

SCHEDULE-VII

TECHNICAL SPECIFICATIONS

Specification No. 01420214

**11KV/415V, SINGLE RATIO, VPI RESIN IMPREGNATED
DRY TYPE (AN) DISTRIBUTION TRANSFORMERS**

**THE BRIHAN-MUMBAI ELECTRIC SUPPLY & TRANSPORT UNDERTAKING
(OF THE BRIHAN MUMBAI MAHANAGARPALIKA)**

Specification No. 1420214

SECTION 1 : GENERAL

1.1 Tender Document :

- 1.1.1 This tender document shall be read and understood as a whole inclusive of all Annexures, Drawings etc. and every section or sub-section of this document shall be incorporated in proper context with other sections contained herein.
- 1.1.2 This specification covers the manufacturing, testing before dispatch and supply of 11KV/415V, single ratio, **VPI** Resin Impregnated Dry type **(AN)** distribution transformer.
- 1.1.3 All work covered by this specification shall be carried out in accordance with the 'General Conditions of Contract'.
- 1.1.4 Wherever the directions to the tenderers embodied herein conflict with those specified in the General Conditions of Contract, the former shall be binding in preference to the latter.

1.2 Standards :

- 1.2.1 Except as specified herein, all equipment shall comply with the requirements of the latest relevant Indian Standard Specifications (as amended to-date).
- 1.2.2 Where Indian Standard Specification does not exist, the relevant BS or IEC Standard Specification shall be taken as standard.
- 1.2.3 If the equipment offered is manufactured according to some other standard, it shall be clearly stated and a copy of the latest publication of the standard in English shall be submitted with the offer.

1.3 Legislation :

- 1.3.1 The whole of the equipment shall comply in every respect with the provisions of relevant Government Legislations and/or Rules and Regulations governing manufacture, installation, operation and maintenance of the equipment.
- 1.3.2 Tenderers shall ensure that all safety measures are provided in the equipment against hazards to life and property and that the proper installation and use of the equipment shall not contravene any enactments, rules and by-laws of the Government and the Local Authority.

1.4 Departure from Specification :

- 1.4.1 If due to any reason tenderers find it necessary to depart from the provisions of any section of the specification such departures shall be clearly stated and underlined giving full reasons.
- 1.4.2 If the departures from the provisions of any section of this specification are not notified in writing it will be presumed that tenderers will abide by this specification.
- 1.4.3 Any suggestion, comment or advise to include in this document additional provisions in respect of any special device or attachment/necessary but not already specified herein, may be put forward by the tenderers giving full details of the special/additional features of the equipment together with the justification for its inclusion.

1.5 Technical Data :

- 1.5.1 Tenderers shall give full specifications of the equipment/materials offered and shall supply technical literature and descriptive particulars together with drawing and illustrations to indicate the type and design of the equipment/material offered.
- 1.5.2 Tenderers shall supply such technical data, characteristics and statistical information as required to study the comparative merits and performance of different types and design of the equipments/materials.

1.6 Materials and Workmanship :

- 1.6.1 The equipment/materials shall conform to the best engineering practice in design, materials and construction so as to ensure reliability, economy and safe and convenient operation.
- 1.6.2 Tenderers shall supply all incidental items necessary or usual for such equipment for efficient working and for erection/installation purpose.
- 1.6.3 Manufacturers shall give details of the experience in the supply of similar equipment. A list of important customers who have been supplied with similar equipment with details of order executed shall be furnished. Details shall include rating of the equipment, quantity, purchase order reference etc.

1.6.4 Guarantee :

All the transformers supplied against this Specification shall be guaranteed for a period of 60 months from the date of installation but not later than 66 months from the date of acceptance for satisfactory operation of transformer. However, any engineering error, omission, wrong provisions etc. which do not have any effect on the time period, shall be attended/ rectified by tenderer as and when observed/ pointed out without any price implication to the entire satisfaction of the Undertaking.

- 1.6.5 The successful tenderer shall make good at his own expense all necessary alterations replacement to prevent any recurrence of such defects on all the equipment/materials supplied by him.
- 1.6.6 All corresponding similar materials and removable parts shall be made to guage and shall be interchangeable with each other.
- 1.6.7 The equipment/materials may be rejected at discretion of the General Manager if the test results are not satisfactory and the permissible tolerances are exceeded.

1.7 Instructions for Erection/Installation

Tenderers shall furnish the necessary instruction manual for erection/installation of the equipment/materials and shall also state precautions/provisions if any to be made for proper use afterwards.

SECTION 2 : DESCRIPTION OF THE POWER SYSTEM

2.1 Grid :

2.1.1 The Tata Power Company Ltd. (TPCL) and the Maharashtra State Electricity Board have their generating stations located in different parts of Maharashtra State and form an interconnected transmission system in the Mumbai-Pune Region.

2.1.2 Power from this system is transmitted at 220 / 110kV through overhead conductors and underground cables amongst others to TPCL's five main receiving stations at Backbay, Carnac, Parel, Dharavi and Mahalaxmi situated in the island of Mumbai, where they have installed either delta/star or star/zigzag step down transformers with star point effectively earthed for making power available to their consumers at 110 / 33 / 22kV.

2.2 Existing B.E.S.T. System :

2.2.1 The B.E.S. & T. Undertaking on behalf of Brihan Mumbai Mahanagarpalika (who are the licensees for the distribution of electric power within the City limits of Mumbai) receives power in bulk from the Tata Power Company Ltd. at 110 / 33 / 22kV, 3 Phase, 50 Hz.

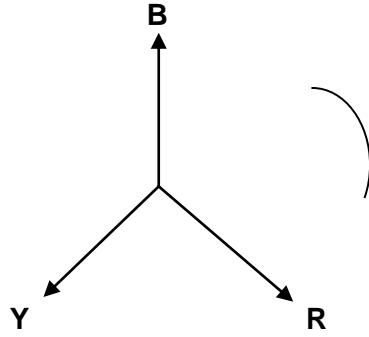
2.2.2 Bulk power at 110 / 33 / 22kV is transmitted from TPCL's five main receiving stations through effectively earthed underground cables to B.E.S.T.'s receiving substations situated at different localities in Mumbai where the B.E.S. & T. Undertaking has installed 110 / 33kV, 110 / 11kV, 33 / 11kV or 22 / 11kV, Star-z, star/star, delta/star power transformers of Vector group YNzn11, Ynyn0, 31 Dyn1 with neutral earthed with/without a resistance. Where the transformation is 110 / 11kV or 110 / 33kV, 22 / 11kV or 33 / 11kV, the star point of the transformers has been effectively earthed. The power transformers are provided with OLTC gear to regulate and maintain the 11kV voltage fairly constant.

2.2.3 Underground 11kV (effectively earthed) feeder cables radiate from the B.E.S.T. receiving substations to supply power to a large number of distribution substations and to certain consumer's substations. These feeders form a radial network under which each feeder supplies on an average 4 to 5 substations in series.

2.2.4 Power at 11kV is stepped down to 415/240V at the distribution substations where the various sizes of 11kV/415-240Volt delta/star transformers of vector group 41 Dyn11 are installed. The star point of these transformer is solidly earthed and is also brought out to an insulated terminal for the 3 phase, 4 wire distribution system.

2.2.5 The 415/240V secondary distribution system comprises of a vast network of underground four core cables, suitably sectionalised by means of distribution pillars, to which service lines are teed off to supply power to medium and low voltage consumers.

2.2.6 The phase sequence of the 3 phases at the existing receiving substations is in accordance with the International Standards as indicated below :-



SECTION 3 : PREVAILING SERVICE CONDITION

3.1 Climatological Data

3.1.1 The information given hereunder is based on data supplied by the Regional Meteorological Centre, Colaba, Mumbai – 400 001.

3.1.2 The information is based on the data collected over the years 1881 to 2007.

3.1.3 The table below gives the climatological data for the city of Mumbai :

a) Air Temperature in Shade

Highest temperature recorded	:	40.6 °C
Lowest temperature recorded	:	11.7° C
24 Hours daily average	:	26.0° C

b) Mean highest temperature in Sun	:	62.2° C
Highest temperature in Sun	:	64.0° C

c) Relative Humidity

Lowest mean RH	:	62%
Highest mean RH	:	85%

d) Rainfall

Mean No. of rainy days in a year	:	75.9 days
Mean rainfall in a year	:	2146.5 mm
Max. rainfall recorded in a year	:	3481.6 mm
Heaviest rainfall in a day recorded	:	575.6 mm

e) Wind

Mean daily wind speed - min. in a year	:	9.8 Km/Hr.
Mean daily wind speed – max. in a year	:	18.7 Km/Hr.
Highest wind speed in gust	:	103 Km/Hr. on 17/06/2004

3.2 **Geographical Data :**

Mumbai city is situated on the western coast of India and is the second biggest city in the country. It has an excellent sea-port and is on the world's main routes by sea and air. It is well connected with the hinterland by road and railways.

Area	64 Sq.Km
Population	38,00,000
Longitude	72 40 E
Latitude	18 54 N
Height above M.S.L.	11 Metres

3.3 **Local Conditions & Existing Practice :**

3.3.1 Mumbai is a densely populated city with large industries such as cotton mills, chemical factories, engineering workshops and several varieties of large and small industries occupied in the manufacture of consumer goods and other commodities.

3.3.2 Although certain areas are still undeveloped, the city is divided into several zones such as residential, commercial, industrial etc. With a view to minimise nuisance and localise several mixed localities where such zoning has not been done and two or more types of activities are allowed to continue. By and large, the heavy industries are gradually shifting from the city.

3.3.3 The 110/33/22kV substations are completely indoor equipped with power transformers, switchgears, control panels, reactors and capacitors, batteries and other auxiliary equipment.

3.3.4 The distribution substations are normally equipped with 11kV switchgear, distribution transformers and L.V. Distribution board or pillar. 56kVAr capacitor banks are connected on the L.V. side of transformers for power factor improvement.

3.3.5 Each distribution substation comprises of one or more incoming and outgoing feeders and one or more transformers of 1600 kVA, 995 kVA, 630 kVA. The outgoing feeders and primary of the transformers are controlled and protected by 11kV oil circuit breakers in conjunction with their associated trip coils and current transformers.

3.3.6 The distribution substations in the city are of the following three types :

- a) Indoor Type :- Where the switchgear and the transformers are located inside a building.
- b) Outdoor Type :- Where the switchgear and the transformers are located in open land and directly subjected to outside atmosphere.
- c) Indoor/Outdoor Type - Where the switchgear is located inside a building and the transformers are located in an outdoor plot open to sky.

3.4 **Short Circuit Level :**

The maximum symmetrical short circuit level in 11kV system is 250 MVA at the substations. The maximum symmetrical short circuit current shall be 13.2 KA.

SECTION 4 : REQUIREMENTS

4.1 TYPE :

- 4.1.1 The transformer shall be **VPI** Resin Impregnated Dry type suitable for operation on primary voltage of 11000 **V** and shall be of the ratio 11000/415 Volts, three phase, 50 Hz, double wound, delta / star, core type, enclosed. **AN** cooled & suitable for indoor use.
- 4.1.2 The transformers shall be suitable for floor mounting and installation and operation inside the substation building or in the basement of a multi-storied building.

4.2 SIZES AND QUANTITIES :

The sizes and quantities of **VPI** Resin Impregnated Indoor Dry type transformers with **class 'H'** or superior insulation, complete with cable boxes and fittings are as follows :

Item No.	Capacity	Quantity (in Nos.)
1	630 kVA	
2	995 kVA	
3	1600 kVA	

4.3 FITTINGS :

The transformers shall be provided with the following fittings as per IS-2026(Part-I)/1977.

- i) Rating plate vide clause 15 of IS-2026(Part-I)/1977.
- ii) Terminal marking plate.
- iii) Two earthing terminals with copper or aluminium lugs of size 120 sq.mm. at the centre of the bottom channels supporting the transformers.
- iv) Lifting lugs to lift the transformer.
- v) Bidirectional rollers with locking arrangement.
- vi) HV dividing box.

- vii) LV dividing box.
- viii) Winding temperature indicator.
- ix) Winding temperature relay with interposing relay to give trip impulse to breaker controlling Distribution Transformer.
- x) Heater alongwith switch to be provided inside transformer tank.
- xi) Heater alongwith switch to be provided in marshaling box.
- xii) Simulating test facility shall be provided in marshaling box for testing alarm and trip commands.

4.4 **QUANTITY VARIATION :**

The General Manager reserves the right to vary the quantities on order upto +/- 25%. In case of assorted ratings of transformers i.e. 630 kVA, 995 kVA and 1600 kVA, the quantity variation upto +/- 25% may be operated either on the ordered quantity of individual rating or on any of the rating upto +/-25% of the total ordered quantity of assorted ratings.

SECTION 5 : SPECIFICATION

5.1 General :

The dry type transformer shall be of **VPI** Resin Impregnated and in accordance with IS-11171/1985 and IEC-726/1982 for dry type transformer as applicable unless specified otherwise and also in accordance with the following supplementary specification.

- 5.1.1 The transformer shall be designed and suitably insulated for continuous operation at the rated kVA at the secondary terminals, under the prevailing service conditions at the rated voltage, frequency and temperature rise stipulated hereinafter.
- 5.1.2 The manufacturers' attention is drawn to clause 3.2.3 of IS-11171/1985 in regards to the restricted cooling / air circulations available and poor ventilation inside vaults / basement and enclosed rooms where the transformers are required to be installed. The maximum surrounding temperature at these locations is about 55° C.
- 5.1.3 The insulating materials shall be suitably processed such that in effect they act as Fire retardant.
- 5.1.4 The manufacturer alongwith offer has to submit type test certificate **(including dynamic ability to withstand short circuit test)** from NABL Accredited laboratory for the type and design of the transformer offered **of same or higher kVA rating with 11kV voltage class**, failing which offer may be overlooked.

5.2 Variation in Voltage & Frequency :

- 5.2.1 The rated no load voltage ratio shall be as under :

HV - 11000 Volts
LV - 415/240 Volts, 4 wire supply.

- 5.2.2 The rated frequency shall be 50 Hz.
- 5.2.3 The transformers shall be designed for satisfactory operation at any supply voltage within +/- 10% of the rated voltage of 11000 volts with the frequency varying by 3% above or below the normal value of 50 Hz.

5.3 Nature of Load :

The transformer will supply a pre-dominantly commercial load with an average load factor of 60% and a lagging power factor between 0.85 and 0.95.

- 5.4 The transformer shall have 4.75% impedance voltage.

5.5 **Winding** :

- 5.5.1 The HV and LV windings shall be of high conductivity electrolytic copper conductor of best quality and shall be insulated with class 'H' superior insulation. The arrangement of the windings shall be such that there is electrical and magnetic balance under all operating conditions.
- 5.5.2 The manufacturer shall give details of the process of manufacturing VPI resin impregnated transformer. Guaranteed performance details should be filled up completely.
- 5.5.3 The design treatment and construction of transformer and bracing of the winding should be such as to withstand the heavy mechanical and thermal stresses which may be experienced under condition of daily cycle of heating and cooling due to fluctuations in load or dead short circuit on either side of the transformer.
- 5.5.4 Connections :- The windings shall be connected in delta on the primary and in star on the secondary with neutral brought out to an insulated terminal for direct earthing. The connections shall be made in accordance to the vector symbol Dyn11.

5.6 **Insulation** :

- 5.6.1 The primary winding of the transformer shall be suitable for highest system voltage of 12 kV and shall withstand power frequency test voltage as per table 5 of IS-11171/1985. The power frequency test voltage for the secondary winding shall be 3 kV RMS. The tenderer shall clearly state in this tender the value of the power frequency test voltage for which the primary and secondary windings of the transformers are designed.
- 5.6.2 The inter-turns and end-turns of the HV and LV windings shall be insulated for protection against surges and transients.
- 5.6.3 The insulation shall be of class 'H' or superior type insulating material conforming to IS-1271/1985 **amended till date.**

5.7 **Temperature Rise** :

The temperature rise of the transformer above the cooling air temperature when tested at rated current and rated voltage shall not exceed the limit indicated in Table-4 of IS-11171-1985. The test shall be conducted as per clause no. 17.2.3 of IS-11171-1985.

5.8 **Flux Density** :

The value of the flux density shall be so chosen that -

- a) The noise is reduced.
- b) The flux density shall not exceed 1.6 tesla.

5.9 Core :

- 5.9.1 The core shall have inter-leaved yokes which shall be well clamped **to eliminate humming as far as possible when the transformer is in service** (refer sub section 5.17).
- 5.9.2 **The construction of core assembly shall be boltless in order to avoid generation of hot spots as well as to reduce noise level. The core shall be constructed from cold rolled, thin non-ageing low loss silicon steel laminations of CRGO sheets with M4/M-OH/laser scribed HI-B or better grade and using 45° mitered step-lap core joints for reducing the iron loss to the minimum possible extent and treated with insulating material on both sides of each lamination. The insulating material shall be non-hygroscopic so that there is no possibility of moisture being absorbed by it due to varying annual and daily temperature cycle resulting in breathing of the transformer in a humid atmosphere. The manufacturer shall ensure uniform quality of laminations free from any manufacturing defects they shall be clamped securely and provided with firm and enduring interlocking so as to minimize the possibility of loosening of laminations during service. All such fixtures shall be well insulated with good quality materials from the core and nearby parts of the windings / connections etc. and shall not affect the magnetic performance of the core adversely. The core limbs shall be provided with a semi-conducting taping to give clamping.**
- 5.9.3 The core shall be provided with suitable lifting lugs to enable the complete core and coil assembly to be lifted for transportation. The lifting lugs shall be so positioned that there shall be no obstacles while lifting the core and coil assembly.
- 5.9.4 **The core material shall be directly procured either from the manufacturer or through their associated marketing organization of repute and not through any agent. The manufacturer shall preferably have in-house core cutting facility. The core shall be preferably cut in manufacturers works.**
- 5.9.5 **The following documents pertaining to procurement and testing of core material to be submitted by the transformer manufacturer during prototype inspection :**
1. **Invoice of supplier.**
 2. **Mills test certificate.**
 3. **Packing list.**
 4. **Bill of Landing.**
 5. **Bill of entry certificate by custom.**
 6. **Description of material, electrical analysis, physical inspection.**
 7. **Certificate for surface defects, thickness & width of material.**

5.10 Rollers :

The bi-directional rollers of mild steel shall enable the transformer to roll in the plane at right angles to the vertical plane containing the centre lines of HV and LV cable boxes. The rollers shall be of 200 mm diameter and 85 mm in width. The centre to centre distance between the rollers along the length and width of transformer shall be 900 mm. Also, the clearance between the roller fixing channel and the top surface of the roller shall be minimum 60 mm.

5.11 Terminals :

- 5.11.1 The primary and secondary terminals as shown in clause no.5.11.5 shall be brought out on opposite sides of the transformer for connection to 3 core x 50 sq.mm. copper conductor XLPE cable and single core x 400 sq.mm. copper unarmoured XLPE cables respectively. An additional insulated neutral terminal, properly protected by a removable cover shall be provided for earthing the star point of the LV side.

5.11.2 The primary and secondary terminals shall be provided with suitable crimping lugs.

5.11.3 The minimum height of the cable gland from ground level shall be 500 mm.

5.11.4 The high and low voltage phase terminals shall be marked with colours red, yellow and blue, the neutral point material being indicated by letter 'n'.

5.11.5 The following colours shall be assigned to the windings respectively from the left to the right facing the side carrying high voltage terminals.

1) HV VIEWED FROM HIGH VOLTAGE SIDE (for all types of ratings) :-

R	Y	B
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2) LV VIEWED FROM LOW VOLTAGE SIDE (for 630 & 995 kVA transformers) :-

n	n	b	y	r
L	0	0	0	0

3) LV VIEWED FROM LOW VOLTAGE SIDE (for 1600 kVA transformers) :-

n	n	b	y	r	n	b	y	r
L	0	0	0	0	0	0	0	0

MARKING AND RELATIVE POSITION OF TERMINALS

5.12 Cable Boxes:

5.12.1 On H.V. side of transformer a cable box made of Cast Iron / M.S. sheet shall be provided. The cable box shall be suitable for both Epoxy / Heat Shrinkable type termination, so as to terminate 3C x 50 sq.mm. copper conductor XLPE cable. The HV cable boxes shall be as per drawing no. ES/PL/A 470.

5.12.2 The LV cable box made of M.S. sheet shall be in 2 removable parts and shall be suitable for being detached from main body with suitable mounting arrangement. The LV cable boxes shall be as per drawing no. ES/PL/A-468 (for 995 kVA and 1600 kVA transformers) and drawing no. ES/PL/A-469 (for 630 kVA transformers). The L.V. cable box shall be suitable for terminating following number of cables which will approach the boxes vertically from the bottom :

Transformer Rating		L.V. Cables
1.	630 kVA	7 nos., 1C x 400 sq.mm. XLPE copper conductor cable (6 for phases and 1 for neutral)
2.	995 kVA	11 nos., 1C x 400 sq.mm. XLPE copper conductor cable (9 for phases and 2 for neutral)
3.	1600 kVA	22 nos., 1C x 400 sq.mm. XLPE copper conductor cable (in two dividing boxes with 11 nos. 1C x 400 sq.mm. copper conductor cable in each box). (9 for phases and 2 for neutral)

5.12.3 A suitable wooden clamping arrangement as per drawing no. ES/PL/A-468 (for 995 kVA and 1600 kVA transformers) and drawing no. ES/PL/A-469 (for 630 kVA transformer) for supporting the L.V. cables in vertical position shall be provided, so that, L.V. busbars will not be loaded. The bottom plate of L.V. dividing box shall be in 3 parts for 630 kVA and in 4 parts for 995 kVA and 1600 kVA with circular holes for entry of 1C x 400 sq.mm. copper conductor XLPE cables.

5.12.4 Long barrel type copper lugs with two holes as per drawing no. ES/PL/A-445, shall be provided for terminating 1C x 400 sq.mm. Copper conductor, XLPE cables.

5.12.5 L.V. busbars shall be supported using epoxy insulators from the top side inside the L.V. dividing box.

5.12.6 Height of the centre line of HV/LV terminals from the surface of the foundation shall be 1.5 mtrs. +/- 5% tolerance.

5.13 Terminal marking plate and rating plate :

Each transformer shall be fitted with a terminal marking plate and rating plate. These shall be engraved metal plate giving clearly the connections for the transformer, the terminal markings, and all other information as specified in clause 15 of IS-2026(Part-I)/1977 alongwith guaranteed values of No Load and Full Load Losses and purchase order no.

5.14 Enclosure (Housing) :

Enclosure for indoor type transformer shall be constructed using suitable weld mesh with robust support structure. The weld mesh panels shall be bolted to the frame. The enclosure shall be finished both internally and externally with weather resistant paint.

The paint colour shall be grey shade as per IS-5.

Suitable lifting lugs must be provided to enable the transformer to be lifted by means of cranes using slings.

5.15 Overall Dimensions :

Due to space constraints, the maximum overall length and width of 630 kVA and 995 kVA transformer shall be 1800 mm x 2000 mm and for 1600 kVA transformer the maximum length and width shall be 2000 mm x 2000 mm.

The transformers are intended for use in substations where the height from floor to roof is limited. The maximum overall height of the transformers shall not therefore exceed 1.8 meters, 2.0 meters & 2.5 meters for 630 kVA, 995 kVA and 1600 kVA transformers, respectively.

5.16 Transport Dimensions:

The transformers are intended to be installed in basement where carriage way to the substation is very narrow. Hence, the transport dimensions of transformer which shall be measured from HV busbar tip to LV busbar tip after removing HV and LV cable boxes shall not exceed 1.2 mtrs for 630 kVA and 995 kVA and 1.4 mtrs for 1600 kVA transformer.

The offer shall be accompanied with a drawing illustrating how the transport dimensions are achieved. However, smaller dimensions will be preferred.

5.17 Vibration & Noise :

The transformer should operate with minimum vibration and humming noise.

5.18 In the Section-10 of specification, the manufacturer is required to submit the guaranteed technical particulars. The transformers shall be as per our requirement regarding the essential parameters listed below. If there is any deviation from our requirement or if the tenderers do not furnish following parameters, no further correspondence will be made after opening of the tender and the offer will be liable to be overlooked.

- 1) Vector Group and Symbol
(The vector group shall be Dyn11)
- 2) Maximum temperature rise at rated kVA
(Max. temp. rise shall be as per test procedure mentioned in clause no.5.7)
- 3) Maximum Full load losses at 75° C (without IS tolerance) : Please refer **Annexure 'F'**.
- 4) Maximum No load losses at rated voltage (without IS tolerance) : Please refer **Annexure 'F'**.
- 5) Maximum Total losses (without IS tolerance) : Please refer **Annexure 'F'**.
- 6) Impedance voltage at rated current at 11kV in percentage.
(Impedance voltage at the rated current shall be 4.75% with IS tolerance at 11kV)
- 7) Type of Core
(The core shall be constructed with low loss Silicon Steel laminations of CRGO type)
- 8) Particulars of insulation
(Insulation shall be of **class 'H'** or superior type insulating material conforming to IS-1271/1985 **amended till date**).
- 9) Overall dimensions

The overall length and width of 630 kVA and 995 kVA transformer shall be less than or equal to 1.8 mtrs. x 2.0 mtrs. and for 1600 kVA transformer the overall length and width shall be less than or equal to 2.0 mtrs. x 2.0 mtrs. Overall height of 630 kVA, 995 kVA and 1600 kVA shall be less than or equal to 1.8 mtrs., 2.0 mtrs. and 2.5 mtrs. respectively.

- 10) Transport dimensions i.e. the dimensions measured from HV bushing tip to LV bushing tip after removing HV and LV cable boxes.
(For 630 kVA and 995 kVA transformer the length and width shall be less than or equal to 1.8 mtrs. and 1.2 mtrs. and for 1600 kVA transformer, the length and width shall be less than or equal to 2.0 mtrs. and 1.4 mtrs. respectively, after removing the detachable parts).
- 11) Height of the centre line of terminals from the foundation level
(This height shall be 1.5 mtrs. (+/- 5%) for both the ratings of transformers)
- 12) The general arrangement drawing showing all the dimensions clearly for each rating of transformer must be submitted. Also, how the transport dimensions are achieved, shall be shown in the GA drawing.

5.19 Drawings :

- 5.19.1 The tenderers shall submit in quadruplicate the following drawings alongwith the quotations on A3 size paper :
 - a) Dimensional drawings of the transformers offered.
 - b) Diagram of connections.
 - c) Dimensional drawings showing the HV and LV cable boxes offered.
 - d) Details drawings of HV/LV busbars / insulators.
 - e) Drawing illustrating how transport dimensions are achieved.
- 5.19.2 The drawings shall be to scale and fully detailed. All important dimensions shall be given and materials of each component shall be indicated.
- 5.19.3 The successful tenderer shall submit the 3 sets of approved drawings on A-3 size paper and on 2 nos. of Compact Disc (CD) to Divisional Engineer, Planning (Materials).
- 5.19.4 The successful tenderer has to submit in quadruplicate, copies of drawings within 2 weeks from the date of receipt of our Acceptance Letter and get the same approved from Divisional Engineer, Planning (Materials) Dept., B. E. S. & T. Undertaking, 3rd Floor, Backbay Veej Bhavan, Gen.Jagannath Bhosale Marg, 149/150, Backbay Reclamation, Mumbai - 400 021, within 4 weeks from the date of submission of drawings. The firm has to depute technical representative for discussion, if any, during the drawing approval stage, so as to avoid delay. Any delay in getting the drawing approved within the specified period will be treated as delay in delivery of the material and necessary L.D. charges will be charged.

SECTION 6 : TESTING AND INSPECTION

6.1 Tests :

6.1.1 The transformers shall be subjected to the following tests free of cost at the manufacturer's works as specified in Section 16.1.2 of IS-2026(Part-I)/1977, Section-5 of IS-11171/1985 and IEC-726/1982.

l) Routine Tests :

- a) a) Measurement of winding resistance.
- b) b) Ratio, Polarity and phase relationship.
- c) Measurement of impedance voltage.
- d) Load Losses (for measurement of the load losses of transformer testing leads shall be connected to the HV and LV end of the busbars). The frequency correction factor as given at 6.1.1.1 shall be applied to the stray losses component calculated.
- e) No-load losses and no-load current :- While carrying out the No load losses, the ratio V rated : f rated shall be maintained by adjusting V test according to f test. (V rated = Rated voltage, V test = Test voltage, f rated = Rated frequency, f test = Test frequency). (The frequency correction factor as given at 6.1.1.2 shall be applied to the measured No load losses).
- f) Insulation resistance.
- g) Induced over voltage withstand.
- h) Separate source voltage withstand.

6.1.1.1 Stray losses at rated frequency

$$= \text{Stray losses at test frequency} \times \left\{ \frac{\text{Rated Frequency}}{\text{Test Frequency}} \right\}^2$$

6.1.1.2 Actual No load losses at rated frequency

$$= \frac{\text{Measured No load losses}}{2} \times \left\{ \frac{\text{Rated Frequency}}{\text{Test Frequency}} \right\}^2$$
$$+ \frac{\text{Measured No load losses}}{2} \times \left\{ \frac{\text{Rated Frequency}}{\text{Test Frequency}} \right\}$$

While carrying out the tests for measuring no load losses the ratio of rated Voltage: rated frequency shall be maintained by adjusting the test voltage according to the test frequency.

- 6.1.2 The tolerance on the above performance test values shall be as specified in IS-2026/1977.
- 6.1.3 The tenderer shall supply three certified copies of the test certificates in respect of each test carried out on the transformers.
- 6.1.4 The test certificates shall give the actual measurements and also the derived values for -
- 1) Losses
 - 2) Impedance Voltage
 - 3) Efficiency at 50%, 75% and full load at unity and 0.8 p.f. lagging at 75° C.
 - 4) Regulation at unity and 0.8 p.f. lagging.
- 6.1.5 In addition to the tests specified above, the Undertaking reserves the right to have any reasonable tests carried out at the manufacturer's works or at site.
- 6.2 The transformers alongwith the enclosure shall be offered for inspection and witnessing the test referred above by our representative at the manufacturer's works before dispatch.
- 6.3 Inspection and acceptance of Prototype and Lots :
- 6.3.1 The prototype of each rating shall be offered for inspection and witnessing the tests by the Undertaking's personnel before the manufacture of lot.
- 6.3.2 Lots shall be manufactured only after the acceptance of prototype at our testing laboratory and each lot shall be offered for inspection at the works.
- 6.3.3 After the delivery of transformer to BEST Undertaking, each transformer will be tested at our laboratory. The transformers will be accepted only after getting the satisfactory test results.
- 6.3.4 The prototype or any lot is liable for rejection during inspection by the Undertaking's officers at the works of the manufacturer, if, test results are not satisfactory and the permissible tolerances are exceeded or if, there are deviations from our specification or if the equipment offered is found to be incomplete. In such cases, the manufacturer has to offer fresh prototype / lot for re-inspection at their works. The re-inspection charges shall be borne by the manufacturer. The re-inspection charges shall include salary and allowances of the officers and to and fro air / first class AC rail fare expenses, etc. as per prevailing procedure of the Undertaking. The re-inspection charges shall be recovered from the outstanding payment to be made to the manufacturer.

SCHEDULE-VIII **PRICES, DELIVERY & VALIDITY**

1. Prices :

- 1.1 Tenderers should quote the prices with IEEMA price variation without ceiling and for free delivery of the transformer to our Kussara Stores, Mazgaon, Mumbai / Anik Depot, including arrangement for unloading and stocking of transformers at the proper place. (The Freight, Insurance & Unloading Charges payable shall be quoted separately. The prices shall, however, be exclusive of Excise Duty, S.T. / C.S.T. & Octroi wherever applicable, the percentage of which should be indicated clearly. The Ex-works prices shall be mentioned for the purpose of charging Excise Duty.
- 1.2 The tenderers are requested to note that Form 'C'/Concessional VAT shall be applicable for this particular item. The prices shall however, be exclusive of Excise Duty, VAT, CST and Octroi, wherever applicable, the percentage of which should be indicated clearly (please refer Clause-2 of 'Conditions of Tender, Schedule-III)
- 1.3 It will be the responsibility of the manufacture for safe transport of the materials including and keeping the same at proper place. The freight charges, insurance and unloading charges shall be clearly quoted in the Schedule of Prices and Delivery. The offers of tenderers, who quote only Ex-works prices will be overlooked.

2 Delivery :

- 2.1 The successful tenderer has to submit in quadruplicate, copies of drawings as specified in Clause No. 5.19 within 2 weeks from the date of receipt of our Acceptance Letter and get the same approved from Divisional Engineer, Planning (Materials) Dept., B. E. S. & T. Undertaking, 3rd Floor, Backbay Veej Bhavan, Gen. Jagannath Bhosale Marg, 149/150, Backbay Reclamation, Mumbai - 400 021, maximum within 4 weeks from the date of submission of drawings. The firm has to depute technical representative for discussion, if required, during the drawing approval stage, so as to avoid delay. Any delay in getting the drawing approved within the specified period will be treated as delay in delivery of the material and necessary L.D. charges will be charged as per clause no.5 of Conditions of Supply.
- 2.2 The successful tenderer shall submit the 3 sets of approved drawings on A-3 size paper and on 2 nos. of Compact Disc (CD) to Divisional Engineer, Planning (Materials).
- 2.3 The prototype unit shall be offered for inspection, so that, it will be delivered to our Kussara Stores (after witnessing the tests by our inspecting officers at the manufacturer's works) within 10 weeks from the date of approval of drawings.
- 2.4** The prototype will be tested at our workshop after delivery. In case of rejection of prototype at our end, the manufacturer shall attend / rectify, defect / shortfall within 10 days from the date of receipt of rejection memo, failing which, the delayed period will be reckoned for counting L.D. charges.
- 2.5** After acceptance of prototype at our end, the 1st lot of 2 nos. of each ratings shall be offered for inspection, so that, it will be delivered to our Kussara Stores within 6 weeks from the date of acceptance of prototype. The delivery of further lots shall be as per the schedule intimated to you by M. M. dept. **Further, in case of rejection of lot at our end, the manufacturer shall attend / rectify, defect / shortfall within 15 days from the date of receipt of rejection memo, failing which, the delayed period will be reckoned for counting L.D. charges.**

- 2.6** Delivery schedule given will be suitably amended from time to time, depending on our requirement. However, minimum one month's advance intimation will be given while effecting the change.

Besides, due cognisance of the lead time required for manufacturing the transformer will be taken while changing the delivery schedule. The tenderer therefore shall quote the "minimum lead time" required for manufacture of transformers.

3. Validity :

The offer shall be valid for acceptance upto the validity date mentioned on the tender site. The offers with lesser validity period may be considered as 'Non-Responsive' and their price bid shall not be opened.

SCHEDULE-IX
TERMS OF PAYMENT

100% payment shall be payable either on the 30th day from the date of supply or on the 8th day from the date of submission of Tax Invoice, whichever is later.

GUARANTEED PERFORMANCE PARTICULARS**(MUST BE FILLED IN BY THE TENDERER)**

The particulars given in this schedule will be binding upon the tenderer and must not be departed.

Sr. No.	Description	630 kVA	995 kVA	1600 kVA
1.	Manufacturer's Name and place of Manufacture.			
2.	Brand Name			
3.	Type – Indoor			
4.	Standard to which the transformers are manufactured.			
5.	Local Representative Details			
6.	a) Type test carried out on the Transformer	Yes / No		
	b) Type test certificate submitted Please refer Clause 8 of Pre-Qualification Criteria.	Yes / No		
7.	Number of phases			
8.	Frequency			
9.	Rated kVA, Output (CMR) corresponding to average temperature rise of winding under service conditions stipulated in IS-2026 (Part-II)/1977 Clause 3.			
10.	Voltage between phases (H.V. side) volts			
11.	Voltage between phases (L.V. side) volts			
	a) At No load			
	b) Full load at Unity P.F.			
	c) At full load 0.8 P.F. (lagging)			
12.	Section of busbars in mm x mm			
	a) H.V. side			
	b) L.V. side			
13.	Connections --			
	a) On H.V. side			
	b) On L.V. side			
14.	Vector group and symbol			
15.	Insulation test voltage (power frequency)			
	a) H.V. winding – KV r.m.s			
	b) L.V. winding – KV r.m.s			
16.	Class and impregnation of insulation			
17.	Method of cooling			
18.	Maximum temperature rise at rated kVA output as per the test procedure mentioned in Section-5, Clause 5.7 of the Specification			

Sr. No	Description	630 kVA	995 kVA	1600 kVA
19.	Maximum temperature rise at rated voltage and rated current continuously for 8 hours.			
20.	Resistance voltage drop at 75° C - %			
21.	Regulation -			
	a) At Unity P.F. at 75° C - %			
	b) At 0.8 P.F. at 75° C - %			
22.	Reactance drop - %			
23.	Exciting current (HV) and Power factor -			
	a) At rated voltage and frequency – Amps			
	b) At 110% rated voltage and frequency – Amps			
24.	Impedance voltage at rated load and normal tap at 75 ° C - %			
25.	Maximum induction in c.g.s lines per sq.mm. for cold rolled steel lamination			
	a) At rated voltage and frequency (i) Core (ii) Yoke			
	b) At 110% rated voltage and frequency (i) Core (ii) Yoke			
26.	Type of core material			
27.	Core Grade			
28.	Type of windings –			
	a) H.V. side			
	b) L.V. side			
29.	Shape (round or rectangular) and section of copper used in –			
	a) H.V. winding sq.mm.			
	b) L.V. winding sq.mm.			
30.	Maximum working current density in windings at rated output –			
	a) H.V. winding amps per sq.mm.			
	b) L.V. winding amps per sq.mm.			
31.	Particulars of insulation for –			
	a) Coil			
	b) Inter-turns			
	c) End turns			
32.	Minimum clearance to earth –			
	a) Of primary windings – mm			
	b) Of secondary windings – mm			

Sr. No.	Description	630 kVA	995 kVA	1600 kVA
33.	Guaranteed efficiency at standard reference temperature of 75° C --			
	a) On 100% load at U.P.F. - %			
	b) On 75% load at U.P.F. - %			
	c) On 50% load at U.P.F. - %			
	d) On 100% load at 0.8 P.F. (Lagging) - %			
	e) On 75% load at 0.8 P.F. (Lagging) - %			
	f) On 50% load at 0.8 P.F. (Lagging) - %			
34.	Weights – Kg.			
	a) Core – Kg.			
	b) Windings – Kg.			
	c) Core, coils insulation (weight to lift for inspection) – Kg.			
35.	Head room necessary to lift – Mtrs.(Untanking height)			
36.	Height of the centre line of terminals from the surface of the foundation – Mtrs. (Section 5.12.6)			
37.	Cable boxes for HV & LV side shall be given as per clause no. 5.12.1 (Drg. No. ES/PL/A-470) and 5.12.2 (Drg. No. ES/PL/A-468 & ES/PL/A-469) respectively			
38.	Clearance between additional Neutral bushing and dividing box.			
39.	Inspection cover on top plate of LV side shall be provided.	Yes / No		
40.	The shade of paint colour for Enclosure shall be given as per Clause no. 5.14	Yes / No		
41.	Rollers			
	a) Material			
	b) Diameter			
	c) Width			
	d) C/C distance between the rollers			
	e) Clearance between the roller fixing channel and top surface of roller			
42.	Wooden cleating arrangement shall be given as per Drg. No. ES/PL/A-468, 469 & 470	Yes / No		
43.	Marking and relative position of HV / LV busbars shall be given as per clause no. 5.11.5	Yes / No		
44.	Terminal marking plate and rating plate shall be engraved metal plate	Yes / No		

PRICE VARIATION CLAUSE FOR DRY TYPE DIST. TRANSFORMER
(Of Ratings upto 10 MVA or Voltage upto 33 kV)
supplied against domestic contracts

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the Price Variation Clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P_0}{100} \left[13 + 25 \frac{C}{C_0} + 20 \frac{ES}{ES_0} + 6 \frac{IS}{IS_0} + 14 \frac{IM}{IM_0} + 10 \frac{ER}{ER_0} + 12 \frac{W}{W_0} \right]$$

Wherein,

P = Price payable as adjusted in accordance with the above formula.

P₀ = Price quoted / confirmed.

C₀ = Average LME settlement price of copper wire bars. This price is as applicable for the month, **one month** prior to the date of tendering.

ES₀ = C&F price of CRGO Electrical Steel Sheets. This price is as applicable on the 1st working date of the month. One month prior to the date of tendering.

IS₀ = Wholesale price index number of Iron & Steel (Base : 2004-05 = 100). This index number is as applicable for the week ending 1st Saturday of the month, **three months** prior to the date of tendering.

IM₀ = Price of Insulating Materials. This price is as applicable on the 1st working day of the month, **one month** prior to the date of tendering.

ER₀ = Price of Epoxy Resin. This price is as applicable on the 1st working day of the month, **one month** prior to the date of tendering.

W₀ = All India average consumer price index number of industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base 2001 = 100)

This index number is as applicable on the first working day of the month, **three months** prior to the date of tendering.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA (PVC)/TRF(R-1)/ / prevailing as on first working day of the month i.e. one month prior to the date of tendering.

C = Average LME settlement price of copper wire bars. This price is as applicable for the month, **one month** prior to the date of delivery.

ES = C&F price of CRGO Electrical Steel Sheets. This price is as applicable on the 1st working day for the month, one month prior to the date of delivery.

IS = Wholesale price index number for 'Iron & Steel (Base : 2004-05=100). This index number is as applicable for the week ending 1st Saturday of the month, **three months** prior to the date of delivery.

IM = Price of Insulating Materials. This price is as applicable on the 1st working day of the month, **one month** prior to the date of delivery.

ER = Price of Epoxy Resin. This price is as applicable on the 1st working day of the month, **one month** prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base 2001 = 100)

This index number is as applicable on the first working day of the month, **three months** prior to the date of delivery.

CONDITIONS FOR OPERATION OF PRICE VARIATION CLAUSE

1. The amount of price variation to be reimbursed or claimed as a refund on account of variation in prices of raw materials and All India Average Consumer Price Index No. for Industrial Workers, shall be worked out on the basis of aforesaid Price Variation Clause and that too for the quantity of **Distribution Transformers** supplied as per the contractual delivery period.
2. The date of delivery is the date on which the Transformer is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's Dispatch Note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.
3. The Price Variation Clause is operative both ways i.e. if the actual price variation admissible is upward, the payment on account of price variation shall be released to the supplier and if it is downward, the Undertaking shall be entitled to recover the same from any amount due to the supplier.
4. The payment shall be released for **Distribution Transformers** supplied as per the delivery schedule based on the quoted price as per the Undertaking's Payment Terms as shown in **Schedule-IX** attached to the Tender Documents.
5. The amount of price variation to be reimbursed or claimed on account of upward/downward price variation, shall be worked out and the necessary price amendments will be released after regular interval of 12 months from the date of release of Purchase Order for the quantity supplied and accepted.
6. Variation in prices of finished product due to change in Statutory Levies, etc. are considered only if the tenderer specifically mentions 'Taxes & Statutory Levies as applicable' in their quotation and mention specific rates/percentage of these taxes applicable at the time of submitting quotation and produces necessary documentary evidence of such variation at the time of claiming the payments.

Variation in price due to Statutory Levies, etc. on the revised basic price of finished product on the basis of Price Variation formula stipulated above, will be worked out and necessary Amendment Form will be issued. If the variation in price is upward, the supplier shall have to submit the Tax invoice (supplementary) for the difference in rate due to price variation, based on which payment will be released.

However, if the variation in price is downward, the Undertaking shall recover the same amount inclusive of statutory component, etc. as per Amendment Form issued to the supplier from any amount due to the supplier. The supplier shall have to follow up with the concerned Government/Municipal authorities for claim settlement of statutory components such as Excise Duty, VAT, Octroi, etc.

7. If the delivery is delayed by the supplier, then the amount of price variation will be worked out on the basis of contractual delivery schedule (and not as per the actual delivery schedule), irrespective of upward/downward price variation.
8. The tenderers, who fail to accept the aforesaid Price Variation Clause shall be considered as Non-responsive and their price bids shall not be opened.

ANNEXURE-C

(To be uploaded alongwith Technical Criteria only)

CERTIFICATION OF ANNUAL SALES TURNOVER BY THE CHARTERED ACCOUNTANT

This is to certify that the Annual Turnover furnished by M/s. _____
for the last two financial years (i.e. _____ & _____) from the sale of
_____ as detailed below and as furnished in the enclosed statement of accounts, is
verified by us and found correct.

Financial Year	Turnover
	_____ Crores
	_____ Crores

CHARTERED ACCOUNTANT:

(Signature with Seal)

My Membership No. _____

Address:

Note : The above certification note shall be uploaded at Sr.No.5 of Pre-Qualification Criteria.

SCHEDULE OF DEPARTURE FROM TECHNICAL SPECIFICATIONS

Tenderers shall mention in this schedule all departures from the various clauses of the Specifications of the item. In the absence of any mention in this schedule, the clauses of these Specifications shall be binding on the tenderers. If the departure specified herein, is found to be in contradiction to the Undertaking's requirements/specifications then such offers will be treated as non-responsive.

(Must be filled by the Tenderers separately, if there is departure & then uploaded against Question No. **12** of the Pre-Qualification Criteria.)

Sr. No.	Ref. to Section No. & Clause No. of specification 01420214	Departures

We here carefully gone through the specifications and we undertake to meet clauses in the specifications in all respects etc. for the deviations mention above.

Signature of tenderer with seal

Date : _____

SCHEDULE OF CREDENTIALS

<u>THE BRIHANMUMBAI ELECTRIC SUPPLY & TRANSPORT UNDERTAKING</u> (Materials Management Department - Kussara)		
PROFORMA FOR FURNISHING INFORMATION BY MANUFACTURING UNIT		
1)	Name of the Firm & Address	
2)	Address for correspondence	
	Telephone No.:	Office :
		Godown :
		Factory :
	Telephonic Address:	
		Telex No.:
		Fax:
3)	Constitution of the Firm:	Govt./ Semi-Govt./ Public Ltd./ Pvt. Ltd./ Proprietary / Partnership
4)	Name & Office / Residential	
	Address of Directors	
	Partners/ Proprietors	
	Tel. No.	
5)	Directorship/Partnership in other firms.	
6)	Name of Bankers & their Full address & Tel. No.	
7)	Details of registration with SSI/NSIC/ Central & State Govt. Authorities/ Electricity Boards/Reputed Public Ltd. & Pvt. Cos.	Please attach Xerox copies of the registration certificates
8)	Details of registration with various tax/Govt. duties authorities such as	Please attach Xerox copies of the registration certificate.
	a) MST/CST Registration No.	
	b) Excise Registration No.	
9)	Details as regards collaboration, if any.	

10)	Area of the	
	a) Factory Premises	Sq.mtr./Sq.ft.
	b) Godown/Store	Sq.mtr./Sq.ft.
	c) Office	Sq.mtr./Sq.ft.
11)	The details of Machinery Equipments installed in the factory	Please furnish a separate list with all details indicating their sizes, capacity etc
12)	a) Authorised capacity (Electric Load)	
	b) Capacity Allowed (Electric Load)	
13)	Persons on Roll	
	a) Engineering/Science Graduates/ Post Graduates	
	b) Diploma holders	
	c) ITI Qualified	
	d) Skilled	
	e) Semi-Skilled	
	f) Unskilled	
	g) Others	
14)	No. of Shifts	
15)	Items manufactured	Separate list may be attached.
16)	Do you have any expansion /diversion plans, if yes, furnish details.	
17)	Please furnish a list of source of raw materials/ sub-components And Quality assurance thereof	Separate list may be attached indicating particulars of raw materials / components source of purchase etc.
18)	Inspection of facilities/testing	List may be attached
	a) Equipments available	
	b) Do you have your own laboratory for testing raw materials/finalized Products.	
19)	Any R & D facilities available? If yes, please furnish details.	
20)	Names of the reputed customers such as O.E Manufacturers/Govt. & Semi-Govt. Organizations /State address of organization, Material Transport Undertakings/reputed Public & Pvt. Cos./Corpns.	List of orders executed during last3 years with full details viz. Name, quantity supplied & value of order must be attached.
21)	Whether the products have been test tested at Central Institute of Road Transport, Pune/Central Power Research Institute, Bangalore /Electronic Research Development Association Baroda OR at any other recognized institute/Lab.	Xerox copies of various recent certificates to be attached.
22)	In case of out-station firms, please furnish the name of the authorized distributors /agent available in Mumbai alongwith their address, telephone no. and their terms/conditions etc.	

23)	Other information -	
	a) Approx. Annual Turnover (Last two Financial years)	Certified copies of the same by Chartered Accountant must be attached.
	b) Delivery Facilities available	
	c) Please furnish latest Xerox copies of-	
	i) Rent Receipt/monthly compensation receipt.	
	ii) Electricity Bill	
	iii) Telephone Bill	
	iv) Income Tax Clearance Certificate/Advance Tax paid receipt.	
	v) Balance sheet/Annual report for last 2 Financial Years	
24)	Any additional information not covered above.	

Signature of Director /Partner /
Proprietor

Date : _____

Capitalization of Losses

i) The following formula shall be used to calculate the Capitalized Cost in Rupees of the Transformer Losses.

$$b = I (0.9337u) + C (0.3894u)$$

Where,

b = Capitalized Cost of losses in Rupees

I = Absolute value of No Load Loss quoted by manufacturer (in watts)

C = Absolute value of Full Load Loss quoted by manufacturer (in watts)

u = Average Power Purchase cost in paise/unit, 596 paise for the financial year 2012-13

ii) The evaluated rate of the transformer for the purpose of ranking shall be the sum of gross rate quoted by tenderer and capitalized cost (as calculated above) due to losses.

iii) The Maximum upper limit of losses for different ratings of AN type distribution transformers are as follows:-

Rating (in kVA)	Maximum No Load Loss (in Watts)	Maximum total Loss (in Watts) <i>=(no load losses+ full load losses)</i>
630	1350	5550
995	1750	8050
1600	2425	12425

The offers of tenderers quoting losses higher than the maximum limit given above will be overlooked.

MATCHING OF EVALUATED GROSS RATES

(Please note that this confirmation/acceptance should be sent through e-mail by sending a scanned copy of this annexure duly filled in by the tenderer as per Clause 2.2 of Schedule-V)

We hereby volunteer & confirm that we are agreeable to accept order at the lowest acceptable evaluated gross rate received against the tender for the following item. We also confirm that for this item, all other terms & conditions of our offer against above tender shall remain unchanged. After matching of rates, the breakup of our revised gross rates is as follows:

Item No.	Description	Revised Basic Rate	Taxes in %	Revised Gross Rate	Originally quoted capitalized cost	Evaluated Gross Rate of LAO informed by the Undertaking for matching purpose
		()	()	()	()	()
1	11kV/ 415V, 630 kVA, Single Ratio Dry type (AN) distribution Transformers					
2	11kV/ 415V, 995 kVA, Single Ratio Dry type (AN) distribution Transformers					
3	11kV/ 415V, 1600 kVA, Single Ratio Dry type (AN) distribution Transformers					

- N.B.:** i) The tenderers may please note that their revised Gross Rate plus Originally quoted Capitalized Cost shall not exceed the Lowest Evaluated Gross Rate informed by the Undertaking to you by e-mail as mentioned in the Clause 2.5 of Schedule-V.
- ii) The gross rate of tenderers who matched their rates with LAO shall be revised downwards and their new basic rates will be calculated by keeping the taxes, all charges etc. as well as the quoted losses remains same.

**SEAL & SIGNATURE OF THE
TENDERER**

ANNEXURE-H

SCHEDULE OF PERFORMANCE
(For a period of last 5 consecutive years)

Name of the Organization/Utility: _____

Order placed by - (Full address of Organization/ Utility)	Order No. & Date	Description and quantity of ordered 11kV/415V, 630kVA/995kVA/1600 kVA, Single Ratio Dry type (AN) Distribution Transformers	Value of Order	Date of completion of delivery		Remarks indicating reasons for late delivery, if any	Have the material been satisfactorily functioning? (Attach satisfactory performance certificate, if any from the Organization/ Utility)
				As per contract	Actual		

N. B.: The tenderers are requested to upload **the list of past customers and their** Purchase Order copies alongwith this Schedule of Performance.

SECURITY DEPOSIT-CUM-PERFORMANCE GUARANTEE FORM

INSTRUCTIONS:

- 1) The Bank Guarantee should be executed exactly as per this Draft on a stamp paper of **Rs.100/-** alongwith a Confirmatory Letter from the regional office of the Bank concerned in an enclosed format.
- 2) A certified copy of the Power of Attorney under which the person is authorized to sign this guarantee bond may please be sent to the Undertaking alongwith the guarantee. This copy should be certified by the Agent of the Bank under his seal.
- 3) The Security Deposit cum Performance Bank Guarantee shall be valid for a period of 84 months from the date of release of Purchase Order.

To,

The General Manager,
The Brihanmumbai Electric Supply & Transport Undertaking,
BEST Bhavan, Best Marg,
Post Box No. 192,
Mumbai- 400 001.

(1) Against Contract No. _____ dtd. _____ Two Thousand
and _____ covering _____ (hereinafter called the said "Contract")
entered _____ into _____ between

(Name/s of the persons authorized to sign on behalf of Contractor)

inhabitants of _____ carrying on business at:

(Full address of the firm)

(Nature of Business)

under the style and name of M/s. _____
(Name of the firm)
(hereinafter called "The Contractor") of the one part and the General Manager, The Brihanmumbai Electric Supply & Transport Undertaking (hereinafter called "The Undertaking") for and on behalf of the Mumbai Municipal Corporation for the purpose of the Undertaking (in which expression are included, unless the inclusion is inconsistent with the context or meaning thereof his successor or successors for the time being holding the office of the "General Manager and Acting General Manager") of the second part and WHEREAS at the request of the Contractor we _____ (Full name and address of the Bank)
Bank are holding in trust in favour of the Undertaking the amount of _____ (Rupees _____ in words) to indemnify and keep indemnified the Undertaking against all losses, damages, expenses or otherwise that may be caused to or suffered by the Undertaking by reason of any breach by the Contractor of any of the terms and conditions of the said Contract and/or the performance thereof. We agree that the decision of the General Manager, whether any breach of the terms and conditions of the said Contract and/or any failure in the performance thereof has been committed by the Contractor and the amount of loss, damage, costs, expenses or otherwise that has been caused or suffered by the Undertaking shall be final and binding on us and the amount of the said loss, damage, costs and expenses or otherwise shall be paid by us forthwith on demand to the Undertaking.

(2) We

(Name of the firm and Bank)

further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for satisfactory performance and fulfillment in all respects of the said Contract including the minimum guarantee of **24 months** from the date of final acceptance as per the clauses included in the tender and including Contractor's obligation to remedy all defects in design, materials and workmanship that may develop under normal use of **"33kV COPPER CONDUCTOR DRY CURE XLPE CABLE SIZE: 3Cx300 SQ.MM"** provided always that before the expiry of the date of the validity of the guarantee herein contained, we shall, from time to time on being called upon by the General Manager, extend the date of validity thereof for the period of **6 months** on each occasion and that if any claim accrues or arises against us -

(Name of the Bank)

by virtue of this guarantee before the said date as extended from time to time, the same shall be on forcible against us _____

(Name of the Bank)

notwithstanding the fact same is enforced after the said date and extended from time to time, provided that notice of any such claim has been given by the General Manager before the expiry of **6 months** from the said extended date, payments under this "Letter of Guarantee" shall be made promptly upon our receipt of notice to that effect from the General Manager.

- (3) It is fully understood that this guarantee is effective from the date of the said Contract and _____ that _____ we

(Name of the Bank)

undertake not to revoke this guarantee during its currency including the extended period without the consent in writing of the General Manager.

- (4) We _____

(Name of the Bank)

further agree that the General Manager shall have the fullest liberty, without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contractor to extend the time of performance by the Contractor from time to time or to postpone for any time or from time to time any of the power exercisable by the General Manager against the said Contractor and to forbear or enforce any of the terms and conditions relating to the said Contract and we _____

(Name of the Bank)

shall not be released from our liability under this guarantee by reason of any such variation or extension being granted to the said Contractor or for any forbearance and/or on the part of the General Manager or any indulgence by the General Manager or by any other matter or thing whatsoever which under the law relating to sureties would, but for this provision have the effect of so releasing us from our liability under this guarantee.

- (5) We _____

(Name of the Bank)

further agree that the guarantee herein contained shall not be affected by any change in the constitution of the said Contractor or the Bank.

(6) Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed ` _____ (Rupees _____).
2. The Bank Guarantee shall be valid upto _____ and the same can be further extended, if so requested by the applicant/Contractor.
3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if you serve upon us a written claim or demand on or before _____.

(7) The guarantee herein contained is subject to Mumbai Jurisdiction.

This _____ day of _____ Two Thousand and _____ In witness whereof-

Witness:

(1) _____
(Signature)

(Name of the witness)

(Address of the witness)

The Duly Constituted Attorney

(Signature)

(Name & Designation of the person)

For _____
(Name of the Bank)

(2) _____
(Signature)

(Name of the witness)

(Address of the witness)

(Name of the Contractor)

The Bank and the said Messrs.

Witness: _____

(Signature)

(Name of the witness)

(Address of the witness)

NAME OF THE BANK (ON THE BANK'S LETTER HEAD)

The General Manager,
The Brihanmumbai Electric Supply &
Transport Undertaking,
BEST Bhavan, Best Marg,
Post Box No. 192,
Mumbai - 400 001

Ref.: Guarantee No. _____ dated _____

For _____ issued on behalf of

M/s. _____

Dear Sir,

We refer to the captioned Bank Guarantee issued on behalf of our clients M/s.
_____, which is drawn at our _____ Bank.

The above Bank Guarantee has been given by our clients towards Security Deposit/Performance Guarantee for the execution of the contract with the B. E. S. & T. Undertaking.

In this regard, we assure and undertaking that in the event of any demand is made by you for invoking the said Bank Guarantee, the Bank will honour the commitment made by them and the payment will be made to you without any demur forthwith upon receipt of demand from your office as per the terms of the guarantee. We, once again, assure you that the interest of your organization under any circumstances will be fully protected by us.

Yours faithfully,

GENERAL MANAGER OF THE BANK

NAME OF THE BANK (ON THE BANK'S LETTER HEAD)

The General Manager,
The Brihanmumbai Electric Supply &
Transport Undertaking,
BEST Bhavan, Best Marg,
Post Box No. 192,
Mumbai - 400 001

Dear Sirs,

Ref: Bank Guarantee No. _____, dated _____
for _____ issued on behalf of _____

We confirm having executed the above guarantee bond in your favour on behalf of

(Designation/s) _____ who has/have signed the guarantee bond
is/are empowered to execute the guarantee bond on behalf of Bank and his/their signature/s
is/are binding on us.

Yours faithfully,

Seal of the Bank

(Name and Designation)

*C:\Users\MR.JAWALE\Desktop\New folder (3)\Specification no 01420214 and drawings of
Dry type transformer\Specification No. 01420214.doc 28.03.14*