

18. **TECHNICAL SPECIFICATION OF CABLING SYSTEM****1. SCOPE :**

This specification covers design, manufacture, assembly, testing at manufacturer's works, supply, delivery, erection of perforated type GI cable tray on M.S. steel support, supporting structures, and all other accessories required for laying of all L.T. power & control cables in the cable trays as well as laying of buried L.T. power cable and 33kV, 11 KV grade XLPE cable as per this specification as well as submitted cable schedule to be furnished by the successful bidder.

2. DEVIATION :

Normally the offer should be as per Technical Specification without any deviation. But any deviation proposed must be mentioned in the 'Deviation Schedule' with reasons and advantage of such deviation. Deviations not mentioned in 'Deviation Schedule' will not be considered after tender opening.

3. CABLE TRAY AND ACCESSORIES :

The GI perforated & adequate sizes slotted cable tray, M.S. supports, supporting structures & all other accessories required for laying of L.T. power & control cables shall be within the scope of the supply of successful bidder.

Width of cable tray and number of tray per trench should be designed by the contractor based on submitted cable schedule and switchyard cable trench drawing.

While deciding no. of cable tray and its width required for new Switchyards, contractor has to consider both the existing number of bays of different voltage classes under the scope of this tender as well as future number of bays as stated below for selection of width of cable trench & no. of cable trays.

- i) For 220 and 132 switchyards :
 - a) Six nos. 132 KV future bays
 - b) Six nos. 220 KV future bays.

All the power & control cable shall be laid in proper dressed up fashion without overlapping of cables on trays. Power and control cables should not be laid in one tray. Minimum gap between two trays in vertical layer should be 250 mm and horizontal gap of 600 mm (minimum). Minimum thickness of cable tray should be 3 mm. Cable trays shall be perforated trough and shall be fabricated from standard structural steel members.

The contractor shall make his own estimate of L.T. power and control cable, 33kV, 11 KV XLPE power cable, cable accessories, cable trays, supporting structures and other materials required for successful commissioning of all the bays of each switchyards to be

completed within the scope of this tender. However cable trays, supports, inserts, and all other accessories required for laying of all power & control cable for all the future bays as stipulated above shall be within the scope of supply as well as erection.

4. LAYING OF CABLES :

- a) All the cables shall be laid on cable trays in accordance with submitted cable schedule and switchyard & control room approved cable trench drawing.
- b) Cables shall be run with good workmanship and shall present a neat appearance. Overlapping of cables on trays shall not be permitted. Twisting & jointing shall not be permitted.
- c) Cables in trays shall be laid and not pulled into. Where pulling is absolutely necessary, instead of using steel or metallic rope, manila or nylon rope is to be used. Cable shall be neatly laid without interlacing.
- d) Sufficient length of cables shall be pulled into all equipment, control & relay panels and different junction boxes, marshalling kiosk etc. so that all the cores of a cable can be terminated in the terminal blocks in a neat fashion.
- e) Termination of cables shall be done in such a fashion to avoid tension of individual conductors or terminals.
- f) The radius of bends of any cable shall not be less than the minimum bending radius, as recommended by the cable manufacturers.
- g) Each cable shall be identified at each end and in exposed runs on cable trays by attaching Aluminium tag with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS : 20. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables. Cable tags shall be provided inside the switchgear, motor control cabinet, control & relay panel etc. wherever required for cable identification.
- h) Location of cables laid directly underground shall be clearly indicated with cable marker made of galvanized iron plate.
- i) Location of underground cable joints shall be indicated with cable marker with an additional inscription "Cable joint".
- j) Location of 11 KV XLPE cable laid directly underground shall be clearly indicated with cable marker with an inscription "11 KV XLPE".
- k) 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 & drain crossings.

5. CABLE TERMINATION, INSTALLATION AND CONNECTIONS :

- a) Cable terminations and their conductor connections shall be done in accordance with the approved scheme diagrams and as per cable and termination kit manufacturer's instruction / drawing applicable for 11 KV XLPE cable.
- b) The work shall include all clamping, fittings, fixing, plumbing, soldering, drilling cutting, taping, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job.
- c) The connecting terminals shall be covered with transparent insulating sleeve so as to prevent accidental contact with ground or adjacent terminals. The insulating sleeve shall be fire resistant and long enough to overpass the conductor insulation. Ferrules must be provided on each core of the control cable in order to facilitate identification

- d) 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 & touching up.
- e) Control & power cable cores entering control panel switchgear, MCCB / MCB / Junction boxes / BMK etc. shall be neatly bunched, clamped and tied with PVC perforated strap to keep them in position.
- f) Spare cores shall be also tagged with cable number & coiled up inserting ferrule numbers at both end.
- g) All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively closed.
- h) Double compression type nickel plated brass cable glands shall be provided by the contractor for all power & control cables. Rubber components used in cable glands shall be neoprene and of tested quality.
- i) The power & control cable between Station auxiliary transformer / Earthing-cum-Station service transformer, Control room, DG set building / or fire fighting, pump house shall be laid underground.
- j) Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of Aluminium paint. The red oxide and zinc chromate shall conform to IS : 2704.
- k) Power and control cables shall be securely fixed to the trays with self locking type nylon ties with de-interlocking facility at every 5 Meter interval for horizontal run. Vertical cable runs shall be secured with 25 mm and 2 mm thick aluminium strip clamps at every 2 Meter interval.
- l) In case of 4 core L.T. power cable and 3 core 33kV, 11 KV XLPE cable, adequate extra length shall be kept at a suitable point to enable two straight through joints to be made in case the cable develop fault at a later date. Bending radius shall be maintained as minimum 12D, where D is the overall diameter of cable.
- m) All due care shall be taken during unreeling, laying and termination of cable to avoid damage due to twist, kinks, sharp bends etc.
- n) Cable ends shall be kept sealed to prevent damage.
- o) Metal screen and armour of the cable shall be bonded to the earthing system of the station, wherever cable shall pass through floor or through wall openings or other partitions, GI / PVC wall sleeves with bushes having a smooth internal surface shall be supplied.

All the intending bidders are advised to assess the volume of supply and erection work prior to submission of bid by site visit of each and every switchyards.

6. CABLE TRAY SUPPORTING STRUCTURES :

Successful bidder shall supply and install all supporting structures, angles, straps, hangers, brackets, clamps, clips, nuts & bolts and all other required materials for the installation of cables and cable trays considering all the cables that are to be laid for successful commissioning of all the bays of different voltage classes for each switchyards under the scope of this tender as well as number of future bays that are to be

considered as per the stipulation laid down in Cl. No. 3(i). Cabling system shall be complete in all respect for laying of all the cables of future bays without any necessity of supply as well as erection of any cable tray, supporting structure & other accessory in future when future bays shall be constructed Cable trays shall be suitably supported with structures or hangers at intervals not exceeding 1200 mm to prevent excessive stressing and deflection of the trays.

7. TENDER DRAWING AND CATALOGUE :

All the relevant drawing, catalogues shall be submitted along with each copy of the tender.

8. CONTRACT DRAWING AND CATALOGUE :

8.1. In the event of placement of L.O.A. the Contractor has to submit Ten (10) copies of all the relevant drawings and Catalogue to the Control Officer, DPL for approval.

8.2. Ten (10) sets of approved drawings and ten (10) copies of Catalogue for each switchyards shall be submitted for record and distribution to site.

9. TESTS AT MANUFACTURER'S WORKS AND TEST CERTIFICATES :

All routine and acceptance tests of all accessories required for cabling system shall be carried out at the works of the manufacturer as per relevant Indian Standard as well as relevant IEC in presence of representative of DPL.

All routine and acceptance tests shall be carried out at the manufacturer's works on every lot offered for inspection. Selection of samples for acceptance test as well as rejection and re-testing shall be guided by relevant IS. The entire cost of acceptance and routine tests that are to be carried out shall be treated as included in quoted price. Ten (10) copies of test reports shall be submitted to the Control Officer, DPL for approval.

An advance notice of 21 (twenty one) days shall be given by the contractor to the Control Officer, DPL intimating the actual date of inspection and details of all tests that are to be carried out.