



PM/ IS 3975/ 1/ April 2018

**PRODUCT MANUAL FOR
LOW CARBON GALVANIZED STEEL WIRES, FORMED WIRES AND TAPES FOR
ARMOURING OF CABLES
According to IS 3975:1999**

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

1.	Product	:	IS 3975:1999
	Title	:	Low Carbon Galvanized Steel Wires, Formed Wires And Tapes For Armouring Of Cables
	No. of amendments	:	Nil
2.	Sampling Guidelines		
a)	Raw material	:	No specific requirements for raw material
b)	Grouping Guidelines	:	Please refer Annex - A
c)	Sample Size	:	For mechanical test: 5 metres For chemical test : 5 pieces of 50 mm length/50 g drilling
3.	List of Test Equipment	:	Please refer Annex - B
4.	Scheme of Inspection and Testing	:	Please refer Annex - C
5.	Possible tests in a day	:	Please refer Annex - D
6.	Scope of the Licence :		
	Licence is granted to use Standard Mark as per IS 3975:1999 with the following scope:		
	Name of the product	Low Carbon Galvanized Steel Wires, Formed Wires And Tapes For Armouring Of Cables	
	Type	<i>[Mention whether Round wire/formed wire/tape]</i>	
	Size	<i>[Mention individual (not range of) nominal diameters for round wire, Type and nominal dimensions (indicate values of A,B,C,R) for formed wires, and thickness and width for tapes]</i>	

ANNEXURE A
TO PRODUCT MANUAL FOR
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GROUPING GUIDELINES

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The following grouping based on type of product, shall be followed for considering grant of licence/inclusion as per IS 3975:1999

Group Number	Group Description	Grouping guidelines
1	Round Wires	<p>The wire of smallest nominal diameter may be tested for covering wires of higher nominal diameters as well.</p> <p>In case the manufacturer wishes to cover nominal diameters other than those specified in table 3/table 6 of IS 3975:1999, he shall submit a declaration regarding the corresponding “gauge length between the vices, mm” and ” minimum number of turns”</p>
2	Formed Wires	<p>The formed wire of smallest nominal dimensions (i.e. lowest value of A, B, C, R) may be tested for covering formed wires of higher nominal dimensions. E.g. If type 1 is tested, type 2 can be covered.</p> <p>In case manufacturer wishes to cover nominal dimensions/types other than those specified in table 4 of IS 3975:1999, he shall submit a declaration for mass of zinc coating and uniformity of zinc coating. For sizes lower than type 2, The values of mass and uniformity of shall not be lower than the value specified</p>
3	Tapes	The tape of smallest nominal width and thickness may be tested for covering tapes of higher nominal widths and thicknesses

While considering grant of licence/inclusion of additional varieties, it shall be ensured that complete manufacturing/testing facility is available with manufacturer. During operation of licence, BOs shall ensure that all varieties covered in the licence shall be tested in rotation to the extent possible.

ANNEXURE B
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LIST OF TEST EQUIPMENTS

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Major test equipment essentially required to test as per requirements of Indian Standard.

Sl. No.	Test Equipment/Chemicals and Identification Numbers (Where applicable)	Tests Used in with Clause Reference
1.	Room Temperature Thermometer	8.4 (Resistance test)
2.	Micrometer	7.2&7.4 (Dimensions and tolerances of round wires and tapes)
3.	Travelling microscope	7.3 (Dimensions and tolerances of formed wire)
4.	Radius gauge	7.3 (Dimensions and tolerances of formed wire)
5.	Profile projector (optional if 3 & 4 are not available)	7.3 (Dimensions and tolerances of formed wire)
6.	Tensile testing machine,	8.1 (Tensile test)
7.	Vernier calipers	8.1 (Tensile test), 7.4 (dimensions and tolerances of tapes)
8.	Torsion test set up, with adjustable gauge length between vices.	8.2 (Torsion test for round wires only)
9.	Wrapping testing machine	8.3 (Wrapping test)
10.	Wrapping test mandrels for round wires	8.3 (Wrapping test)
11.	Wrapping test mandrels for formed wires & tapes	8.3 (Wrapping test)
12.	Kelvin bridge/ Wheatstone bridge/ micro ohm meter	8.4 (Resistance test –for round and formed wires only)
13.	DC supply,	8.4 (Resistance test –for round and formed wires only)
14.	Galvanometer (Not required for micro ohm meter)	8.4 (Resistance test –for round and formed wires only)
15.	Antimony trioxide / Antimony tri chloride, HCl , Volatile organic solvent such as ether, trichloroethylene, carbon tetrachloride, etc. (Con. & Dil.) and other chemicals and reagents applicable	9.1 (Mass of zinc coating)
16.	Weighing balance	9.1 (Mass of zinc coating)
17.	Clean soft cotton cloth	9.1 (Mass of zinc coating)
18.	100 ml glass burette with stopcock, rubber tube, reservoir (for Volumetric method) and other glassware as applicable	9.1 (Mass of zinc coating)
19.	Copper carbonate (laboratory grade) or Copper hydroxide (laboratory grade), Copper Sulphate Crystals – Technical grade, Ammonium Hydroxide, Alcohol, Distilled water, Volatile organic solvent such as ether, trichloroethylene, carbon tetrachloride, etc.	9.2 (Uniformity of zinc coating)

	and other chemicals and reagents applicable	
20.	Room Air conditioner with temperature control facility	9.2 (Uniformity of zinc coating)
21.	Thermometer	9.2 (Uniformity of zinc coating)
22.	Mandrels of suitable sizes	9.3 (Adhesion tests)
23.	Spectrometer or spectrophotometer	Cl 6.2 Sulphur and Phosphorus content (optional for instrumental method of determining chemical composition)
24.	Weighing balance	Cl 6.2 Sulphur and Phosphorus content (for chemical method of determining chemical composition)
25.	Heater/ Heating element along with energy regulator	Cl 6.2 Sulphur and Phosphorus content (for chemical method of determining chemical composition)
26.	Ice water bath	Cl 6.2 Sulphur and Phosphorus content (for chemical method of determining chemical composition)
27.	Flat bottom Flask (Glass), Thistle Funnel (Glass), Glass bend tube for carrying of H ₂ S – gas, Glass Beaker, Vol. Flask, Cap.-1 liters, Measuring Cylinder, Conical Flask, Washing bottle, Burette along with Stand and other glassware as applicable	Sulphur content cl.6.2 (For chemical method of determining chemical composition)
28.	Cadmium Chloride, Ammonia, NH ₄ OH soln., Hydrochloric Acid, Potassium Iodate (KIO ₃) (GR-grade), Potassium Iodide (KI), Sodium Thiosulphate (Na ₂ S ₂ O ₃ . 5H ₂ O), Sodium Carbonate, Soluble Starch, Distilled water, other chemicals and reagent as applicable	
29.	Potassium Permanganate (KMnO ₄), Sodium Nitrite (NaNO ₂), Ammonium Molybdate [(NH ₄) ₂ MoO ₇], Ammonium Phosphate [(NH ₄) ₃ PO ₄], Potassium Nitrate (KNO ₃), Phenolphthalein Solution, Rectified spirit or methyl alcohol, Sodium Hydroxide (NaOH), Hydrofluoric Acid (HF), Perchloric Acid (HClO ₄), Sulphurous Acid, Vol Flask, Cap – 1 litre, Hydrobromic Acid (HBr) , other chemicals and reagent as applicable	Phosphorus content cl.6.2 (For chemical method of determining chemical composition)
30.	(Whatman) filter paper No. 040	
31.	Suction. Filtration Facility	
32.	Filter paper pulp pad	

Nitrogen content shall be occasionally tested.

Note: The above is an indicative list for the purpose of guidance only and may not be treated as exhaustive

ANNEXURE C
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SCHEME OF INSPECTION AND TESTING

LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING, MARKING, PACKING –

The Standard Mark as given in Column (1) of the First Schedule of the license and Licence Number (i.e. CM/L.....) shall be incorporated, and the marking and packing shall be done as per the provisions of the Indian Standard, provided always that the product thus marked and packed conforms to all the requirement of the specification.

4. CONTROL UNIT – All the coils of the wires, formed wires or tapes of the same nominal dimensions in any consignment, manufactured under uniform conditions of production in the same place.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

6. REJECTIONS – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016. Any rejected material which is potentially re-salable be sheared or cut or deformed in such a manner that it cannot be used for any other purpose except re-melting. A separate record shall be maintained giving information on quantity and cast number/coil number/control unit number, as applicable, relating to all such rejections/defective/sub-standard material of the production not conforming to the requirements of the Specification and the method of its disposal. Such material shall in no case be stored together with that conforming to the Specification. The Standard Mark (if already applied) on rejected material should be defaced.

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SCHEME OF INSPECTION AND TESTING

TABLE 1: LEVELS OF CONTROL

(1)				(2)	(3)		(4)
TEST DETAILS					LEVELS OF CONTROL		
Clause	Requirements	Test Method		Test equipment requirement R: required (or) S: Sub-contracting permitted	No. of Samples	Frequency	REMARKS
		Clause	Reference				
6	Chemical Composition						In case material is received with test certificate indicating conformity, no further testing is required
6.1	Ladle Analysis	Relevant parts of IS 228 or any other established instrumental/chemical method		S	One	Every heat	
6.2	Product Analysis	-do-		S	One	Each heat of 100 t or part thereof	Product analysis shall not apply to rimming quality steel
6.3	Dimensions and tolerances	7.1 to 7.4	IS 3975	R	One	Every coil	
9.0	Galvanizing requirement	IS 3975:1999		R	One	Every 5 coils	In case the sample coil fails, the coil from which the sample has been drawn shall be rejected. A sample
9.1	Mass	IS 6745:1972		R	-do-	-do-	
9.2	Uniformity	IS 4826:1979		R	-do-	-do-	

9.3	Adhesion test	9.3	IS 3975:1999	R	-do-	-do-	shall be drawn from the remaining coils in the lot shall be drawn and tested and only those coils which conform to IS, shall be marked with the Standard Mark
8.1	Tensile test	IS 1608		R	-do-	-do-	
8.2	Torsion test (for round wires only)	IS 1717		R	-do-	-do-	
8.3	Wrapping test	IS 1755		R	-do-	-do-	
8.4	Resistance test (for round and formed wires only)	IS 10810 (part 42)		R	-do-	-do-	

Note-1: Whether test equipment is required or sub-contracting is permitted in column 2 shall be decided by the Bureau and shall be mandatory. Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empaneled by the Bureau.

Note-2: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification with the approval of BO Head.