TIPS & RECOMMENDATION DURING THE INSTALLATIONS

The following are some of the salient factors which should be kept in view during installation of PVC & XLPE insulated Heavy Duty cables.

1) Before Laying the insulation of the cable should be checked with megger as a preliminary check against any probable damages. During megger check following Procedure follow.

Procedure for IR Testing (Megger Testing) of Screened XLPE Insulated Cables

Scope:

Applicable to all Single & Multicore XLPE Insulated Screened Cables from 3.3 kV to 33 kV.

Purpose:

To test the Insulation of XLPE Cables for HV Testing / Megger Testing

Steps:

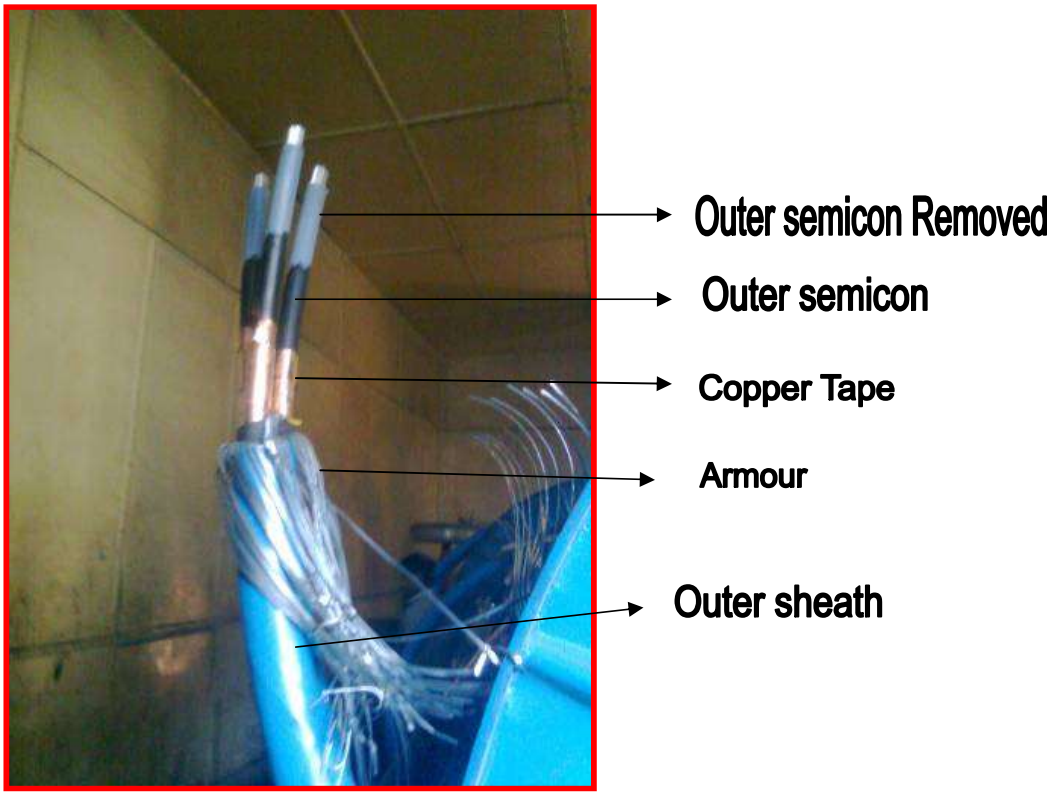
1. Remove approx. 300 mm all coverings from both the cable ends, i.e., Outer PVC Sheath, Armour, Inner sheath and fillers.
2. Remove copper tape approx. 200 mm. carefully from each core so that it shall not damage or get loose.
3. The outer semi-conducting layer shall be removed from each core by using stripping tool up to approx. 150 mm. from both ends of cable.

The stripping tool shall be adjusted in such a manner that the blade shall be removing only semi-conducting layer. It shall be removed all around and shall not damage insulation.

Alternatively a sharp edged piece of glass can be used to remove the outer semi-conducting layer. The core shall be kept inclined at approx. 60^{o} from horizontal axis and glass piece shall be rubbed against the surface of core. It takes out the semi-conducting layer. The rubbing shall be done uniformly in order to maintain smooth surface.

Before measuring I.R. Value, check 'O" By Shorting + & - terminal of megger.

The Insulation Resistance shall be measured between conductor, copper screen and armour. Minimum 2.5 kV Megger shall be used for cables of 3.3 kV & above.



2) The drum should be always roller in the “direction of arrow for rolling” marked on the drum. In the absence of such mark the drums should be rolled in the direction same as that of inside end of the cable (BOTTOM END) & opposite to that of the out side end (TOP END)

3) Where the cable is to be jointed with existing cable, the sequence f core at the two ends to be jointed should be in the opposite direction, i.e if at one end it is in clockwise direction at the other end it should be in anticlockwise direction. This is necessary to avoid the crossing of core while jointing. This will also decide the direction in which the cable is to be pulled.
4) Cable Bending & Pulling Instructions

Cable Roller to be used during the laying cable of each 1 to 1.5 meter length

Always used the Jack for unwind the cable

RECOMMENDED MINIMUM BENDING RADIUS FOR HEAVY DUTY CABLES.

Single Core : 20 x D
Multicore : 15 x D
Where D= Diameter of cable in mm

RECOMMENDED SAFE PULLING FORCE WITH STOCKINGS

a). For Unarmoured Cable: $P = 5 D^2$
Where P= Pulling Force
b). For Armoured Cable : $P = 9 D^2$

Where D= Diameter of cable in mm

RECOMMENDED SAFE PULLING FORCE WHEN PULLED WITH PULLING EYE

a) For Aluminium Conductors : 30 N/mm^2
b) For Copper Conductor : 50 N/mm^2

5) **Armoured Cables :** All bonding clamps at the joints and terminations and the armour wire should be thoroughly cleaned. The clamps should be adequately tightened this is necessary to ensure proper electrical contact because armour & copper Tape is the only return path for earth fault current.

   Unarmoured Cables : In case of unarmoured cables, the external metallic earth bonding connector of adequate size should be used.

6) **Earth :** A joints terminations armour wires and external metallic bonding should be connected to earth. Wherever possible armour at one end of the cable should be connected to main earth system at the supplying end by employing metallic connectors Precautions should be taken to eliminate the chemical and bimetallic corrosion of the earth connectors or bonds.

COMMON BIRDCAGING PROBLEMS

1) Proper Handing of cables is very important both for safety as well as long life of the installation.
2) The most common causes of cables failure are due to mishandling of the products at installation stage.

3) This can be prevented by unwinding the cables by loading the drums on jacks & pulling in the proper direction with stocking or pulling eye.

Single Core Cables - 1

Installed in Parallel

The following rules must be observed:

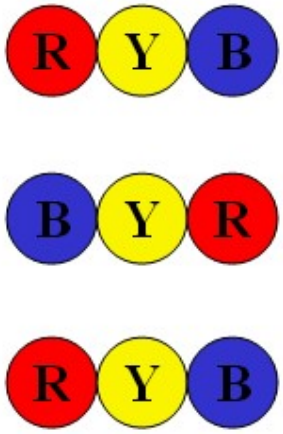
- Cables should have the same cross-sectional area.
- Cables should have the same type & construction.
- They should follow the same path.
- They must be of the same length substantially.
- They cannot be made to operate individually.
- They must not include any branch circuits along their route.

Single Core Cables - 2

Cable pertaining to the same phase should be as far as practicable alternated with those cable of the other phase so that unequal division of current is avoided

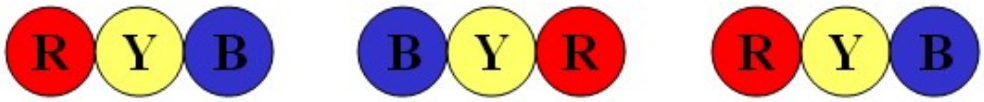
For three single core cables per phase, the correct dispositions are:

Flat Vertical

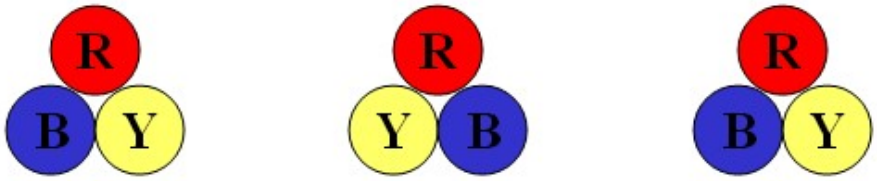


Single Core Cables - 2

Flat Horizontal



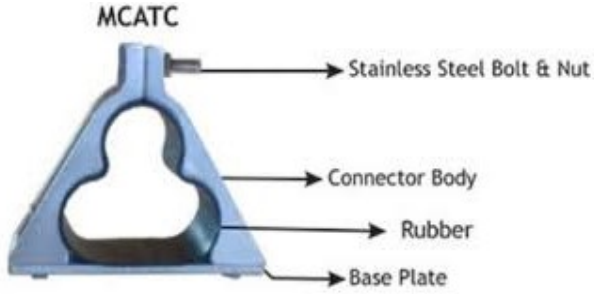
Trefoil Horizontal



Single Core Cable – 3

- **Space between three cables laid in one tray > cable OD.**
- **Secure tightly by non magnetic and non corrosive clamps at every 0.5 m – 0.8 m**
- **Trefoil arrangement in duct or in rack improve current distribution and reduces sheath losses**
- **Single core cables should not be installed individually in protective steel ducts; instead all three should be laid together in one single duct.**

Trifoil Formation



Trifoil Clamp

Trifoil Laying with clamping

Flat Formation

Bonding methods:

Single point bonding

- Screens connected and earthed at one end.
- No closed circuit, hence screen circulating current is eliminated.
- Normally used for limited route lengths (about 1.2 kM).

Beyond this length, sheath voltage is expected to increase beyond 65 volts.

Both end bonding

- Cable screen bonded and earthed at both end.
- Closed loop electro-magnetically linked with conductor loops.
- Circulating current in cable screen set up.
- Losses can be minimized by laying cable in TREFOIL formation.