



## UTTAR GUJRAT VIJ COMPANY LIMITED

Regd. & Corporate Office : Visnagar Road,  
MEHSANA

# STANDARD TECHNICAL SPECIFICATION

*FOR THREE PHASE 11 kV/433 - 250V CLASS*

## DISTRIBUTION TRANSFORMERS

( 10 KVA, 16KVA & 25 KVA RATINGS )

Signature of Tenderer

Company's Round Seal

Date

Place



Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans

TECHNICAL SPECIFICATION FOR OUTDOORS TYPE DISTRIBUTION TRANSFORMERS OF 11 KV/433 - 250V CLASS UPTO AND INCLUDING 10,16 & 25 KVA WITH CRGO / AMORPHOUS METAL CORE

1.0 SCOPE:

This specification covers, engineering, manufacture, assembly, stage testing, inspection and testing before supply and delivery at site of oil immersed, naturally cooled 3 phase 11 kV/433 - 250 V Distribution Transformers for outdoor use.

1.1 It is not the intent to specify completely herein all the details of the design and construction of equipment. However the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation upto the Bidder's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject/accept any work or material which, in his judgment is there or not in accordance therewith. The offered equipment shall be complete with all components necessary for their effective and trouble free operation. Such, components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.

1.2 Standard Ratings:

The Standard Ratings shall be 10, 16 and 25 KVA.

2.0 STANDARDS:

2.1. The materials shall conform in all respects to the relevant Indian / International Standard Specification, with latest amendments thereof, some of them are listed below:

Indian Standard	Title	International & Internationally recognised standard
ISS -2026/1977	Specification for Power Transformer	IEC 76
ISS - 1180	Outdoor distribution Transformer upto and including 100 kVA	
IS 12444	Specification for Copper wire rod	ASTM B-49
ISS -3347/1967	Specification for porcelain Transformer bushing	DIN 42531,23,3
ISS-335/1983	Specification for Transformer Oil	BS 148, D-1473, D-1533-1934 IEC Pub 296-1969

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ISS 5/1961	Specification for colors for ready mixed paints	
ISS - 2099/1973	Specification for High Voltage Porcelain bushings	
ISS - 7421/1974	Specification for Low Voltage bushings	
ISS - 3347	Specification for Outdoor Bushings	DIN 42531 to 33
ISS - 5484	Specification for Al Wire rods	ASTM B - 233
ISS - 9335	Specification for Insulating Kraft Paper	IEC 554
ISS - 1576	Specification for Insulating Press Board	IEC 641
ISS- 6600/1972	Guide for loading of oil Immersed Transformers	IEC 76
ISS-649	Testing of Steel Sheets & Strips For Magnetic circuits	
ISS-6162(Part-I&II)	Paper covered Aluminum Conductor	
ISS-10028	Installation , Maintenance Of Transformers	
ISS-4257	Dimension for clamping arrangement for bushings (for porcelain and metal parts)	
ISS- 6160	Rectangular conductors for electrical machine	
ISS- 3401	Silica gel	
ISS-1866	Code of practice for maintenance & supervision of Mineral insulating oil in equipment	

Material conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned above, would also be acceptable. In case the Bidders who wish to offer material conforming to the other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Four copies of such standards with authentic English translations shall be furnished along with the offer.

3.0 System details:

The transformers shall be suitable for outdoor installation with 3 phase 50 Hz, 11 KV system in which the neutral is effectively earthed and they should be suitable for service under fluctuations in supply voltage up to plus 10% to minus 15%.

3.1. SERVICE CONDITIONS:

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The Distribution Transformers to be supplied against this Specification shall be suitable for satisfactory continuous operation under the following climatic conditions as per IS 2026 (Part - I ) Latest Revision

- i) Location : At various locations in Gujarat
- ii) Max ambient airtemperature (deg.C) : 50
- iii) Min. ambient air temperature (deg.C.) : 0
- iv) Max average daily ambient air temperature (deg.C) : 45
- v) Max. yearly weighed average ambient temperature(deg.C) : 40
- vi) Max. altitude above mean sea level (Meters) : 1000
- (vii) Maximum relative humidity : 0 to 100%
- (viii) Average thunder storm days/annum: 15 nos
- (ix) Average rainy days per annum: 90 days
- (x) Average annual rain fall: 800/900MM
- (xi) Number of months of tropical monsoon: 3 Months.

The equipment shall be for use in moderately hot and humid tropical climate, conducive to rust and fungus growth.

**4.0. PRINCIPAL PARAMETERS:**

The Transformers shall be suitable for outdoor installation with three phase, 50 Hz, 11 kV system in which the neutral is effectively earthed and they should be suitable for service under fluctuations in supply voltage upto plus 10% to minus 15%.

Sl. No.	Item	Specification
1.	Continuous rated capacity	10 kVA    16 kVA    25 kVA
2.	System voltage (max.)	12 kV    12 kV    12 kV
3.	Rated voltage HV	11 kV    11 kV    11 kV
4.	Rated voltage LV	433 - 250 V    433 - 250 V    433 - 250 V
5.	Line current HV	0.525 A    0.84 A    1.31 A
6.	Line current LV	13.3 A    21.33 A    33.33 A
7.	Frequency	50 c/s +/-    50 c/s +/-    50 c/s +/-

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		5%	5%	5%
8.	No. of Phases	Three	Three	Three
9.	Connection HV	Delta	Delta	Delta
10.	Connection LV	Star	Star	Star
		(Neutral brought out)	(Neutral brought out)	(Neutral brought out)
11.	Vector group	Dyn-11	Dyn-11	Dyn-11
12.	Type of cooling	ONAN	ONAN	ONAN
13.	Tap changing arrangement	Not applicable	Not applicable	Not applicable
14.	Noise level at rated voltage and frequency	45 db	45 db	45 db
15.	Permissible temperature rise over ambient	35 Deg.C	35 Deg.C	35 Deg.C
	i) Of top oil measured by thermometer	40 Deg.C.	40 Deg.C.	40 Deg.C.
	ii) Of winding measured by resistance			
16.	Minimum clearances in air of bushing terminals with connectors fitted.			-----255 / 205-----
	a) HV phase to phase/ phase to earth (mm)			-----75 / 55 -----
	b) LV phase to phase/ phase to earth (mm)			
	c) LV phase to neutral (mm)			-----75-----
	d) LV neutral to Earth (mm)			-----55-----

5.0. TECHNICAL REQUIREMENTS:

5.1.1 MATERIAL - CRGO/ AMORPHOUS METAL :

- a) CRGO Material:
  - i) Transformer core shall be Stacked core type shell type or with wound core construction using new and high quality CRGO steel/Amorphous metal core with heat resistant insulating coating. The core shall be of NEW high grade cold rolled grain annealed steel lamination / Amorphous metal core having low loss and good grain properties, coated with hot oil proof insulation, bolted together and to the frames firmly to prevent vibration or noise. The complete design of core must ensure permanency of the core losses with continuous working of the transformers. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated in the offer.

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- ii) Core Clamping for CRGO :
1. MS channel shall be used on top and bottom
  2. Core Channel on LV side to be reinforced at equidistance, if holes / cutting is done for LT lead in order to avoid bending of channel.
  3. MS Channels shall be painted with varnish or oil-resistant paint.
- iii) The transformers core shall be suitable for over fluxing (due to combined effect of voltage and frequency) upto 12.5% without injurious heating at full load conditions and shall not get saturated. The Bidder shall furnish necessary design data in support of this situation.
- iv) The nominal flux density in any part of the core shall not exceed 1.69 Tesla at 1.0 p.u.voltage and 1.9 Tesla at 1.1 p.u.voltage. The vendor shall furnish necessary design data in support of this stipulation.
- v) No load current shall not exceed 3% of full load current and will be measured by energising the transformer at 433 volts, 50 c/s on the secondary. Increase of voltage of 433 volts by 12.5% shall not increase the no load current by Max. 6% of full load current. Test for magnetic balance by connecting the LV phase by phase to rated phase voltage and measurement of an, bn, cn voltage will be carried out.
- vi) Clamping and Tie-rods shall be made from HT steel & shall be parkarised.
- b) **AMORPHOUS METAL:**
- i) The core shall be high quality Amorphous ribbons having very low loss formed into wound cores of rectangular shape, bolted together to the frames firmly to prevent vibration or noise. The complete design of core must ensure permanency of the core loss with continuous working of the transformers. The value of the flux density allowed in the design shall be clearly stated in the offer. Curve showing the properties of the metal shall be attached with the offer.
- ii) Core Clamping for Amorphous metal Transformers
1. Core clamping shall be with top and bottom U-shaped core clamps made of sheet steel clamped HT steel tie rods for efficient clamping.
  2. MS core clamps shall be painted with varnish or oil-resistant paint.
  3. MS rods shall be used as tie rods.
  4. Suitable provision shall be made in the bottom core clamp / bottom plate of the transformer to arrest movement of the active part.
- iii) The transformers core shall be suitable for over fluxing (due to combined effect of voltage and frequency) upto 12.5% without injurious heating at full load conditions and shall not get saturated. The Bidder shall furnish necessary design data in support of this situation.

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iv) No load current shall not exceed 2% of full load current and will be measured by energizing the transformer at 433 volts, 50 c/s on the secondary. Increase of voltage of 433 volts by 12.5% shall not increase the no load current by Max. 5% of full load current. Test for magnetic balance by connecting the LV phase by phase to rated phase voltage and measurement of an, bn, cn voltage will be carried out.

**NOTE: "Equal weightage shall be given to the transformers with Amorphous metal core & CRGO "**

**5.2 WINDINGS:**

5.2.a Materials:-Double paper covered aluminum conductor or class H enamel round aluminium

wire shall be used for 11 KV class transformer. A mix of copper & aluminum conductors

for HV & LV winding will not be permitted.

5.2.b. Current density for HV and LV shall not be more than 2.5 A/sq.mm. for copper and 1.60 A/sq.mm. for aluminum conductor. (However, +5% tolerance for LV winding is permissible)

5.2.c. Note:

1) LV winding shall be in form of even layers so that the neutral formation will be at top.

5.2 d 1) Manufacturer shall provide higher cross sections as required to keep winding & oil Temp. as specified, within limit.

**5.2.e. Insulation material & clearances:**

5.2..e(i). Materials Electrical grade insulating craft paper of Triveni/Ballarpur/Cauvery or equivalent make subject to approval of the purchaser shall be used. Similarly Press Board of Senapaty, Whitelay or Raman make or equivalent subject to the approval of the purchaser shall be used. Perma wood or Haldi wood blocks shall be used for top and bottom yoke insulation.

5.2.e(ii) Radial clearance of LV coil to core (bare conductor) shall not be less than-

SR.NO	KVA RATING OF TRANSFORMER	MINIMUM RADIAL CLEARANCE OF COIL TO CORE for Stack / Conventional core	MINIMUM RADIAL CLEARANCE OF COIL TO CORE for Wound core
1	10	3.0mm	1.5mm
2	16	3.5mm	1.5mm

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3	25	3.5mm	1.5mm
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5.2.e(iii) Radial clearance between HV & LV shall not be less than-

SR.NO	KVA RATING OF TRANSFORMER	MINIMUM RADIAL CLEARANCE BETWEEN HV & LV for Stack / Conventional core	MINIMUM RADIAL CLEARANCE BETWEEN HV & LV for Wound Core
1	10	11mm	2.25 mm
2	16	11mm	2.25 mm
3	25	11mm	2.25 mm

5.2.e(iv) -Phase to phase clearance between HV conductors shall not be less than-10mm For 11 KV class with a provision of minimum of 2 x 1 mm press board to cover the tie rods for Stack / Conventional core.

For Wound Core Phase to phase clearance between HV conductors shall not be less than- 2.0 m For 11 KV.

5.2.e(v) The minimum electrical clearance between the winding and body of the tank (between inside surface of the tank and outside edge of the windings) shall be 30 mm for 11 KV.

For Stack / Conventional core

And for Wound Core The minimum electrical clearance between the winding and body of the tank (between inside surface of the tank and outside edge of the windings) shall be 20 mm for 11 KV for bare conductor.

5.2. e(vi) Minimum end insulation to earth shall be 11 KV class - 25 mm for Stack / Conventional core For Wound Core Minimum end insulation to earth shall be 11 KV class - 10 mm

5.2.e(vii) No. of coils HV/Phase (minimum)-

	KVA RATING OF TRANSFORMER	MINIMUM NO . OF HV COILS PER PHASE for Stack / Conventional core	MINIMUM NO . OF HV COILS PER PHASE Wound Core
		11KV	
1	10	4	1
2	16	4	1

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3	25	4	1
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5..2.e(viii) No. of axial wedges between LV and HV winding equi -spaced around for 10 KVA-  
4 nos

No. of axial wedges between LV and HV winding equi -spaced around for 16/ 25 KVA-  
6 nos

1. Material: Double paper covered aluminum.
2. LV winding shall be in even layers so that neutral formation will be at top.
3. The winding construction of single HV coil wound over LV coil is preferable.
4. Inter layer insulation shall be Epoxy dotted Kraft Paper.
5. Proper bonding of inter layer insulation with the conductor shall be ensured. Test for Bonding strength to be conducted.
6. Dimensions of winding coils are very critical. Dimensional tolerances for winding coils shall be with in limits as specified in GTP.

5.2.1 OIL :

The insulating oil shall comply with the requirements of relevant standards IS 335 / 1993 or BS 148 or REC 39/1993 . Oil shall be filled under vacuum of 250 tor +/- 5 %.

5.3 **LOSSES & LEBELLING : It is mandatory that transformers having rating 16 & 25 KVA shall be 3 Star as per the BEE specifications and shall be labeled accordingly as per the gazette notification Dtd.06.07.2009 of BEE.** However, the bidder should guarantee individual No load loss and load loss without any positive tolerance. The bidder should also guarantee the total losses at 50% load condition (50% of rated KVA rating at rated voltage and frequency and at 75 deg centigrade without any positive tolerance as under.

**For Amorphous Core Transformers:-**

Sr No	Capacity KVA	Iron Losses Watts	Copper Losses in watts		Total Losses in watts	
			50% Loading	100% Loading	50% Loading	100% Loading
1	2	3	4	5	6	7
1	10	15	56	225	71	240
2	16	20	106	425	126	445

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3	25	28	154	615	182	643
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**For CRGO Core Transformers:-**

Sr No	Capacity KVA	Iron Losses Watts	Copper Losses in watts		Total Losses in watts	
			50% Loading	100% Loading	50% Loading	100% Loading
1	2	3	4	5	6	7
1	10	45	56	225	101	270
2	16	40	106	425	146	465
3	25	48	154	615	202	663

The above losses are maximum allowable and there would not be any positive tolerance. Bids with higher losses than the above specified values would be treated as Non-responsive.

Transformers with losses less than those specified above will be capitalized during bid evaluation as indicated below:

Loss Capitalization factors:

- A. Iron losses - Rs. 196.66 / W.
- B. Copper losses - Rs. 39.33/ W.

**5.3.1. Percentage Impedance:**

KVA Rating	Percentage Impedance.
10	3.75 %
16	4.5 %
25	4.5 %

% impedance shall be subject to tolerance specified in IS:2026 - 1977.

Bids not meeting the limits indicated above will be treated as non-responsive

**5.3.2 Temperature rise: The temperature rise over ambient shall not exceed the limits described below:**

- Top oil temperature rise measured by thermometer : 35 deg.C
- Winding temperature rise measured by resistance : 40 deg.C

Bids not meeting the above limits of temperature rise will be treated as non-responsive

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**5.4 PENALTY FOR NON PERFORMANCE:**

5.4.1. During testing, if it is found that the actual measured losses are more than the values quoted by the bidder, the purchaser will have right to exercise one of the following options

- a) Reject the complete lot
- b) Penalty shall be recovered from the bidder for the excess losses as under

No load loss - @ Rs 395.00 per watt

Load Loss at 100%load - @79.00 per watt

5.4.2. Transformers with temperature rise and impedance beyond guaranteed values:

5.4.2.1. Purchaser reserves the right to reject the available lot of the such transformer in any sample of the transformer during the test at supplier's works, if the temperature rise exceeds the guaranteed values.

5.4.2.2 Purchaser reserves the right to reject any transformer during the test at supplier's works, if the impedance values differ from the guaranteed values including tolerance.

5.4.2.3 Purchaser also reserves the right to retain the rejected transformer and take it into service until the Bidder replaces it with a new transformer at no extra cost. The delivery as per contract will be counted when the new transformer as per specification is provided by the manufacture.

**5.5 INSULATION MATERIAL :**

a) Material: Electrical grade insulation Kraft Paper of standard make or better material subject to approval of the purchaser. Pressboard of standard make or better material subject to approval of purchaser.

b) All spacers, axial wedges / runners used in windings shall be made of pre-compressed Pressboard–solid, conforming to type B 3.1 of IEC 641-3-2. In case of cross-over coil winding of HV all spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges / runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, cutting, milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations.

**5.6 TANK:**

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The transformer tank can be with radiator fins/ rounded or elliptical cooling tubes or made of corrugated panels.

**For Rectangular plain tank:**

- i. The transformer tank shall be of robust construction rectangular in shape and shall be built up of tested MS sheets.

The tank shall be made of prime quality MS sheet of thickness stated below with necessary stiffener to withstand the pressure built in during the expansion of oil due to temperature rise.

Rating	Minimum thickness of plate in mm	
	For sides	For Top & Bottom
10,16 & 25 KVA	3.15	5

The exterior of the transformer tank and other ferrous fitting shall be thoroughly cleaned , scraped /sand blasted and given a priming coat and two finishing coats of durable oil and weather resistant paint of light admiralty grey conforming to colour code No. 697 of IS-5/2978

- ii. The internal clearance of tank shall be such that, it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings.
- iii. All joints of tank and fittings shall be oil tight and no bulging should occur during service. The tank design shall be such that the core and windings can be lifted freely. The tank plate shall be of such strength that the complete transformers when filled with oil may be lifted bodily by means of lifting lugs. Inside of tank shall be painted with varnish / Hot oil.
- iv. Manufacturer should carry out all welding operations as per the relevant ASME standards and submit a copy of the welding procedure qualifications and welder performance qualification certificates to the customer.
- v. The four walls of the tank shall be made of Two "L" shaped sheets (without joints) fully welded at the corners from inside and outside of the tank for withstanding a pressure of 0.8 kg/cm<sup>2</sup> for 10 minutes.

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- vi. The tank shall be reinforced by welded angle on all the outside walls on the edge of the tank to form two equal compartments. Permanent deflection when the tank without oil is subject to a vacuum of 525 mm of mercury for rectangular tank and 760 mm of mercury for round tank, shall not be more than 5 mm upto 750 mm length and 6 mm upto 1250 mm length. The tank shall further be capable of withstanding a pressure of 0.8 kg/sq.cm (g) and a vacuum of 0.3 kg/sq.cm(g) without any deformation.
- \* Top cover of the transformer tank shall be slatting minimum 10 to 15 mm or as per requirement towards HV Bushing so that entry of water can be avoided.
- vii. The radiators can be tube type or fin type or pressed steel type to achieve the desired cooling to limit the specified temperature rise. The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise. Bidder shall submit the calculation sheet.
- viii. Lifting lugs: 4 Nos. welded heavy duty lifting lugs of MS plate 8 mm thick (min) suitably reinforced by vertical supporting flat welded edgewise below the lug on the side wall.
- ix. Pulling lugs: 4 Nos. of welded heavy duty pulling lugs of MS plate 8 mm thick (min) shall be provided to pull the transformer horizontally.
- x. Top cover fixing bolts of G.I adequately spaced and 6 mm Neoprene bonded cork gaskets conforming to IS 4253 part-II shall be placed between tank and cover. The bolts outside tank shall have 2 flat washers & one spring washer.

5.6.8. Conservator

On Transformers of all ratings with rectangular plain tank the provision of conservators is obligatory.

When a conservator is provided, oil gauge and the plain or dehydrating breathing devise shall be fixed to the conservator which shall also be provided with a drain plug and a filling hole (1¼" normal size thread) with cover. The capacity of a conservator tank shall be designed to contain 10% of the total quantity of oil and its contraction and expansion due to temperature variations. Normally 3% quality of total oil will be contained in the conservator. In addition the cover of main tank shall be provided with an air release plug to enable air trapped within to be released, unless the conservator is so located as to eliminate the possibility of air being trapped within the main tank.

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The inside diameter of the pipe connecting the conservator to the main tank should be within 30 to 50 mm and it should be projected into the conservator so that its end is approximately 20 mm above the bottom of the conservator so as to create a sump for collection of impurities. The minimum oil level ( corresponding to -5 deg C) should be above the sump level.

#### 5.6.9. Breather:

Breather shall be screwed type. It shall have die cast aluminum body & further, inside container for silica gel shall be of tin sheet, Volume of Silica gel breather shall be 0.5 Kg. The make and design of breather shall be subject to approval of UGVCL. Inverted U-shape pipe shall be used for connection of breather.

### 5.7 SURFACE PREPARATION & PAINTING

#### 5.7.1. General

5.7.1.1 All paints shall be applied in accordance with the paint manufacturer's recommendations. Particular attention shall be paid to the following:

- a) Proper storage to avoid exposure as well as extremes of temperature.
- b) Surface preparation prior to painting.
- c) Mixing and thinning
- d) Application of paints and the recommended limit on time intervals between coats.
- e) Shelf life for storage

5.7.1.2 All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

5.7.1.3 All primers shall be well marked into the surface, particularly in areas where painting is evident, and the first priming coat shall be applied as soon as possible after cleaning. The paint shall be applied by airless spray according to manufacturer's recommendations. However,

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where ever airless spray is not possible, conventional spray be used with prior approval of purchaser.

5.7.1.4 The Supplier shall, prior to painting protect nameplates, lettering gauges, sight glasses, light fittings and similar such items.

#### 5.7.2. Cleaning and Surface Preparation

5.7.2.1 After all machining, forming and welding has been completed, all steel work surfaces shall be thoroughly cleaned of rust, scale, welding slag or spatter and other contamination prior to any painting.

5.7.2.2 Steel surfaces shall be prepared by Shot blast cleaning or Chemical cleaning by Seven Tank process including Phosphating to the appropriate quality.

5.7.2.3 The pressure and volume of the compressed air supply for blast cleaning shall meet the work requirements and shall be sufficiently free from all water contamination to ensure that the cleaning process is not impaired.

5.7.2.4 Chipping, scraping and steel wire brushing using manual or power driven tools cannot remove firmly adherent mill-scale shall only be used where blast cleaning is impractical. Manufacturer to explain such areas in his technical offer clearly.

#### 5.7.3. Protective Coating

5.7.3.1 As soon as all items have been cleaned and within four hours of the subsequent drying, they shall be given suitable anti-corrosion protection.

#### 5.7.4. Paint Material

Followings are the types of paint that may be suitably used for the items to be painted at shop and supply of matching paint to site:

5.7.4.1 Heat resistant paint (Hot oil proof) for inside surface.

5.7.4.2 For external surfaces one coat of Thermo Setting Powder paint or 1 coats of Zinc chromate primer followed by 2 coats of Synthetic Enamel / Polyurethane base Paint These paints can be either air drying or stoving.

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5.7.4.3 The color of the finishing coats shall be dark admiral gray conforming to No. 632 of IS-5 of 1961

#### 5.7.5. Painting Procedure

5.7.5.1 All painting shall be carried out in conformity with both Specification and with the paint manufacturer's recommendation. All paints in any one particular system, whether shop or site applied, shall originate from one paint manufacturer.

5.7.5.2 Particular attention shall be paid to the manufacturer's instructions on storage, mixing, thinning and pot life. The paint shall only be applied in the manner detailed by the manufacturer e.g. brush, roller, conventional or airless spray and shall be applied under the manufacturer's recommended condition. Minimum and maximum time intervals between coats shall be closely followed.

5.7.5.3 All prepared steel surfaces should be primed before visible rusting occurs or within 4 hours, whichever is sooner. Chemical treated steel surfaces shall be primed as soon as the surface is dry and while the surface is still warm.

5.7.5.4 Where the quality of film is impaired by excess film thickness (wrinkling, mud cracking or general softness) the Supplier shall remove the unsatisfactory paint coating and apply another. As a general rule, dry film thickness should not exceed the specified minimum dry film thickness by more than 25%. In all instances where two or more coats of the same paint are specified, such coatings may or may not be of contrasting colours.

5.7.5.5 Paint applied to items that are not be painted shall be removed at Supplier's expense, leaving the surface clean, unstained and undamaged.

#### 5.7.6. Damaged Paintwork

5.7.6.1 Any damage occurring to any part of a painting scheme shall be made good to the same standard of corrosion protection and appearance as that originally employed.

5.7.6.2 Any damaged paint work shall be made good as follows:

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- a) The damaged area, together with an area extending 25 mm around its boundary, shall be cleaned down to bare metal.
- b) A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage.
- c) The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

**5.7.7. Dry Film Thickness**

- 5.7.7.1 To the maximum extent practicable the coats shall be applied as a continuous film of uniform thickness and free of pores. Overspray, skips, runs, sags and drips should be avoided. The different coats may or may not be of the same colour.
- 5.7.7.2 Each coat of paint shall be allowed to harden before the next is applied as per manufacturer's recommendation.
- 5.7.7.3 Particular attention must be paid to full film thickness at edges.
- 5.7.7.4 The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as given below.

Sl. No	Paint Type	Area to be painted	No. of coats	Total Dry film thickness (min.)
1.	Thermo setting paint.	inside outside	01 01	20 microns 60 microns
2.	<b>Liquid paint</b> a) Zinc chromate (primer) b) Synthetic Enamel / Poly Urethane (Finish coat) c) Hot oil paint / Varnish	outside  outside  inside	01  02  01	30 microns  25 microns each  35 / 10 microns

**5.7.8. Tests**

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- 5.7.8.1 The painted surface shall be tested for paint thickness.
- 5.7.8.2 The painted surface shall pass the Cross Hatch Adhesion test, Salt spray test and Hardness test as per the relevant ASTM standards.

NOTE: Supplier shall guarantee the painting performance requirement for a period of not less than 5 years.

#### 5.8. BUSHINGS:

5.8.1 For 11 KV Transformers - 12 KV class bushings shall be used and further for LV side, viz 433 volts, 1.1KV terminal bushing shall be used. Bushing of the same voltage class shall be interchangeable bushing with plain shed as per IS 3347. Bushings shall be mounted on top plate only. Sheet metal pocket shall be designed in such a way that all HT bushings shall remain parallel and at equidistance throughout.

The arrangement of bushing at top plate is only acceptable. The HV bushings shall have to be installed on turret, flange and gaskets to prevent eventual entry of water.

The turret height should be minimum 25 to 30mm.

Radiator shall be provided on both sides on HV and LV sides.

Bushings of following or other makes having type tested as per IS 2099 and approved by the UGVCL shall only be used & are acceptable.

- H.V. BUSHINGS:
- 1) JAYASHREE
  - 2) BEPCO.
  - 3) W.S. INSULATORS
  - 4) ASSOCIATED PORCELAIN (11KV Only)
  - 5) JAIPUR GLASS
  - 6) SESHASAYEE
  - 7) LUSTER CERAMICS
  - 8) AGRAWAL SALT CO., BIKANER.
  - 9) B.P.P.L., BIKANER.
  - 10) VENKATESHWARA CERAMICS P.LTD.
  - 11) CJI PORCELAIN INDIA LTD.
  - 12) MAXWELL CERAMIC, WADHWAN, (ONLY 11KV)
  - 13) Ravikiran((ONLY 11KV)
  - 14) VISHAL MALLEABLE LTD.,
  - 15) AS Insulators

- L.V. BUSHINGS:
- 1) J.S.I. (RISHRA)
  - 2) LUSTER CERAMICS

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- 3) JAIPUR GLASS
- 4) AGRAWAL SALT CO.,BIKANER.
- 5) B.P.P.L., BIKANER.
- 6) VENKATESHWARA CERAMICS, PVT.,LTD
- 7) CJI Porcelain
- 8) MAXWELL CERAMIC, WADHWAN.
- 9) Ravikiran
- 10) VISHAL MALLEABLE LTD.,
- 11) AS Insulators

**Note: Embossing on bushing showing the Manufacturer's name shall be clearly visible, even after fixing the same on Transformer.**

5.8.2 The bi-metallic connectors shall have to be fitted on HV/LV terminals having capacity of double the size of rated HV/LV current of transformer.

**5.8.3 Internal connection:**

a) HV winding:

- i) In case of HV winding all jumpers from winding to bushing shall have cross section larger than winding conductor.
- ii) Inter coil connection shall be done by brazing.
- iii) In case of AL/CU winding Delta joint shall be with brazing only.
- iv) Lead from Delta joint shall be connected to bushing rod by brazing only.

b) LV Winding:

LV star point shall be formed of AL/CU flat of sufficient size and length. Lead from winding shall be connected to the flat by brazing.

Firm connection of LV winding to bushing shall be made of adequate size of "L"

shape flat. Connection of LV coil lead to "L" shape flat shall be made by brazing.

The "L"Shape flat shall be of copper for copper winding & Alluminium of Alluminium winding.

"L" shape flat/lug shall be clamped to LV bushing metal part by using nut, locknut and washer.

**5.9. Tank Base Channel:**

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Two numbers of channels of size 75 x 40 mm are to be provided for 10 KVA, 16 KVA and 25 KVA Transformer.

#### 5.10. Terminal markings

High voltage and Low voltage phase windings shall be marked both in the terminal boards inside the tank and on the outside with capital letter 1U, 1V, 1W and low voltage winding for the same phase marked by corresponding small letter 2u, 2v, 2w. The neutral point terminal shall be indicated by the letter 2n. Neutral terminal to be brought out and connected to local grounding terminal by an Earthing strip.

#### 5.12 FITTINGS:

The following standard fittings shall be provided.

- a) 1) Rating and terminal marking plates non-detachable  
2) Metallic name plate should be provided
- b) Earthing terminals with lugs - 2 Nos.
- c) Lifting lugs for main tank & top cover
- d) Terminal connectors on the HV/LV bushings
- e) Thermometer pocket with cap - 1 No.
- f) Air release device
- g) HV bushings - 3 Nos.
- h) LV bushings - 4 Nos.
- i) Pulling lugs - 4 Nos
- j) Stiffener angle 40x40x5 mm and vertical strip of 50x5 mm flat
- k) Radiators - No. & length may be mentioned (as per heat dissipation calculations)
  - l) Arcing horns for HV bushings .
  - m) Prismatic Oil level gauge indicating the position of oil marked (with background of yellow colour) as follows.  
Min. (-5 deg.C)  
30 deg. C  
Max. 90 deg.C
- n) Drain cum sampling valve
- o) Oil filling hole having p. 1- ¼ " thread with plug and drain valve on the conservator
- p) Silicagel breather
- q) Base channel 75x40 mm 2 Nos to be provided for all rating transformers.

#### 5.13 FASTENERS:

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All bolts, studs, screw threads, pipe threads, bolt heads and nuts shall comply with the appropriate Indian Standards for metric threads, or the technical equivalent.

Bolts or studs shall not be less than 6 mm in diameter except when used for small wiring terminals.

All nuts and pins shall be adequately locked.

Wherever possible bolts shall be fitted in such a manner that in the event of failure of locking resulting in the nuts working loose and falling off, the bolt will remain in position.

All ferrous bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanising, except high tensile steel bolts and spring washers which shall be electro-galvanised/ plated. Appropriate precautions shall be taken to prevent electrolytic action between dissimilar metals.

Each bolt or stud shall project at least one thread but not more than three threads through the nut, except when otherwise approved for terminal board studs or relay stems. If bolts nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided.

The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.

Taper washers shall be provided where necessary.  
Protective washers of suitable material shall be provided front and back or the securing screws.

**5.14. MOUNTING ARRANGEMENT:**

The under base of all transformers shall be provided with two 75 x 40 mm channels 460 mm long with holes to make them suitable for fixing on a platform or plinth

**5.15. OVERLOAD CAPACITY**

The transformers shall be suitable for loading as per IS: 6600 / 1972 with latest amendment if any.

**5.16 LV ENCLOSURE :**

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1. The transformer shall have external mounted LT circuit breaker on the secondary side. The breaker shall be housed in an enclosure confirming to IP44 as per IS: 13947 forming integral part of the transformer. Suitable louvers fitted with wire gauze shall be provided to ensure circulation of air but not to allow ingress of rain

water. An operating handle shall be provided outside the enclosure in such a way that ON & OFF operation of the breaker can be conveniently performed from the ground level by means of an operating rod. The ON & OFF position of the handle shall be clearly and bodily mark on the enclosure.

2. LT cable shall be connected to the outgoing terminals of MCCB. Detachable gland plate and provision for glands to be provided at the bottom of the enclosure.

3. The circuit breaker shall generally confirm to the requirement of IS : 13947. The electrical characteristics of the breaker shall be mentioned by bidder as follows.

Transformer rating (KVA)	Full load current of the transformer (Amp)	Rated thermal current of C.B. (Amp)	Current setting (Amp)	Minimum short circuit breaking current (KA)
10				
16				
25				

The circuit breaker shall confirmed to IS : 13947 part-II and short circuit test shall be carried out at a power factor not exceeding 0.4 (lagging).

4. Only following makes of MCCB shall be acceptable.

- (a) Siemens (b) L & T (c) ABB (4) GE POWER (5) Shnider (6)

Crompton

Greaves (7) Heavells and bidder shall have to mentions the make of MCCB to

be provided with the offer. The bidder shall also submit the type test certificate.

However any other make of MCCB having valid BIS Certificate of ISI mark shall

be acceptable only at the discretion of the Purchaser, alternatively complete Type

Test Certificates. The decision of Purchaser shall be final & binding in this regard.

For other make of MCCB Bidder shall also have to submit certificate of satisfactory operation from other two Utilities.

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The successful bidder shall be required to furnish the guarantee certificate of 05 (five) year obtained from the MCCB manufacture on 100/- non-judicial stamp paper.

5. The circuit breaker shall have the following time / current characteristics and test will be made with all the 3 Ph. Loaded. The reference calibration temperature of the breaker shall be 50 degree centigrade.

Multiple of normal current setting	Tripping time
1.05	More than 2.5 HRS.
1.1	Less than 2.5 HRS
1.15	More than 1 Hr. & less than 2 Hrs.
1.2	More than 0.5 Hrs. & less than 1 Hr.
1.3	Less than 20 minutes
1.4	Less than 10 minutes
2.5	Less than 1 minute
6.0	Less than 5 seconds
8.0	Less than 40 milli seconds
12.0	Instantaneous (less than 20 milli Scnds)

6. The LT circuit breaker and the associated terminals / wiring shall be designed with reference to ambient temperature of 55 ° C instead of 40 ° C due to operation in metallic enclosure installed outdoors. The permissible temperature rise limits stipulated in IS : 13947 shall be reduced accordingly and the supplier shall furnish necessary data to show that all the components are suitable for the expected temperature rise over and above the ambient temperature 55 ° C under various loading conditions. The supplier shall furnish all the type and routine test certificate of the circuit breakers in accordance with IS : 13947 pt. 2.

**5.15.1 The inspection of proto type transformer.**

The Manufacturer shall have to offer one no of prototype transformer for along with relevant drawing as stated in tender specification clause 17 for approval of UGVCL before offering first lot.

The proto type shall be subjected to following test.

1) Verification of CRGO/Amorphous laminations material documents and quality.

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- 2) Verification of internal parameters with respect to drawing and GTP.
- 3) All Routine tests/ acceptance test as per clause 6.1 & 6.4
- 4) Temperature rise test as per clause no.6.2 (1)
- 5) Verification of Air pressure test certificate from manufacturer of tank.
- 6) Unbalanced current test.

The manufacturer has to submit the following details along with offer of prototype transformers

- i) G.A. Drawing.
- ii) Internal Construction Drawing.
- iii) Name plate drawing & Metallic name plate (size 100 mm x 50 mm x 1.5 mm)name of company, order no., capacity. Month & year of manufacturing, sr.no. of Transformer shall be engraved on tank of Transformer on opposite side of the Rating (Name) plate fitted on tank of Transformer & it shall be clearly visible.
- iv) Technical Details Sheet.
- v) HT/LV Bi metallic connectors.
- vi) Drain cum sampling Valve Drawing.
- vii) Drawing for month & year of manufacture to be written on conservator tank & body.
- Viii) Core details drawing
- ix) Short circuit capacity calculation sheet
- x) Cooling capacity calculation
- xi) Technical details as per UGVCL 's Prescribed Performa for design & constructional details
- xii) LV Enclosure with MCCB with wiring diagram

The above drawings are illustrative. However, the bidder may submit their own drawing if they so desires. However , offer without drawings shall not be considered Also each pages of technical bid & price bid shall be provided with seal of manufacturer & duly signed.

5.15.2 GUARANTEE FOR THE TRANSFORMERS;

- 1) Guarantee period shall be 60 months from the date of installation or 66 months from the date of receipt by purchaser whichever is earlier.

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- 2) The supplier shall return guarantee failed transformers duly repaired and tested as per approved GTP and tender specification within 30 days from the date of receipt at repair shop without any cost, failing which bank guarantee shall be encashed without any notice and all business will be stopped with the said supplier at least for a period of 3 years. This clause itself shall be the notice to the supplier about encashment of Bank Guarantee in case of his failure to adhere to timelines & no separate notice will be served.
  
- 3) After intimation of failure of transformer failed within guarantee period, UGVCL will arrange for the dispatch of guarantee period failed transformer to firm's works at the cost of UGVCL. On receipt of guarantee period failed transformer at firm's works, the external inspection will be carried out by the representative of UGVCL not below the rank of Junior Engineer. The cost of any outer component damage not because of supplier's fault and required to be provided will be reimbursed to the supplier as per the approved rate of UGVCL on the strength of joint external inspection report. No. internal inspection of failed unit is to be carried out in presence of representative of UGVCL. However, the supplier may prepare an internal inspection report of failed unit for his study and analysis. If required, such analysis shall be furnished to UGVCL.

Testing of transformer will be done in presence of company's Engineer to ensure losses as per GTP, Transformer found with higher losses than GTP will not be accepted and cost thereof will be recovered. The new Transformers supplied in this circumstances must as per GTP submitted with tender and shall match the losses offered by the supplier as per Tender.

The testing of each G.P .failed transformers will be carried out for all acceptance test as per the relevant standard where no load losses and load losses are also required to be maintained identical as per GTP attached

- 4) The supplier situated outside Gujarat State shall have to establish suitable and adequate arrangement for repairing and testing of failed transformer in Gujarat State at his cost. This arrangement shall have to be continued up to the completion date of guarantee period of supply of last lot.

**6.0. TESTS:**

- a) All the equipment offered shall be fully type tested by the bidder or his collaborator as per the relevant standards including the additional type tests mentioned at clause 6.2. The type test must have

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been conducted on a transformer of same design. The Bidder shall furnish four sets of type test reports along with the offer. Offers without type test reports will be treated as Non-responsive.

All the necessary Type tests will have to be carried out in NABL accredited laboratory of INDIA before submission of the tender and to be submitted along with the Technical bid. The type tests which are more than 05(five) years old will not be considered and such tender will be rejected. All the required type tests should not be older than 5(five) years from the due date of tender,

b) Special tests other than type and routine tests, as agreed between purchaser and Bidder shall also be carried out as per the relevant standards.

c) The requirements of site tests are also given in this clause.

d) The test certificates for all routine and type tests for the transformers and also for the bushings and transformer oil shall be submitted with the bid.

The successful bidder may submit the type test report of Temperature Rise Test within commencement period only on receipt of LOI. If successful bidder fails to submit the Temperature rise Test report within commencement period only on receipt of LOI. GUVNL / Purchaser / order placement authority / LOI placement authority may initiate penal action against such successful bidder.

### 6.1. ROUTINE TESTS:

1. Ratio, polarity and phase sequence.
2. No Load current and losses at service voltage and formal frequency
3. Load losses at rated current and normal frequency
4. Impedance Voltage test
5. Resistance of windings at each tap, cold(at or near the test bed temp.)
6. Insulation resistance
7. Induced over voltage withstand test.
8. Separate source voltage withstand test.
9. Neutral current measurement
10. Oil samples (one sample per lot) to comply with IS 1866.
11. Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 110% voltage.

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12. The acceptance test as per relevant IS shall be carried out on Ckt.Breaker.

6.2 **TYPE TESTS TO BE CONDUCTED ON ONE UNIT:** In addition to the Tests mentioned in para 6.1 following Tests shall be conducted.

1. Temperature rise test for determining the maximum temperature rise after continuous full load run.

The ambient temperature and time of test should be stated in the test certificate.

2. Impulse voltage test: As per Clause No. 13 (With chopped wave) of IS - 2026 part-III latest version. BIL for 11 kV shall be 95 kV Peak instead of 75 kV

3. Air Pressure Test: As per C1.22.5 of IS - 1180 / part-I/1989

4. Short Circuit withstand test: Thermal and dynamic ability.

5. Magnetic Balance Test

6. Noise-level measurement

7. Measurement of zero-phase sequence impedance.

8. Measurement of Harmonics of no-load current

9. Pressure relief device test ( if provided)

10. Transformer tank shall be subjected to specified vacuum. The tank designed for vacuum shall be tested at an internal pressure of 0.35 kg. Per sq. cm. absolute (250 mm of Hg) for one hour. The permanent deflection of flat plates after the vacuum has been released shall not exceed the values specified below:

Horizontal length of flat plate (in mm)	Permanent deflection (in mm)
Upto & including 750	5.0
751 to 1250	6.5
1251 to 1750	8.0
1751 to 2000	9.5
2001 to 2250	11.0
2251 to 2500	12.0
2501 to 3000	16.0
Above 3000	19.0

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11. Transformer tank together with its radiator and other fittings shall be subjected to pressure corresponding to twice the normal pressure or 0.35 kg / sq.cm. whichever is lower, measured at the base of the tank and maintained for an hour. The permanent deflection of the flat plates after the excess pressure has been released, shall not exceed the figures for vacuum test.
12. The pressure relief device shall be subject to increasing fluid pressure. It shall operate before reaching the test pressure as specified in the above class. The operating pressure shall be recorded. The device shall seal-off after the excess pressure has been released.

Type test certificates for the tests carried out on prototype of same specifications shall be submitted along with the bid.

The purchaser may select the transformer for type tests randomly.

- 6.3. **TESTS AT SITE:** The purchaser reserves the right to conduct all tests on Transformer after arrival at site and the manufacturer shall guarantee test certificate figures under actual service conditions.

In order to ensure quality the acceptance test shall be carried out even after installation of transformer within grantee period. If acceptance test standards are not met during such field test, 5% penalty may be imposed on all transformers supplied as per that proto type design.

- 6.4. **ACCEPTANCE TESTS :** The transformers shall be subjected to the following routine/ acceptance test in presence of purchaser's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS:1180 and IS:2026.

1. Checking of weights, dimensions, fitting and accessories, tank sheet thickness, oil quality,  
material, finish and workmanship as per GTP / QA Plan and contract drawings.
2. Physical verification of core coil assembly and measurement of flux density of one unit of each  
rating, in every inspection with reference to short circuit test report
3. All tests as specified in clause 6.1

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4. Temp.Rise Test will be carried out at Supplier's works & at his cost on any Transformer in the following slab.

(a) up to 100 nos.- 1 nos.

(b) Further each lot of 100 nos. of Transformer offered- 1 no.

**Acceptance test for MCCB.**

As per relevant IS Acceptance test on random sample shall be carried out.

**6.5 TOLERANCES:** Unless otherwise specified herein the test value of the transformers supplied would be within the tolerance permitted in the relevant standards. No positive tolerance is allowed on guaranteed No Load and Load losses.

**7.0. INSPECTION:**

All tests and inspection shall be made at the place of manufacturer and unless other wise especially agreed upon the manufacturer and the purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge to satisfy him that the material is being furnished in accordance with specification.

The manufacturer shall provide all services to establish and maintain quality of workman ship in his works and that of his sub-contractors to ensure the mechanical / electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9000.

Along with the bid the manufacturer shall prepare Quality Assurance Plan identifying the various stages of manufacture, quality checks performed at each stage and the Customer hold points. The document shall also furnish details of method of checking, inspection and acceptance standards / values and get the approval of purchaser or his representative before proceeding with manufacturing. However, purchaser or his representative shall have the right to review the inspection reports, quality checks and results of manufacturer's in house inspection department which are not customer hold points and the manufacturer shall comply with the remarks made by purchaser or his representative on such reviews with regards to further testing, rectification or rejection etc. Manufacturer should submit the list of equipment for testing along with latest calibration certificates to the purchaser.

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Purchaser shall have every right to appoint a third party inspection to carryout the inspection process. The purchaser has the right to have the test carried out at his own cost by an independent agency wherever the dispute regarding the quality of supply. Purchaser has right to test 1% of the supply selected either from the stores or field to check the quality of the product. In case of any deviation purchaser have every right to reject the entire lot or penalize the manufacturer, which may leads to blacklisting among other things.

**8.0. QUALITY ASSURANCE PLAN:**

8.1. The Bidder shall invariably furnish following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of equipment offered.

i. Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in the presence of Bidder's representative, copies of test certificates.

ii. Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii. List of manufacturing facilities available.

iv. Level of automation achieved and list of areas where manual processing exists.

v. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspection.

vi. List of testing equipment available with the bidder for final testing of equipment along with valid calibration reports shall be furnished with the bid. Manufacturer shall posses 0.1 class instruments for measurement of losses.

vii. Quality Assurance Plan (QAP) with hold points for purchaser's inspection as per Annexure.

8.2 The successful Bidder shall within 30 days of placement of order, submit following information to the purchaser.

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i. List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer.

ii. Type test certificates of the raw materials and bought out accessories.

8.3 The successful Bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.

#### 9.0. DOCUMENTATION:

The Bidder shall furnish along with the bid the dimensional drawings of the items offered indicating all the fittings.

- i) Dimensional tolerances
- ii) weight of individual components and total weight

#### 10.0 PACKING & FORWARDING:

10.1 The packing shall be done as per the manufacturer's standard practice. However, it should be ensured that the packing is such that, the material would not get damaged during transit by Rail / Road / Sea.

10.2 The making on each package shall be as per the relevant IS.

#### 11.0 MANADATORY SPARES:

Mandatory spares shall be supplied as per the purchaser's requirement.

#### 12.0 CHALLENGE TESTING:

The other manufacturer can also request challenge testing for any test based on specification and losses. The challenger would request for testing with testing fee. The challenge test fees are proposed at least three time the cost of testing .This is likely to deter un necessary challenges. The challenger would have the opportunity to select the sample from the store and any such challenge should be made within the guaranty period. The party challenged, challenger and the utility could witness the challenged testing.

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The challenged testing would cover the 1) Measurement of magnetizing current. 2) No load losses test. 3) Load losses test (at 50% loading or as per acceptance test). 4) Temperature rise test.

The challenge test could be conducted at NABL accredited laboratory, like ERDA and CPRI Bhopal. If the values are within limit the product gets confirmed else not confirmed. No positive tolerance in losses be permitted. If the product is not confirmed the manufacturer would pay the challenge fee and challenger would get the fee refunded. However as a redressal system the challenger would be allowed to ask for fresh testing of two more samples from the store and the same be tested in NABL laboratory in presence of party challenged, challenger and the utility. If any one or both sample does not confirm the test then the product is said to have failed the test. In such cases the manufacturer will be declared as un successful manufacturer for the said product with wide publicity and would not be allowed to compete in tenders of the Board for the period of three years and heavy penalty would be imposed.

**13.0. Drawings:**

One copy of the dimensional drawing and internal construction drawing of each ridding transformer shall be submitted with the tender. These drawings shall be of A-3(420 x 297 mm) size only. Format and pattern of the drawings shall be as per specimen drawing attached with the tender specification. Guaranteed and other technical particulars of the transformers as per the A/T shall also be submitted in A-4 size for our approval. In the Performa attached with tender only.

**14.0 GTP-. Guaranteed and other particulars for transformers.**

To be filled in and submitted by the tenderer in the Performa attached with the tender.

**15.0 . Schedule:**

15.1 The tenderer shall fill in the following Schedules which from part of the tender specification and offer. In schedule 'A' the specific values shall be furnished and only quoting of IS reference is not sufficient. If the schedule are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule 'A'	Guaranteed Technical Particulars (Annexure-I, II & III).
Schedule 'B'	Schedule of Deviations from Specification.
Schedule 'C'	Schedule of Tenderer's Experience.

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Schedule 'D' Schedule of Deviation from specified standards.

Schedule 'E' Schedule of Deviations from specified Test requirements.

15.2. All deviations from the specifications shall be brought out in the schedules of deviation (Schedules 'B','D' & 'E'). The discrepancies between the specification and the catalogues, literatures and indicative drawings which are subject to change, submitted as part of the offer, shall not be considered and representation in this regard will not be entertained. If it is observed that there are deviations in the offer in G.T.P. of elsewhere other than those specified in the deviation schedule 'B' then such deviations shall be treated as deviations.

15.3. For any deviation from the specification, which is not specifically brought out in the schedule of deviations, the offer may be liable for rejection. The deviation brought out in the schedule shall be supported by authentic documents, standards and clarifications, otherwise the offer may be liable for rejection.

15.4. The tenderer shall submit the list of orders for similar type of equipments, executed of under execution during the last three years, with full details in the schedule of Tender's experience (Schedule 'C') to enable the purchaser to evaluate the tender.

15.0 Tender Drawings to be enclosed:

- I) G.A. Drawing. No. 1
- ii) Internal Construction Drawing. No. 2
- iii) Name plate drawing
- iv) Technical Details Sheet. No. 3
- v) HT/LV Bimetalic connectors. No 4 & 5.
- vi) Drain cum sampling Valve Drawing. No. 6.
- vii) Drawing for month & year to be No. 7.
- written on conservator tank & body.
- Viii) core details drawing
- ix) short circuit capacity calculation sheet
- x) cooling capacity calculation
- xi) LV Enclosure with MCCB with wiring diagram

The above drawings are illustrative. However, the tenderer may submit their own drawing if they so desires. The bidder shall submit above

Signature of Tenderer	Company's Round Seal	Date	Place
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**Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans**

details along with offer as well as before offering the prototype transformer.

#### 16.0 AUDIT INSPECTION:

After inspection of ordered transformer by the User Department Inspector, field engineer may pick up samples from the lots supplied at RSOs/Power Stations Stores/ or other stores of the Board or from the works of party, for quality check at random. The samples picked up will be tested for Acceptance Test / Type Tests or the tests as decided by Company, at Government approved laboratory, in presence of representatives of supplier and MGVCCL, as per relevant ISS/BIS/GEB Specification and GTP, as under:

- (i) One number of each rating of transformer shall be picked up at random by field engineer from RSO's / Power Station Stores and will be tested for Acceptance Tests & Temperature Rise Test.
- (ii) One number of each rating of transformer sealed at party's works by field engineer will be tested for (a) Impulse Test (b) Short Circuit Test (c) other Type Tests(if decided by the Board).

As regard bearing test charges,

- (i) For transformers picked up for testing from RSOs/Power Station Stores, MGVCCL will bear total expenses. However, for witnessing the tests, successful tenderer shall have to bear their own expenses.
- (ii) For transformers sealed at party's works for Type Tests, if sample passes in all tests, MGVCCL will bear only testing charges.

However, if sample fails in any of the tests, cost of testing charges including transportation, loading unloading etc. will have to be paid by supplier. Alternatively, it will be recovered from supplier's bills.

In case, if the materials do not conform to specifications or fails at Government approved laboratory or other laboratory decided by the Board for testing and if subsequent testings are to be carried out (which will solely at company's discretion), all Testing fees, expenses of the inspector & other expenses incurred by the company will be to successful tenderer's account. For acceptance as above, the decision of the company shall be final & will be binding to successful tenderer.

Signature of Tenderer

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Place



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The test results will be binding on the suppliers. Company in general will not allow re-sampling. If the material fails in any of the acceptance tests carried out (except for no load and load losses), the materials supplied till date will be considered as rejected and if replacement is not possible due to consumption of the materials Company will deduct penalty @ **1%** of the end cost prices of all transformers supplied till date of receipt of failure report. If the same are not utilized / consumed, Company at sole discretion may ask for replacement or may accept the material with penalty as above. For failure in No Load and or Load Losses, transformers supplied till date of receipt of failure report shall be rejected or penalty @ Rs.395.00 per watt for No Load Losses and penalty @ Rs.79.00 per watt for Load Losses for the transformers supplied till date of receipt of failure report shall be charged. The decision of the Company will be binding on the successful tenderer.

In the event of transformer failing during any of the type tests (temperature rise test is part of type test), following recovery shall be made.

Recovery, equivalent to **1%** of end cost of particular rating transformers supplied against the order till receipt of test reports.

Further in case, any transformer taken for type testing, fails either in short circuit test or impulse test or temp. rise test, or other type tests (if decided by the Company), supplier will be allowed for modification in their design and other technical parameters. In that case, supplier will have to obtain prior approval from MGVCL for such proposed changes / modifications desired to be effected, by submitting revised drawings and other technical details, clearly indicating the changes proposed to be made, compared to previous design.

In case, if transformers shall fail in testing and same are rejected or accepted with penalty, Company shall pick up another transformer for Acceptance Tests / Type Tests (as the case may be) of same rating from replaced and or subsequently supplied lots for testing to have verification of the quality of other transformers supplied.

In case of any dispute for testing, the Company's decision will be final and binding to the supplier. If supplier will not agree to accept the Company's decision, the order for balance quantity will be cancelled without any clarification and material will be purchased by the Company at risk and cost of the supplier.

The minimum lot to be offered for inspection shall be as under:

Signature of Tenderer	Company's Round Seal	Date	Place
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**UGVCL**

UTTAR GUJARAT VIJ COMPANY LIMITED



**Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans**

- i) Atleast 33% of each rating or as mentioned in delivery schedule of the order, whichever is less, for the ordered quantity up to 100 Nos.
- ii) Minimum 50 Nos. of each rating or as mentioned in delivery schedule of the order, whichever is less, for the ordered quantity above 100 Nos.

17. The Tender shall offer either conventional core type of Transformer or Wound core type of Transformer. Tender shall not offer or quote the rate for both type of Transformer at a time with this Tender.

18. The price variation formula for Aluminium wound for CRGO/AMORPHOUS metal is attached as file name corri-1 PV formula. Further bidders are requested not to considered the page 1 to 3 to 3 to 3 for DRY TYPE transformer and the clause no.5(b) of page 3 of 3 for Aluminium wound and clause no. 5(d) of page 3 of 3 for copper wound. The said price variation formula is applicable for both CRGO & AMORPHOUS metal.

**SEAL & SIGNATURE OF THE  
TENDERER**

Signature of Tenderer	Company's Round Seal	Date	Place
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**SCHEDULE - A**

**ANNEXURE-I**

**GUARANTEED & OTHER PARTICULARS FOR DISTRIBUTION TRANSFORMERS  
(To be furnished by the Manufacturer)**

Sr	Description	10 kVA	16 kVA	25 kVA
1.	Make & Manufacturer			
2.	Place of Manufacture			
3.	Voltage Ratio	11000/43 3V	11000/43 3V	11000/43 3V
4.	Rating in kVA	10 kVA	16 kVA	25 kVA
5.	Core Material used and Grade			
	a) Flux density			
	b) Over fluxing without saturation (Curve to be furnished by the Manufacturer in support of his claim)			
6.	Maximum temperature rise of			
	a) windings by resistance method			
	b) Oil by Thermometer			
7.	Magnetising (No load) Current at			
	a) Normal Voltage			
	b) Maximum Voltage			
8.	Core loss in watts			
	a) Normal Voltage			
	b) Maximum Voltage			
9.	Resistance of Windings at 20 deg. c			

Signature of Tenderer	Company's Round Seal	Date	Place
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**Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans**

- (with 5% tolerance)
- a. HV Winding (ohms)
  - b. LV Winding (ohms)
10. Full load losses (watts) at 75 deg.C.  
Current density used for
11. a) HV winding.  
b) LV winding.
12. Clearances
- a) Core & LV
  - b) LV & HV
  - c) HV Phase to Phase
  - d) End insulation clearance to Earth
  - e) Any point of winding to tank
13. Efficiency at 75 deg.C.
- a) Unity P.F. &
  - b) 0.8 P.F.
- 1) 125% load
  - 2) 100% load
  - 3) 75% load
  - 4) 50% load
  - 5) 25% load
14. Regulation at
- a) Unity P.F.
  - b) 0.8 P.F. at 75 deg.C.
15. % Impedance at 75 deg.C.
16. Flash Test  
HV 28 kV / 50 HZ for 1 minute  
LV 3 kV/50 Hz for 1 minute
17. Over potential Test Double Voltage &  
Double frequency for 1 minute
18. Impulse test value in KVP
19. Weight content of
- a) Core lamination (min)
  - b) Windings (min) Aluminum./Copper
  - c) Tank & Fittings
  - d) Oil
  - e) Oil qty (min)
  - f) Total Weight
20. Oil Data
1. Qty for first filling (min)

Signature of Tenderer

Company's Round Seal

Date

Place

Regd. & Corporate Office : Visnagar Road : Mehsana : 384 001 ( North Gujarat )

Phone No: 02762- 222080-81

Fax No: 02762-223574/236254

Website : [www.ugvcl.com](http://www.ugvcl.com)

e mail : [sp@ugvcl.com](mailto:sp@ugvcl.com)

**Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans**

2. Grade of oil used
3. Maker's name
4. BDV at the time of filling
21. Transformer:
  - 1) Overall length x breadth x height
  - 2) Tank length x breadth x height
  - 3) Thickness of plates for
    - a) Side plate (min)
    - b) Top & Bottom plate (min)
  - 4) Conservator Dimensions
22. Radiation:
  - 1) Heat dissipation by tank walls exclusive top & bottom
  - 2) Heat dissipation by cooling tube
  - 3) Dia & thickness of cooling tube
  - 4) Whether calculation sheet for selecting cooling area to ensure that the transformer is capable of giving continuous rated output without exceeding temperature rise is enclosed.
23. Inter layer insulation provided in design for
  - 1) Top & bottom layer
  - 2) In between all layer
  - 3) Details of end insulation
  - 4) Whether wedges are provided at 50% turns of the HV coil
24. Insulation materials provided
  - a) For Conductors (1) HV (2) LV
  - b) For Core
25. Material and Size of the wire used
  - 1) HV
    - a) SWG/mm
    - b) Dia
  - 2) LV
    - a) Strip size
    - b) No. of Conductors in parallel
    - c) Total area of cross section (sq.mm.)
26. Is the name plate gives all particulars as required in Tender
  
27. Particulars of Bushings HV / LV
  - 1) Maker's name
  - 2) Type IS-3347/IS-1180
  - 3) Rating as per I.S.
  - 4) Dry power frequency voltage withstand test
  - 5) Wet power frequency voltage withstand test

NOTE: The following shall be specifically confirmed

Signature of Tenderer

Company's Round Seal

Date

Place



Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans

1. Whether the offer conforms to the limits of impedance mentioned in the specification
2. Whether the offer conforms to the limits of temperature rise mentioned in the specification
3. Whether the losses of the transformers offered are within the limits specified
4. Whether the transformer offered is already type tested for the design and test reports enclosed.

SEAL & SIGNATURE OF THE TENDERER

Signature of Tenderer	Company's Round Seal	Date	Place
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Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans

SCHEDULE -A

ANNEXURE-II

ADDITIONAL DETAILS

Sl.No.	Description	
1.	Core Grade	
2.	Core diameter	mm
3.	Gross Core area	cm
4.	Net Core area	cm
5.	Flux density	Tesla
6.	Wt. of Core	kg.
7.	Loss per kg. of Core at the specified Flux density	
8.	Core window height	Watts
9.	Center to center distance of the core	mm
10.	No. of L.V. Turns	mm
11.	No. of H V turns	
12.	Size of LV Conductor bare/ covered	mm
13.	Size of HV conductor bare/covered	mm
14.	No. of parallels	
15.	Current density of LV winding	amps/sq.mm.
16.	Current density of HV winding	amps/sq.mm
17.	Wt. of the LV winding for Transformer	kg.
18.	Wt. of the HV winding for Transformer	kg.
19.	No. of LV Coils/phase	
20.	No. of HV coils / phase	
21.	Height of LV Windings	mm
22.	Height of HV winding	mm
23.	ID/OD of LV winding	mm
24.	ID/OD of LV winding	mm
25.	Size of the duct in LV winding	mm
26.	Size of the duct in HV winding	mm
27.	Size of the duct between HV & LV	mm
28.	HV winding to LV winding clearance	mm
29.	HV winding to tank clearance	mm
30.	Calculated impedance	%
31.	HV to earth creepage distance	mm
32.	LV to earth creepage distance	mm

Signature of Tenderer

Company's Round Seal

Date

Place



Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans

SEAL & SIGNATURE OF THE  
TENDERER

SCHEDULE - A

*ANNEXURE-III*

SOURCE OF MATERIALS/PLACES OF MANUFACTURE, TESTING AND INSPECTION

Sl.No	Item	Source of Material	Place of Manufacture	Place of testing and inspection
1.	Laminations			
2.	Copper Conductor/ Aluminum Conductor			
3.	Insulated winding wires			
4.	Oil			
5.	Press Boards			
6.	Kraft Paper			
7.	MS Plates / Angles / Channels			
8.	Gaskets			
9.	Bushing HV / LV			
10.	Paints			

SEAL & SIGNATURE OF THE  
TENDERER

Signature of Tenderer	Company's Round Seal	Date	Place
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**Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans**

**SCHEDULE-B**

**DEVIATIONS FROM SPECIFICATION**

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SR.NO.	CLAUSE NO.	DETAILS OF DEVIATION
-----	-----	-----

-----

NAME OF FIRM-----

NAME & SIGNATURE  
OF TENDERER -----

DESIGNATION -----

DATE -----

Signature of Tenderer	Company's Round Seal	Date	Place
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**Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans**

**SCHEDULE - C**

**SCHEDULE OF TENDERER'S EXPERIENCE**

Sr. No.	Name of Client Name & address to whom reference may be made	Value of order along- with cap. of transformer	Period of supply and commissioning
1			
5			

NAME OF FIRM \_\_\_\_\_

NAME & SIGNATURE OF TENDERER \_\_\_\_\_  
DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

Signature of Tenderer	Company's Round Seal	Date	Place
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SCHEDULE - D

SCHEDULE OF DEVIATION FROM SPECIFIED STANDARDS

Sr. No.	Particulars	Stipulation of specified standards		Stipulation of standard adopted by tenderers		Remarks
		Standard Ref.	Stipulations	Standard Ref.	Stipulations	
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-----	-----	-----	-----	-----	-----	-----

NAME OF FIRM \_\_\_\_\_

NAME & SIGNATUR  
OF TENDERER \_\_\_\_\_

DESIGNATION \_\_\_\_\_

DATE :-

Signature of Tenderer	Company's Round Seal	Date	Place
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SCHEDULE - E

DEVIATION FROM SPECIFIED TEST REQUIREMENTS SPECIFIED IN RELEVANT AND PRESENT SPECIFICATIONS.

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Sr. No.	Name of Test Reason for deviation	Standard No. and clause no.	Requirement of standards	Proposed deviation
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1. TYPE TEST
2. ADDITIONAL TEST
3. ACCEPTANCE TEST
4. ROUTINE TEST

NAME OF FIRM \_\_\_\_\_

NAME & SIGNATURE  
OF TENDERER \_\_\_\_\_

DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

Signature of Tenderer	Company's Round Seal	Date	Place
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Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans

SCHEDULE - F

DEVIATION FROM SPECIFIED TEST REQUIREMENTS SPECIFIED IN RELEVANT AND PRESENT SPECIFICATIONS FOR MCCB.

Sr. No.	Name of Test	Standard No. and clause no	Requirement of standards	Proposed deviation	Reason for deviation
1	TYPE TEST				
2	ADDITIONAL TEST				
3	ACCEPTANCE TEST				
4	ROUTINE TEST				

NAME OF FIRM-----

NAME & SIGNATURE  
OF TENDERER -----

DESIGNATION -----

DATE -----

Signature of Tenderer

Company's Round Seal

Date

Place



## QUALITY ASSURANCE PLAN FOR DISTRIBUTION TRANSFORMERS

### Scope and Purpose:

This document indicates the requirement expected by the Purchaser from the manufacturer of Transformers. Manufacturer shall submit for purchaser's approval a quality assurance plan in line with this document incorporating specific document numbers for "format of records", "acceptance norms" and "reference documents" for purchaser's approval.

Quality assurance plan is the document setting out the specific quality practices, resources, and sequence of activities relevant to a particular product. Quality plan helps both the purchaser and supplier as it defines each and every material used, every stage of manufacturing process, characteristics to be checked, extent of check, reference documents, acceptance norm and format of record specifically.

### Abbreviations:

PS	-	Plant Standard / Process Specification
TR	-	Test Report
IS	-	Indian/ International Standard
CS	-	Customer Specification
AD	-	Approved Document such as Drawing, Purchase Order
V	-	Verified by
P	-	Performed by
W	-	Witnessed by
H	-	Hold by Purchaser
1	-	Purchaser
2	-	Manufacturer
3	-	External laboratory
4	-	Sub Vendor QC

### Notes:

1. Minor: The characteristics of a component, process or operation whose failure neither materially reduce the usability of the product in operation, nor does it affect the aesthetic aspects.
2. Major: The characteristics of a component, process, or operation whose failure may cause operation failure which cannot be readily corrected, at site cause substandard performance, increase erection and maintenance cost, reduce life or seriously affect aesthetics.
3. Critical: The characteristic of a component, process, or operation failure of which will surely cause operating failure or intermittent troubles

Signature of Tenderer	Company's Round Seal	Date	Place
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**Tender No:-UGVCL/SP/CPC/286/5-10-16-25-63-100-200-500 KVA CRGO Trans**

which is difficult to rectify at site or render the unit unfit for use or safety hazards.

4. “Failure” of a characteristic means failure to meet the ‘accepted norms’

5. Sampling: Generally sampling will be done in accordance with IS: 2500. Sampling will be as under:-

If 100% “Witness” of tests is carried out by Prime supplier, Customer will witness on sample basis or if 100% “Witness” of tests is carried out by Sub Vendor, Manufacturer will witness on sample basis.

Signature of Tenderer

Company’s Round Seal

Date

Place