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1. SCOPE

The Specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at store/ site of LT Junction Box for Service Connection (10 Way) overhead distribution lines.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

Ref. IS	Description
IS:14772-2000	General requirements for enclosures for accessories for household and similar fixed electric installations specification.
IS: 8623-1993	Specification for Low Voltage switchgear and control gear (Part 1 and 2) assemblies Part 2 Particular requirements for busbar trunking systems.
IS: 11731-1986	Methods of test for determination of Flammability of solid Electrical insulating materials when exposed to an igniting source.
IS: 11000-1934	Fire hazard testing
IS: 13411-1992	Glass Reinforced polyester dough moulding Compounds.
IS: 4247	Test for Non-ignitable and Self-Extinguishing Properties of Solid Electrical insulating Material.
IS: 4249	Classification and methods or tests for non-ignitable and self-extinguishing properties of solid electrical Insulating materials.
IS: 2500-2000	Sampling Procedure for Inspection by Attributes.
IEC: 60695	Glow Wire Test at 960 Deg. C
UL: 94	Tests for Flammability of Plastic Materials.
UL: 746-C	Polymeric Materials in Electrical equipment's.
UL: 1059	Terminal blocks up to 1500V.
IEC: 61238-1:2003	Compression and Mechanical connectors for Power cable part 1: Test methods and requirements

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. cm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4. GENERAL TECHNICAL REQUIREMENTS:

Sl. No.	DESCRIPTION	REQUIREMENT
1	Type of Box	Three phases, Four wire, 10 Ways
2	Application	Outdoor
3	No. of incoming	1
4	No. of Outgoing	9 (8 Nos. of Single phase and 1 no. of Three Phase)
5	Incoming cable size	1 no. of 4C X 95 sq.mm / 4C X 50 sq.mm XLPE armoured, 1.1kV
6	Outgoing cable size	2CX10/ 2CX16 sq. mm - 6 No's, 2CX25 sq.mm - 2 No's & 4CX25 sq. mm - 1 No (XLPE armoured 1.1kV)
7	Number of busbar sets	3 Nos (Phase) of 5 way 1 No (Neutral) of 11 way
8	Degree of Protection	IP 55
9	Dielectric withstand for the box	5kV for 1 min
10	Flammability requirement	Vo
11	Box Material	Virgin Polycarbonate
12	Colour of the box	Greyish White
13	Thickness of the box	2 mm
14	Gaskets	EPDM rubber (ethylene propylene diene monomer)
15	Bus Bar	
15.1	Rated voltage	415V
15.2	System voltage	1.1 kV
15.3	System frequency	50 Hz
15.4	Rated current of the Bus bar	300 A
15.5	Number of Bus Bar Sets	3 (Three phase) + 1 Neutral
15.6	Bus Bar Material	Aluminium
15.7	Current Density (Max.)	1 Amp/Sq.mm
15.8	Temperature rise	Maximum permissible temperature rise for the busbar and terminals shall 45°C and 70°C respectively at ambient temp. (not exceeding 50°C). For busbar and incoming terminal, test shall be conducted at 300A and for outgoing terminals shall be 72A. Testing to be conducted up to a time period until maximum temperature reaches and gets constant. After getting constant rise, further it should be checked up to 1 hrs at same current loading. During terminal testing, minimum two adjacent terminals to be checked at a time.
15.9	Short Time withstand current for bus bar	3kA for 1 sec
15.10	Material of insulation for mounting bus bar (Bus bar support)	In built with Busbar housing of Virgin Polycarbonate
15.11	Clearance between phases	Min. 25 mm
15.12	Clearance between phase to neutral	Min. 50 mm
15.13	Weight of the box	To be given by bidder
15.14	Weather Recyclable Material	YES
15.15	Drainage	2 Nos adequate size hole for water drainage
15.16	Lid-stoppers	The lid-stoppers should have provision for holding the lid at 3 number of distinct positions

5. GENERAL CONSTRUCTIONS:

5.1 Enclosure

The enclosure shall be weather proof, tamper proof and shall be made of injection moulded reinforced polycarbonate material with Vo grade fire retardant, self- extinguishing, UV stabilize, recyclable and Anti oxidation properties with minimum 2mm of thickness. The enclosure shall be of adequate strength, unbreakable and shall be made in two piece (base and cover). The enclosure and cover shall be greyish white color. Enclosures cover shall open by 120 degree on the top of the enclosure and a suitable polycarbonate hinge support shall be provided at both end of the inner side of the box to hold cover when it is in open condition. In the joints, fixed parts shall be properly riveted to the cover base and cylindrical play shall be provided on the cover to ensure smooth opening of the boxes. The Incoming and Outgoing cables should be connected to the bus bar using T type insulated Allen bolt and key. The enclosure base should have holes to accommodate incoming cables and outgoing cables with single compression brass glands. The incoming and outgoing holes shall be covered with rubber grommet to avoid water ingress inside the box.

5.2 Bus Bar

The Bus bars meeting the requirement of aforesaid current rating and maximum current density shall be provided in identical pairs for Phase as well as for neutral as mentioned in specification. Polycarbonate supports suitable for fixing the busbars at base shall be provided at the ends of Bus Bar casings. The Bus bar housings shall be arranged and mounted at a suitable height and stepped angle so that providing new connections is easy and can be done without much bending of the cables. The Busbar's adaptor shall be mounted through two screws and further riveted at both the end. Colors of the adaptors shall be Red, Yellow and Blue for the phases and Black for Neutral. The Bus Bar block should have 2 nos. of Screws in each terminal for proper tightening with cable conductor .The Busbar's adaptor material shall be polycarbonate/nylon grade fire retardant, self-extinguishing .The Busbar's adaptor material shall not damage due to temperature rise during entire operational period on continuous load. Anticorrosion compound shall be provided with each box for protecting bare aluminum conductor near contact area of terminal.

The Busbar shall be split type and the distance between the busbars shall be min 25 mm with the phase separator of FRP material.

Completely insulated Busbar for Terminations:

The arrangement shall be completely insulated busbar with T type insulated Allen key type arrangement having uniform torque during cable connection into the busbar. The bus bar shall be of aluminium. The insulated bus bar connectors are covered with polycarbonate plastic material and mounted separately with the help of mounting lugs arrangement on DIN rail. There should be split bus bars connectors for multiple connections. Additional screws shall be supplied with these busbars by the bidder. Busbar mounting should be with double nut arrangement to avoid breaking during cable connection.

5.3 Sealing of Box

For the enclosure, the gasket shall be made up of Ethylene-Propylene-Diene Rubber and shall be provided all around the cover. The box shall be provided with a safety key made of PA 6.6 (Nylon) to ensure theft proof locking arrangement. The Key shall be identical for all the boxes. The box locking screw should be made of stainless steel or plating finished steel. Addition to lock and key arrangement the box shall be provided with two U-shaped latches of approx. size 25 mm on bottom side of the box. The latch shall be GS with minimum thickness of 1.2mm. The latch shall be provided along with suitable clamp assembly in base as well as cover, such that these are fully covered by the latch after closing. The clamps along with the latch shall be provided with a sealing hole on both the sides such as top provide a thru sealing arrangement on both the corners of the door opening in the assembly.

There must be an additional push-fit lock which requires key for opening but closes automatically once the lid is closed under the effect of gravity or by pushing.

5.4 Earthing Connector

Earthing studs are to be connected with the gland plate properly with an U-shaped, 2mm thick (minimum) GI base plate to ensure safe earthing arrangement for the incoming and outgoing cable. The earthing base plate should be symmetrical at both the sides. There must be 4 numbers of hot-dip galvanized M8 size earthing bolts (2 on each side) of 40 mm length (min.) each, connected to this earthing base plate. The 2 earthing bolts on each side must be 50 mm (minimum) away from one-another. The earthing connector should be sufficient to carry the fault current. Earthing points on the outside of the box, to be connected with double washer and double nut of suitable size for proper earthing.

Green coloured thin metallic sticker having earthing symbol marked, to be provided at both ends of the box.

5.5 Mounting Arrangement

Boxes shall be provided with mounting arrangement suitable for installation on PSC/RSJ/H-Beam/WPB poles by using Suitable Clamp/Cleat 2 Nos (50x6) with Nut & Bolt arrangement (4 Nos).

or

High strength Stainless Steel Strap with 20mm x 0.7mm thickness. The arrangement shall be such that the strap runs behind the box and holds the box properly with pole.

6. MARKING:

The distribution box shall be provided with weather proof sticker clearly visible and effectively secured against removal. Indelibly and distinctly marked with all essential particulars as per relevant standards along with the following.:

- Name of the manufacturer
- Po Number with Date
- Serial Number/ Batch Number
- Property of "TPCODL/TPNODL/TPWODL/TPSODL" shall be Embossed.
- Voltage & Current Rating of Bus Bar.
- Guarantee Period.
- Danger-sign engraved and a weather-proof, large yellow coloured danger-sign sticker of triangular shape, pasted on the external surface of the cover

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/EC. All routine & acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the LT Distribution box in addition to others specified in IS/IEC standards.

7.1. Type Tests for Box:

S. No.	Tests/Standard	Requirements
1	Protection against electric shock (IS:14772-2000)	Enclosure shall be so designed that when they are mounted as for normal use, the live parts of any correctly installed accessories or any parts of these accessories which may become live due to a fault shall not be accessible.

2	Provision for earthing (IS:14772-2000)	Enclosure shall be provided with a facility for permanent and reliable connection to earthing
3	Resistance to ageing, humid conditions, Ingress of solid objects and to harmful ingress of water (IS:14772-2000)	Resistance to Ageing: Enclosure & Busbar adopter shall be kept in a heating cabinet with temp 70 ± 2 C for 7 days as per IS. After completion of the test, the enclosure shall not show any cracks. Humid conditions: Enclosure & Busbar adopter shall be kept in a cabinet with humidity between 91 to 95 % for 7 days as per IS. After completion of the test, enclosure & Busbar adopter shall not show any damage. Resistance against ingress of solid objects and to harmful ingress of water: Enclosure shall be subjected to test for degree of protection (IP 55) as per IS 12063.
4	Mechanical strength/Impact Resistance Test (IS:14772-2000)/(UL: 746C)	The sample shall be subjected to Impact resistance test as per the respective standards and shall not show occurrence of any of the following: 1. Making uninsulated live parts accessible to contact 2. Producing a condition that might affect the mechanical performance of the enclosure 3. producing a condition that would increase the likelihood of an electric shock
5	Resistance to heat /Ball Pressure Test (IS:14772-2000)	The test shall be made on a sample in a heating cabinet at a temp of $125 \pm 2^\circ\text{C}$ for 1hr per IS. After completion of test, the diameter of the impression caused by the ball shall be measured and should not exceed 2 mm.
6	Resistance to Abnormal heat and fire/Glow wire test (IS:14772-2000)	Parts of insulating materials which might be exposed to thermal stresses due to electric effects shall not be affected by abnormal heat and by fire. The compliance shall be checked by means of the glow wire test performed at 850. C. according to IS 11000 (Part 2/sec1) with no flame and glowing.
7	Resistance to Tracking (IS 14772-2000)	The sample when tested as per clause no 17 of IS: 14772, shall show no flashover after completion of the Test.
8	Flammability test (IS:11731(Part II)- 1986)/UL:94)	The sample shall comply to flammability requirements of category FVO as per respective standards.
9	Test for self-extinguishing property (IS:4249-1967)	The sample when tested as per clause 3.5.1 of IS 4249, shall comply to the specified requirements.
10	Test for water absorption (IS:5133 (Part II)-1969)	The sample shall be heated to a temperature of $50 \pm 3^\circ\text{C}$ for 24 h, as per IS and after completion, the water absorbed should not be more than 1%.
11	Verification of Die-electric properties (IS:8623 (Part I)-1993)	The enclosure shall be tested as per clause no 8.2.2 of IS 8623 (Part 1). with test voltage of 5KV for 1 minute and withstand it satisfactorily.

 	 	Specification No: ENG-LV-3029 Specification Name: LT Junction Box for Service Connection (10 Way)
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12	UV Light Exposure (UL-746C)	The sample when exposed to UV light as per the defined test method, shall comply to following a) Physical Properties: The average value of physical properties after the UV light exposure shall not be lower than 70% of its initial value (without UV aging) i.e. the variation shall not be more than 30%. b) Flammability Test: After the UV light exposure, flammability the requirement of FVO shall remain unchanged. c) Flexural Strength: After the UV light exposure, Flexural strength shall not be lower than 70% of its initial value (without UV aging) i.e. the variation shall not be more than 30%.
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7.2. Type Tests for Bus Bar:

S. No.	Tests/Standard	Requirements
1	Verification of temperature Rise test (IS:8623 Part-1 Cl. No. 8.2.1)	Maximum permissible temperature rise for the busbar and terminals shall be 45°C and 70°C respectively.
2	Verification of Dielectric Strength (IS:8623 Part-1 Cl. No. 8.2.2)	The test voltage at the moment of application shall not exceed 50% of the 2.5kV and it shall then be increased steadily within a few seconds to the full value and maintained for 1 minute. There shall be no flash over at the bus bars.
3	Short Circuit withstand Strength. (IS:8623 Part-1 CL.NO. 8.2.3)	The assemblies shall be rated for prospective short circuit current of 3KA for 1 Sec.
4	Verification of Clearance and Creepage distance. (IS:8623 Part-1 CL. No. 8.2.5)	The clearance and creepage distance shall comply with dielectric properties, abnormal conditions such as short circuit, which shall not reduce the distance between busbars and connection.
5	Mechanical Operations (IS:8623 Part-1 CL. NO. 8.2.6)	The number of operating cycles shall be 50
6	Tab Pull out Test (UL1059)	The male tab block employing quick-connect terminals shall be subjected to a direct, in line pull along the axis of the tab. The force of 89N pull shall be applied on the terminal block mounted as in service condition and this shall be with stood satisfactorily.
7	Heat cycle Test (UL 1059)	Current of 150% of rated current is to be passed through the connection for 84 ON periods of 3.5 hrs, each followed by a %1/2 hour OFF period as specified in the standard, temperature rise for the last ON period shall not be more than 5deg C higher than the first ON period.

7.3. ROUTINE TESTS (For Boxes and Bus Bar):

Below Routine test to be conducted:

- a) Marking
- b) Visual Examination and Dimensions
- c) Protection against electric shock
- d) Provision for earthing
- e) Test for self-extinguishing properties

7.4. ACCEPTANCE TESTS:

Following tests shall be performed as per the sampling plan defined in the Cl. No. 10 of the IS 2500 for ever offered lot size.

For Boxes:

- a) Marking
- b) Visual Examination and Dimensions
- c) Protection against electric shock
- d) Provision for earthing
- e) Resistance to ageing, humid conditions, Ingress of solid objects and to harmful ingress of water
- f) Mechanical strength/Impact Resistance Test
- g) Resistance to Abnormal heat and fire/ Glow wire test
- h) Flammability test
- i) Test for Self-Extinguishing Property.
- j) Verification of Dielectric properties.

For Bus Bar:

- a) Temperature Rise Test as per above GTP cl.no.15.6
- b) Verification of Dielectric Properties of moulded casing of bus bar
- c) Glow Wire Test at 950 degrees Centigrade of moulded casing bus bar

Note- For destructive testing, only 02 pcs to checked per lot.

8. TYPE TEST CERTIFICATES:

The bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA/any Govt. Lab as per the relevant standards. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/ TPNODL/ TPWODL/ TPSODL.

9. PRE DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPWODL/TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPWODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPWODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPWODL/TPSODL.

Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPCODL/TPNODL/TPWODL/TPSODL
- c) Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORES:

The material received at TPCODL/TPNODL/TPWODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of guarantee period for any 'latent defects' if noticed by the company.

12. PACKING:

Supplier shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport and be packed in such a manner so as to protect the equipment from damage in transit. The material used for packing shall be environmentally friendly. All insulators shall be packed in strong corrugated box of min. 7 ply duly palette or wooden crates. The gross weight of the crates along with the material shall not normally exceed 100 Kg to avoid handling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season. Each wooden case / crate / corrugated box shall have all the markings stenciled on it in indelible ink. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE:

Bidder shall submit the sample of material during submission of Bids in case of new to Tata Power DISCOMS.

14. QUALITY CONTROL:

The bidder shall submit with the offer Quality Assurance Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections. The bidder shall ensure that the material supplied is as per the Guaranteed Technical Particulars as specified in the specifications.

15. TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES:

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality

assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS:

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
- b) Work Experience details
- c) Type test certificates.
- d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder shall have to comply & submit clause wise compliance of this specification.

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

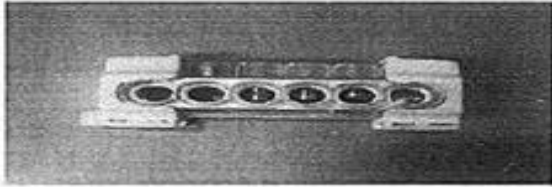
We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

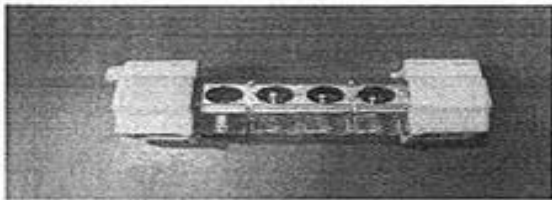
Signature

Designation

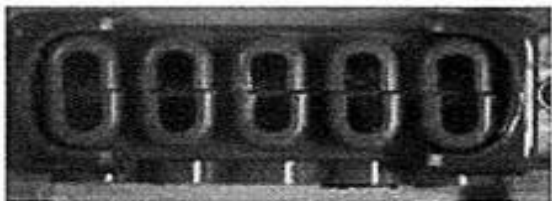
PHOTOGRAPH OF BUSBAR FOR TERMINAL



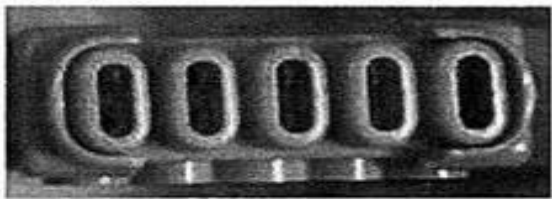
BOTTOM VIEW



BACK VIEW



FRONT VIEW BLUE PHASE



FRONT VIEW YELLOW PHASE



FRONT VIEW RED PHASE