Government of India
Ministry of Railways
(Railway Board)

Indian Railway
Standard Specification

For

PVC Insulated
PVC Insulated Cables & Wires
For Indian Railway Signalling

(Tentative)

Serial No. S : 76-89

0. FOREWORD

0.1 This specification is issued under the fixed Serial No. IRS : S76-89 followed by the year of original adoption as standard or in case of revision, the year of last revision. Adopted – 1989

0.2 This specification requires reference to the following Indian Railway Standard Specification (IRS) and Indian Standard Specification (IS) :

IRS S : 23	-	Electrical Signalling and Interlocking Equipment (Tentative)
IS : 723	-	Steel Countersunk Head Wire Nails.
IS : 5831-84	-	PVC Insulation and Sheath of Electric Cables.
IS : 10810	-	Methods of Test for Cables
IS : 8130-84	-	Conductors for insulated electric cables and flexible cords.
IS : 9938	-	Recommended colours for PVC insulation for LP wires and cables.
IRS : S63	-	PVC insulated cables for Railway Signalling

0.3 Whenever in this specification, any of the above mentioned specifications are referred to by number only without mentioning the year of issue, the latest issue of that specification is implied, otherwise the particular issue referred to is meant.

0.4 This specification is intended chiefly to cover the technical provisions and does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This specification covers the requirements and tests for railway signalling cable single core and multicore copper conductor and wires with PVC insulated sheathed and unsheathed for indoor railway signalling.

1.2 The PVC compound and manufacturing process of the cables and wires called for in this specification shall be such that they are suitable for use in the buildings, locations, huts and cabins which may or may not be air-conditioned and ambient temperature and relative humidity may go upto 55^0 C and above 95% respectively.

1.3 The cable covered in this specification shall be suitable for use on AC systems (earthed or unearthed) for rated voltages upto and including 650 volts. These cables may be used on DC systems for rated voltages upto and including 900 volts.

1.4 The cables/wires covered in this specification are suitable for use where the combination of ambient temperature and temperature rise due to load results in a conductor temperature not exceeding 70^0 C.

2. TERMINOLOGY

2.1 For the purpose of this specification terminology given in IRS : S 23, in addition to given in IRS : S 63 shall apply.

3. GENERAL REQUIREMENTS

3.1 Conductors

3.1.1 The conductors shall be composed of plain, annealed high conductivity copper wire (s) complying with IS : 8130 except for annealing test requirements. The dimensions, nominal weights and resistances of conductors shall be in accordance with the values given in Table 1. Any other sizes may be accepted as agreed between the purchaser and the manufacturer. In such cases, the wire diameter, the insulation thickness and the tolerances thereon shall be specified by the purchaser.

3.2 Insulation

3.2.1 The insulation shall be of PVC compound conforming to the requirements of type A compound of IS : 5831-84 (General purpose insulation for maximum rated conductor temperature 70^0 C operation) except for the values which have been specified in this specification. Re-cycled or re-claimed PVC compound shall not be used.

3.2.2 The insulation resistance of each core shall not be less than 3.0 mega ohm per kilometre at 50^0 C for core insulation thickness of 0.5 mm and 5 mega ohm/Km at 50^0 C for core insulation thickness of 0.8 mm & above.

3.2.3 The insulation shall be applied by extrusion in one continuous process and shall be homogeneous and free from any joints or repairs. It shall fit closely on the conductor but shall not adhere to it so that it is possible to remove it easily, without damage to the conductor.

3.2.4 The average thickness of the insulation not be less than the nominal value t_1 as specified in Table 2. The smallest of the measured values of the thickness of insulation shall not fall below the nominal value t_1 by more than 0.1 mm + 0.1 t_1.

3.2.5 The cores of cables shall be identified by different colouring of PVC insulation. The colours shall conform reasonable with the standard colours shown in IS : 9938.

3.2.6 For single core cables, the colour scheme as recommended in Clauses 3.2.5 of IRS : S 63 shall be adopted unless otherwise specified by the purchaser.

3.3 Laying up of cores :

3.3.1 The laying up of the cores shall be according to Table 3. The outermost layer shall have right hand lay and the successive layers shall be laid with opposite lay : where necessary. The interstices shall be filled with non-hygroscopic material.

3.3.2 Way of counting from inner to outer continuously shall be in clockwise direction. Colour sequence within the group shall be in accordance to Table 3.

3.3.3 Blue or yellow cores of the first complete colour group in any layer shall have a white or red colour ring respectively at an interval of not more than 50mm. The remaining core, if any, of a previous colour group, be in the next layer before the red ring marked core.

3.3.4 The standard cable shall be tightly lapped with malinex tape of thickness not less than 0.013 mm and with minimum 30% overlap.

3.3.5 The cores of a layer shall not cross each other. The sequence of the cores shall be maintained throughout the length of the cable.

3.3.6 The recommended plan for lay-up of cores upto 60 cores shall be according to the Table 4.

3.4 Sheath

3.4.1 In case of multicore cables, the sheath shall be applied by extrusion in one continuous process and shall be homogeneous and free from joints and repairs.

3.4.2 PVC compound conforming to the requirements of Type ST1 to IS : 5831-64 except for the values which have been specified in this specification shall be used for the sheath. The colour of the sheath shall be grey. Re-cycled or reclaimed PVC compound shall not be used.

3.4.3 The average thickness shall not be less than the nominal value (ts) specified in Table 5 and the smallest of the measured values shall not fall below the nominal value by more than (0.2mm + 0.2 ts).

4. MARKING

4.1 The marking on all the multicore cables shall comply with the requirements as laid down in Clause 4 of IRS : S 63/89.

4.2 In case of single core cables having core diameter upto 4mm, packed in coils of 100 metres, each coil shall be labelled as under :

a) Manufacturer's name, brand name or trade mark.
b) IRS specification number.
c) Type of cable and voltage grade.
d) Nominal cross sectional area of conductor.
e) Colour of cores
f) Number of lengths in coil.
g) Length of the cable (length of each piece to be indicated in case there is more than one length).
h) Order number and date.
i) Approximate gross weight.
j) Country of manufacture.

k) Month and year of manufacture.

4.3 In case of single core cables having core diameter more than 4mm, the following information shall also be legibly and indelibly indicated throughout the length of cable at intervals of one meter or less through core printing in addition to the above labelling of coils :

a) Name of trade mark of the manufacturer.
b) IRS Specification number.
c) Month and year of manufacture.

4.4 In case of single core cable with calculated core dia of more than 6mm, sequential length marking with an accuracy of 0.2 % shall be provided on the core at an interval of every one metre by indenting/embossing-cum-printing. The single core cable of 6mm dia or less shall not this provision.

5. TESTS AND PERFORMANCE REQUIREMENTS :

5.1 Unless otherwise specified, all tests shall be carried out under ambient atmospheric conditions.

5.1.1 For inspection of material, relevant clauses of IRS : S 23 shall also apply.

5.2 **TYPE TESTS** – The following shall constitute type tests and shall be carried out once in three years or earlier at the discretion of the Inspection Authority :

a) Physical tests for conductor (Clause 5.5)
b) Conductor resistance test (Clause 5.6)
c) Test for thickness of insulation and sheath (Clause 5.8)
d) Physical tests for insulation and sheath (Clause 5.9)
e) Flammability test (Clause 5.10)
f) High voltage test (Clause 5.11)
g) Insulation resistance test (Clause 5.12)
h) Water immersion test (Clause 5.13)
i) Visual inspection & sequential marking (Clause 5.14)

5.2.1 At least samples shall be taken from the lot. There shall be no failure.

5.3 **ACCEPTANCE TESTS** – The following shall constitute acceptance tests :

a) Physical test conductor (Clause 5.5)
b) Conductor resistance test (Clause 5.6)
c) Test for thickness of insulation and sheath (Clause 5.7)
d) Physical tests for insulation and sheath (Clause 5.8 except Cl. 5.10.5 to Cl. 5.10.10 of IRS : S 63-89).
e) Flammability test (Clause 5.9)
f) High voltage test (Clause 5.10)
g) Insulation resistance test (Clause 5.11)
h) Water immersion test (Clause 5.12.1).
i) Visual Inspection and Sequential marking (Clause 5.13).
j) For single core cables (Clause 5.10.2).

k) Any other test at the discretion of Inspecting Authority to ensure that offer is in conformity with the requirements of the specification.

5.3.1 Sampling plan as per clause 7 shall be followed.

5.3.2 For conductor diameter and resistance, thickness of insulation, thickness of sheath, insulation resistance, high voltage, shrinkage, thermal stability, visual inspection and sequential marking tests, there shall be no failure.

5.3.3 In case of tests for annealing, elongation and tensile strength of insulation and sheath and water immersion, if more than one sample fails the lot shall be rejected. However, if only one sample has failed, two further samples of the same drum shall be tested and there shall be no failure.

5.4 **ROUTINE TESTS** – The following shall constitute routine tests :

a) Conductor resistance test (Clause 5.6).
b) High voltage test (Clause 5.10).
c) Insulation resistance test (Clause 5.11).
d) Tensile strength and percentage elongation of cores (01.5.8) except Clause 5.10.5 to 5.10.10 of IRS : 63/89 100% upto 20 cores. 20 + 50% of the total cores in excess of 20. The specimen shall cover all the cores.
e) Tensile strength and percentage elongation of sheath (Clause 5.9).
f) Annealing test (Clause 5.5.2) – All cores.

5.4.1 The routine tests shall be conducted on all the drums offered for inspection.
The results of routine tests shall be available to the Inspecting Authority, alongwith the offer list.

5.5 PHYSICAL TESTS FOR CONDUCTOR

5.5.1 **DIMENSIONS** – The diameter of the conductor (s) shall be measured on a sample from the finished cables.
The measurements shall be made at least at three different points (at intervals of not less than 100 mm) with two readings at 90^0 along the length of the sample. The values shall meet the requirements given in Clause 3.1.1.

5.5.2 **ANNEALING TEST** – A sample of wire taken from finished cable, when tested as described in Clause 5.6.2 of IRS : 63 shall have elongation at fracture of not less than the value given below :

Wire diameter in mm	Elongation at break, Min.
0.20	14%
0.30	14%
0.60	22%

0.75	22%
0.85	23%
1.0	25%
1.4	27.5%

For stranded conductors, the values obtained shall not be less than 95% of the values, mentioned above.

5.5.3 **TEST FOR CORRESPONDENCE OF CORES -** The sequence of cores shall be checked on the complete drum length and there shall be no discrepancy in the correspondence of the cores.

5.6 CONDUCTOR RESISTANCE TEST :

5.6.1 Conductor resistance shall be measured first on complete drum/coil lengths. The cable drum/coil under test shall be at reasonably constant temperature for sufficient time to ensure that the cable temperature is equal to the ambient temperature. The measurement shall be carried out to an accuracy of at least one part in hundred.

5.6.2 The DC resistance of the conductor shall be measured at room temperature and corrected to 20^0 C by means of the appropriate factors given in Table 7 of IRS : S 63-89.

5.6.3 The corrected resistance in case of full drum lengths shall not exceed the value given in Table 1, or shall it be less than 87 % of the nominal (standard) value.

5.6.4 The specific resistance of conductor shall meet the requirements of Appendix B-2 of IS : 8130-1976.

5.7 TEST FOR THICKNESS OF INSULATION AND SHEATH :

5.7.1 This test shall be conducted in accordance with Clause 5.9 of IRS : S63-89. The test shall comply with the requirements given in Clauses 3.2.4 and 3.4.3.

5.8 PHYSICAL TESTS FOR INSULATION AND OUTER SHEATHS :

5.8.1 The physical test for insulation and sheath shall comply with the tests and requirements of Clause 5.10 of IRS : S63-89.

5.9 FLAMMABILITY TEST :

5.9.1 The flammability test shall comply with the tests and requirements of Clause 5.11 of IRS : S 63-89.

5.10 HIGH VOLTAGE TEST :

5.10.1 This test shall be conducted in accordance with Clause 5.12.1 of IRS : S63-89. The test voltage shall be as follows :

Nominal Insulation Thickness (mm)	Test Voltage
0.5	AC 2.5 KV (rms)
0.8 & above	AC 4 KV (rms)

The cable shall be successfully withstand this voltage.

5.10.1.1 For single core cables, the sampled coils shall be immersed in water at ambient temperature for at least two hours and subjected to H.V. Test. The test voltage shall be as indicated in Clause 5.10.1.

5.10.2 SPARK TEST :

The spark test shall comply with tests and requirements of Clause 5.12.2 of IRS : S 63-89.

5.11 INSULATION RESISTANCE TEST :

5.11.1 This test shall be conducted in accordance with Clause 5.13 of IRS : S 63-89. The value of insulation resistance shall be as follows :

Nominal insulation Thickness (mm)	Minimum value of insulation resistance Megom/Km at 50^0 C
0.5	3
0.5 & above	5

5.11.1.1 For insulation resistance of single core cables sampled coils shall be immersed in water at ambient temperature and subjected to insulation resistance test after H.V. Test as per Clause 5.10.1.1.

5.12 WATER IMMERSION TEST :

5.12.1 **AC Test** : This test shall be conducted in accordance with Clause 5.14.1 of IRS : S63-89. The test voltage shall be as follows :

Nominal insulation Thickness (mm)	Test Voltage
0.5	2.5 KV (rms) applied then raised to 5 KV (rms) within 10 seconds & held constant for 5 minutes.
0.8 & above	4 KV (rms) applied then raised to 8 KV (rms) within 10 seconds and held constant for 5 minutes.

The sample shall successfully withstand this voltage. For single core cables, this voltage shall be conducted not less than 6 hours.

5.12.2 **DC Test :** This test shall be conducted in accordance with Clause 5.14.2 of IRS : S63-89. The test voltage shall be as follows :

Nominal insulation Thickness (mm)	Test Voltage
0.5	0.8 KV
0.8 & above	1.2 KV

The core shall withstand this DC voltage for 240 hours without breakdown.

5.13 VISUAL INSPECTION TEST :

5.13.1 The visual inspection shall comply with the tests and requirements of Clause 5.15 of IRS : S 63-89.

5.13.2 For single core cables, the cable shall be spark-tested with Clause 5.13.1 & as per Clause 5.10.2.

6. **PACKING :**

6.1 Packing shall be done as per Clauses 6.1, 6.2, 6.3, 6.4, 6.5, 6.7 & 6.8 of IRS : S63-89.

6.2 For the thickness in the flange portion of the drum there shall be two batons.

6.3 Single core cables shall be supplied in 100 meters coils with tolerance of ± 1% unless otherwise specified by the purchaser.

7. **SAMPLING :**

7.1 Sampling of the cables/wires shall be randomly selected as per Clauses 7.1, 7.2 & 7.4 of IRS : S63-89.

7.2 The number of drums to be random selected for taking samples shall be as per column 2 of Table 10 of IRS : S 63-89 except at Sl. No. 2. The number of drums has been expressed as a percentage of the total drums in the lot.

7.3 For thermal stability test minimum one specimen of sheath and minimum one specimen of each colour used of insulation shall be taken from the samples for the physical test for insulation and sheath (Clause 5.9).

7.4 For single core cables, sampling plan shall be as per Table –6.

7.5 The sampling plan for thermal stability, less of mass and percentage variation of tensile strength and percentage elongation before and after ageing shall be as follows :

Sl. No.	Test	Sample size (Nos. of drums/coils)	No. of test pieces to be taken from each sample
1.	Thermal stability test (Cl. 5.10.11 of IRS : S 63-89)	4 % (Subject to minimum of one & maximum of two drums/coils)	Two specimen of each colour from each sampled drum/coil for insulation. In case of sheath two specimen from each sampled drum.
2.	Loss of mass test (Cl. 5.10.4 of IRS : S63-89)	-do-	Two specimens from each colour for insulation. In case of sheath four dumbbells from sheath.
3.	Percentage variation of T.S. and percentage elongation (Cl. 5.10.1 of IRS : S63-89)	-do-	-do-

8. INFORMATION TO BE SUPPLIED BY THE PURCHASER :

8.1 IRS Specification number.

8.2 Number of cores and nominal cross sectional area of the conductor.

Note : In case of non- standard sizes, wire diameter, insulation thickness and the tolerance thereon and maximum conductor resistance shall be specified.

8.3 The colour of cores in case of single core cables.

8.4 The number of wires in each conductor in case of single core cables.

TABLE – 1 : CABLES FOR FIXED INSTALLATIONS CIRCULAR COPPER CONDUCTORS (CLAUSE 3.1.1)

Nominal cross sectional area	No. of wires in conductors	Diameter of wires	Tolerance on diameter of wire	Wt./Km.	Standard resistance of conductor per Km at 20^0 C	Maximum allowable resistance of each conductor per Km at 20^0 C		
						Single core cable	Twin & Multi. Core cables	
							Plain copper	Tinned copper
1.	2.	3.	4.	5.	6.	7.	8.	9
mm		mm	mm	Kg.	Ohms	Ohms	Ohms	Ohms

0.28	1	0.6	± 0.02	2.57	63.73	65	66.97	68.30
0.79	1	1.0	± 0.02	7.0	22.94	23.4	24.11	24.59
1.5	1	1.4	± 0.025	13.72	11.20	11.54	11.77	12.00
10	7	1.4	± 0.025	97.96	1.627	1.660	1.693	1.726
0.50	16	0.20	± 0.005	4.57	36.02	36.75	37.85	38.60
3.09	7	0.75	± 0.02	28.11	5.57	5.68	5.85	5.97
1.33	3	0.75	± 0.02	12.04	13.0	13.26	13.66	13.93
3.97	7	0.85	± 0.02	36.11	4.414	4.591	4.64	4.73
2.5	36	0.3	± 0.005	23.13	7.056	7.20	7.42	7.57
10	140	0.3	± 0.005	89.96	1.815	1.85	1.91	1.95

TABLE – 2 : THICKNESS OFINSULATION (CLAUSE 3.2.4)

Number and diameter of wires	Nominal thickness of insulation (t 1)	
	Single core	Multi core
1.	2.	3.
Mm	mm	mm
16/0.20	0.8	0.5
1/0.6	0.8	0.5
1/1.0	0.8	0.5
3/0.75	1.5	0.8
1/1.04	1.5	0.8
7/1.4	1.5	1.0
26/0.3	1.5	1.0
7/0.85	1.5	1.0
7/0.75	1.5	1.0
140/0.3	1.5	1.0

TABLE – 3 : COLOUR SCHEME OF CORES (CLAUSE 3.3)

Conductor Diameter 0.6					1.0				
No. of cores	20	30	40	60	16	20	24	40	60
No. of colour group	2	5	5	10	2	4	3	5	10
No. of cores in a group	5	6	8	6	8	5	8	8	6
Colour scheme of each colour group	Blue Red Grey Black Yellow	Blue Red Grey Green Brown Black	Blue Red Grey Green Brown Black Yellow White	Blue Red Grey Green Brown Black	Blue Red Grey Green Brown Black Yellow White	Blue Red Grey Black Yellow	Blue Red Grey Green Brown Black Yellow White	Blue Red Grey Green Brown Black Yellow White	Blue Red Grey Green Brown Black

TABLE – 4 : PLAN OF LAY OF CORES
(CLAUSE 3.3.6)

No. of cores	Centre	No. of cores in each layer			
		1st layer	2nd layer	3rd layer	4th layer
16	Dummy	5	11	-	-
20	Dummy	7	13	-	-
24	Dummy	9	15	-	-
30	4	10	16	-	-
40	Dummy	7	13	20	-
60	Dummy	6	12	18	24

TABLE – 5 : THICKNESS OF SHEATH
(CLAUSE 3.4.3)

Calculated diameter under the sheath		Nominal thickness of sheath (t 1)
(1)	(2)	(3)
-	10	1.0
10	15	1.2
15	-	1.4

TABLE – 6
SAMPLING PLAN FOR SINGLE CORE CABLES

No. of coils in a lot	No. of sampled coils		Annealing Test	T, S & % E of insulation	Shrinkage Test	Conductor resistance	H.V & I.R	Water Immersion Test	Thickness of Conductor & Insulation
Upto 25	For all tests	For visual test	Min. one conductor of each sampled coil	Min. one sample of each coil	Min. one sample of each coil	All the sampled coils	All the sampled coils	One coil	All the sampled coils. Min. 3 wire if conductor is more than 3.
	3	2							
26 to 50	5	2	-do-	-do-	-do-	-do-	-do-	One coil	-do-
51 to 100	8	4	-do-	-do-	-do-	-do-	-do-	One coil	-do-
101 to 300	13	6	-do-	-do-	-do-	-do-	-do-	One coil	-do-
300 to 500	20	8	-do-	-do-	-do-	-do-	-do-	Two coils	-do-

501 to 1000	30	10	-do-	-do-	-do-	-do-	-do-	Two coils	-do-
1001 to 5000	40	12	-do-	-do-	-do-	-do-	-do-	Two coils	-do-
5001 to above	50	12	-do-	-do-	-do-	-do-	-do-	Two coils	-do-

AMENDMENT NO. 1 OF APRIL, 1996

TO

INDIAN RAILWAY STANDARDS SPECIFICAITON

FOR

PVC INSULATED CABLES AND WIRES

(TENTATIVE)

SERIAL NO. 76

CLAUSE 3.2.4 : TABLE 2 REGARDINGTHICKNESS OF INSULATION IS AMENDED AS FOLLOWS :

TABLE – 2 : THICKNESS OF INSULATION

(CLAUSE 3.2.1)

Number and diameter of wires	**Nominal thickness of Insulation (t_1)**	
	Single Core	**Multi Core**
1	**2**	**3**
mm	**mm**	**mm**
16/0.20	0.5	0.5
1/0.6	0.5	0.5
1/1.0	0.5	0.5
3/0.75	1.5	0.8
1/1.4	1.5	0.8
7/1.4	1.5	1.0
26/0.3	1.5	1.0
7/0.85	1.5	1.0
7/0.75	1.5	1.0
140/0.3	1.5	1.0

Amendment No. 2 of May, 2002

To

Indian Railway Standards Specification

For

PVC Insulated Cables and Wires

(Tentative)

Serial No. S:76/89

Clause No. 3.2.6 shall be read as follows:

For single core cable, the colour of the core shall be any one of the colours Red, Black, Blue, Yellow and Grey as specified by the purchaser.

Clause No. 3.2.7 (New Clause):

The permissible tolerance shall be ±0.05mm on insulation thickness of 0.5mm and ±0.15 mm on core diameter for sizes 1/0.6, 1/1, 16/0.2 mm.

Clause No. 3.3.2 shall be read as follows:

Way of counting from inner to outer continuously shall be unidirectional. Colour sequence within the group shall be in accordance to Table-3.

Clause No. 3.3.3 shall be read as follows:

Blue or yellow cores of the first complete colour group in any layer shall have a white or red colour ring respectively at an interval of not more than 50mm. The remaining core, if any, of a previous colour group, be in the next layer before the white or red ring marked core.

Clause No. 3.3.4 shall be read as follows:

The stranded cable shall be tightly lapped with malinex tape of thickness not less than 0.025mm and with minimum 30% overlap.

Clause No. 4.1 shall be read as follows:

The following information shall be legibly and indelibly indicated throughout the length of the cable by embossing at every meter on the cable. The embossing shall only be done on the sheath:

a) Name or trade mark of the manufacturer.
b) IRS Specification number.
c) Month and year of manufacture.
d) Cable drum Number.
e) Sequential Length Marking (as per Clause 4.1.1)

Clause No. 4.1.1(New Clause):

The length of the cable shall be marked in a sequential manner, over the outer sheath at an interval of every one metre with an accuracy of ± 0.2%. The marking shall be distinctively in printing-cum-indented / embossed form.

The colour of SLM shall be suitable colour and clearly legible.

Clause No. 4.2 shall be read as follows:

In case of single core cable having core diameter upto 4 mm, packed in coils of 100/200/500 meters, each coil shall be labelled as under:

a) Manufacturer's name, brand name or trade mark.
b) IRS specification number.
c) Type of cable and voltage grade.
d) Nominal cross-sectional area of the conductor.
e) Colour of cores (in case of single-core cable).
f) Length of the Cable.
g) Order number and date
h) Approximate gross weight.
i) Country of manufacture.

j) Month and year of manufacture.

Clause No. 4.3 shall be read as follows:

In case of single core cables, the following information shall also be legibly and indelibly indicated throughout the length of the cable at intervals of one meter or less on cores by inject printing / printing in suitable colour depending on the base colour of the core in addition to the above labelling of coils:

a) Name or trademark of the manufacturer.
b) IRS Specification number.
c) Month and year of manufacture.
d) Size of the cable.

Clause No. 4.4 shall be read as follows:

In case of single core cable with calculated core dia. equal to or more than 6mm, sequential length marking with an accuracy of ±0.2% shall be provided on the core at an interval of every one meter by printing/ inject printing in suitable colour depending on the base colour of the core.

Clause No. 5.2 shall be read as follows:

TYPE TESTS - The following shall constitute type tests and shall be carried out once in three years or earlier at the discretion of the Inspecting Authority.

a) Physical tests for conductor (Clause 5.5)
b) Conductor resistance test (Clause 5.6)
c) Test for thickness of insulation and sheath (Clause 5.7).
d) Physical tests for insulation and sheath (Clause 5.8).
e) Flammability test (Clause 5.9)
f) High voltage test (Clause 5.10)
g) Insulation resistance test (Clause 5.11).
h) Water immersion test (Clause 5.12)
i) Visual inspection and Sequential marking (Clause 5.13).

Clause No. 5.3(d) shall be read as follows:

Physical tests for insulation and sheath(Clause 5.8.1, 5.8.2, 5.8.4, 5.8.11 and 5.8.12)

Clause No. 5.3.2 shall be read as follows:

For conductor diameter and resistance, thickness of insulation, thickness of sheath, insulation resistance, high voltage, shrinkage, thermal stability, specific gravity, visual inspection and sequential marking tests, there shall be no failure.

Clause No. 5.4(d) shall be read as follows:

Tensile strength and percentage elongation of cores (Clause 5.8.1, 5.8.2, 5.8.4, 5.8.11 and 5.8.12). 100% upto 20 cores. 20+50% of the total cores in excess of 20. The specimen shall cover all the colours.

Clause No. 5.4(e) shall be read as follows:
Tensile strength and percentage elongation of sheath (Clause 5.9). Minimum two samples of each sheath from each lot.

Clause No. 5.5.2 shall be read as follows:
ANNEALING TEST - A sample of wire taken from the finished cable, when tested as described in IS: 10810 (Part-I)-1984, shall have elongation at fracture of not less than the value given below:

Wire diameter in mm	Elongation at break, Minimum
0.20	14%
0.30	14%
0.60	22%
0.75	22%
0.85	23%
1.0	25%
1.4	27.5%

For stranded conductors, the values obtained shall not be less than 95% of the values, mentioned above.

Clause No. 5.5.3 shall be read as follows:
TEST FOR CORRESPONDENCE OF CORES - The sequence of cores shall be checked on the complete drum length and there shall be no discrepancy in the correspondence of the cores.

Clause No. 5.6.1 shall be read as follows:
Conductor resistance shall be measured first on complete drum/sample lengths. The cable drum under test shall be at reasonably constant temperature for 2 to 4 hours to ensure that the cable temperature is equal to the ambient temperature. The measurement shall b carried out to an accuracy of at least one part in hundred.

Clause No. 5.6.2 shall be read as follows:

The DC resistance of the conductor shall be measured at room temperature and corrected to 20^{o}C by means of the appropriate factors given in Table 8.

Clause No. 5.7.1 shall be read as follows:

Determination of thickness of insulation of round cores and sheath shall be made on a representative sample of the cable approximately one meter long taken not less than 300 mm from the end of a factory length of the cable.

Clause No. 5.7.2(New Clause):

The measurement in case of core insulation shall be made at 3 different points, at intervals of not less than 75 mm along the length of the sample. At each point, the minimum thickness will be measured along with 2 more readings made at equidistant points around the periphery. The

minimum thickness at any point and the average thickness at the 3 points selected will comply with the requirements given in Clause 3.2.4 & 3.2.7.

Clause No. 5.7.3(New Clause):

In case of sheath, measurement shall be made at 3 different points at intervals of not less than 75 mm along the length of the sample. At each point, measurement will be taken for the minimum thickness of the sheath. The minimum thickness of sheath at any of the 3 points will comply with the requirements laid down in Clause 3.4.3.

Clause No. 5.8.1 shall be read as follows:

Tensile strength and elongation at break - This test shall be conducted in accordance with IS:10810(Part- 7)-1984. The material shall fulfil the requirements indicated below:

	Insulation	Sheath
a) Before ageing:		
i) Min. tensile strength, kg/cm^2	150	150
ii) Min. elongation percentage	150	200
b) After ageing* in air oven at 80 ± 1^{o}C for 168 hours:		
i) Min. tensile strength, kg/cm^2	150	150
ii) Min. elongation percentage	150	200

*For acceptance test accelerated ageing may be done for which air oven temperature shall be 130±2^{o}C for 5 hours.

The maximum variation after ageing shall be ±20% of the value obtained before ageing. For tests before and after ageing, samples shall be from the same drum in case of sheaths and from the same core in case of insulation.

However, value after ageing for tensile strength and elongation shall not be less than given in Clause 5.8.1

Clause No. 5.8.2(New Clause):

SHRINKAGE TEST - This test shall be conducted in accordance with IS:10810(Part 12)-1984. The insulation or sheath shrinkage shall not exceed 2% of the original length. During the test no cracks shall occur in the insulation or sheath.

Clause No. 5.8.3(New Clause):

HOT DEFORMATION TEST - This test shall be conducted in accordance with IS: 10810(Part 15)-1984 and the material shall fulfil the requirements laid down in IS:5831-84.

Clause No. 5.8.4(New Clause):

LOSS OF MASS TEST - This test shall be conducted in accordance with IS: 10810(Part 10)-1984. The sample shall be kept in air oven at 80 ± 2° C for 168 hours. The loss of mass shall be 2 mg/cm^2 maximum.

Clause No. 5.8.5(New Clause):

COLOR FASTNESS TO DAYLIGHT EXPOSURE - This test shall be conducted in accordance with IS: 10810(Part 18)-1984. The minimum rating shall be 4.

Clause No. 5.8.6(New Clause):

COLOUR FASTNESS TO WATER - A piece about 100 mm long is cut into small pieces and immersed for 48 hours in about 10 times its own volume of distilled water at 70 ± 2° C. At the end of the period, the water shall be examined. It shall be free from any trace of colour.

Clause No. 5.8.7(New Clause):

BLEEDING AND BLOOMING TEST - This test shall be conducted in accordance with IS: 10810(Part 19)-1984. There shall be no appreciable staining of indicator compound.

Clause No. 5.8.8(New Clause):

COLD BEND TEST - The test shall be conducted in accordance with IS: 10810(Part 20)-1984. The sample shall be cooled in air in refrigerator at a temperature - 15 ± 2° C for a specified period. There shall be no signs of cracks or scales.

Clause No. 5.8.9(New Clause):

COLD IMPACT TEST - The test shall be conducted in accordance with IS: 10810(Part 21)-1984. The sample shall be cooled in air in refrigerator at a temperature - 5 ± 2° C for a specified period. There shall be no signs of cracks or scales.

Clause No. 5.8.10(New Clause):

HEAT SHOCK TEST - The test shall be conducted in accordance with IS:10810(Part-14)-84. The sample shall be placed in an oven at temperature 150 ± 2° C for one hour. There shall be no signs of cracks or scales.

Clause No. 5.8.11(New Clause):

THERMAL STABILITY TEST - The test shall be conducted in accordance with IS:5831-84 and shall meet the requirements indicated therein.

Clause No. 5.8.12(New Clause):

SPECIFIC GRAVITY TEST – The test shall be conducted on PVC insulation and sheath in accordance with BS:6469/1990 with distilled water. The test samples shall be taken from the finished cable. The specific gravity of insulation and sheath shall not exceed 1.42 and 1.50 respectively.

Clause No. 5.9.1 shall be read as follows:

This test shall be conducted in accordance with IS: 10810(Part 53)-1984 The period of burning after removal of the flame shall not be more than sixty seconds and the affected burnt length shall not be more than 200mm.

Clause No. 5.10.1 shall be read as follows:

This test shall be conducted on coils or complete drum or on sample of cable as the case may be.

The test voltage shall be as below:

Nominal thickness of Insulation	**Test Voltage**
0.5mm	2.5KV AC (rms)
0.8mm and above	4KV AC (rms)

The AC voltage used for testing shall be approximately of sine wave from at any convenient frequency between 40 and 60 Hz.

Test connections between	**Period**
1. Alternate Layers	5 minutes
2. Alternate Cores	5 minutes
3*. First core(s) against Last core(s)	5 minutes

(in all the layers)

* Applicable when number of cores in a layer are odd and more than one.

Clause No. 5.10.1.1 shall be read as follows:

In case of coils, samples shall be immersed in water bath at ambient temperature for minimum 2 hours and H.V. applied between conductors as one terminal and metal electrode immersed in water bath as other terminal. The test voltage shall be as indicated in Clause 5.10.1.

Clause No. 5.10.2 shall be read as follows:

SPARK TEST(Routine Test Only): Spark test shall be conducted in accordance with IS: 10810(Part 44)-1984. All cores to be used in a cable shall be subjected to this test by the manufacturer before the laying up process. The test electrode shall make an intimate contact with the surface of the core. The speed at which the core passes through the electrode shall be such that every point of it remains in contact with the electrode for not less than 0.1 second. The conductor of the core shall be earthed and the potential applied between the electrode and the conductor shall be as specified below:

Thickness of insulation (mm)	Test voltage kV(rms)
Upto and including 1.0	6
Above 1.0 and upto and including 1.5	10

The fault detector shall be arranged so as to maintain its indication even after the fault has passed out of the electrode. The sensitivity of the test apparatus shall comply with the requirement given in IS: 10810(Part 44)-1984.

Clause No. 5.11.1 shall be read as follows:

This test is conducted just after H.V. Test.

In case of cable on drum, the I.R. is measured on drum length between each conductor and all other conductors bunched together, in air at ambient temperature. The cable drum should have attained steady temperature by keeping it in test room for sufficient time. The test voltage shall be 500V DC and applied for one minute so that reading becomes steady.The insulation resistance of the cable shall be measured at room temperature and corrected to50^{o}C by means of the appropriate factors given in Table 9.

The value of the I.R. shall be as below:

Insulation Thickness (nominal)	**Mim. I.R. in Megohms/Km at 50^{o} C**
0.5mm	3
0.8mm and above	5

Clause No. 5.11.1.1 shall be read as follows:

In case of coils I.R. shall be measured between same terminal to which H.V. was applied as in clause 5.10.1.1. The value of the I.R. shall be as in Clause 5.11.1.

Clause No. 5.11.2 (New Clause):

For wet I.R. test, a three meter length of cable shall be taken and all cores taken out taking care not to damage their insulation. These bunched cores shall be immersed in water bath kept at 50 ± 1^{o} C for a period of 2 hours. The I.R. shall then be measured between each conductor and a metal electrode immersed in water with a test voltage of 500V DC.

Clause No. 5.12.1 shall be read as follows:

The cores of single-core and multicore cable shall be carefully removed from the samples approximately 3.5 meters long cut off from coil/cable drum. The bunched cores shall then be immersed in water bath at 60 ± 2^{o}C so that their ends protrude approximately 25 cm above water level. After the lapse of 24 hours in this condition a voltage shall be applied between all conductors bunched together and a metal electrode immersed in water as mentioned below:

Nominal insulation thickness (mm)	Test Voltage
0.5	2.5 KV (rms) applied then raised to 5 KV (rms) within 10 seconds and held constant for 5minutes.
0.8 & above	4 KV (rms) applied then raised to 8 KV (rms) within 10 seconds and held constant for 5minutes.

The samples shall withstand this voltage without breakdown.

Clause No. 5.12.2 shall be read as follows:

D. C. Test: This would be part of type tests only. The cores which have passed type test in 5.12.1 shall be left in water bath and a voltage shall be applied between all conductors bunched together(Negative pole of supply) and a metal electrode(Positive pole of supply) for total duration of 240 hours as mentioned below:

Nominal insulation thickness (mm)	Test Voltage
0.5	0.8 KV
0.8 & above	1.2 KV

The samples shall withstand this voltage without breakdown.

Clause No. 5.13.1 shall be read as follows:

The physical condition of the cable shall be visually inspected by transferring it to another drum/bobbin. The cable shall be reasonably circular throughout its length and shall be free from any physical defects.

The measured length of cable on any drum/bobbin shall not be less by more than one metre of the declared length. The cable shall conform to the requirements of Cl. 4.2.

Clause No. 5.13.2 : **Deleted**

Clause No. 6.1 shall be read as follows:

Multicore cables shall be wound on drums, unless otherwise specified. The timber used for the manufacture of drums shall be seasoned, reasonably straight-grained, uniform in thickness, free from insect attack, splits, warping and other defects which may reduce the overall strength of the drums. The timber shall be treated with suitable fungicide.

Clause No. 6.1.1 (New Clause):

The drums shall be of general construction as shown in Fig. 1. The dimensions D, X, X_i and Y shall be suitable for the size of the cable. Dimension D shall not be less than 20 times the overall diameter of the cable. The size of the drum must be such that the cable when packed the outer most layer of cable is 50 mm below the flange tip.

Clause No. 6.1.2 (New Clause):

Nails used in the manufacture of drums shall be of the clout headed type to IS:723. They shall be properly clenched and shall be so driven as to avoid splitting of the wood. The ends shall not protrude into the surface where the cable has to be wound.

Clause No. 6.1.3 (New Clause):

Unless otherwise specified, the cable shall be supplied in lengths of 500 metres . The tolerance shall be + 4% (-) 2%. Non-standard lengths, each not less than 100 metres, shall be acceptable upto 4% of the total quantity ordered. Unless otherwise specified by the purchaser, the tolerance on total quantity shall be ± 2%.

Clause No. 6.1.4 (New Clause):

Before despatch the drums shall be effectively lagged with suitable closely fitted batons of thickness 25 mm minimum. Every baton shall be secured to prevent it from getting displaced or damaged during transit and storage. The lagging shall further be strengthened by steel straps bound circumferentially over the drum. The steel strapping not less than 12 mm wide and 0.6 mm thick shall be used.

Clause No. 6.1.5 (New Clause):

The batons on the drums to be removed for obtaining access to the cable shall be painted red.

Clause No. 6.1.6 (New Clause):

The flange portion of drum shall be made of two batons. The thickness of each baton shall be 25 mm for flange dia. upto 1070 mm. If the flange dia. exceeds 1070 mm, the baton thickness shall be 37.5 mm.

Clause No. 6.1.7 (New Clause):

Both the ends of the cable shall be firmly secured and brought to the outer layer of the drum with suitable protective arrangement to prevent damage during testing and transit. In the inside portion of one side flange, suitable arrangement to guide lower end of the cable upto the top must be provided. The initial and final sequential length marking shall be properly visible at the outer layer. A red adhesive tape shall be put around the initial and final sequential number for easy location.

Clause No. 6.3 shall be read as follows:

Single core cable shall be supplied in 100 meters coils with tolerance of ±1 meter. These can also be supplied in lengths of 200/500 ±1meters if specified by the purchaser. Coils of 500 meters length shall be packed in suitable bobbin/reel/drum.

Clause No. 7.1 shall be read as follows:

Sampling of the cables/ wires shall be randomly selected.

Clause No. 7.1.1(New Clause):

All cable drums having cable of same conductor diameter, number of cores and similar construction shall constitute a lot.

Clause No. 7.1.2(New Clause):

For taking samples, drums will be chosen at random from the lot. From each of these drums, one sample of cable shall be taken. The length of the sample shall be sufficient so as to provide test pieces of required lengths as laid down in various test clauses.

Clause No. 7.1.3(New Clause):

The number of Test pieces to be taken from each sample shall be as per column 4 of Table 7. The number of test pieces has been expressed as a percentage of the number of cores in the sample.

Clause No. 7.2 shall be read as follows:

The number of drums to be randomly selected for taking sample shall be as per column 3 of Table 7. The number of drums has been expressed as a percentage of the total drums in the lot.

Clause No. 7.3 : **Deleted**

Clause No. 7.4 : **Renumbered as Clause 7.3**

Clause No. 7.5 : **Deleted**

Table – 1 shall be read as follows:

Table-1 Cables For Fixed Installations Circular Copper Conductor

Nom. cross sectional area	No. of wires in conduc-tors	Diameter of wires	Tolerance on diameter of wire	Weight per Km	Standard resistance of conductor per Km at 20 deg. C	Maximum allowable resistance of each conductor per Km at 20° C		
						Single* core cable	Twin & Multicore cables	
							Plain copper	Tinned copper
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0.28	1	0.6	±0.02	2.57	63.73	65	66.97	68.30
0.79	1	1.0	±0.02	7.0	22.94	23.4	24.11	24.59
1.5	1	1.4	+0.025 -0.015	13.72	11.20	11.54	11.77	12.00
10	7	1.4	+0.025 -0.015	97.96	1.627	1.660	1.693	1.726
0.50	16	0.20	-0.005	4.57	36.02	36.75	37.85	38.60
3.09	7	0.75	±0.02	28.11	5.57	5.68	5.85	5.97
1.33	3	0.75	±0.02	12.04	13.00	13.26	13.66	13.93
3.97	7	0.85	+0.025 -0.000	36.11	4.414	4.591	4.64	4.73
2.5	36	0.3	±0.005	23.13	7.056	7.20	7.42	7.57
10	140	0.3	±0.005	89.96	1.815	1.85	1.91	1.95
10	104	0.35	±0.005	89.96	1.815	1.85	1.91	1.95

* For Single Core Tinned Copper conductor, value of C.R. shall be 1.02 times of values given in Column- 7

Table – 6 shall be read as follows:

SAMPLING PLAN FOR SINGLE CORE CABLES (Clause 7.3)

No. of Coils in a lot	No. of Sampled Coils		***Annealing Test***	T.S, %age Elongation, Loss of Mass, Thermal Stability & Specific Gravity Tests	Shrinkage Tests	Conductor Resistance	H.V. & I.R. Test	W.I.R. & Water Immersion Tests	Thickness of Insulation & conductor size
	For All Tests	For Visual Tests (Cl.5.13.1 & 4.4)							
Upto 25	3	2	Min. one conductor/ 3 wires (if no. of strands are more than 3) of each sampled coil	Min. one sample from each coil of each colour	Min. one sample from each coil of each colour	All the sampled coils	All the sampled coils	***Two Coils***	All the sampled coils. Min. 3 wires if conductors are more than 3
26 to 50	5	2	--- do ---	2	--- do ---	--- do ---	--- do ---	Two Coils	--- do ---
51 to 100	8	4	--- do ---	3	--- do ---	--- do ---	--- do ---	Two Coils	--- do ---
101 to 300	13	6	--- do ---	3	--- do ---	--- do ---	--- do ---	Three Coils	--- do ---
301 to 500	20	8	--- do ---	4	--- do ---	--- do ---	--- do ---	Three Coils	--- do ---
501 to 1000	30	10	--- do ---	5	--- do ---	--- do ---	--- do ---	Four Coils	--- do ---
1001 to 5000	40	12	--- do ---	5	--- do ---	--- do ---	--- do ---	Five Coils	--- do ---
5001 and above	50	12	--- do ---	5	--- do ---	--- do ---	--- do ---	Six Coils	--- do ---

Table – 7 shall be read as follows:

TABLE - 7 -- SAMPLING PLAN FOR ACCEPTANCE TEST (CLAUSE 7.1, 7.2)

S.No.	**Tests**	**Sample size (No. of drums)**	**No. of test pieces to be taken from each sample**
1. a)	Conductor dia (Cl. 5.5.1)	5% subject to min. One sample from each lot	All cores
b)	Thickness of insulation (5.7)	-- do --	-- do --
c)	Annealing (5.5.2)	-- do --	100% upto 10 cores. 10+30% of the core in excess of 10

S.No.	Tests	Sample size (No. of drums)	No. of test pieces to be taken from each sample
			(Specimen shall cover all colours)
2.	Thickness of sheath (5.7)	-- do --	All sampled drums
3.a) i)	T.S. & % elongation of sheaths (5.8.1)	-- do --	Four samples from each sample drum
ii)	Ageing & Loss of mass Tests of sheath (5.8.1 & 5.8.4)	4% (out of 5% for Physical Tests) subjected to Max. 3 drums.	-- do --
b) i)	T.S. & % elongation of insulation (5.8.1)	5% subject to min. One sample from each lot	100% upto 10 cores. 10+30% of the core in excess of 10 (Specimen shall cover all colours)
ii)	Ageing & Loss of mass Tests of insulation (5.8.1 & 5.8.4)	4% (out of 5% for Physical Tests) subjected to Max. 3 drums.	Two samples of cores of each colour from each sampled drum.
c)	Specific gravity of insulation (5.8.12)	4% subject to max. 3 samples from each lot.	shall cover cores of all colours
d)	Specific gravity of PVC sheath (5.8.12)	-- do --	One sample from each drum
e)	Thermal Stability test for insulation (5.10.11)	4% (out of 5% for Physical Tests) subjected to Max. 3 drums.	Two samples of cores from each sampled drum (Sample shall cover all colours).
f)	Thermal Stability test for sheaths (5.10.11)	-- do --	Two samples of sheath from each sampled drum.
4.a)	Shrinkage test for insulation (5.8.2)	-- do --	One sample of core of each colour from each sampled drum.
b)	Shrinkage test for sheaths (5.8.2)	-- do --	One sample from each sample drum.
5.	Flammability test (5.9)	---	Minimum one sample from the lot
6.	Specific resistance test (5.6.4)	4% (out of 5% for Physical Tests) subjected to Max. 3 drums.	One sample of core of each colour from a lot.
7.	Conductor resistance test (5.6)	25% subject to min. 2 drums	All cores.
8.	High voltage test (5.10)	25% subject to minimum 2 drums	All cores

S.No.	Tests	Sample size (No. of drums)	No. of test pieces to be taken from each sample
9. a)	I.R. test (5.11.1)	25% subject to Min. 2 drums	All cores
b)	I.R. test (5.11.2)	4 % subject to minimum 2 drums.	All cores
10.	Water immersion test (5.12.1)	4 % subject to minimum one drum.	All cores
11.	Visual inspection (5.13) and Sequential marking (4.1.1)	5 % subject to minimum one drum.	On complete drum length.

INDIAN RAILWAY STANDARD SPECIFICATION FOR

PVC INSULATED CABLES & WIRES FOR RAILWAY SIGNALLING

SPECIFICATION NO. IRS:S-76/89

AMENDMENT 3

Number of pages 06

SIGNAL DIRECTORATE
RESEARCH, DESIGNS & STANDARDS ORGANISATION

MINISTRY OF RAILWAYS

MANAK NAGAR

LUCKNOW – 226011

DOCUMENT DATA SHEET			
Designation **IRS:S-76/89**			**Amendment 3**
Title of Document **PVC INSULATED CABLES & WIRES** **For Railway Signalling.**			
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Abstract This document defines PVC INSULATED CABLES & WIRES **For Railway Signalling.**			

Document control Sheet

Designation	**Organization**	**Function**	**Level**
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REVISIONS AND AMENDMENTS:

Version	Chapter/ Annexure	Amendment	Effective date
IRS: S 76/89	**-**	**First Issue**	**1989**
IRS: S 76/89	**-**	**Amendment 1**	**April 1996**
IRS: S 76/89	**-**	**Amendment 2**	**May 2002**
IRS: S 76/89	**-**	**Amendment 3 (Clause 3.2.6 & 3.3.2 modified)**	**January 2010**

Amendment No. 3
to
Specification No. IRS:S-76/89
for
PVC Insulated Cables & Wires for Railway Signalling.

Following clauses have been amended as below:

Clause No.	Existing Clause	Amended Clause
3.2.6	**For Single Core Cable, the colour of the core shall be any one of the colours Red, Black, Blue, Yellow and Grey as specified by the purchaser.**	**For Single Core Cable, the colour of the core shall be any one of the colours Red, Black, Blue, Yellow and Grey** or **as specified by the purchaser.**
3.3.2	**Way of counting from inner to outer continuously shall be unidirectional. Colour sequence within the group shall be in accordance to Table-3.**	**Way of counting from inner to outer continuously shall be unidirectional. Colour sequence within the group shall be** according to Table-3A or 3B.

TABLE – 3A : COLOUR SCHEME OF CORES (CLAUSE 3.3)

Conductor Diameter 0.6					**Conductor Diameter 1.0**				
No. of cores	**20**	**30**	**40**	**60**	**16**	**20**	**24**	**40**	**60**
No. of colour group	**4**	**5**	**5**	**10**	**2**	**4**	**3**	**5**	**10**
No. of cores in a group	**5**	**6**	**8**	**6**	**8**	**5**	**8**	**8**	**6**
Colour scheme of each colour group	**Blue Red Grey Black Yellow**	**Blue Red Grey Green Brown Black**	**Blue Red Grey Green Brown Black Yellow White**	**Blue Red Grey Green Brown Black**	**Blue Red Grey Green Brown Black Yellow White**	**Blue Red Grey Black Yellow**	**Blue Red Grey Green Brown Black Yellow White**	**Blue Red Grey Green Brown Black Yellow White**	**Blue Red Grey Green Brown Black**

TABLE – 3B : COLOUR SCHEME OF CORES (for Railway following specific practice historically)

(CLAUSE 3.3)

Conductor Diameter 0.6		Conductor Diameter 1.0
No. of cores	**40**	**24**
No. of colour group	**10**	**4**
No. of cores in a group	**4**	**6**
Colour scheme of each colour group	**Yellow White Pink Violet**	**Blue Red Grey Green Brown Black**