

SECTION - 16

ARMoured COPPER CONTROL CABLES

The cable supplied shall be FRLS Type C1 category Conforming to IS - 1554/PART I /1988 WITH AMENDMENTS UPTO DATE

Sl No	Description	
1	Voltage	1100v
2	Purpose	use in substation for supplying Power to equipments (AC 230 V/ DC 220 V) to be laid directly under earth / in cable ducts
3	Conductor sizes and no. of cores	As per schedule of materials
4	Conductor material	Plain annealed , high conductivity copper complying with IS - 8130/1984 with amendments up to date
5	Formation of conductor	Multi stranded circular shaped conductor as per the relevant ISS. Minimum 7 strands irrelevant to area.
6	No. of wires in each Conductor	As per IS 8130/1984 with amendments upto date as per the Schedule of materials.
7	Resistance of conductor at 20 Degree C	As per IS 8130/1984 with amendments upto date.
8	Materials and Thickness of core insulation	PVC Compound of Type - C as per IS - 5831 / 1984 shall be extruded over conductor Recycled granules should not be used for insulation Thickness should be as per IS-1554/part 1 / 1988 with amendments upto date.
9	Flexibility of Conductor	Class 2 of IS 8130 / 1984 with amendments upto date
10	Colour identification of cores	To conform to colour scheme as per IS - 1554/Part I/1988 with amendments up to date.
11	Laying of cores	The outer most layer of cores shall be laid up together with right hand lay & the successive layers shall be laid with opposite lay as per IS-1554 part I / 1988 with amendments upto date & shall be provided with non hygroscopic material wherever necessary.

12	Materials and thickness of sheath.	<p>The laid up cores shall be inner Sheathed with extruded PVC compound of type ST2 as per IS - 5831/1984 with its amendments upto date.</p> <p>The inner sheath shall fit closely on the laid up core & it should be possible to remove it without damage to insulation on individual cores.</p> <p>Recycled granules should not be used for sheathing. The thickness of inner sheath shall conform to IS -1554 / PartI/1988 with amendments upto date</p>
13	Armouring	<p>The armouring shall be provided over the inner sheath in left hand lay, as closely as practicable with galvanised steel wires / strips conforming to IS - 3975 / 1988 (II revision). The dimensions of the armouring shall conform to IS - 1554 / Part I / 1988 with amendments upto date.</p>
14	Outer Sheath	<p>The armour shall be outer sheathed with extruded black PVC compound of type ST2 as per IS - 1554 / Part I / 1988 with amendments upto date.</p> <p>Recycled PVC granules should not be used for Sheathing. The thickness of outer sheath shall conform to IS 1554/ PartI/1988 with amendments upto date.</p>

NOTE:

Both inner and outer sheathing should be done by two separate processes only. Dual extrusion should not be done.

15.0 Embossment

- 1) "HR 85" Embossment shall be done as per IS 1554/Part I/1988
- 2) "TANTRANSCO" Embossing shall be done for each meter throughout the length of cable.

16.0 CABLE LENGTHS:

The cable to be supplied should be in standard lengths of 500 meters with a tolerance of +/- 5% in non returnable wooden drums. The last drum to be supplied for completion of the quantity ordered with allowed tolerance shall contain bit length of not less than 50% of the standard length specified. A total tolerance of +/- 5% of quantity ordered will be allowed to be supplied.

16.1 CABLE MATERIAL

16.1.1 CABLE TAGS AND MARKERS

16.1.2 Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule.

16.2.1 The tag shall be of aluminium with the number punched on it and securely attached to the cable conduit by not than two turns of 20 SWG GI wire conforming to IS:280. cable tags shall be of rectangular shape for power cables and of circular shape for control cables.

16.2.2 Location of cables laid directly underground shall be clearly indicated with cable marker made of galvanized iron plate.

16.2.3 Location of underground cable joints shall be indicated with cable marker with an additional inscription cable joints.

16.2.4 The marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road and drain crossings.

16.2.5 Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry and at each end & turning point in cable tray/trench runs. Cable tags shall be provided inside the switchgear, motor control centers, control and relay panels etc. wherever required for cable identification, where a number of cable enter together through a gland plate.

16.3 Cable supports and cable Tray Mounting Arrangement

16.3.1 The Contractor shall provide embedded steel inserts on concrete floors/walls to secure supports by welding to these inserts or available building steel structures.

16.3.2 The supports shall be fabricated from standard structural steel members.

16.3.3 Insert plates will be provided at an interval of 750 mm wherever cables are to be supported without the use of cable trays, such as in trenches. While at all other places these will be at an interval of 2000mm

16.4 Cable termination and Connection

16.4.1 The termination and connection of cables shall be done strictly accordance with cable and termination kit manufacturer's instruction drawing and /or as directed by the Owner.

16.4.2 The work shall include all clamping, fitting, fixing, plumbing, sold Drilling, cutting, taping, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job.

16.4.3 Supply of all consumable material shall be in the scope of Contractor.

16.4.4 The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The contractor shall be responsible for drilling of gland plates, painting and touching up. Holes shall not be made by gas cutting.

16.4.5 Control cable cores entering control panel/ switchgear /MCCB /MCC / miscellaneous panels shall be bunches, clamped and ties with nylon strap or PVC perforated strap to keep them in position.

16.4.6 The contractor shall tag/ferrule control cores at all terminations, as instructed by the owner. In panels where a large number of cables are to be

- terminated and cable identification may be difficult, each core ferrule may include the complete cable number as well.
- 16.4.7 Spare cores shall be similarly tagged with cable numbers and coiled up.
- 16.4.8 All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively closed.
- 16.4.9 Double compression type nickel plated (coating thickness not less than 10 microns) brass cable glands shall be provided by the contractor for all power and control cables to provide dust and weather proof terminations.
- 16.4.10 The Cable glands shall conform to BIS 6121. they shall comprise of heavy duty brass casting, machine finished and nickel plated, to avoid corrosion and oxidation, rubber components used in cable glands shall be neoprene and of tested quality. Cable glands shall be of approved make.
- 16.4.11 The cable glands shall also be suitable for dust proof and weather proof termination. The test procedure, if required, has to be discussed and agreed to between owner and cable gland manufacturer
- 16.4.12 If the cable end box or terminal enclosure provided on the equipment is found unsuitable and requires modification, the same shall be carried out by the contractor, as directed by the owner.
- 16.4.13 Crimping tool used shall be of approved design and make.
- 16.4.14 Cable lugs shall be tinned copper solderless crimping type conforming to IS 8309 & 8394. Bimetallic lugs shall be used depending upon type of cables used.
- 16.4.15 Solderless crimping of terminals, shall be done by using corrosion inhibitory compound. The cable lugs shall suit the type of terminals provided.
- 16.5 Storage and handling of Cable Drums
- 16.5.1 Cable drums shall be unloaded handled and stored in an approved manner and rolling of drums shall be avoided as far as possible. For short distance, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.

TECHNICAL

1100V , 4x120 SQ.MM LT UG CABLE.

1. Requirements 1100V rated 4 x 120 sq.mm LT UG cable, comprising of Multi-stranded shaped compacted Aluminium Conductor of grade H2/H4, XLPE insulated, cores laid up, inner sheath of extruded PVC of type ST2, galvanized steel strips armoured and PVC of type ST2 sheathed overall, conforming to IS.7098/Part-1/1988 with its amendments upto date and with ISI marking.

1100 Volts
2. Voltage
3. Purpose For use in L.T. distribution network, cable to be laid in trench/ directly underground.
4. Conductor size 4 x 120 sq.mm.
5. Conductor materials Aluminium of H2/H4 grade complying with ISS 8130/1984, with latest amendments, if any
6. Formation of conductor Multistranded shaped compacted conductor
7. No. of wires in conductor 4x120 sq.mm

For the main core - 37

For the neutral core - 37

4x240 sq.mm

Main core ... 61

Neutral core ... 61

- | | | |
|-----|--------------------------------|--|
| 8. | Resistance of the conductor | Maximum resistance at 20 degree Celsius shall be 0.253 ohm/Km for main and neutral conductors for 4x120 sq,mm and 0.123 for 4x240 sq.mm. |
| 9. | XLPE insulation | <p>(1) The insulation shall be extruded over conductor with cross linked polyethylene (XLPE) conforming to section VI of table of IS 7098/Part I/1988 with its latest amendments upto date (i.e) the insulation should be suitable for normal operation at 90 degree Celsius and withstand 250 degree Celsius during short circuit. The insulation shall be applied that it fits closely</p> <p>on the conductor.</p> <p>(2) The curing of XLPE insulation shall be processed with steam curing or Nitrogen gas curing so that the insulation is cured homogenously.</p> |
| 10. | Thickness of insulation | Minimum thickness of 1.2 mm for phase and neutral conductors for 4x120 sq.mm and 1.7 mm for 4x240 sq.mm. |
| 11. | Colour identification of cores | To conform to colour schemes as per ISS 7098/Part I/1988 with its latest amendments upto date. Red, Yellow, Blue for main core and Neutral conductor shall be black. |
| 12. | Laying up of core | The cores shall be laid up together with right hand lay complying with IS 7098/Part I/1988 with amendments upto date. The interstices shall be filled with non-hygroscopic material, wherever necessary. |
| 13. | Inner sheath | The laid up cores shall be provided with inner sheath of PVC applied by extrusion . The PVC sheathing shall be extruded from FRESH PVC granules. Recycled PVC granules should not be used. Polyester Transparent tape overlap over XLPE is preferable.The sheathing shall conform to Type ST2, PVC Compound of IS 5831/1984 ie. for 90 degree Celsius operation. It shall |

- be ensured that it is as circular as possible. The inner sheath shall fit closely on the laid up cores and it should be possible to remove it without damage to insulation of individual cores. The thickness of inner sheath shall conform clause 12.3 table IV of IS 7098/Part I/1988 with its latest amendments.
14. Armouring Galvanised Steel strip armour conforming to IS3975/1979 with its latest amendments. The armouring shall be applied over the inner sheath (common covering) as closely as practicable and should cover fully. The number of armour strips so applied shall remain the same throughout (i.e.) in the inner end of the cable/along the length of the cable and the outer end of the cable. The direction of lay of the armour shall be left handed. The dimension of the armouring shall be 4x0.8 mm conforming to table 6 of IS.7098/Part-I/1988 with its latest amendments.
15. Outer sheath The colour of the outer sheath shall be black. It shall be applied over the armouring. The thickness shall conform to clause 14.3 table 8 of IS 7098/Part I/1988 with its latest amendments. PVC sheathing shall conform to Type ST 2, PVC compound of IS.5831/1984 with its latest amendments for 90 degree Celsius operation & shall be extruded from fresh PVC granules. Recycled PVC granules should not be used.
16. Cable length i) Cable shall be supplied in drum with continuous drum lengths of 500 metres with a tolerance of +/- 3%.
- ii) A Quantity of cable, not exceeding 5% of the quantity ordered will be allowed to be supplied in non-standard lengths, but none of which shall be less than 250 metres.
- iii) A tolerance of +/- 2% of the total ordered will be allowed to be supplied more

17. Manufacturer's identification

or less than the quantity ordered.

The manufacturers identification shall be provided throughout the length of the cable by embossing the following on the outer sheath at intervals of two metres approximately.

i) Trade Mark/ Manufacturer's name/IS

marking .

ii) Year of manufacture.

iii) Type of cable viz. A2XFY.

iv) Voltage Grade as per relevant ISS.

v) Size of the cable (viz) 4 x120 sq.mm

vi) Letters "T.N.E.B.", ELECTRIC CABLES",

vii) The Length of the cable shall be

indicated sequentially along with the

length of the cable in each drum.

18. Packing

The cables shall be securely packed in non-returnable, well-seasoned wooden drum so as to withstand rough handling during transport by RAIL, ROAD, etc. and subsequent storage. Following information shall be marked on the drum.

a) Reference to the Indian Standard ie.

ref. IS 7098/Part-I/1988 with its latest

amendments.

b) Manufacturer's name, brand name or

trade mark

c) Type of Cable and Voltage grade

d) Number of cores.

- e) Nominal cross sectional area of the conductor.
- f) Cable Code
- g) Length of the cable in the drum
- h) No. of lengths in the drum (if more than 1)
- i) Direction of rotation of drum (by means of an arrow)
- j) Approximate gross weight
- k) Country of manufacture
- l) Year of manufacture
- m) The drum or label may also be marked

with ISI Certification Mark.

19. Test Certificate

Type tests, routine tests, acceptance test and optional tests as per IS 7098/Part-I/1988 with its latest amendments shall be conducted and test results shall be furnished to the TANTRANSCO for approval.
