



**PRODUCT MANUAL FOR
SHOT FIRING CABLES (FOR USE OTHER THAN IN SHAFTS)
ACCORDING TO IS 5950: 1984**

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 5950 : 1984
	Title	:	Shot Firing Cables (For Use Other Than in Shafts)
	No. of Amendments	:	NIL
2.	Sampling Guidelines:		
a)	Raw material	:	Plain annealed copper wire IS 8130
b)	Grouping guidelines	:	Please refer <u>ANNEX – A</u>
c)	Sample Size	:	(i) 5 meters Copper wire (before stranding) (ii) Cu wire – 100 g (for Cu purity test)
3.	List of Test Equipment	:	Please refer <u>ANNEX – B</u>
4.	Scheme of Inspection and Testing	:	Please refer <u>ANNEX – C</u>
5.	Possible tests in a day	:	Please refer <u>ANNEX – D</u>
6.	Scope of the Licence: Shot Firing Cables (for use other than in shafts), for the following varieties: <ul style="list-style-type: none"> a) Type-I – PVC Insulated and Unsheathed, Twin cable (Parallel Twin) for single-shot and multi-shot firing, and/or b) Type- II – PVC Insulated and Sheathed, Single-core cable for multi-shot firing 		

ANNEX-A

GROUPING GUIDELINES

1. IS 5950 covers the following two types of Shot Firing Cables (for use other than in shafts):
 - (a) Type I – PVC Insulated and Unsheathed, Twin cable (Parallel Twin) for single-shot and multi-shot firing, Type A Insulation, nominal cross-sectional area of conductor 1 mm².
 - (b) Type II – PVC Insulated and Sheathed, Single-core cable for multi-shot firing, Type A Insulation, Type ST1 Sheath, nominal cross-sectional area of conductor 2.5 mm².
2. Samples of each Type of cable shall be tested to cover both the varieties of cable in the scope of licence.
3. The Firm shall declare the varieties of Shot Firing Cables they intend to cover in the Licence. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
4. During the operation of the Licence, BO shall ensure that all the varieties covered in the Licence are tested in rotation, to the extent possible.

ANNEX B**List of Test Equipment***Major test equipment required to test as per the Indian Standard*

Sl. No.	Test Equipment	Tests used in with Clause Reference	
		Cl. Ref.	Tests
1.	Vernier Calipers	7.1, 7.2, 8.1, 8.2, 9.1 (c)	Measurement of thickness of insulation and sheath
2.	Steel Scale	10.4, 9.1 (a)	Flammability Test, Annealing test and Elongation
3.	Micrometer	6.1 and 9.1(a)	Measurement of Wire Diameter.
4.	Measuring Microscope or Graduated Magnifying Glass	9.1(d) (iv)	Measurement of thickness (insulation & sheath) and hot deformation test
5.	Tensile Testing Machine	9.1 (a), 9.1(d) (i)	Annealing Test & Elongation Test Tensile Strength
6.	Hot Air oven with thermostatic Temperature	9.1 (d) (iv, v and vi)	Heat Shock, Hot Deformation & Shrinkage Test
7.	Thermal Ageing Oven with Thermostatic Temperature controller, Air flow Meter & Hour	9.1 (d) (ii)	Tensile Strength & Elongation After ageing, Loss of Mass Test
8.	Megohm Meter with DC Supply	9.1 (f)	Insulation Resistance Test/Volume Resistivity
9.	Heat Shock Mandrels	9.1 (d) (v)	Heat Shock Test
10.	Hot Pressure Test Apparatus with Weights	9.1 (d) (iv)	Hot Deformation Test
11.	Physical Weighing Balance with Weights (LC 0.2mg)	9.1 (d) (iii), 9.1(g)	Loss of Mass Test, Flammability Test
12.	Kelvin Double Bridge with galvanometer, D.C.	9.1 (b)	Conductor Resistance Test
13.	Balance Digital	9.1 (d) (iii)	Loss of Mass Test
14.	Water Bath and Hour Meter	9.1 (e), 10.2.2	Voltage Test for Type-II Cables
15.	A C. High Voltage Test set	9.1 (e), 10.2	Voltage Test
16.	AC Spark Tester	10.3	Spark Testing
17.	Glass Thermometer	10	Conductor Resistance & Insulation Resistance Test
18.	Flammability Test apparatus with burner, Gas cylinder, Scale, Stopwatch & 0.71 mm copper	9.1 (g) , 10.4	Flammability Test

The above list is indicative only and may not be treated as exhaustive.

ANNEX C

Scheme of Inspection and Testing

1. **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 equipment.
2. **TEST RECORDS** – The manufacturer shall maintain test records for the tests carried out to establish conformity.
3. **LABELLING AND MARKING** – In addition to the marking requirements under clause 12.2 of IS 5950 :1984, Identification in code or otherwise shall be either stenciled on each reel or contained in the label attached to the coil, in order that the date of manufacture and control unit can be traced back to factory records.
4. **CONTROL UNIT** – Cable of same type, and having continuous length of 5000 meters or part thereof manufactured/ extruded under similar conditions of production shall constitute a control unit.
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.
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.

TABLE-1

(1)			(2)	(3)		
Test Details			Test equipment requirement	Levels of Control		
Cl.	Requirement	Test Methods Reference	R: required (or) S:Sub-contracting permitted	No. of Sample	Frequency	Remarks
	Purity test for Cu	Table 4 of IS 191	S	One	Each consignment	Further testing is not required if ISI marked or accompanied with TC.
10.2	Voltage Test	IS 10810 (Part 45)	R	One from Each Type	Once for the entire length of the cable produced in a day	In case spark test is used as a routine test, voltage test shall be carried out only on one coil produced in a day.
10.3	Or Spark Test	IS 10810 (Part 44)				
6.1	Conductor Resistance	IS 10810 (Part 5)	R	One	-do-	--
9.1 (f) and IS 5831	Insulation Resistance	IS 10810 (Part 43)	R	One	Each Control Unit	
9.1 (c), 7.1, 7.2, 8.1 & 8.2	Thickness of Insulation & Sheath	IS 10810 (Part 6)	R	Two	-do-	
6.1	Conductor	6.2 and Table -2 IS 8130	--	One	-do-	Visual Examination
6.1 & 9.1(a), 7.1.2 of IS 8130	Annealing Test	IS 10810 (Part 1)	R	One	Once for each Bobbin of conductor before stranding	--
9.1 (d) & IS 5831	Physical Test on Insulation and Sheath					
(i)	Tensile Strength & Elongation at break	IS 10810 (Part 7)	R	One	Each Control Unit	--
(ii)	Ageing in Air Oven	IS 10810 (Part 11)	R	One	Once in every week for each type of	--

					cable manufactured from a batch of PVC compound	
(iii)	Loss of Mass test	IS 10810 (Part 10)	R	-do-	-do-	--
(iv)	Hot Deformation	IS 10810 (Part 15)	R	-do-	-do-	--
(v)	Heat Shock	IS 10810 (Part 14)	R	-do-	-do-	--
(vi)	Shrinkage	IS 10810 (Part 12)	R	-do-	-do-	--
10.4	Flammability Test	IS 10810 (Part 53)	R	-do-	-do-	--
7.3, 8.3 and 11	Colour of Insulation, sheath, manufacturer's identification	7.3, 8.3 and 11 of IS 5950	--	Each Coil		Visual Examination

Note-1: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-2: The control unit and levels of control as decided by the Bureau are obligatory to which the licensee shall comply with.

ANNEX D

Possible Tests in a day

- a) Dimensions
 - (i) Number of Wires.
 - (ii) Thickness of sheath and insulation
- b) Annealing Test
- c) Conductor Resistance
- d) Tensile Test and Elongation (before ageing) on Insulation and Sheath
- e) Shrinkage Test
- f) Hot Deformation
- g) Heat Shock Test
- h) Insulation Resistance Test
- i) Voltage Test (at Room Temperature) for Type-1 cables
- j) Flammability Test