IS 12776 (2002): Galvanized Strand for Earthing [MED 10: Wire Ropes and Wire Products]

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भारतीय मानक

भू-सम्पर्कन के लिए जस्तीकृत लड़ — विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

GALVANIZED STRAND FOR EARTHING — SPECIFICATION

(First Revision)

(Incorporating Amendment No. 1)

ICS 29.240.20; 77.140.65

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

Price Group 3

Wire Ropes and Wire Products Sectional Committee, ME 10

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wire Ropes and Wire Products Sectional Committee had been approved by the Mechanical Engineering Division Council

The galvanized steel earth wire covered in this standard is used for shielding of electric transmission conductors by various electric utilities in the country.

The standard prepared based on specification No. CC-203-932 E Vol.-II 'Technical specification for GS earth wire' issued by the National Thermal Power Corporation was first published in 1989. Based on the experience gained in the industry, in this first revision the following modifications have been made:

a) Alternative method of checking the compactness of the strand at the time of conducting breaking force test is added.

b) Method of wrapping test is more elaborately described.

c) Sampling criteria has been modified for sampling before and after stranding.

d) Alternative method of marking at the end of one length when two lengths of strands are supplied in one drum is added.

e) Requirement of tensile strength, torsion, elongation and zinc coating have been modified to include before and after stranding values for the properties.

f) Breaking force and d.c. resistance values of strands have been modified by applying the specified stranding factor.

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

This edition 2.1 incorporates Amendment No. 1 (June 2004). Side bar indicates modification of the text as the result of incorporation of the amendment.

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 or analysis, 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 the same as that of the specified value in this standard.

Indian Standard

GALVANIZED STRAND FOR EARTHING — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers requirements for galvanized steel earth strand used for overhead transmission purposes with the three tensile grades of wires, namely, 981, 1 100 and 1 310.

2 REFERENCES

The following Indian Standards contain provisions, which through reference in this text constitute provisions 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 editions of the standards indicated below:

IS No.	*Title*
2363 : 1981	Glossary of terms relating to wire ropes (*first revision*)
4826 : 1979	Hot-dipped galvanized coatings on round steel wires (*first revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2363 shall apply.

4 MATERIAL

4.1 The steel wire shall be drawn from carbon steel wire rods produced by either the acid or the basic open hearth process, the electric furnace process or the basic oxygen process and shall have the following chemical composition:

Element	*Percentage Composition*
Carbon	0.55, *Max*
Manganese	0.40 to 1.10
Phosphorous	0.05, *Max*
Sulphur	0.05, *Max*
Silicon	0.15 to 0.35

4.2 Density

The density of galvanized steel wire at a temperature of 20°C may be taken as 7.8 g/cm^3.

4.3 Coefficient of Linear Expansion

The value of coefficient of linear expansion for galvanized steel wire used may be taken as 11.5×10^{-6}/°C.

5 CONSTRUCTION

5.1 The construction of the galvanized steel earth strand shall be as given in Annex A.

5.2 All steel galvanized steel earth strand shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasion and kinks after drawing and also after stranding.

5.3 The joints shall be allowed in individual wires and the distance between the two joints shall not be less than 15 m.

6 DIMENSIONS AND TOLERANCES

6.1 The dimensions and manufacturing tolerances shall be permitted in the diameter of individual wires and the lay length of the galvanized steel earth strand as given in Annex A.

7 STANDARD LENGTH

7.1 The standard length of the galvanized steel earth strand shall be between 1 500 to 2 000 m. A tolerance of ± 5 percent on the standard length shall be permitted.

7.2 Unless otherwise agreed to between the manufacturer and the purchaser, random length shall also be accepted provided one length is not less than half of the standard length of the galvanized steel earth strand offered by the manufacturer and the total quantity of random length is not more than 10 percent of the total quantity in each shipment.

8 TESTS

The following tests shall be conducted on the completed strand.

8.1 Breaking Force

8.1.1 Breaking force of the galvanized steel earth strand when tested according to procedure given in **8.1.2** shall have minimum breaking force as given in Annex A.

8.1.2 A circle perpendicular to the axis of the strand shall be marked at two places on a sample of galvanized steel earth strand of minimum 5 m length suitably compressed on the dead end clamps at either end. The force shall be increased at a steady rate up to 50 percent of

minimum breaking force. The circle drawn shall not be distorted due to relative movement of the component wires. The applied force then be increased until the breaking force is reached and the value is recorded.

8.1.3 Alternatively a galvanized steel earth strand sample when cut perpendicular to its axis by an abrasive cutter shall not have wires projected out nor shrunk inside from the cut end by more than 3 mm.

8.2 Elongation

The elongation of individual wires when measured on a gauge length of 200 mm after breakage shall meet the requirements as given in Annex A.

8.3 d.c. Resistance Test

8.3.1 The galvanized steel earth strand shall be tested according to **8.3.2**. The values of d.c. resistance shall be as given in Annex **A**.

8.3.2 On a galvanized steel earth strand of minimum 5 m length, two contact clamps shall be fixed. The resistance shall be measured by a Kelvin bridge or by any suitable instrument by placing the clamps initially from one end and subsequently one metre apart. The test shall be repeated at each metre length and the value recorded. The value obtained shall be corrected to 200°C. The average of five such results shall be reported as the resistance of the strand sample.

8.4 Wrapping Test

This test shall be conducted by wrapping the wire around a mandrel of diameter equal to four times the wire diameter to form a close helix of eight turns. Six turns then be unwrapped and finally closely wrapped again in the same direction as before. The wire shall not break during the test (applicable for wires before stranding).

8.5 Galvanizing Test

The zinc coating on the individual wires shall meet the requirements as given in Annex A.

8.6 Torsion Test

Torsion value of the individual wires shall meet the requirements as given in Annex A

9 SAMPLING CRITERIA

9.1 Before Stranding

Manufacturer shall prepare his own sampling plan for conducting various tests covered by this specification and shall present the test records for the verification of the purchaser if agreed in the contract.

9.2 After Stranding

One sample from every 10 drums or part thereof for conducting all tests except d.c. resistance, for which only one sample out of total material offered at a time, shall be taken.

10 REJECTION AND RE-TEST

10.1 If any of the test pieces first selected fail to pass the tests given in **8**, two further samples from the same batch excluding the length from which the original sample was taken shall be selected at random for testing.

10.2 All the samples shall satisfy the requirement of the tests. In case of any failure, the batch represented by the samples shall be deemed not to comply with the standard.

11 PACKING

11.1 The material shall be suitably packed before dispatch in strong non-returnable wooden drums.

11.2 Two standard lengths of galvanized steel earth strand may be wound in a drum.

11.2.1 In that case each standard length of galvanized steel earth strand shall be individually welded to the other to prevent parting of the two lengths at a tension less than 15 kN. The two ends where the first length finishes and the second length starts shall be clearly marked with adhesive tape. The length between the two marks shall be treated as scrapped and shall not be taken into account for measurement purposes.

11.2.2 Alternatively the galvanized steel earth strand may be supplied in a continuous length in a drum with markings by adhesive tape between two standard lengths.

12 MARKING

12.1 Each drum shall have the following information:

a) Manufacturer's name or trade-mark,
b) Drum number,
c) Size of galvanized steel earth strand,
d) Length of galvanized steel earth strand,
e) Gross weight of drum with galvanized steel earth strand, and
f) Arrow marking for unwinding.
g) Grade of galvanized steel earth strand given in **1** as applicable.

12.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

12.2.1 The use of the Standard Mark is governed by the provisions of *the Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to the manufacturers or the producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clauses* 5.1, 6.1, 8.1.1, 8.2, 8.3.1, 8.5 *and* 8.6)

CONSTRUCTION AND OTHER PROPERTIES OF GALVANIZED STEEL EARTH STRAND

1. Construction		7 × 3.00 mm			7 × 3.15 mm			7 × 3.25 mm			7 × 3.33 mm			7 × 3.66 mm			7 × 4.00 mm		
2. Wire Size (*D*) (mm)	a) Nominal	3.00			3.15			3.25			3.33			3.66			4.00		
	b) *Max*	3.08			3.25			3.33			3.41			3.74			4.08		
	c) *Min*	2.92			3.07			3.17			3.25			3.58			3.92		
3. Minimum tensile strength of wire, N/mm^2		Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
	(Before stranding)	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310
	(After stranding)	931	1 050	1 260	931	1 050	1 260	931	1 050	1 260	931	1 050	1 260	931	1 050	1 260	931	1 050	1 260
4. Torsion of wire on 100 × *D*																			
(before stranding)		*Min*: 20			*Min*: 20			*Min*: 20			*Min*: 20			*Min*: 20			*Min*: 20		
(after stranding)		*Min*: 18			*Min*: 18			*Min*: 18			*Min*: 18			*Min*: 18			*Min*: 18		
5. Wrap test on wire as described in **8.4**		No wire breakage during the test			No wire breakage during the test			No wire breakage during the test			No wire breakage during the test			No wire breakage during the test			No wire breakage during the test		
6. Elongation of wire (on 200 mm gauge length) in percent																			
(before stranding)		*Min*: 4			*Min*: 4			*Min*: 4			*Min*: 4			*Min*: 4			*Min*: 4		
(after stranding)		*Min*: 3.5			*Min*: 3.5			*Min*: 3.5			*Min*: 3.5			*Min*: 3.5			*Min*: 3.5		
7. Zn-coating on wires																			
a) Amount of coating (g/m^2)																			
(before stranding)		*Min*: 240			*Min*: 240			*Min*: 250			*Min*: 250			*Min*: 250			*Min*: 250		
(after stranding)		*Min*: 228			*Min*: 228			*Min*: 238			*Min*: 238			*Min*: 238			*Min*: 238		
b) Uniformity of coating																			
(before stranding)		*Min*: 3 dips of 1 minute			*Min*: 3 dips of 1 minute			*Min*: 3 dips of 1 minute			*Min*: 3 dips of 1 minute			*Min*: 3 dips of 1 minute			*Min*: 3 dips of 1 minute		
(after stranding)		*Min*: 2 dips of 1 minute and 1 dip of ½ minute			*Min*: 2 dips of 1 minute and 1 dip of ½ minute			*Min*: 2 dips of 1 minute and 1 dip of ½ minute			*Min*: 2 dips of 1 minute and 1 dip of ½ minute			*Min*: 2 dips of 1 minute and 1 dip of ½ minute			*Min*: 2 dips of 1 minute and 1 dip of ½ minute		

ANNEX A (*Concluded*)

8. Lay and lay length of galvanized steel earth strand (mm)	RH	*Min*: 117 *Max*: 252		RH	*Min*: 123 *Max*: 265		RH	*Min*: 127 *Max*: 273		RH	*Min*: 130 *Max*: 280		RH	*Min*: 143 *Max*: 307		RH	*Min*: 156 *Max*: 336	
9. Minimum breaking force of galvanized earth strand, kN	Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire			Tensile Grade of Wire		
	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310	981	1 100	1 310
	43.7	49.0	58.3	48.2	54.0	64.3	51.3	57.5	68.5	53.8	60.4	60.4	65.0	72.9	86.8	77.7	87.1	104.0
10. Approximate mass per km of galvanized steel earth strand (kg)	386			426			454			476			575			687		
11. Equivalent modulus of elasticity galvanized steel earth strand (kg/mm^2)	19×10^3			19×10^3			19×10^3			19×10^3			19×10^3			19×10^3		
12. Maximum d. c. resistance in ohm, per km of the galvanized steel earth strand at 20°C	3.77			3.41			3.20			3.05			2.51			2.09		

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Wire Ropes and Wire Products Sectional Committee, ME10

Organization	*Representative*(s)
Directorate General of Mines Safety, Dhanbad	SHRI D. SAHA (*Chairman*) SHRI S. P. BANSAL (*Alternate*)
Aerial Ropeway and Mechanical Handling Co Pvt Ltd, Kolkata	SHRI A. K. KINRA SHRI RANJAN MUKHERJEE (*Alternate*)
Amar Promoters Pvt Ltd, Solan	SHRI VIRENDER AGARWAL SHRI JATINDER AGARWAL (*Alternate*)
Bharat Coking Coal Ltd, Dhanbad	SHRI R. K. PRASAD
Bharat Wire Ropes Ltd, Mumbai	SHRI D. M. SHAH
Central Mining Research Institute, Dhanbad	SHRI S. P. CHAUDHARY SHRI R. P. CHAKRABORTY (*Alternate*)
Directorate General of Aeronautical Quality Assurance, New Delhi	SHRI S. B. PRASAD SHRI SANJAY CHAWLA (*Alternate*)
Directorate General of Civil Aviation, New Delhi	SHRI R. C. SHARMA SHRI N. M. WALECHA (*Alternate*)
Directorate General of Supplies and Disposals, New Delhi	SHRI M. GANGARAJU SHRI S. M. MUNJAL (*Alternate*)
Eastern Coalfields Ltd, Kolkata	SHRI H. K. CHAKRABORTY
Fort William Industries Ltd, Hooghly	SHRI I. N. BANERJEE SHRI J. L. RATHI (*Alternate*)
JCT Ltd (Steel Division), Hoshiarpur	SHRI MANMOHAN SINGH SHRI S. K. SETH (*Alternate*)
Ministry of Defence (Naval), New Delhi	CDR BRAHMASWAROOP SHRI B. L. KHDWAL (*Alternate*)
Ministry of Surface Transport, New Delhi	SHRI G. P. ROY SHRI T. K. DUTTA (*Alternate*)
National Test House, Ghaziabad	SHRI D. S. MAJUMDAR SHRI B. N. SARKAR (*Alternate*)
North Eastern Coalfields Ltd, Kolkata	SHRI A. TIRKEY
Oil and Natural Gas Commission, Dehra Dun	SHRI R. K. GARG SHRI P. K. SOOD (*Alternate*)
Research Designs and Standards Organization, Lucknow	DEPUTY DIRECTOR (STANDARDS)
South Eastern Coalfields Ltd, Bilaspur	SHRI S. K. MISHRA SHRI G. RAMASWAMI (*Alternate*)
Usha Breco Ltd, Kolkata	SHRI AMIT KUMAR BASU SHRI C. K. KARMAKAR (*Alternate*)
Usha Martin Industries Ltd, Ranchi	SHRI RANA PRATAP SHRI K. K. SENGUPTA (*Alternate*)
Vidarbha Hardware Industries, Akola	SHRI O. P. DALMIA SHRI SANJAY K. DALMIA (*Alternate*)
BIS Directorate General	SHRI M. L. CHOPRA, Director and Head (MED) [Representing Director General (*Ex-officio*)]

Member-Secretary

SHRI P. VENKATESWARA RAO
Joint Director (MED), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

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 latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. ME 10 (477)

Amendments Issued Since Publication

Amend No.	Date of Issue
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AMENDMENT NO. 2 OCTOBER 2008
TO
IS 12776 : 2002 GALVANIZED STRAND FOR EARTHING — SPECIFICATION

(First Rrevision)

(*Page* 1, *clause* **8.1.1**) — Add following at the end:

'This is a Type Test.'

(*Page* 2, *clause* **8.1.3**, *first line*) — Delete the word 'Alternatively'.

(*Page* 2, *clause* **8.3.2**, *eighth line*) — Substitute '20°C' *for* '200°C'.

(*Page* 2, *clause* **8.6**) — Add following new clause after **8.6**.

'**8.7** Sample of wire shall be taken from lengths of each galvanized steel earth strand for the purpose of calculating tensile strength of the individual wires. Sample shall be taken from finished strand also for breaking force test of strand. The value of breaking force of individual wires and strand shall meet the requirement as specified in Annex A of the standard.'

(ME 10)

Reprography Unit, BIS, New Delhi, India