ANX-1

SPECIFICATION FOR DISTRIBUTION TRANSFORMER

1.0 GENERAL:

This job covers design, manufacture, and assembly, shop testing, packing and delivery to site, supervision of erection, pre-commissioning tests and commissioning to ensure safe and trouble-free continuous operation of one (1) Nos. Indoor type, oil-immersed 2500 kVA 11/0.433 kV, Distribution Transformers to be installed on the transformer foundation.

1.1 The turns ratio of the transformer shall be so selected that the LV side voltage at full load condition should be 415 V while the primary being at rated voltage on principal tap position.

1.2 The transformer shall be capable of operation continuously at its rated output without exceeding the temperature rise limits specified in the IS.

1.3 Transformer shall be capable of continuous operation at the rated output at any particular tap position under following power system conditions:
   - Voltage variation of ±15% of the rated voltages of 11kV on primary side & 415 V on Secondary side.
   - Frequency variation of ±5% of rated frequency of 50 Hz
   - Combined voltage & frequency of 10% (absolute sum)

1.4 The transformer should withstand short circuit for 3 secs. Between phases or between phase to ground with voltage maintained on one side without damage to any part.

1.5 The symmetrical fault levels of the system to which the transformer would be connected are:
   - 350 MVA at 11kV
   - 31 MVA at 415V

1.6 The transformer should be designed with particular attention to the suppression of harmonic voltage: especially 3rd, 5th, and 7th so that the detrimental effect therefore is avoided.

1.7 The Transformer should be absolutely free from noise and vibration even when operating at 10% higher voltage over the rated voltage.

1.8 The transformer shall have overload capacities as per IS 2026.

1.9 Necessary first filling of oil shall be supplied for the transformer in non-returnable container for out-doors storage. 10% excess oil shall also be provided to take wastage into account.

1.10 The following technical particulars should follow

A. For Indoor Type for 11kV/415 V Transformer

   a) Service. : Indoor Type for 11kV/415 V
b) Quantity: **1No. for 2500kVA**
c) Rating: **2500 kVA**
d) Primary Voltage: 11000 volts
e) Secondary Voltage (No load): 415 volts
f) Type: Oil immersed & step-down
g) Cooling: ONAN
h) Connection: Vector Group **Dyn 11**
i) Type of tap changing looking arrangements: Off circuit manually operated with
   With handle position indicator.
j) No of Taps / Range steps (Minimum): Seven (7) + 7.5% + 5% & + 2.5% in
   each step.
k) **Terminal arrangements.**

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<tr>
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<tbody>
<tr>
<td><strong>H.V.</strong></td>
<td>Detachable type air insulated cable end box for accepting 1x3c, 70 to 150 mm2 XLPE, 11kV cable from bottom.</td>
</tr>
<tr>
<td><strong>L.V.</strong></td>
<td>Adequate space and design are required for housing end termination of <strong>1 to 9nos. 3.5 core 400 sqmm L.T XLPE</strong> cable 11kV/415V Trf. to <strong>PCC panel</strong> keeping in view for ease of future maintenance work.</td>
</tr>
<tr>
<td><strong>Neutral</strong></td>
<td>For service neutral: Inside secondary side (L.V.) terminal box for fixing the neutral bus of the trucking. For neutral earthing: Separate bushing for solid earthing by 2 nos. 50 x 6mm copper strips are required.</td>
</tr>
<tr>
<td><strong>H.V. &amp; L.V. terminal position angle to suit the layout requirement</strong></td>
<td>Placed opposite (i.e. 180° apart)</td>
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**2.0 CONSTRUCTIONAL FEATURES**

2.1 The transformer tank should be welded in construction, fabricated from sheet steel of adequate thickness, ready to absorb stress due to short circuit.

2.2 The transformer shall be provided with bi-directional wheel, Jacking pads, lifting eye holes, pulling lugs, oil sampling taps on top as well as bottom, oil filter valves, thermometer pocket for top oil temperature, double diaphragm type explosion vent with equalizer pipe connection to conservator air space and silica gel breather.

2.3 The transformer bushing shall conform to the requirements of minimum clearance specified in I.S: 2026 with latest version. H.V. bushing shall be porcelain type with studs.

2.4 The core and coil assembly of the transformer shall have following features: -

- Interleaved grade non- aging, low loss, high permeability, grain oriented, cold rolled silicon steel lamination properly treated core material and electrolytic copper of suitable grade coils, both properly insulated and stacked to minimize impulse and power frequency voltage stress.
- Insulating spacers, barriers and bracings are designed for free oil circulation and minimum hot spot of the winding.
- Supports are to prevent vibration and short circuit stress.
• Fixed position with respect to the transformer movement and short circuit stress.

2.5 Marshalling Box:

Sheet steel, weather proof with glass window. Complete with terminal block and wired up to the signaling devices provided on the transformer NCT, WTI, OTI, OLG, Buchholz Relay alarm & trip contacts, aux. Power supply, cubicle illumination lamp & door limit switch contacts terminated to the terminal block. Removable bottom gland plate for control cable entry.

2.6 Tapping & Tap Changers shall be suitable for voltage variation ranging between +7.5% to –7.50% of the rated voltage in steps of 2.5% with respect to the principal tap position. The transformer shall be capable of operation at rated output at any tap position provided the voltage does not vary by more than +10% of the rated voltage corresponding to that tap position. Electromagnetic balance shall be maintained between primary and secondary.

Tap changer shall be of off load type

1) FITTINGS AND ACCESSORIES

As per recommendation in the latest revisions IS but definitely including the following:

• Conservator tank connected to main tank by pipes through double float type Buchholz Relay with valves at both sides of the Relay and fitted with Dial type Magnetic oil level Gauge on one side and prismatic oil level gauge on the other side, both being visible from the ground level.

• Buchholz Relay shall have separate alarm & trip contacts wired up to the terminal block of marshalling Box.

• Winding Temperature Indicator with maximum, Reading Pointer and two separate contacts for alarm & trip duly wired up to the terminal block of Marshalling Box.

• Oil Temperature Indicator with separate alarm & trip contacts wired up to the terminal block of Marshalling Box.

2.7 Capitalization of losses

The No Load Loss and Load Loss (Copper Loss) quoted by the Tendered shall be guaranteed under penalty.

Capitalization cost would be computed for evaluation purpose and later on penalty levied in case test figures differ with the guaranteed figures beyond IS tolerance.

2.8 Documents/Drawings to be submitted along with the Quotation.

a) Technical particulars along with literature and write-up on the constructional features of each part, fittings and accessories.
b) Details list of accessories & fitting.
c) General Arrangement drawings of the transformer indicating the overall dimensions.
d) Certified percentage impedance & loss figures.
e) Type Test certificate including CPRI Test Report of an identical transformer.
**Warranty:** Two years from the date of successful commissioning at site.

**Factory Inspection:** Factory inspection and testing are to be arranged by the contractor for IIT officials by the contractor/Manufacturer.

**Erection:** The contractors are liable to perform all the arrangement for erecting the Transformer on MS channels including supply of iron channels of approx size 150 x 75 x 75 mm as approved by the Engineer or on RAIL of suitable sized and fixing them on cable trench with foundation bolts including supply of all hardware for complete execution of the job.
1.0 GENERAL

Power control centre or PCC shall comprise of eleven panel Circuit Breaker assembly comprising of 1 Nos. 4pole 4000 amps Air Circuit Breaker, 415Volts as incomer and outgoings consisting of the following features:

a) 3200 ACB, 4 pole, 75kA, MDO type with SR-18 G releases – 1no

b) 800 amps MCCB, 4 pole, with microprocessor based releases (O/C.E/F, S/C) -- 4no

c) 63 amp, 4 Pole, MCB, 10 kA -4 no

d) TPN Aluminium Bus-Bar: 6000 amps with colored insulated and sleeved Electrolytic AL/copper bus bars of 50 kA symmetrical fault current withstanding capacity.

The ACB and MCCB should be mutually coupled with 415 volts TPN 6000 amps Bus Bars with suitable rated Al bars only.

CONSTRUCTION

1.1 Indoors, floor mounted, self- standing, compartmentalized cubicle type made of minimum 2mm thick CRCA steel sheet.

1.2 Front operated (having operating height between 450mm and 1800mm from operating floor) and rear access type.

1.3 Suitable for bottom and top entry cables depending on final lay out. Accordingly horizontal bus bar chamber will be either at bottom or at top.

1.4 Having detachable type gland plat of 4mm thickness for drilling and fixing of cable glands at site.

1.5 Each cubicle door casketed and having concealed type hinged front door knob.

1.6 Provided with a continuous earth bus bar of 50x6mm copper strip running throughout the entire length with two (2) earthing terminals at ends suitable for connecting specified PE conductors.

2.0 BUS-BARS

3.0

3.1 Bus-bar grade, high-conductive electrolytic copper / aluminium conductor having adequate size to carry the continuous current 6000 Amp breaking at the design ambient temperature and the max. Short circuit current specified.

3.2 Braced to withstand the short circuit force developed max short circuit specified for 1 second.

3.3 Provided with heat shrinkable type PVC insulating sleeves for bus bars and shrouds for bus bar joints, colour codes for three phases and neutral.

3.4 Bus bar supports of epoxy resin molded or FRP type insulator.

4.0 INCOMING FEEDERS AND OUTGOING FEEDERS

4.1 1 no. Incoming feeder shall be of Air Break, horizontal draw out (MDO) type 4 pole, 415V having continuous current rating of 4000 amps with Microprocessor based SR 18 G releases.

a) Outgoing feeders consisting with the following features:-

a) 3200 amps ACB, 4 pole, 75kA MDO type with SR-18 G releases – 1no

b) 800 amps MCCB, 4 pole, with microprocessor based releases (O/C.E/F, S/C) -- 4no

c) 63 amp, 4 Pole, MCB, 10 kA -4 no

b) All ACB and MCCBs should be with microprocessor based releases having over current, short circuit and earth fault features and should have Ics=Icu=Icw=100% for ACBs and Ics=Icu =100% for MCCBs

Special Feature:-
1.1 a) The circuit breakers shall be provided with manually operated spring charged stored energy closing mechanism, with features like solid state Release with SR 18G (L&T), shunt trip release, earth fault release, with fault indication etc and providing Intelligent panel meter (QUASAR meter 3ph, 4 wire, 415 volt, LT meter with 5A CT, L&T make with RS 485 communication port) for each Air Circuit Breaker & MCCB units.

5.3b) The I/C unit should also have analog type Voltmeter, Ammeter &C.T with selector switches apart from Quasar meter.

5.3c) All C.Ts should be cast resin type.

5.3d) The I/C and O/G unit should also have Multifunctional Meter with RS485 port & suitable rating C.T with selector switches apart from Quasar meter.

1.2 ALL ACBs shall be provided with R, Y, B, ON, OFF, TRIP, SPRING CHARGE, TRIP CIRCUIT HEALTHY etc indicator and manual close and trip push buttons as required. All MCCB unit should have ON, OFF, TRIP indications, Rotary handles and spreader links. Interconnections with B/Bar should be with Suitable aluminium buses only.

1.3 The following indicating light (LEDs) on the front of the compartment shall be provided.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Color</th>
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<tbody>
<tr>
<td>Breaker Open</td>
<td>GREEN</td>
</tr>
<tr>
<td>Breaker close</td>
<td>RED</td>
</tr>
<tr>
<td>Spring Charged</td>
<td>White</td>
</tr>
<tr>
<td>Trip circuit Healthy</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

1.4 Mechanical safety inter lock shall be provided for:

a) The breaker cannot be plugged in or withdrawn from service position in closed condition.

b) The breaker can only be operated either in TEST or SERVICE position and not permitted to operate in any other position in side the cubicle.

1.5 Each breaker shall have (for inter locking purpose in addition to auxiliary contacts)

a) Position switch with 4 NO. & 4 NC Contacts.

b) Auxiliary switch with 4NO & 4 NC contacts.

1.6 Breaker compartment shall be provided with a door, which can be closed with the breaker in any of the three positions namely ‘SERVICE’, ‘TEST’, and ‘ISOLATED’ position.

Warrantee: Two years from the date of successful commissioning at site.

Factory Inspection: Factory inspection and testing are to be arranged by the contractor for IIT officials by the contractor/ manufacturer.

Erection: The contractors are liable to perform all the arrangement for erecting the PCC panel unit on MS channels including supply of iron channels of approx size 150 x 75 x 75 mm as approved by the Engineer and fixing them on cable trench with foundation bolts including supply of all hardware for complete execution of the job.