape between the flat heads of a compression testing machine. The conduit shall be held in the machine in such a position that as the load is applied the radius of the bend shall be decreased until the yield point is reached .The breaking load thus found shall be not less than that specified in Table 1.

9.7 Crushing Test

A 50 mm length of conduit shall be compressed between the flat steel plates and a load of 40 kgf per linear centimeter uniformly distributed shall be applied across the diameter when no permanent distortion shall be produced.

9.7.1 The ends of the specimen shall be perpendicular to axis for which the end of the helical strip has to be grounded.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Electrical Wiring Accessories Sectional Committee, ETD 14

Organization	*Representative(s)*
Central Public Works Department, New Delhi	SHRI PRABHAKAR SINGH **(*Chairperson*)**
All India Plastic Manufacturers Association, Mumbai	SHRI JAGAT KILLAWALA
Central Electricity Authority, New Delhi	SHRI VIVEK GOYAL SHRIMATI KAVITA JHA (*Alternate* I) SHRI ASHOK KUMAR RAJPUT (*Alternate* II)
Central Public Works Department, New Delhi	SHRI S. K. CHAWLA SHRI AWADHESH KUMAR (*Alternate*)
Consumer Education and Research Centre,	SHRIMATI SHWETA MAHAJAN SHRIMATI SHWETA SETH (*Alternate*)
Consumer Guidance Society of India, Mumbai	SHRI ANIL K. DHUMAK SHRI V. SHENOY (*Alternate*)
Consumer Voice, New Delhi	SHRI H. WADHWA
Delhi Electrical Accessories BIS Licensees Association, New Delhi	SHRI KHERA ADARSH SHRI AJIT SINGH (*Alternate*)
Dell Technologies, Gurugram	SHRI RAJENDER SAINI SHRI LALIT KUMAR MEHTA (*Alternate*)
Directorate General of Quality Assurance, Ministry of Defence, New Delhi	SHRI Y. A. KAMBLI
Electrical Contractors Association of Maharashtra, Mumbai	SHRI KAMLESH SHAH SHRI SANJAY KOLHATKAR (*Alternate*)
Electrical Research & Development Association, Vadodara	SHRI RAKESH PATEL DR VINOD GUPTA (*Alternate*)
Fine Switchgears, Phagwara	SHRI MOHINDER SETHI SHRI ASHOK SETHI (*Alternate*)
Havells India Limited, Noida	SHRI NITESH KUMAR SHRI YOGESH SONAWANE (*Alternate*)
Hager Electro Pvt Ltd, Pune	SHRI SHIRISH ZOPE
Honeywell Electrical Devices and Systems India Ltd, Chennai	SHRI SUMIT JAIN SHRI ARVIND KUMAR (*Alternate*)
Indian Electrical and Electronics Manufacturers Association, New Delhi	SHRI RISHABH JOSHI SHRI NAVDEEP SINGH (*Alternate*)
Kinjal Electricals Pvt Ltd, New Delhi	SHRI R. K.JAIN SHRI MOHIT JAIN (*Alternate*)

Organization	*Representative(s)*
Manufacturers Association for Information Technology, New Delhi	SHRI COL A. A. JAFRI SHRI RISHI KANT VERMA (*Alternate*)
Ministry of Micro, Small and Medium Enterprises, New Delhi	SHRI S. V. SHARMA SHRI ANUJ KANSAL(*Alternate*)
Novateur Electrical & Digital systems Pvt Ltd, Mumbai	SHRI SURESH DEOTALU SHRI V. A. TILEKAR (*Alternate*)
National Test House, Ghaziabad	SHRI D. G BASUMATARY SHRI ANIL K. PANDEY (*Alternate* I) SHRI P. SOMU (*Alternate* II)
Panasonic life solutions India Pvt Ltd, Haridwar	SHRI ROHIT PANDEY SHRI JAI BHAGWAN (*Alternate*)
Public Works Dept, Maharashtra	SHRI SANDEEP ARVIND PATIL
Rex Polyextrusionsi, New Delhi	SHRI TEJAS S. DANDEKAR
Simon Electric, Mumbai	SHRI ANIL KUMAR
Schneider Electric India Pvt Ltd, Bangaluru	SHRI SURESH RAJA SHRI GURVEEN SINGH SACHDEVA (*Alternate* I) SHRIMATI RACHNA VERMA (*Alernate* II)
Western India Electrical Accessories Manufacturers' Association, Mumbai	SHRI KISHORE NANDU SHRI KAPIL AJMERA (*Alternate* I) SHRI MITESH GOSRANI (*Alternate* II)
In personal Capacity (*Mumbai*)	SHRI HEMANT M SALI
BIS Directorate General	SHRIMATI PRITI BHATNAGAR, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (ELECTROTECHNICAL) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRIMATI NEHA AGARWAL
SCIENTIST 'C'/DEPUTY DIRECTOR
(ELECTROTECHNICAL), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: ETD 14 (22123).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Manakalya, 4th Floor, NTH Complex (W Sector), F-10, MIDC, Andheri (East), Mumbai 400093	283 25838

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYNA, HUBLI, HYDERABAD, JAIPUR, JAMMU & KASHMIR, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.

Published by BIS, New Delhi