



GUYANA POWER AND LIGHT INC.

SUPPLY OF POWER TRANSFORMERS

GPL-PD-048-2021

The Guyana Power & Light Inc. is committed to providing our customers with a quality electricity supply and a level of service that meets and exceeds the expectations of our customers. In an effort to continually improve our services, GPL is inviting bids from reputable companies, individuals and contractors for the **Supply of Power Transformers**.

The following must be clearly stated:

1. Copies of original documents defining the constitution or legal status, place of registration, principal place of business & Individual/Company TIN/VAT Certificate.
2. Valid National Insurance Certificate (NIS) and Guyana Revenue Authority Compliance Certificate along with VAT registration are required from all local service providers.
3. Information regarding any current litigation in which the service provider is involved, the parties' concerned and disputed amount.
4. Satisfactory evidence of the capability and adequacy of resources to execute the service efficiently and effectively.
5. Include rates/quotes with your submission.
6. Bids **MUST ONLY** be submitted electronically to GPL's Electronic Tender Box **gpltenderbox@gplinc.com** on or before **14:00 hrs. on Tuesday, October 12, 2021**.
7. Bids submitted to the electronic tender box beyond the deadline will be excluded from the evaluation process.
8. GPL reserves the right to reject bids if the above details are not stated.

Line	UOM	TX Size	TX Spec	Description of Item	Quantity	Estimated Foreign Cost	Estimated Cost G\$	NLL/W	LL/W
POLE MOUNTED TRANSFORMERS									
1	Each	75 KVA	13.8 KV; 120 / 240 V; 60 Hz	Pole Mount Transformer (TX) Single Phase	25				
2	Each	50 KVA	13.8 KV; 120 / 240 V; 60 Hz	Pole Mount Transformer (TX) Single Phase	50				
3	Each	15 KVA	13.8 KV; 120 / 240 V; 60 Hz	Pole Mount Transformer (TX) Single Phase	10				
4	Each	100 KVA	13.8 KV; 120 / 240 V; 60 Hz	Pole Mount Transformer	25				
				(TX) Single Phase					
5	Each	25 KVA	13.8 KV; 120 / 240 V; 60 Hz	Pole Mount Transformer (TX) Single Phase	35				
6	Each	167 KVA	13.8 KV; 120 / 240 V; 60 Hz	Pole Mount Transformer (TX) Single Phase	8				
7	Each	10 kVA	13.8 KV; 120 / 240 V; 60 Hz	Pole Mount Transformer (TX) Single Phase	5				
8	Each	50kVA	13.8 KV; 266/460 V; 60 Hz	Pole Mount Transformer (TX) Three Phase	4				
SUB TOTAL					162				
PAD MOUNTED TRANSFORMERS									

9	Each	200 KVA	13.8 KV; 127/220 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	3				
10	Each	200 KVA	13.8 KV; 254/440 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	3				
11	Each	300 KVA	13.8 KV;415 / 240 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	2				
12	Each	300 KVA	13.8 KV; 254/440 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	4				
13	Each	225 KVA	13.8 KV; 254/440 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	2				
14	Each	500 KVA	13.8KV; 277/480V; 60 HZ;	Pad Mount Transformer (TX) 3 Phase	2				

15	Each	500 KVA	13.8 KV; 254/440 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	3				
16	Each	500 KVA	13.8 KV; 127/220 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	2				
17	Each	750 KVA	13.8 KV; 127/220 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	2				
18	Each	750 KVA	13.8KV; 440/254; 60 HZ;	Pad Mount Transformer (TX) 3 Phase	2				

19	Each	1000 KVA	13.8 KV; 254/440 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	2				
20	Each	1000 KVA	13.8 KV; 127/220 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	2				
21	Each	1000 KVA	13.8KV; 277/480V; 60 HZ;	Pad Mount Transformer (TX) 3 Phase	2				
22	Each	112.5 KVA	13.8 KV; 220/127V; 60Hz	Pad Mount Transformer (TX) 3 Phase	3				
23	Each	112.5 KVA	13.8 KV; 254/440 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	3				
24	Each	150 KVA	13.8 KV; 220/127V; 60Hz	Pad Mount Transformer (TX) 3 Phase	2				
25	Each	150 KVA	13.8 KV; 254/440 V; 60 Hz;	Pad Mount Transformer (TX) 3 Phase	3				
SUB TOTAL					42				
TOTAL					204				



Technical Specifications

Transformers

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1. SCOPE

This specification covers the design, engineering, manufacture, testing, supply and performance requirements of single phase pole mounted distribution transformers for use in the primary distribution networks of Guyana.

2. APPLICABLE STANDARDS

Except where modified by this specification, the transformers shall be designed, manufactured and tested in accordance with the latest editions of the following standards (Table 1). The Proponent may propose alternative standards, but shall demonstrate that they give a degree of quality and performance equivalent to or better than the referenced standards herein.

Acceptability of an alternative standard is at the discretion of the Purchaser.

The Proponent shall furnish a copy of the alternative standard proposed along with the bid. If the alternative standard is not written in the English Language, a certified English Language translated version of the original standard shall be submitted with the bid.

Table 1: Applicable Standards

Item No.	ANSI/IEC Standards	Title
1	ANSI C57.12.20	Standard For Overhead Type Distribution Transformers, 500 kVA and Smaller: High Voltage, 34500 Volts and Below; Low Voltage, 7970/13800Y Volts and Below
2	IEEE C57.12.31	Pole Mounted Equipment—Enclosure Integrity
3	IEEE C57.12.00	General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
4	ANSI/IEEE C57.92	Guide for Loading Mineral-oil-immersed Power Transformers
5	IEEE C57.12.90	Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers Corrigendum 1: Editorial and Technical Corrections
6	IEEE C57.12.70	Standard Terminal Markings and Connections for Distribution and Power Transformers
7	IEEE Std 519-2014	Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
8	NEMA TR1	Transformers, Regulators, and Reactors
9	IEC 60076-10	Power transformers - Part 10: Determination of sound levels

10	IEC 60296	Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear
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In case of conflict, the order of precedence shall be:

- This Technical Specification for Single Phase Distribution Transformers;
- Other Applicable and Recognised Standards for pole mounted distribution transformers.

3. INSTALLATION/SERVICE CONDITIONS

The installation conditions of the transformers shall be as follows:

1. Maximum altitude above mean sea level less than 1,000 m;
2. Maximum ambient air temperature 40°C;
3. Maximum daily average ambient air temperature 30°C;
4. Minimum ambient temperature 15°C; and
5. Maximum relative humidity 100%.

All outdoor materials, components and equipment shall be designed and protected for use in exposed, heavily polluted and salty, corrosive and humid tropical coastal atmospheric conditions.

4. ELECTRICAL SYSTEM CONDITIONS

The transformer shall be suitable to be installed in GPL's primary distribution system, which has the following characteristics (Table 2).

Table 2: Characteristics of GPL's Primary Distribution System

Nominal System Voltage, Frequency and Phase	High Voltage (HV) Side	13.8 kV, 60 Hz, 1φ-2-wire
	Low Voltage (LV) Side	120/240 V, 60 Hz, 1φ-3 wire
Voltage Class	15 kV	
Short circuit withstand Capability	As per IEEE C57.12.00, section 7.1.3	
Insulation Level		
Basic Insulation Level (BIL)	As per IEEE C57.12.00, Table 4	
Power Frequency withstand level – Dry 1 Minute	As per ANSI C57.12.00, Table 10	

Power Frequency withstand level – Wet 10 Seconds		
System Grounding		
Neutral Grounding	High Side	Primary distribution feeders from Distribution Substations are three phase delta and are grounded by a zigzag transformer. Primary distribution feeders emanating from generator buses are wye and are grounded by the power plant neutral grounding system.
	Low Side	Solidly grounded.

NB: The Low Side (Low Voltage - LV) can also be 240V, 3φ using three (3) transformers in a three-phase delta bank configuration or 208 V, 3φ in a wye configuration. The aforementioned 3φ transformer banks can also be open delta or open wye.

5. TYPE OF TRANSFORMER

The transformers shall be double wound, sealed type, oil immersed with natural oil and aircooling (ONAN), single phase (1φ) with ratings as specified herein.

The polarity of all transformers shall be subtractive and shall be clearly indicated on the tank of the transformers.

The transformers are required to be equipped with two (2) HV and four (4) LV bushing terminations and shall be suitable for pole mounting.

The four (4) LV bushings shall be provided with the transformer, and both legs/terminals of each secondary winding shall be brought out to the LV bushings, such that, the secondary windings can be paralleled externally to the tank, as required by the Purchaser. This will permit the transformer to be loaded at 120 V and at the full rating of each winding and will allow connection in for 120/208 V three-phase configuration.

The design of the tank, fittings, bushings, etc., shall be such that it will not be necessary to keep the transformer energised to prevent deterioration as the transformers may be held in reserve and outdoors conditions for many years.

All transformers shall be equipped with a pair of lighting arrestor, with each arrestor electrically connected to each HV bushings and mechanically secured onto the tank.

6. RATINGS

This specification covers the following single-phase transformers:

5 kVA, 10 kVA, 15 kVA, 25 kVA, 37.5 kVA, 50 kVA, 75 kVA, 100 kVA, and 167 kVA

All transformers shall be rated in accordance with ANSI C57.12.20, section 3.

All transformers, inclusive of tap changer and other current carrying components, shall accept emergency overloading as per ANSI/IEEE C57.92, section 4.

7. TAPS AND VOLTAGE REGULATION

Transformers shall have the following voltage transformation ratio and tapping range:

- the nominal primary voltage for single phase transformers shall be 13.8 kV and the secondary voltage shall be 120 V per winding, where the secondary shall have two (2) 120 V windings with subtractive polarity;
- tolerance on the voltage ratio shall be in accordance with IEEE C57.12.00, section 9.1;
- taps shall be provided in the high voltage winding (13.8 kV side), with steps of two (2) 2.5% taps above and below the primary voltage rating (13.8 kV); and
- The bidder shall state in the technical schedule, the percentage regulation at full load, power factor 1.0 and at full load power factor 0.8 lagging. The primary and secondary voltage variation shall be based on a winding temperature of 85°C.

8. PARALLELLING AND THREE PHASE BANKS

Transformers of different ratings shall be suitable for parallel operation with each other.

Transformers of the same and different ratings shall be suitable for operating as a three-phase bank connected in Delta-Wye, Delta-Delta, Open Wye and Open Delta.

Both legs of the secondary windings shall be brought out to LV bushings so that the secondary windings can be paralleled externally to the tank when required to give 120 V at the full rating of the transformer.

9. OVERCURRENT PROTECTION

Transformers up to and including the rating of 167 kVA shall be equipped with an internally mounted low-voltage circuit breaker and high voltage protection fuse links.

The operation of the LV breaker and HV protection fuse links shall be coordinated such that any short circuit and/or overloading on the secondary side of the transformer will first trip the LV breaker before the HV protective links operate, taking the load off the transformer before the core and/or coil is/are thermally and/or mechanically damaged.

The operation of the protection devices mentioned above shall be indicated externally on the tank, and the circuit breaker shall be made to be externally controlled, by a suitable switch mounted on the tank, using a linesman's hot stick.

The characteristics of the protection devices shall allow for full usage of the transformer's continuous rating and short-time overload capabilities for emergency loading condition (150% of nominal kVA rating).

The Proponent shall submit the characteristic curves of the internal protection devices with the bid. The characteristic curves shall also include the transformers' through-fault withstand capability curves or transformer damage curves.

10. IMPEDANCE

The guaranteed minimum value of impedance measured at 85°C, on the nominal tap and at the rated voltage of the transformer shall be:

- Between 1.2% and 1.3% for 5 kVA to 10 kVA; and
- Between 1.2 % and 2.5% for transformers between 15 kVA to 75 kVA; and □
Between 1.3 % and 2.5 % for transformers from 100 kVA to 167 kVA.

Tolerance for transformers' impedances shall be in accordance with IEEE C57.12.00, section 9.2, for impedance less than 2.5%.

11. SHORT CIRCUIT RATINGS

Bidders must submit all short circuit test results for compliance with IEEE C57.12.00, section 7.1.3.

12. LOSSES

The acceptable range for iron (or core) and copper losses of the transformers at 65 °C are as follows -

Rating (kVA)	Acceptable Transformer Losses					
	No Load	Load	Total	% of No-Load	% of Load	% of Total
	Losses (W)	Losses (W)	Losses (W)	Losses to Rated kVA	Losses to Rated kVA	Losses to Rated kVA
5	19	75	94	0.38%	1.50%	1.88%
10	36	120	156	0.36%	1.20%	1.56%
15	50	195	245	0.33%	1.30%	1.63%
25	80	290	370	0.32%	1.16%	1.48%
37.5	105	360	465	0.28%	0.96%	1.24%
50	135	500	635	0.27%	1.00%	1.27%
75	190	650	840	0.25%	0.87%	1.12%
100	210	580	790	0.21%	0.85%	1.06%
167	350	1410	1760	0.21%	0.84%	1.05%

Proponents shall guarantee that each loss component, as mentioned above, should be not exceed by 10% for No-load loss and 6 % for total transformer losses at full load (IEEE C27.12.00, section 9.3).

The losses proposed by the Bidders shall be measured during routine tests. If the results from the routine tests indicate that either the copper or iron loss is more significant than the proponents' guaranteed values, the Purchaser shall have the right to reject the transformer(s). Accuracies required for measuring losses shall be in accordance with IEEE C57.12.00, section 9.4.

The capitalization of guaranteed losses of the transformer shall be calculated and considered while evaluating the bids as the final bid price. The guaranteed values of no-load losses and load losses shall be stated in the bid, which should match the corresponding loss figures mentioned in the short circuit type test report submitted along with the offer by the bidder. Liquidated damages will be applied to successful bidder for not achieving the quoted guaranteed figures.

The Total Ownership Cost formula is as follow:

$TOC = \text{Bid Price} + [(A \times NLL) + (B \times LL)]$ Where:

1. TOC is the Total Owning Cost in US\$
2. Bid Price in US\$
3. A is the No Load-Loss Factor = 14.82 US\$/W
4. B is the Load-Loss Factor = 3.63 US\$/W
5. NNL is the No-Load Loss in W
6. LL is the Load Loss in W

13. FLUX DENSITY

The flux density at any point of the magnetic circuit, core and winding, when the transformer is connected on the centre tap and operating at normal voltage and frequency, shall be stated in the bid and shall not exceed 1.7 Tesla. The transformer must be capable of operating at 10% overvoltage at 97% of rated frequency without resulting in magnetic saturation of the transformer's core or the flux density exceeding 1.9 Tesla.

14. NOISE LEVEL

The acceptable audible sound levels for all transformers shall comply with NEMA TR1, table 0-3.

Bidders shall confirm procedure for noise level measurement according to IEC 60076-10 or IEEE C57.12.90 and submit audible sound levels test results with the bid document.

15. RADIO INFLUENCE VOLTAGE

Radio influence voltage of all transformers, contained herein, shall comply with NEMA TRI, section 0.03.1.

16. TAP CHANGING CHARACTERISTICS

Tap positions shall be numbered as shown in Table 6 and in accordance with ANSI C57.12.20, section 6.2.1 and be made to operate externally to the tank.

Table 3: Transformer tap positions

Tap 1	+5%
Tap 2	+ 2.5%
Tap 3	0%(Principal Tap)
Tap 4	-2.5%
Tap 5	- 5.0 %

The operating handle shall have provision for padlocking and shall give a visual indication of the tap position without unlocking.

Each tap-changer position and the tap voltage or percentage associated with voltage shall be identifiable by reference to nameplate information. All positions of the tap changer shall be operative positions.

Tap changer handles shall be fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.

17. CORE AND WINDINGS

The core and windings shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum, the windings will be energized to heat the coils and drive out moisture, and the transformer will be filled with preheated filtered degassed insulating fluid.

The core and winding shall be capable of withstanding mechanical shocks during transport, installation and servicing.

17.1 CORE

The core shall be manufactured from burr-free, grain-oriented silicon steel laminations and shall be precisely stacked to eliminate gaps in the corner joints.

Provision to the design and construction of the transformer shall be made to prevent movement of the core and windings, relative to the tank, during transport, installation and short-circuits.

The design shall avoid the presence of pockets, which can prevent complete emptying of the oil in the tank through its drain plug.

17.2 WINDINGS

The winding conductor shall be of electrolytic copper or aluminium, to give the optimum economic and technical results of the transformers.

The windings shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper, and shall be free from any other insulating compounds that are liable to soften, ooze out, shrink or collapse, and non-catalytic and chemically inert in the transformer oil during normal servicing. The windings shall be uniformly insulated, and the LV neutral points shall be insulated for full line-to-line voltage.

The stacks of windings shall receive adequate shrinkage treatment, and the windings and connections are to be braced to withstand mechanical shocks during transport, switching, shortcircuit or other transient conditions.

18. BUSHINGS AND TERMINATIONS

18.1 Bushings

Bushings shall be of the outdoor type and easily replaceable. Porcelain bushings are required. The bushings shall be sufficiently robust (mechanically) to withstand normal transport and erection hazards.

All bushings shall have a minimum creepage distance of 25 mm/kV for maximum phase-to-phase system voltage, and shall have a continuous rating of 200 % of the transformer capacity rating.

High Voltage and Low Voltage bushings shall be sized in accordance with the applicable ANSI/IEEE and/or IEC standards such as ANSI C57-12.20 clause 6.1, and with the following characteristics:

- High voltage bushings shall have tinned bronze eyebolt type connectors.
- LV terminals shall be bi-metallic clamp type.

Approximately 10% of the transformer to be supplied may be with LV terminals protected with armoured anti-theft features, and is specifically meant for use in areas with high level of theft.

18.2 Bushing Labels

HV bushings shall be labelled H₁ and H₂.

LV bushings shall be labelled X₁ to X₄ in accordance with IEEE C57.12.70 standards.

Marking letters shall be at least 12 mm (or 1/2 inch) high. The means of marking shall conform to the requirements of the section on Labels in this specification (31) for further details.

18.3 EARTHING TERMINALS

All transformers shall be provided with two earthing/grounding terminals comprising an M12 isometric bolt and nut, which shall be non-ferrous material but not plastic. It shall include a spring washer and a lock washer.

External connecting strip(s) between earthing/grounding terminal and neutral bushing(s) **is/are** required.

18.4 LIGHTNING ARRESTORS – HV SIDE OF TRANSFORMER

The lightning arrestors shall be capable of discharging lightning and switching surges and temporary power frequency over voltages, and shall be capable of discharging over voltages occurring during switching of unloaded transformers and long lines.

The Arrestors shall be capable of withstanding Maximum Continuous Operating Voltages (M.C.O.V) and rate for operation in 15 kV class distribution system. The reference current of the arrestors shall be of such value to eliminate the influence of grading and stray capacitance on the measured reference voltages.

These arrestors shall be of Heavy Duty, Station Class / Distribution Class and Gapless Zinc Oxide type and shall be hermetically sealed units suitable for outdoor installation and mounting on distribution transformers. Additionally, the arrestors shall be suitable for heavily polluted atmospheric conditions as mentioned in section 3.

19. TANK FABRICATION

The tank shall be of sealed construction and fabricated using materials to withstand internal pressures as per ANSI C57.12.20, section 7.2.6.1. The Proponent shall state if other than bolted cover construction is used, and shall give full details of such construction.

The interior of the tank shall be sealed to comply with ANSI C57.12.20, section 6.4.2.

The Proponent shall state the top oil temperature that corresponds to the tank's internal pressure of 15 psi and steady load at rated capacity and emergency loading condition while considering an ambient temperature of 40°C.

Adequate space shall be provided at the bottom of the tank for collection of sediments.

Transformer tanks shall be designed to allow the unit to be lifted and transported with the weight of the transformer and oil at the required level, without permanent deformation or oil leakages. Lifting provisions shall consist of two lifting brackets welded to opposite sides of the tank.

The tank shall be fabricated of mild steel with a minimum thickness of 3 mm. Top and bottom covers of the tank shall have a minimum thickness of 5 mm. Thickness below this value will be considered only in exceptional cases with a written guarantee and/or warranty from the Proponent and must be submitted along with the bid.

The transformer tank and the top cover shall be designed to conform with IEEE C57.12.31.

All sealing washers/gaskets shall be made of oil and heat resistant nitrile rubber or neoprene bonded cork seals suitable for temperatures as stipulated in this specification. Surfaces, where joints have gaskets, shall be, such that, an even surface is presented to the gasket, thereby eliminating the necessity for the gasket to take up surface irregularities.

All pipes, radiators, stiffeners, or corrugations, which are welded to the tank wall, shall be welded externally and shall be double welded wherever possible. All welds shall be stress relieved.

19.1 Pressure Relief Device

The pressure relief valve specified in the standard shall be operable manually by hotstick and with venting and sealing characteristics that comply with ANSI C57.12.20, section 6.2.5.1. Proponents shall submit all test results of the pressure relief device with the bid document.

19.2 Oil Level Indication

The oil level marker shall be comply with ANSI C57.12.20, sections 6.2.1, 6.2.3 and 6.2.5.1.

20. FITTINGS

The following standard fittings shall be provided:

- rating, diagram and terminal marking plate;
- tank grounding terminal;
- lifting lugs;
- manual pressure relief device; and □ drain/sampling valve with plug.

The fittings and accessories listed above are only indicative and any other fittings and accessories according to the applicable standards herein shall be provided for the transformers.

21. TRANSFORMER OIL

The transformers shall be supplied with Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1.

The dielectric strength of the oil shall not be less than 40 kV.

22. RATING AND CONNECTION PLATE

Each transformer shall be provided with anodized aluminium laser engraved nameplate, in accordance with IEEE C57.12, Table 9 - Nameplate C. Additionally, Proponents shall ensure that the following attributes are indicated on the aforementioned nameplate:

- standard to which it is manufactured and tested;
- identification of internal short-circuit and overload protection devices;
- type of cooling (ONAN);
- rated currents in A;
- chopped wave (short time) impulse voltage withstand level in kV;
- power frequency withstand voltage in kV;
- percentage impedance at 85⁰C;

- load loss in kW at rated current;
- no-load loss in kW at rated voltage and frequency;
- continuous ambient temperature at which ratings apply in °C (40);
- top oil and winding temperature rise at rated load in °C;
- winding connection diagram;
- total mass (core, windings and oil) in kg;
- mass of core and windings in kg;
- volume of oil in litres;
- Oil with less than 2ppm of PCB; and
- name of the purchaser (Property of Guyana Power & Light Inc.)

The nameplate shall meet Nameplate B per ANSI C57.12.00 and conform to the requirements of the section on Labels (31) in this specification.

23. MOUNTING ARRANGEMENT

The tank shall include an upper and lower support lug for direct pole mounting in accordance with ANSI C57.12.20 Type B or equivalent.

24. SURFACE TREATMENT

The transformer tank and all accessories shall be treated in accordance with IEEE C57.12.31 to ensure enclosure and equipment integrity. The transformer shall have a grey color finish.

25. SUPPRESSION OF HARMONICS

Each transformer's core shall be designed with attention to the suppression of harmonic voltages and currents, as per IEEE Std 519-2014 in Table 1 for bus voltage between 1 kV and 69 kV and Table 2 for current distortion limits for systems rated 120 V through 69 kV.

Proponents shall submit results for harmonic suppression tests for voltage and current distortions.

26. TESTS

In addition to the routine tests required in IEEE C57.12.00, as per section 8 and Table 18, the following additional tests shall be carried out on all transformers. The following routine measurements and tests shall be carried out and results shall be submitted to the Purchaser upon delivery:

- a) Measurement of winding resistance at the nominal and extreme tap positions for each transformer provided;
- b) Measurement of impedance;
- c) Measurement of no-load loss and no-load currents at full, 90% and 110% voltages;
- d) Induced overvoltage withstand test;

- e) Separate source voltage withstand tests on HV and LV windings;
- f) Magnetic balance test;
- g) Polarization Index Test. The index shall be not less than 1.5;
- h) Oil leakage test: The criterion of leakage shall be discolouration by oil of whitewash applied externally to suspected parts at an oil temperature of 90⁰C or other method approved by the Purchaser;
- i) Bushings and oil shall be subject to the following routine tests.
 - a. bushing routine tests
 - b. oil dielectric and moisture content test.

Routine test certificates shall include in addition to the test results, the Purchaser's order number, the transformers' serial numbers, outline drawing number and transformer kVA rating.

Upon acceptance of Tender, the Manufacturer/Proponent shall provide results of standard design type tests required in Table 18 of IEEE C57.12.00.

27. COMPLIANCE WITH SPECIFICATION

The transformers shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of tendering in the Non-Compliance Schedule in this document (see page 78).

28. COMPLIANCE WITH REGULATIONS

All the transformers/equipment shall comply in all respects with the Laws of Guyana Governing the Importation of Commercial Items and/or Goods.

The equipment and connections shall be designed and arranged to minimize the risk of fire and any damage that might be caused in the event of a fire.

29. QUALITY ASSURANCE, INSPECTION AND TESTING

29.1 General

To ensure that the supply and services are in accordance with the Specification herein, with the regulations of Guyana and with relevant authorized international standards, the Proponent shall have in place suitable Quality Assurance Programmes and Procedures to ensure that all activities are being controlled and documented as necessary.

The quality assurance arrangements shall conform to the relevant requirements of ISO 9001 or ISO 9002, as deemed appropriate by the Purchaser and the Proponent.

The systems and procedures that the Proponent will use to ensure that the supply complies with the specified requirements, shall be defined in the Proponent's Quality Plan.

The Proponent shall operate systems that implement the following:

Hold Point “A stage in the material procurement or workmanship process beyond which work shall not proceed without the documented approval of designated individuals or organisations.”

The Purchaser's written approval is required to authorise work to progress beyond the Hold Points indicated in approved Quality Plans.

Notification Point “A stage in material procurement or workmanship process for which advance notice of the activity is required to facilitate witness.”

If the Purchaser's representative does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

29.2 Quality Assurance System

Unless the Proponent's Quality Assurance System has been audited and approved by the Purchaser, a Quality Assurance System shall be submitted to the Purchaser for approval within a minimum of One (1) month from the placement of order, or such other period as shall be agreed with the Purchaser. The Quality Assurance System shall provide a description of the Quality Control System for the supply and shall, unless advised otherwise, shall include, but not limited to the following details:

1. The structure of the organisation;
2. The duties and responsibilities assigned to staff to ensure quality of work;
3. The system for purchasing, taking delivery and verification of the specifications of raw materials;
4. The system for ensuring the quality of workmanship
5. The system for control of documentation;
6. The system for the retention of records; and
7. The arrangement for the Proponent's internal auditing.

29.3 Quality Plans

The Quality Plans shall set out the activities in a logical sequence and, unless advised otherwise, shall include, but limited to the following:

1. An outline of the proposed programme sequence;
2. The duties and responsibilities assigned to staff ensuring the quality of work;
3. Hold and notification points;
4. Submission of engineering documents required by the specification;
5. The inspection of materials and components on receipt;
6. Reference to the Supplier's procedures appropriate to each activity;

7. Inspection during fabrication and assembly; and
8. Final inspection and test.

29.4 Inspection and Testing

The Purchaser shall have free entry at all times, while work on the order is being performed, to all parts of the manufacturer's working area which are in relation to the processing of the transformers ordered. The Manufacturer/Proponent shall afford the Purchaser without charge, all reasonable facilities to assure that the transformers being furnished are in accordance with the specifications herein.

The equipment shall have successfully passed all tests as described in Section 26.

The Purchaser reserves the right to reject an item of the transformer if the test results do not comply with the values specified herein.

Tests, including any retests required, shall be carried out by the Supplier at no extra charge, at the manufacturer's works.

Full details of the proposed methods of testing, including connection diagrams, shall be submitted to the Purchaser by the Supplier for approval, at least one month before testing.

All costs in connection with the testing, including any necessary re-testing, shall be borne by the Manufacturer/Proponent.

Any cost incurred by the Purchaser in connection with inspection and re-testing as a result of the failure of the transformer or any of its components under test or damage during transport or offloading shall be to the account of the Proponent.

The Proponent shall submit to the Purchaser three signed copies of the test certificates, giving the results of the tests as required. No materials shall be dispatched until the test certificates have been received by the Purchaser and the Proponent has been informed that they are acceptable.

The test certificates must show the actual values obtained from the tests, in the units used in this specification, and **not** merely confirm that the requirements have been met.

No inspection or lack of inspection or approval by the Purchaser's Representative of equipment or materials whether supplied by the Proponent or a Sub-Proponent, shall relieve the Proponent from his/her liability to complete the contracted works in accordance with the contract would exonerate him/her from any of his/her guarantees.

29.5 Guarantee

The Proponent shall guarantee the following:

- Quality and strength of materials used;
- Satisfactory operation during the guarantee period of one (1) year from the date of commissioning, or 18 months from the date of acceptance of the equipment by the

Purchaser following delivery, whichever is the earlier. The Purchaser shall advise the Proponent of the date of commissioning;

- Performance figures as supplied by the Proponent in the Technical Data Schedule, the guaranteed copper and iron losses and other particulars;
- The offered surface treatment shall protect the treated metal from corrosion for a period of not less than ten (10) years from the date of delivery.

30. SPARE PARTS AND SPECIAL TOOLS

The Proponent shall provide a list of recommended spare parts and their individual prices and shall include HV and LV bushings and bi-metallic connectors for HV and LV bushings. This list shall identify all essential spares and consumable items for any recommended maintenance for a period of five (5) years after commissioning.

The Purchaser may order all or any of the spares parts listed at the time of placement of order.

A spare parts catalogue with price list shall be provided and this shall form part of the drawings and literature to be supplied with the bid.

The Proponent shall give an assurance that spare parts and consumables will continue to be available through the life span of the equipment/transformers, which shall be 25 years minimum. However, the Proponent shall give a minimum of 12 months notice to the Purchaser, in the event that the Proponent or any Sub-supplier, plan to discontinue manufacturing of any component used in the transformers.

Any spare apparatus, parts or tools shall be subjected to the same specification herein, tests and conditions as similar main material supplied. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the transformer and must be suitably marked and numbered for identification.

Spare parts shall be delivered suitably packaged and treated for long periods in storage. Each package shall be clearly and indelibly marked with its contents, including a designation number corresponding to the spare parts lists in the operation and maintenance instructions.

31. LABELS

All apparatus shall be clearly labelled indicating, where necessary, its purpose and service positions.

The material of all labels and plates, their dimensions, legend and the method of printing shall be subject to the approval of the Purchaser.

Colours shall be permanent and free from fading. All labels and plates for outdoor use shall be of non-corrosive material.

They shall be engraved in English. Nameplates shall carry all the applicable information specified in the applicable items of the Standards and other details as required in this specification. No scratching, corrections or changes will be allowed on nameplates.

Wherever possible the equipment shall carry the markings **"THIS EQUIPMENT IS PROPERTY OF GPL Inc."**.

32. SUBMITTALS REQUIRED WITH THE BID

The following shall be required in duplicate of three (3) copies:

1. completed technical data schedule for each type and rating of the transformer;
2. descriptive literature giving full technical details of equipment offered;
3. Outline dimension drawings for each major component, general arrangement drawing showing component layout and general schematic diagrams;
4. type test certificates, where available, and sample routine test reports for each type and rating of the transformer;
5. summary reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating;
6. details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification;
7. deviations from this specification. Only deviations approved in writing before placement of order shall be accepted; and
8. list of recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements.

33. NON-COMPLIANCE SCHEDULE

On this schedule, the Proponent shall provide a list of non-compliance with this specification, documenting the effects that such non-compliance is likely to have on the transformer/equipment/component life span and operating characteristics. Each noncompliance shall be referred to the relevant specification clause.

Clause No.

Non-Compliance

34.TEST CERTIFICATE SCHEDULE

On this schedule, a list of the test certificates shall be included with the bid. This list shall include the certificates for the type tests and sample routine test reports. Each certificate listed shall be referred to the relevant specification clause.

Clause No.	Type Test Certificate or Routine Test Report
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35.SHIPPING

The Manufacturer/Proponent shall prepare the transformers for shipping in such a manner as to protect from them from damage or deterioration during shipping and storage, and shall be responsible for, and make good, any and all damage due to improper preparation for loading, shipment and storage.

All transformers shall be shipped on open sided trucks or trailers, in such a manner as to facilitate off-loading, handling and storage.

The transformers shall be shipped securely banded with a steel strap or approved synthetic strap to a pallet. The pallet shall be constructed to accept two fixed 195 mm forks spaced either 65mm or 320 mm apart. At least 90 mm clearance shall be provided under each transformer pallet and the bottom of the pallet must not be fully covered in order to facilitate the use of pallet jacks.

36. TECHNICAL SCHEDULE

Below is a sample of the Technical Schedule that is applied to each transformer separately. Proponents must complete this schedule for each transformer to be considered for evaluation. Failure to complete this schedule will result in bid disqualification.

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVA - ONAN Rated)	kVA	10	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	
7	Suitable for parallel operation with transformers of different rating.	YES/NO	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/NO	YES	
9	A list of recommended spare parts and their individual prices is provided.	YES/NO	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/NO	YES	
Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	
13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/NO	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/NO	YES	
19	LV terminals have bi-metallic clamp	YES/NO	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/NO	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	
22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	
27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	

28	Can the tap changer switch be Locked	YES/NO	YES	
29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	
30	Tap changer catalogue details attached	YES/NO	YES	
Overcurrent Protection				
31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	
36	Characteristic curves of protective devices are submitted	YES/NO	YES	
Impedance & Short Circuit Rating				
37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.2% to 1.3 % ± 10%	
38	Rated Short-circuit withstand Current	kA	40pu x In	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.1 to 1.4	
Losses				
41	No Load Current	A	(1% to 2%) x In	
42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 36	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 120	
Flux Density				
44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	
Coils & Windings				
46	The core and windings are vacuum processed.	YES/NO	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/NO	YES	
48	The core is manufactured from burr-free, grain-oriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/NO	YES	
49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/NO	YES	
50	Conductor for HV winding - Manufacturer/Supplier			

51	Type of Winding material on HV Side		Copper	
52	Conductor for LV winding - Manufacturer/Supplier			
53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and easily replaceable	
55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lighting arrestor electrically connected to each HV bushing and mechanically secured onto the tank.	YES/NO	YES	
60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x In of transformer	
64	Current rating LV Bushing	A	2 x In of transformer	
65	HV Bushing BIL	kV	95	
66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	
75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	
Transformer Oil				
77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	
Overloading				

79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	
Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	
84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			
	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				
89	Rating, diagram, and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				
94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot-stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		

106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

Name:.....

.....

Signature:.....

Date:.....

Affix

Company

Seal Below

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVAn - ONAN Rated)	kVA	15	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	
7	Suitable for parallel operation with transformers of different rating.	YES/NO	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/NO	YES	
9	A list of recommended spare parts and their individual prices is provided.	YES/NO	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/NO	YES	
Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	

13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/NO	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/NO	YES	
19	LV terminals have bi-metallic clamp	YES/NO	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/NO	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	
22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	
27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	
28	Can the tap changer switch be Locked	YES/NO	YES	

29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	
30	Tap changer catalogue details attached	YES/NO	YES	
Overcurrent Protection				
31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	
36	Characteristic curves of protective devices are submitted	YES/NO	YES	
Impedance & Short Circuit Rating				
37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.2% to 2.5 % ± 10%	
38	Rated Short-circuit withstand Current	kA	40pu x In	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.1 to 1.6	
Losses				
41	No Load Current	A	(1% to 2%) x In	

42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 50	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 195	
Flux Density				
44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	
Coils & Windings				
46	The core and windings are be vacuum processed.	YES/NO	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/NO	YES	
48	The core is manufactured from burr-free, grainoriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/NO	YES	
49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/NO	YES	
50	Conductor for HV winding - Manufacturer/Supplier			
51	Type of Winding material on HV Side		Copper	

52	Conductor for LV winding - Manufacturer/Supplier			
53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and easily replaceable	
55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lightning arrester electrically connected to each HV bushing and mechanically secured onto the tank.	YES/NO	YES	
60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x In of transformer	
64	Current rating LV Bushing	A	2 x In of transformer	
65	HV Bushing BIL	kV	95	

66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	
75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	
Transformer Oil				
77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	
Overloading				
79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	
Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	
84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			
	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				

89	Rating, diagram and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				
94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		
106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

Affix Company

Name:.....

Seal Below

Signature:.....

Date:.....

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVA _n - ONAN Rated)	kVA	25	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	

7	Suitable for parallel operation with transformers of different rating.	YES/NO	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/NO	YES	
9	A list of recommended spare parts and their individual prices is provided.	YES/NO	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/NO	YES	
Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	
13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/NO	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/NO	YES	
19	LV terminals have bi-metallic clamp	YES/NO	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/NO	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	
22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	
27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	
28	Can the tap changer switch be Locked	YES/NO	YES	
29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	
30	Tap changer catalogue details attached	YES/NO	YES	
Overcurrent Protection				
31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	

36	Characteristic curves of protective devices are submitted	YES/NO	YES	
Impedance & Short Circuit Rating				
37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.2% to 2.5 % ± 10%	
38	Rated Short-circuit withstand Current	kA	40pu x In	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.1 to 1.8	
Losses				
41	No Load Current	A	(1% to 2%) x In	
42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 80	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 290	
Flux Density				
44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	
Coils & Windings				
46	The core and windings are to be vacuum processed.	YES/NO	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/NO	YES	
48	The core is manufactured from burr-free, grainoriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/NO	YES	
49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/NO	YES	
50	Conductor for HV winding - Manufacturer/Supplier			
51	Type of Winding material on HV Side		Copper	
52	Conductor for LV winding - Manufacturer/Supplier			
53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and easily replaceable	
55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lightning arrester electrically connected to each HV bushing and mechanically secured onto the tank.	YES/NO	YES	

60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x In of transformer	
64	Current rating LV Bushing	A	2 x In of transformer	
65	HV Bushing BIL	kV	95	
66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	
75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	
Transformer Oil				
77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	
Overloading				
79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	
Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	
84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			
	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	

	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				
89	Rating, diagram and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				
94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		
106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

Affix Company Seal

Name:.....

Below

Signature:.....

Date:.....

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVA _n - ONAN Rated)	kVA	37.5	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	
7	Suitable for parallel operation with transformers of different rating.	YES/NO	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/NO	YES	
9	A list of recommended spare parts and their individual prices is provided.	YES/NO	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/NO	YES	
Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	
13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/NO	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/NO	YES	
19	LV terminals have bi-metallic clamp	YES/NO	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/NO	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	
22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	
27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	
28	Can the tap changer switch be Locked	YES/NO	YES	
29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	

30	Tap changer catalogue details attached	YES/NO	YES	
Overcurrent Protection				
31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	
36	Characteristic curves of protective devices are submitted	YES/NO	YES	
Impedance & Short Circuit Rating				
37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.2% to 2.5 % ± 10%	
38	Rated Short-circuit withstand Current	kA	35 pu x I _n	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.4 to 1.5	
Losses				
41	No Load Current	A	(1% to 2%) x I _n	
42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 135	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 500	
Flux Density				
44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	
Coils & Windings				
46	The core and windings are to be vacuum processed.	YES/NO	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/NO	YES	
48	The core is manufactured from burr-free, grainoriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/NO	YES	
49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/NO	YES	
50	Conductor for HV winding - Manufacturer/Supplier			
51	Type of Winding material on HV Side		Copper	
52	Conductor for LV winding - Manufacturer/Supplier			
53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and easily replaceable	

55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lightning arrester electrically connected to each HV bushing and mechanically secured onto the tank.	YES/NO	YES	
60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x In of transformer	
64	Current rating LV Bushing	A	2 x In of transformer	
65	HV Bushing BIL	kV	95	
66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	
75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	
Transformer Oil				
77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	
Overloading				
79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	
Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	

84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			
	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				
89	Rating, diagram and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				
94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		
106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

Name:.....

Affix Company Seal Below

Signature:.....

Date:.....

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVA - ONAN Rated)	kVA	50	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	
7	Suitable for parallel operation with transformers of different rating.	YES/NO	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/NO	YES	
9	A list of recommended spare parts and their individual prices is provided.	YES/NO	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/NO	YES	
Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	
13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/NO	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/NO	YES	
19	LV terminals have bi-metallic clamp	YES/NO	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/NO	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	
22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	
27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	
28	Can the tap changer switch be Locked	YES/NO	YES	

29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	
30	Tap changer catalogue details attached	YES/NO	YES	

Overcurrent Protection				
31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	
36	Characteristic curves of protective devices are submitted	YES/NO	YES	
Impedance & Short Circuit Rating				
37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.2% to 2.5 % ± 10%	
38	Rated Short-circuit withstand Current	kA	35pu x In	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.4 to 1.6	
Losses				
41	No Load Current	A	(1% to 2%) x In	
42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 135	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 500	
Flux Density				
44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	
Coils & Windings				
46	The core and windings are be vacuum processed.	YES/NO	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/NO	YES	
48	The core is manufactured from burr-free, grainoriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/NO	YES	
49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/NO	YES	
50	Conductor for HV winding - Manufacturer/Supplier			
51	Type of Winding material on HV Side		Copper	
52	Conductor for LV winding - Manufacturer/Supplier			

53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and easily replaceable	

55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lightning arrestor electrically connected to each HV bushing and mechanically secured onto the tank.	YES/NO	YES	
60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x In of transformer	
64	Current rating LV Bushing	A	2 x In of transformer	
65	HV Bushing BIL	kV	95	
66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	
75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	

Transformer Oil				
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77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	

Overloading				
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79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	

Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	
84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			
	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				
89	Rating, diagram and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				
94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		
106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

Name:.....

Below

Signature:.....

Date:.....

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVAn - ONAN Rated)	kVA	75	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	
7	Suitable for parallel operation with transformers of different rating.	YES/N O	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/N O	YES	
9	A list of recommended spare parts and their individual prices is provided.	YES/N O	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/N O	YES	
Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	
13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/N O	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/N O	YES	
19	LV terminals have bi-metallic clamp	YES/N O	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/N O	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	

22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	

27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	
28	Can the tap changer switch be Locked	YES/NO	YES	
29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	
30	Tap changer catalogue details attached	YES/NO	YES	

Overcurrent Protection

31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	
36	Characteristic curves of protective devices are submitted	YES/NO	YES	

Impedance & Short Circuit Rating

37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.2% to 2.5 % ± 10%	
38	Rated Short-circuit withstand Current	kA	35 pu x In	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.6 to 1.8	

Losses

41	No Load Current	A	(1% to 2%) x In	
42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 190	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 650	

Flux Density

44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	

Coils & Windings

46	The core and windings are be vacuum processed.	YES/ N O	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/ N O	YES	
48	The core is manufactured from burr-free, grainoriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/ N O	YES	

49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/ N O	YES	
50	Conductor for HV winding - Manufacturer/Supplier			
51	Type of Winding material on HV Side		Copper	
52	Conductor for LV winding - Manufacturer/Supplier			
53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and easily replaceable	
55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lightning arrester electrically connected to each HV bushing and mechanically secured onto the tank.	YES/ N O	YES	
60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x In of transformer	
64	Current rating LV Bushing	A	2 x In of transformer	
65	HV Bushing BIL	kV	95	
66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	

75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	
Transformer Oil				
77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	
Overloading				
79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	
Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	
84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			
	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				
89	Rating, diagram and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				

94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		
106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

Affix Company Seal

Name:.....

Below

Signature:.....

Date:.....

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVAn - ONAN Rated)	kVA	100	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	
7	Suitable for parallel operation with transformers of different rating.	YES/NO	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/NO	YES	
9	A list of recommended spare parts and their individual prices is provided.	YES/NO	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/NO	YES	

Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	
13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/NO	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/NO	YES	
19	LV terminals have bi-metallic clamp	YES/NO	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/NO	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	
22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	
27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	
28	Can the tap changer switch be Locked	YES/NO	YES	
29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	
30	Tap changer catalogue details attached	YES/NO	YES	

Overcurrent Protection				
31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	
36	Characteristic curves of protective devices are submitted	YES/NO	YES	
Impedance & Short Circuit Rating				
37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.3% to 2.5 % ± 10%	
38	Rated Short-circuit withstand Current	kA	35pu x In	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.8 to 2	

Losses				
41	No Load Current	A	(1% to 2%) x I _n	
42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 210	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 850	
Flux Density				
44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	
Coils & Windings				
46	The core and windings are be vacuum processed.	YES/NO	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/NO	YES	
48	The core is manufactured from burr-free, grainoriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/NO	YES	
49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/NO	YES	
50	Conductor for HV winding - Manufacturer/Supplier			
51	Type of Winding material on HV Side		Copper	
52	Conductor for LV winding - Manufacturer/Supplier			
53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and easily replaceable	
55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lightning arrester electrically connected to each HV bushing and mechanically secured onto the tank.	YES/NO	YES	
60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x I _n of transformer	
64	Current rating LV Bushing	A	2 x I _n of transformer	
65	HV Bushing BIL	kV	95	

66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	
75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	
Transformer Oil				
77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	
Overloading				
79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	
Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	
84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			
	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				

89	Rating, diagram and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				
94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		
106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

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Name:.....

Below

Signature:.....

Date:.....

Item No.	Description	Unit	GPL	Bidder
General				
1	Rated Power (kVAn - ONAN Rated)	kVA	167	
2	Rated Frequency	Hz	60	
3	Voltage class	kV	15	
4	Rated Primary Voltage	V	13,800	
5	Rated Secondary Voltage	V	120/240	
6	Number of Phases		1	
7	Suitable for parallel operation with transformers of different rating.	YES/NO	YES	
8	Suitable for operating in three-phase bank with transformers of same and/or different rating.	YES/NO	YES	

9	A list of recommended spare parts and their individual prices is provided.	YES/NO	YES	
10	Manufacturer			
11	Manufacturer's data sheet supplied	YES/NO	YES	
Type of Transformer				
12	Transformer Type		Double wound, sealed type, oil immersed	
13	Cooling Type		ONAN	
14	Transformer polarity		subtractive	
15	Number of HV bushing terminations		2	
16	Number of LV bushing terminations		4	
17	Both legs of secondary winding are out to LV bushings	YES/NO	YES	
18	HV bushings have tinned bronze eyebolt type connectors	YES/NO	YES	
19	LV terminals have bi-metallic clamp	YES/NO	YES	
20	It is not necessary to keep the transformer energised to prevent deterioration.	YES/NO	YES	
Taps & Voltage Regulation				
21	No. of Tap Positions/Steps	No.	5	
22	Max Tap Position (above nominal)	%	5	
23	Min Tap Position (below nominal)	%	-5	
24	Tap Steps	%	2.5	
25	Transformer suitable for pole mounting	YES/NO	YES	
26	Voltage Regulation at Full Load and Power Factor of 1	%	≤ 1	
27	Voltage Regulation at Full Load and Power Factor of 80%	%	< 2.5	
28	Can the tap changer switch be Locked	YES/NO	YES	
29	Tap changer handles are fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.	YES/NO	YES	

30	Tap changer catalogue details attached	YES/NO	YES	
Overcurrent Protection				
31	High voltage protective fuse links	YES/NO	YES	
32	Internally mounted LV Circuit Breaker	YES/NO	YES	
33	Circuit Breaker and protective links are coordinated	YES/NO	YES	
34	Operation of protective devices are indicated externally	YES/NO	YES	
35	The Circuit Breaker is controllable with switch on tank	YES/NO	YES	
36	Characteristic curves of protective devices are submitted	YES/NO	YES	
Impedance & Short Circuit Rating				

37	Impedance measured at 85 °C, nominal tap position and rated voltage.	%	1.3% to 2.5% ± 10%	
38	Rated Short-circuit withstand Current	kA	25pu x In	
39	Rated Short-circuit Current withstand duration (both sides)	s	1	
40	X/R Ratio	%	1.8 to 2.5	
Losses				
41	No Load Current	A	(1% to 2%) x In	
42	No-load Loss at Nominal Tap Position and Rated Primary Voltage	W	≤ 350	
43	Load Loss at Nominal Tap Position and Rated Load Current	W	≤ 1,410	
Flux Density				
44	Magnetic Flux Density at nominal tap, operating at normal voltage and frequency.	Tesla	≤ 1.7	
45	Magnetic Flux Density (one minute at normal tap) (10% overvoltage at 97% of rated frequency)	Tesla	≤ 1.9	
Coils & Windings				
46	The core and windings are be vacuum processed.	YES/NO	YES	
47	The core and windings are capable of withstanding mechanical shocks.	YES/NO	YES	
48	The core is manufactured from burr-free, grainoriented silicon steel laminations and was precisely stacked to eliminate gaps in the corner joints.	YES/NO	YES	
49	The windings are insulated with B-stage, epoxy coated, diamond pattern, insulating paper.	YES/NO	YES	
50	Conductor for HV winding - Manufacturer/Supplier			
51	Type of Winding material on HV Side		Copper	
52	Conductor for LV winding - Manufacturer/Supplier			
53	Type of Winding material on LV Side		Copper	
Bushings & Terminations				
54	Busing Type		outdoor type and	

			easily replaceable	
55	Type of bushing insulator - HV		porcelain	
56	Type of bushing insulator - LV		porcelain	
57	Creepage Distance (minimum) line to line	mm/kV	25	
58	Creepage Distance (minimum) line to ground	mm/kV	44	
59	15 kV class lighting arrester electrically connected to each HV bushing and mechanically secured onto the tank.	YES/NO	YES	

60	Number of earthing/grounding terminals comprising of non-ferrous material M12 isometric bolt and nut which include a spring washer and a lock washer.		2	
61	Voltage rating HV Bushing (Voltage Class)	kV	15	
62	Voltage rating LV Bushing (Voltage Class)	V	600	
63	Current rating HV Bushing	A	2 x In of transformer	
64	Current rating LV Bushing	A	2 x In of transformer	
65	HV Bushing BIL	kV	95	
66	HV Bushing Power Frequency withstand Voltage - Dry	kV	35	
67	HV Bushing Power Frequency withstand Voltage - Wet	kV	30	
68	LV Bushing Power Frequency withstand Voltage - Dry	kV	35	
69	LV Bushing Power Frequency withstand Voltage - Wet	kV	30	
70	Type and Metal used in HV Terminal		tinned bronze	
71	Type and Metal used in LV Terminal		bi-metallic	
72	Type and Metal used in Earth Terminal		non-ferrous	
73	Minimum phase to phase clearance HV	mm	140	
74	Minimum earth to phase clearance	mm	229	
75	Minimum phase to phase clearance LV	mm	76	
76	Spring and lock washer included	YES/NO	YES	
Transformer Oil				
77	Oil type		Class 1 mineral oil that conforms to IEC 60296 or IEEE C57.12.00, section 6.6.1	
78	Dielectric strength of the oil	kV	> 40	
Overloading				
79	Duration of 25% Overload at Service Conditions	minutes	180	
80	Duration of 50% Overload at Service Conditions	minutes	90	
Installation/Service Conditions				
81	Maximum altitude above mean sea level	m	< 1,000	
82	Maximum relative humidity	%	100	
83	Design maximum outdoor temperature	°C	40	
84	Design continuous ambient temperature	°C	30	
85	Minimum ambient temperature	°C	15	
86	Maximum temperature rise over ambient temperature:			

	a) In oil by thermometer	°C	65	
	b) In winding by resistance measurement	°C	65	
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	
	d) Temperature gradient between windings and oil	°C	20	
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	
	f) Type of maximum winding temperature indicator		analogue/ digital	
87	Average Winding Temperature Rise	°C	65	
88	Maximum Winding Temperature Rise	°C	105	
Fittings				
89	Rating, diagram and terminal marking plate	YES/NO	YES	
90	Tank grounding terminal	YES/NO	YES	
91	Lifting lugs	YES/NO	YES	
92	Manual pressure relief device	YES/NO	YES	
93	Drain/sampling valve with plug	YES/NO	YES	
Tank				
94	Tank material		mild steel	
95	Thickness of tank	mm	≥ 3	
96	Thickness of top and bottom covers	mm	≥ 5	
97	Bolted cover construction is used	YES/NO	YES	
98	Two lifting brackets welded to opposite sides of the tank.	YES/NO	YES	
99	Pressure relief valve can be operable manually by hot stick.	YES/NO	YES	
100	Painting method details attached	YES/NO	YES	
Tank (for information purposes only)				
101	Tank Width	mm		
102	Tank Height	mm		
103	Tank Dept (length)	mm		
104	Weight of Core and Windings	kg		
105	Weight of Tank	kg		
106	Weight of Oil at 20 °C	kg		
107	Total weight of Transformer without oil	kg		
108	Shipping weight of Transformer	kg		

Name:.....

Affix Company Seal Below

Signature:.....

Date:.....

End of Technical Specification For Pole Mount Transformers

Pad Mounted Transformers

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1. SCOPE

The design, manufacture, test, supply, delivery and warranty of three-phase live front pad-mounted distribution transformers with separable insulated high voltage connectors, rated up to 1000 kVA, generally conforming to IEEE C57.12.34 except as specified otherwise herein.

This specification is intended to supplement IEEE C57.12.34, Additional or modifying statements made in this document shall override applicable sections. Where no reference is made in this specification, IEEE C57.12.34 shall apply.

Materials will be evaluated to ensure conformance with submitted manufacturer's drawings/documentation and relevant standards as listed within this specification.

2. APPLICABLE STANDARDS

Except where modified by this specification, the transformers shall be designed, manufactured and tested in accordance with the latest editions of the following standards (Table 4). The proponent may propose alternative standards, but shall demonstrate that they give a degree of quality and performance equivalent to or better than the referenced standards herein.

Acceptability of an alternative standard is at the discretion of the Purchaser.

The Proponent shall furnish a copy of the alternative standard proposed along with the bid. If the alternative standard is not written in the English Language, a certified English Language translated version of the original standard shall be submitted with the bid.

Table 4: Applicable Standards

Item No.	ANSI/IEC Standards	Title
1	IEEE C57.12.34	IEEE Standard for Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 5MVA and Smaller; High Voltage 34.5 kV Nominal System Voltage and Below; Low Voltage, 15 kV Nominal System Voltage and Below"
2	IEEE C57.12.00	Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
3	IEEE C57.12.28;	"IEEE Standard for Pad-Mounted Equipment – Enclosure Integrity
4	IEEE C57.12.70	IEEE Standard Terminal Markings and Connections for Distribution and Power Transformers
5	IEEE C57.12.90	Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers Corrigendum 1:Editorial and Technical Corrections
6	IEEE C57.147	Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers
7	IEEE 386-2006	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V
8	ASTM D3487	Standard Specification for Mineral Insulating Oil Used in Electrical

		Apparatus
9	NEMA TR 1	Transformers, Regulators, and Reactors
	IEC 60076	Power Transformers

In case of conflict, the order of precedence shall be:

- This Technical Specification
- IEEE standards
- Other Applicable and Recognised Standards for pad mounted distribution transformers.

3. INSTALLATION/SERVICE CONDITIONS

The installation conditions of the transformers shall be as follows:

6. Maximum altitude above mean sea level less than 1,000 m;
7. Maximum ambient air temperature 40°C;
8. Maximum daily average ambient air temperature 30°C;
9. Minimum ambient temperature 15°C; and
10. Maximum relative humidity 100%.

All outdoor materials, components and equipment shall be designed and protected for use in exposed, heavily polluted and salty, corrosive and humid tropical coastal atmospheric conditions.

4. ELECTRICAL SYSTEM CONDITIONS

The transformer shall be suitable to be installed in GPL's primary distribution system, which has the following characteristics (Table 5).

Table 5: Characteristics of GPL's Primary Distribution System

Nominal System Voltage, Frequency and Phase	High Voltage (HV) Side	13.8 kV, 60 Hz, 3φ-3-wire
	Low Voltage (LV) Side	220/127, 415/240, 440/254, 240/120, 60 Hz, 3φ-4 wire
Voltage Class	15 kV	
Short circuit withstand Capability	As per IEEE C57.12.00, section 7.1.3	
Insulation Level		
Basic Insulation Level (BIL)	As per IEEE C57.12.00, Table 3	
Power Frequency withstand level – Dry 1 Minute	As per ANSI C57.12.00, Table 10	
Power Frequency withstand level – Wet 10 Seconds		
System Grounding		

Neutral Grounding	High Side	Primary distribution feeders from Distribution Substations are three phase delta and are grounded by a zig-zag transformer. Primary distribution feeders emanating from generator buses are wye and are grounded by the power plant neutral grounding system.
	Low Side	Solidly grounded.

5. TRANSFORMER RATING

The transformers shall be double wound, sealed type, oil immersed with natural oil and air-cooling (ONAN), three phase (3 ϕ), pad-mounted with typical ratings from 45 kVA to 1000 kVA.

The polarity of all transformers shall be subtractive and shall be clearly indicated on the tank of the transformers.

The transformers are required to be equipped with three (3) HV and four (4) LV bushing terminations.

The design of the tank, fittings, bushings, etc., shall be such that it will not be necessary to keep the transformer energised to prevent deterioration as the transformers may be held in reserve and outdoors conditions for many years.

All transformers shall be rated in accordance with ANSI C57.12.20, section 3.

All transformers, inclusive of tap changer and other current carrying components, shall accept emergency overloading as per ANSI/IEEE C57.92, section 4.

6. TAPS AND VOLTAGE REGULATION

Transformers shall have the following voltage transformation ratio and tapping range:

- Voltage ratings shall be specified on the purchase order typically:
13800 delta – 220Y/127 Volts or
13800 delta – 415Y/240 Volts or
13800 delta – 440Y/254 Volts or
13800 delta – delta 240/120 Volts
- tolerance on the voltage ratio shall be in accordance with IEEE C57.12.00, section 9.1;
- taps shall be provided in the high voltage winding (13.8 kV side), with steps of two (2), 2.5% taps above and below the primary voltage rating (13.8 kV); and
- The bidder shall state in the technical schedule, the percentage regulation at full load, power factor 1.0 and at full load power factor 0.8 lagging. The primary and secondary voltage variation shall be based on a winding temperature of 85°C.

7. OVERCURRENT PROTECTION

Transformers up to and including the rating of 1000 kVA shall be equipped with an internally mounted lowvoltage circuit breaker.

The operation of the LV breaker shall be coordinated such that any short circuit and/or overloading on the secondary side of the transformer will first trip the LV breaker before the externally mounted HV protective links

operate, taking the load off the transformer before the core and/or coil is/are thermally and/or mechanically damaged.

The operation of the protection devices mentioned above shall be indicated externally on the tank/cabinet, and the circuit breaker shall be made to be externally controlled.

The characteristics of the protection device shall allow for full usage of the transformer's continuous rating and short-time overload capabilities for emergency loading condition (120% of nominal kVA rating).

The Bidder shall submit the characteristic curves of the internal protection device with the bid. The characteristic curve shall also include the transformers' through-fault withstand capability curves or transformer damage curves.

8. BIL RATING

The transformer shall be rated minimum 95 kV BIL.

9. IMPEDANCE

The guaranteed minimum value of impedance measured at 65°C, on the nominal tap and at the rated voltage of the transformer shall be:

- 2.4 % for transformers between 25 kVA to 50 kVA; and \square 3.7 % for transformers from 50 kVA to 167 kVA.
- 5.2% for transformers from 167 kVA to 1000 kVA.

Tolerance for transformers' impedances shall be in accordance with IEEE C57.12.00, section 9.2.

10. SHORT CIRCUIT RATINGS

Bidders must submit all short circuit test results for compliance with IEEE C57.12.00, section 7.1.3.

11. LOSSES

The losses proposed by the Bidders shall be measured during routine tests. If the results from the routine tests indicate that either the copper or iron loss is more significant than the proponents' guaranteed values, the Purchaser shall have the right to reject the transformer(s).

Accuracies required for measuring losses shall be in accordance with IEEE C57.12.00, section 9.4.

The capitalization of guaranteed losses of the transformer shall be calculated and considered while evaluating the bids as the final bid price. The guaranteed values of no-load losses and load losses shall be stated in the bid, which should match the corresponding loss figures mentioned in the short circuit type test report submitted along with the offer by the bidder. Liquidated damages will be applied to successful bidder for not achieving the quoted guaranteed figures.

The Total Ownership Cost formula is as follow:

TOC = Bid Price + [(A x NLL) + (B x LL)] Where:

7. TOC is the Total Owing Cost in US\$
8. Bid Price in US\$
9. A is the No Load-Loss Factor = 14.82 US\$/W
10. B is the Load-Loss Factor = 3.63 US\$/W
11. NLL is the No-Load Loss in W
12. LL is the Load Loss in W

12. FLUX DENSITY

The flux density at any point of the magnetic circuit, core, and winding, when the transformer is connected on the centre tap and operating at normal voltage and frequency, shall be stated in the bid and shall not exceed 1.7 Tesla. The transformer must be capable of operating at 10% overvoltage at 97% of rated frequency without resulting in magnetic saturation of the transformer's core or the flux density exceeding 1.9 Tesla.

13. NOISE LEVEL

The acceptable audible sound levels for all transformers shall comply with NEMA TR1, table 0-3.

Bidders shall confirm procedure for noise level measurement according to IEEE C57.12.90 and submit audible sound levels test results with the bid document.

14. RADIO INFLUENCE VOLTAGE

Radio influence voltage of all transformers, contained herein, shall comply with NEMA TRI, section 0.03.1.

15. TAP CHANGING CHARACTERISTICS

Tap positions shall be numbered as shown in Table 6.

Table 6: Transformer tap positions

Tap 1	+5%
Tap 2	+ 2.5%
Tap 3	0%(Principal Tap)
Tap 4	-2.5%
Tap 5	- 5.0 %

The operating handle shall have provision for padlocking and shall give a visual indication of the tap position without unlocking.

Each tap-changer position and the tap voltage or percentage associated with voltage shall be identifiable by reference to nameplate information. All positions of the tap changer shall be operative positions.

Tap changer handles shall be fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.

16. CORE AND WINDINGS

The core and windings shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum, the windings will be energized to heat the coils and drive out moisture, and the transformer will be filled with preheated filtered degassed insulating fluid.

The core and winding shall be capable of withstanding mechanical shocks during transport, installation, and servicing.

16.1 CORE

The core shall be manufactured from burr-free, grain-oriented silicon steel laminations and shall be precisely stacked to eliminate gaps in the corner joints.

Provision to the design and construction of the transformer shall be made to prevent movement of the core and windings, relative to the tank, during transport, installation and short-circuits.

The design shall avoid the presence of pockets, which can prevent complete emptying of the oil in the tank through its drain plug.

16.2 WINDINGS

The winding conductor shall be of electrolytic copper or aluminium, to give the optimum economic and technical results of the transformers.

The windings shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper, and shall be free from any other insulating compounds that are liable to soften, ooze out, shrink or collapse, and non-catalytic and chemically inert in the transformer oil during normal servicing. The windings shall be uniformly insulated, and the LV neutral points shall be insulated for full line-to-line voltage.

The stacks of windings shall receive adequate shrinkage treatment, and the windings and connections are to be braced to withstand mechanical shocks during transport, switching, short-circuit or other transient conditions.

17. BUSHINGS AND TERMINATIONS

17.1 BUSHINGS

Bushings shall be of the outdoor type and easily replaceable. Cemented types will **not** be acceptable. The bushings shall be sufficiently robust (mechanically) to withstand normal transport and erection hazards.

All bushings shall have a minimum creepage distance of 25 mm/kV for maximum phase-to-phase system voltage and shall have a continuous rating of 200 % of the transformer capacity rating.

17.2 BUSHING LABELS

HV bushings shall be labelled H1, H2 and H3.

LV bushings shall be labelled X1 to X4 in accordance with IEEE C57.12.70 standards.

Marking letters shall be at least 12 mm (or 1/2 inch) high. The means of marking shall conform to the requirements of the section on Labels in this specification.

Transformers shall be constructed with either a 5-legged core or a triplex core to mitigate ferro-resonant tank heating.

The core shall be constructed from high grade, non-aging, cold rolled grain-oriented silicon steel laminations or superior material.

18. EARTHING TERMINALS

All transformers shall be provided with two earthing/grounding terminals comprising an M12 isometric bolt and nut, which shall be non-ferrous material. It shall include a spring washer and a lock washer.

External connecting strip(s) between earthing/grounding terminal and neutral bushing(s) **is/are** required.

19. HIGH AND LOW VOLTAGE TERMINAL CONFIGURATION

Transformers shall comply with C57.12.34 Figure 4(a) (staggered arrangement), Figure 1 and Figure 2 for radialfeed transformers.

20. LOW-VOLTAGE TERMINALS

Terminals shall be constructed per IEEE C57.12.34, Section 8.7.3 with an additional ground pad near the low voltage.

21. LIGHTING ARRESTORS – HV SIDE OF TRANSFORMER

The lightning arrestors shall be capable of discharging lightning and switching surges and temporary power frequency over voltages and shall be capable of discharging over voltages occurring during switching of unloaded transformers and long lines.

The Arrestors shall be capable of withstanding Maximum Continuous Operating Voltages (M.C.O.V) and rate for operation in 15 kV class distribution system. The reference current of the arrestors shall be of such value to eliminate the influence of grading and stray capacitance on the measured reference voltages.

These arrestors shall be of Heavy Duty, Station Class / Distribution Class and Gapless Zinc Oxide type and shall be hermetically sealed units suitable for outdoor installation and mounting on distribution transformers. Additionally, the arrestors shall be suitable for heavily polluted atmospheric conditions as mentioned in section 3 on page 66.

22. PRESSURE RELIEF VALVE

The pressure relief valve provided as per C57.12.34, 8.9.2, shall include an orange or red indicator that becomes visible only after the valve has vented. The valve shall be covered by a cap with a pull ring which will separate from the assembly during venting, revealing the orange or red indicator.

23. TRANSFORMER OIL

The transformers shall be supplied filled with class 1 mineral oil conforming to ASTM D3487. The complete first filling shall be of new oil free from inhibitors and additives. The dielectric strength of the oil shall not be less than 40kV. If an antioxidant inhibitor is recommended, its use shall be subject to the Purchaser's approval.

24. TANK COVER

The bidder shall state if other than bolted construction is used.

25. TRANSFORMER ANCHOR TABS

Four tabs shall be provided on the tank for mounting the transformer to the pad.

26. HANDHOLE

The tank shall include a handhole to access internal components for testing. The handhole shall have a cover that can be unbolted from within the terminal compartments to prevent unauthorized access.

27. FITTINGS

The following standard fittings shall be provided:

- rating, diagram, and terminal marking plate;
- tank grounding terminal;
- lifting lugs;
- oil level indicator;
- manual pressure relief device; and drain/sampling valve with plug.

The fittings and accessories listed above are only indicative and any other fittings and accessories according to the applicable standards herein shall be provided for the transformers.

28. RATING AND CONNECTION PLATE

Each transformer shall be provided with anodized aluminium laser engraved nameplate, in accordance with IEEE C57.12 - Nameplate A and C as necessary. Additionally, Proponents shall ensure that the following attributes are indicated on the aforementioned nameplate and conform to the requirements of the section on Labels in this specification:

- standard to which it is manufactured and tested;
- identification of internal short-circuit and overload protection devices;
- type of cooling (ONAN);
- rated currents in A;
- chopped wave (short time) impulse voltage withstand level in kV;
- power frequency withstand voltage in kV;
- percentage impedance at 85⁰C;
- load loss in kW at rated current;
- no-load loss in kW at rated voltage and frequency;
- continuous ambient temperature at which ratings apply in ⁰C (40);
- top oil and winding temperature rise at rated load in ⁰C;
- winding connection diagram;
- total mass (core, windings and oil) in kg;
- mass of core and windings in kg;
- volume of oil in litres;
- Oil with less than 2ppm of PCB; and
- name of the purchaser (Property of Guyana Power & Light Inc.)

29. SURFACE TREATMENT

The transformer tank and all accessories shall be treated in accordance with IEEE C57.31 to ensure enclosure and equipment integrity.

30. SUPPRESSION OF HARMONICS

Each transformer's core shall be designed with attention to the suppression of harmonic voltages and currents, as per IEEE Std 519-2014 in Table 1 for bus voltage between 1 kV and 69 kV and Table 2 for current distortion limits for systems rated 120 V through 69 kV.

Proponents shall submit results for harmonic suppression tests for voltage and current distortions.

31. TESTS

In addition to the routine tests required in IEEE C57.12.00, as per section 8 and Table 18, the following additional tests shall be carried out on all transformers. The following routine measurements and tests shall be carried out and results shall be submitted to the Purchaser upon delivery:

- j) Measurement of winding resistance at the nominal and extreme tap positions for each transformer provided;
- k) Measurement of impedance;
- l) Measurement of no-load loss and no-load currents at full, 90% and 110% voltages;
- m) Induced overvoltage withstand test;
- n) Separate source voltage withstand tests on HV and LV windings;
- o) Magnetic balance test;
- p) Polarization Index Test. The index shall be not less than 1.5;
- q) Oil leakage test: The criterion of leakage shall be discolouration by oil of whitewash applied externally to suspected parts at an oil temperature of 90°C or other method approved by the Purchaser;
- r) Bushings and oil shall be subject to the following routine tests.
 - a. bushing routine tests
 - b. oil dielectric and moisture content test.

Routine test certificates shall include in addition to the test results, the Purchaser's order number, the transformers' serial numbers, outline drawing number and transformer kVA rating.

Upon acceptance of Tender, the Manufacturer/Proponent shall provide results of standard design type tests required in Table 18 of IEEE C57.12.00.

32. COMPLIANCE WITH SPECIFICATION

The transformers shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of tendering in the NonCompliance Schedule in this document (see page 78).

33. COMPLIANCE WITH REGULATIONS

All the transformers/equipment shall comply in all respects with the Laws of Guyana Governing the Importation of Commercial Items and/or Goods.

The equipment and connections shall be designed and arranged to minimize the risk of fire and any damage that might be caused in the event of a fire.

34. QUALITY ASSURANCE, INSPECTION AND TESTING

34.1 GENERAL

To ensure that the supply and services are in accordance with the Specification herein, with the regulations of Guyana and with relevant authorized international standards, the Proponent shall have in place suitable Quality Assurance Programmes and Procedures to ensure that all activities are being controlled and documented, as necessary.

The quality assurance arrangements shall conform to the relevant requirements of ISO 9001 or ISO 9002, as deemed appropriate by the Purchaser and the Proponent.

The systems and procedures that the Proponent will use to ensure that the supply complies with the specified requirements, shall be defined in the Proponent's Quality Plan. The Proponent shall operate systems that implement the following:

Hold Point "A stage in the material procurement or workmanship process beyond which work shall not proceed without the documented approval of designated individuals or organisations."

The Purchaser's written approval is required to authorise work to progress beyond the Hold Points indicated in approved Quality Plans.

Notification Point "A stage in material procurement or workmanship process for which advance notice of the activity is required to facilitate witness."

If the Purchaser's representative does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice, then work may proceed.

34.2 QUALITY ASSURANCE SYSTEM

Unless the Proponent's Quality Assurance System has been audited and approved by the Purchaser, a Quality Assurance System shall be submitted to the Purchaser for approval within a minimum of One (1) month from the placement of order, or such other period as shall be agreed with the Purchaser. The Quality Assurance System shall provide a description of the Quality Control System for the supply and shall, unless advised otherwise, shall include, but not limited to the following details:

8. The structure of the organisation;
9. The duties and responsibilities assigned to staff to ensure quality of work;
10. The system for purchasing, taking delivery and verification of the specifications of raw materials;
11. The system for ensuring the quality of workmanship
12. The system for control of documentation;
13. The system for the retention of records; and
14. The arrangement for the Proponent's internal auditing.

34.3 QUALITY PLANS

The Quality Plans shall set out the activities in a logical sequence and, unless advised otherwise, shall include, but limited to the following:

9. An outline of the proposed programme sequence;

10. The duties and responsibilities assigned to staff ensuring the quality of work;
11. Hold and notification points;
12. Submission of engineering documents required by the specification;
13. The inspection of materials and components on receipt;
14. Reference to the Supplier's procedures appropriate to each activity;
15. Inspection during fabrication and assembly; and
16. Final inspection and test.

34.4 INSPECTION AND TESTING

The Purchaser shall have free entry at all times, while work on the order is being performed, to all parts of the manufacturer's working area which are in relation to the processing of the transformers ordered. The Manufacturer/Proponent shall afford the Purchaser without charge, all reasonable facilities to assure that the transformers being furnished are in accordance with the specifications herein.

The equipment shall have successfully passed all tests as described in Section 26 (see page 18).

The Purchaser reserves the right to reject an item of the transformer if the test results do not comply with the values specified herein.

Tests, including any retests required, shall be carried out by the Supplier at no extra charge, at the manufacturer's works.

Full details of the proposed methods of testing, including connection diagrams, shall be submitted to the Purchaser by the Supplier for approval, at least one month before testing.

All costs in connection with the testing, including any necessary re-testing, shall be borne by the Manufacturer/Proponent.

Any cost incurred by the Purchaser in connection with inspection and re-testing as a result of the failure of the transformer or any of its components under test or damage during transport or offloading shall be to the account of the Proponent.

The Proponent shall submit to the Purchaser three signed copies of the test certificates, giving the results of the tests as required. No materials shall be dispatched until the test certificates have been received by the Purchaser and the Proponent has been informed that they are acceptable.

The test certificates must show the actual values obtained from the tests, in the units used in this specification, and **not** merely confirm that the requirements have been met.

No inspection or lack of inspection or approval by the Purchaser's Representative of equipment or materials whether supplied by the Proponent or a Sub-Proponent, shall relieve the Proponent from his/her liability to complete the contracted works in accordance with the contract would exonerate him/her from any of his/her guarantees.

34.5 GUARANTEE

The Proponent shall guarantee the following:

- Quality and strength of materials used;

- Satisfactory operation during the guarantee period of one (1) year from the date of commissioning, or 18 months from the date of acceptance of the equipment by the Purchaser following delivery, whichever is the earlier. The Purchaser shall advise the Proponent of the date of commissioning;
- Performance figures as supplied by the Proponent in the Technical Data Schedule, the guaranteed copper and iron losses and other particulars;
- The offered surface treatment shall protect the treated metal from corrosion for a period of not less than ten (10) years from the date of delivery.

35. SPARE PARTS AND SPECIAL TOOLS

The Proponent shall provide a list of recommended spare parts and their individual prices and shall include HV and LV bushings and bi-metallic connectors for HV and LV bushings. This list shall identify all essential spares and consumable items for any recommended maintenance for a period of five (5) years after commissioning.

The Purchaser may order all or any of the spares parts listed at the time of placement of order.

A spare parts catalogue with price list shall be provided and this shall form part of the drawings and literature to be supplied with the bid.

The Proponent shall give an assurance that spare parts and consumables will continue to be available through the life span of the equipment/transformers, which shall be 25 years minimum. However, the Proponent shall give a minimum of 12 months' notice to the Purchaser, in the event that the Proponent or any Sub-supplier, plan to discontinue manufacturing of any component used in the transformers.

Any spare apparatus, parts or tools shall be subjected to the same specification herein, tests and conditions as similar main material supplied. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the transformer and must be suitably marked and numbered for identification.

Spare parts shall be delivered suitably packaged and treated for long periods in storage. Each package shall be clearly and indelibly marked with its contents, including a designation number corresponding to the spare parts lists in the operation and maintenance instructions.

36. LABELS

All apparatus shall be clearly labelled indicating, where necessary, its purpose and service positions.

The material of all labels and plates, their dimensions, legend and the method of printing shall be subject to the approval of the Purchaser.

Colours shall be permanent and free from fading. All labels and plates for outdoor use shall be of non-corrosive material.

They shall be engraved in English. Nameplates shall carry all the applicable information specified in the applicable items of the Standards and other details as required in this specification. No scratching, corrections or changes will be allowed on nameplates.

Wherever possible the equipment shall carry the markings "**THIS EQUIPMENT IS PROPERTY OF GPL Inc.**".

37. DECALS

"Danger do not open" decal on exterior transformer doors

“Danger do not touch” decal on interior transformer doors

Typical decals shown in Appendix A.

38. SUBMITTALS REQUIRED WITH THE BID

The following shall be required in duplicate of three (3) copies:

9. completed technical data schedule for each type and rating of the transformer;
10. descriptive literature giving full technical details of equipment offered;
11. Outline dimension drawings for each major component, general arrangement drawing showing component layout and general schematic diagrams;
12. type test certificates, where available, and sample routine test reports for each type and rating of the transformer;
13. summary reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating;
14. details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification;
15. deviations from this specification. Only deviations approved in writing before placement of order shall be accepted; and
16. list of recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements.

39. NON-COMPLIANCE SCHEDULE

On this schedule, the Proponent shall provide a list of non-compliance with this specification, documenting the effects that such non-compliance is likely to have on the transformer/equipment/component life span and operating characteristics. Each non-compliance shall be referred to the relevant specification clause.

Clause No.

Non-Compliance

40. TEST CERTIFICATE SCHEDULE

On this schedule, a list of the test certificates shall be included with the bid. This list shall include the certificates for the type tests (see page **Error! Bookmark not defined.**) and sample routine test reports. Each certificate listed shall be referred to the relevant specification clause.

Clause No.

Type Test Certificate or Routine Test Report

41. SHIPPING

The Manufacturer/Proponent shall prepare the transformers for shipping in such a manner as to protect from them from damage or deterioration during shipping and storage, and shall be responsible for, and make good, any and all damage due to improper preparation for loading, shipment, and storage.

All transformers shall be shipped on open sided trucks or trailers, in such a manner as to facilitate off-loading, handling and storage.

The transformers shall be shipped securely banded with a steel strap or approved synthetic strap to a pallet. The pallet shall be constructed to accept two fixed 195 mm forks spaced either 65mm or 320 mm apart. At least 90 mm clearance shall be provided under each transformer pallet and the bottom of the pallet must not be fully covered in order to facilitate the use of pallet jacks.

42. TECHNICAL SCHEDULE

Below is a sample of the Technical Schedule that is applied to each transformer separately. Proponents must complete this schedule for each transformer to be considered for evaluation. Failure to complete this schedule will result in bid disqualification.

Please see the attached spreadsheet with the technical criteria for each capacity and voltage requirement.

End of Technical Specification for Pad Mounted Transformers

Evaluation & Qualification Criteria

1. Evaluation Criteria

a) Mandatory Administrative Requirements:

The Purchaser's evaluation of a bid will take the following into account:

1	Warranty/Guarantee	18 months
2	Proof of Performance	Within five years
3	Validity of Quotation	90 Days
4	All Technical Schedules completed and submitted	Required
5	Manufacture Authorization	Required
6	Country of Origin	Required
7	Payment Terms	Bids must comply with the Terms set out
		30% of Order Value when Order is accepted
		30% Prior to shipment
		30% On receipt of goods
		10% 30 days after receipt of goods

b) Compliance with technical requirements

Failure to comply with any of the requirements set out in section (a) and (b) above will result in the bid being deemed un-responsive and no further evaluation would be conducted.

	(c) Points allocation and ranking as follows:	MAXIMUM POINTS	
1	Total Owning Cost (Bid Price + Losses Capitalised)	80	Points awarded as per Note 1 below

A penalty of 0.5% of the value of the order (or any portion thereof) for every completed calendar week that the delivery of the products exceed the promised delivery period.

NOTES ON EVALUATION

- (a) The Contract would be awarded to the Bidder whose bid is determined to be substantially technically responsive to the Bid Document and who has offered the lowest evaluated Bid Price*
- (b) A penalty of immediate rejection of a bid or termination of contract will be applied upon discovery of misrepresentation of information.*

Law of Guyana: Procurement Act 2003

Section 39 – Subsection 6 (b)

- (c) The procuring entity may grant a margin of preference not exceeding ten percent to tenders submitted by domestic contractors or for the benefit of tenders for domestically produced goods, provided that such preference is specified in the tender documents. If the lowest evaluated tender was submitted by a foreign tenderer, the evaluating committee will apply the margin of preference to the prices submitted by all foreign tenderers, for evaluation purpose. If, after applying the margin of preference, the lowest evaluated tender was submitted by a domestic tenderer, such tenderer shall be awarded the contract. Otherwise, the foreign tenderer who has submitted the lowest evaluated tender shall be awarded the contract.*