ANNEXURE A – TECHNICAL SPECIFICATIONS

RLM/DTIS/0114/2025/26 - APPOINTMENT OF ONE OR MORE SERVICE PROVIDERS (MAXIMUM OF 3 PER LINE ITEM) FOR THE SUPPLY AND DELIVERY OF MINITURE SUBSTATION, RINGMAIN UNITS, METERING UNIT, DISTRIBUTION TRANSFORMERS, PLINTHS AND TRANSFORMER OIL TO RUSTENBURG LOCAL MUNICIPALITY AS AND WHEN REQUIRED FOR A PERIOD OF 3 YEARS

DIRECTORATE: TECHNICAL & INFRASTRUCTURAL SERVICES

UNIT: ELECTRICAL ENGINEERING SERVICES

STANDARD TECHNICAL SPECIFICATION: HV-016/2021

MINI-SUBSTATIONS – SF6/VACUUM

1. GENERAL INFORMATION

This specification is applicable to SF6 / Vacuum mini substations. Miniature substations purchased and installed on the Rustenburg Local Municipality network shall comply with this document.

The tests prescribed in this specification will evaluate the performance capabilities of medium voltage miniature substations.

Minisubs shall be manufactured in accordance with SANS 1029. All mini substations offered shall comply in all aspects to the latest edition of the NRS standards and shall bear the SABS mark

System particulars:

Normal operating voltage	:	11 000 Volt
Normal operating voltage	:	230/400 Volt
Frequency	:	50 Hz
Number of phases	:	3
Neutral earthing	:	Solid

Service conditions:

Maximum temperature	:	40° C
Altitude	:	1200 m above sea level
Lightning conditions	:	Severe

Standards:

All equipment manufactured and supplied must comply with NRS 004-1:1991.

Mini Substations shall be built to the following specifications:

- SANS 62271-202 (Prefabricated Substation)
- NRS 004 (Prefabricated Substations)
- SANS 1029 (Mini- Sub)
- SANS 1030
- SANS 780 (trf)
- NRS 012 (Cable box's)
- SANS 62271-200 (Switchgear general spec)
- NRS 003 (Metal Clad Gear)
- SANS 1885 (Metal Clad Gear)

- NRS 006 (RMU)
- SANS 1874 (RMU)
- SANS/IEC 60076 (Transformer)

Compliance to Statutory Regulations:

All units must comply with the Occupational Health and Safety Act, (Act 85 of 1993).

The units offered must provide both operator (Authorized personnel and public} safety for Internal Arc Venting as per SANS 1029 (preferably Front, Lateral and Rear)

2. GENERAL REQUIREMENTS - CONSTRUCTION AND FINISH

Base:

The complete mini substation shall be mounted on a single channel iron base.

Locking of Doors:

Provision must be made to lock the doors by means of a padlock supplied by the Council. The entire lock and door closing mechanism must be enclosed by means of a metal cover box secured to the doors by means of nuts and bolts. The metal box must be open on the bottom to enable the lock to be put in place.

Colour

The final colour shall be Avocado Green C12 in accordance with SANS 1091.

MV Compartment:

Final internal colour of MV and LV compartments to be white

The following equipment shall be housed in this compartment:

(3) x MV transformer Type C bushings.

The terminals of the ring-main units shall be suitable for terminating 3 core 11 kV unarmoured XLPE aluminium cables type B up to 400 mm, by means of heat shrink terminations. Loose individual phase barrier shrouds with suitable mounting arrangements shall be provided.

The MV compartment shall be equipped with a tee-off ring-main unit, suitable for on-load switching. The ring main unit shall comply with the latest edition of SANS 1872.

The Ring main configuration shall be 2 x Isolators and 1 x Breaker tee-off switch to the transformer with Protection. (NEIDI)

The MV compartment shall be ARC Proof metal enclosed with Top Vent chimney.

Cable Testing Facility - COMPULSORY

Cable test facilities that are independent of the cable end boxes and are accessible from the front of the Ring main are REQUIRED.

For operator safety, the cable testing procedures shall be displayed on the front and inside of the cable testing facility covers.

Earth and test

Cable test terminals to be accessible only when the switch is in the EARTH AND TEST position. Interlocks are to be provided to ensure that the switch cannot be moved from the EARTH AND TEST position when the test terminal access cover is open.

The test terminals to be suitable for cable testing voltages up to 30 kV D C for 15 minutes.

Interlocks

A substantial interlock must be fitted to prevent operation of the switch directly from the ON position to the EARTH AND TEST positions. Provision to be made for padlocking in any position.

Transformer Compartment

The transformer compartment shall contain a transformer of nominal system voltage = 11 000 Volts and the rated no-load secondary voltage 230/400 Volts 50 Hz class ON - cooled transformer, complete with the first filling of oil. The high voltage winding shall be arranged in delta connection and shall have taps of plus minus 5,0% in steps of 2,5% connected on an OFF-LOAD tap switch. Vector group Dyn 11.

The LV - windings shall be arranged in the star- connection with the neutral brought out. Type of windings - copper.

NOTE: The working voltage shall be on tap 3.

Compartment (double module with maximum width and double doors).

The LV compartment shall contain the following:

4 x LV transformer bushings
1 x Transformer drain valve
1 x Silica Gel breather (Alternative: Hermetically sealed)
1 x Oil level gauge (Ensure that no oil leaks occur)
1 x Unistrut for fixing cables with K-clamps.

3 x Current transformers of suitable ratio for the various transformer sizes.
3 x Ammeters suitably calibrated with 20 % over scale for the current transformers to read:
a) Instantaneous current
b) Maximum demand over 15 minutes and
c) Maximum of b)

The ammeters shall be mounted below each other in the top left-hand corner of the panel on the small side of mini-sub. Size of bezel 96 x 96 mm. All needles to be on the same pivot. Pilot wires to the Amp meters must be long enough to remove the ammeters from the front of the panel for inspection purposes or replacement.

1 x set LT connections from transformer to Main circuit breaker, and from circuit breaker to busbars. All supply connections (from transformer) to be on the top connections of circuit breakers. Main circuit breaker to be mounted at the side of mini-sub.

1 x Blank fibre panel mounted in upper LV side (front facing) of minisub for mounting meters to have a maximum surface area. Circuit breakers mounting rail to allow mounting underneath the aforementioned.

The following mains 3 phase LV Circuit Breakers (CBI type) shall be installed with the different rated mini-substations:

SIZE		C/B	SIMILAR	SPECS	MIN KA LEVEL REQUIRED
100 kVA -	175 A	(J25S)	Yes		15 kA (min)
200 kVA -	350 A	(L20Y)	Yes		15 kA (min)
315 kVA -	500A	(L20Y)	Yes		15 kA (min)
500 kVA -	830 A	(M25B)	Yes		20 kA (min)
630 kVA -	1000 A	(N50DE)	Yes		35 kA (min.)
800 kVA -	1250 A	(SPEC)	Yes		35 kA (min.)

All circuit breakers shall preferably be of the hydraulic-magnetic type. Specifications of Thermal type shall be submitted and stated. All circuit breakers shall bear the SABS mark.

The Main circuit breaker shall be mounted in the side panel on the LV side to enable the Main circuit breaker to be locked separately from the front metering panel. Two rails must be fixed for circuit breaker installation.

The connections from the transformer shall terminate on the top of the circuit breaker and the busbar connections shall terminate at the bottom of the circuit breaker.

Busbars

3 x Rear mounted copper busbars, each to be drilled with sixteen (16) 12 mm diameter holes evenly spaced.

1 x Front mounted neutral bar right at the bottom of the panel, drilled as above.
1 x Front mounted earth bar at the bottom of the panel, drilled as above.

Rating

Maximum rating for copper busbars to be taken at 2 ampere per mm. Thickness of busbars not to be less than 6 mm.

500 & 630 & 800 kVA Mini substation

The HV Compartment equipped as in paragraph 4.4.3. Cable terminations as in paragraph 4.4.1 but up to 400 mm. Full details including drawings to be included in tender documents.

The LV Compartment to be equipped similarly as for the other mini-substations. (Refer to above paragraph 1.1)

3 MINI-SUB WITH DISTRIBUTION CIRCUIT BREAKERS – PURCHASE THROUGH RLM APPOINTED CONTRACTORS

Where mini substations are ordered purchased through RLM appointed contractors, circuit breakers for distribution shall be included (for Contractors and Developers developments) the following requirements shall be adhered to:

All circuit breakers shall preferably be magnetic-hydraulic CBI type or similar and equivalent.

Local consumers fed from the mini sub shall be protected for fault levels by means of relevant breakers - F15D.

4.1 Minisubs shall be manufactured in accordance with SANS 1029. All mini substations offered shall comply in all aspects to the latest edition of the NRS standards and shall bear the SABS mark

4.2 ELECTRICAL REQUIREMENTS

4.2.1 Transformer

4.2.1.1 The transformer shall bear the SANS 780 mark. The unit shall be three-phase, oil-immersed and naturally cooled. The insulation oil shall comply with the requirements of SANS 780.

4.2.1.2 The standard transformer power ratings for Type B miniature substation which may be ordered shall be:

a) 200kVA
b) 315kVA
c) 500kVA
d) 630kVA

e) 800kVA

4.2.1.3 The MV nominal voltage shall be 11kV. The rated voltage (U_m) of the transformer shall be 12kV. The transformer shall be capable of operating continuously at U_m without loss of life due to over-fluxing of the core.

4.2.1.4 The rated LV no-load phase to phase voltage shall be 400V.

4.2.1.5 **Physical transformer sizes and fixing arrangements shall be identical to facilitate interchangeability of transformers up to 630kVA. Interchangeable transformers shall be ordered from successful m/s supplier**

4.2.1.6 The rated impulse voltage withstand level (BIL) and the rated short-duration power frequency withstand R.M.S. voltage (1 minute) of the transformer shall be as specified in table 1.

	Rated voltage kV (r.m.s.)	**Rated lightning impulse withstand voltage (BIL) kV (peak)**	**Rated short-duration power frequency withstand r.m.s. voltage kV (r.m.s.) – 1 min**
	12	95	28
	0,400	30	1

Table 1

4.2.1.7 The transformer unit shall have a welded cover. The unit shall have a butt-welded valve for the purpose of draining and filling oil must be situated at the top away from the core. The unit shall have no drain valve or pressure release device/breather.

4.2.1.8 A robust oil level indicator shall be fitted in the LV compartment. It shall not be subjected to discoloration or deformity when exposed to heat generated within the MSS. Perspex or plastic oil level indicators shall not be accepted. The oil level indicator shall be clearly visible to the operator when standing at the open miniature substation LV compartment door.

4.2.1.9 The transformer shall have a Thermal indicator sticker. The indicator shall be self-adhesive and will be affixed to the side of a transformer, alongside the tap changer switch.

4.2.1.10 An off-load tap-changer shall be fitted and on the 11kV rating shall have a range of ± 6% with incremental steps of 3%, i.e. -6%, -3%, 0%, +3% and +6%.

4.2.1.11 The vector group of the transformer shall be Dyn11

4.2.1.12 The transformer MV bushing requirements are specified in 4.4.2.4.1

4.2.1.13 The transformer earth terminal shall be a 30mm long boss, with an internal M12 thread throughout, welded to the transformer tank. The boss shall be fitted with an M12 x 25mm setscrew, washer and spring washer. The boss and the setscrew shall be stainless steel of grades 304 and 316 respectively.

4.2.1.14 Transformer windings, both MV and LV, shall be copper.

4.2.2 Earthing

4.2.2.1 The miniature substation shall have a copper earth bar, with a cross sectional area equal to at least 70mm^2 that is accessible from within both MV and LV compartments.

4.2.2.2 The transformer earth terminal (boss) shall be connected to the miniature substation earth bar by means of a bare 70mm^2 copper wire conductor.

4.2.2.3 A combined LV neutral-earth busbar shall be provided and shall be insulated from the minisub. No separate LV earth bar shall be provided.

4.2.2.4 The neutral terminal of the transformer LV winding shall be connected to the LV neutral-earth busbar.

4.2.2.5 The miniature substation earth bar shall make provision, by means of a dedicated hole, for the fitting of a LV neutral surge arrester. A surge arrester shall be provided by the miniature substation manufacturer and positioned so that the 250mm insulated jumper is connected to the LV neutral earth busbar (see figure 1). In addition, two electrolytic copper conductors, each with a cross-sectional area of at least 70mm^2 shall be fitted (in parallel with the surge arrester) to provide an electrical bridge between the miniature substation earth busbar and the LV neutral-earth busbar.

4.2.2.6 The main RMU earth bar shall be connected to the minisub earth bar using 70mm^2 bare copper conductor.

4.2.2.7 The earth connection to the transformer tank shall be between the transformer earth terminal (boss), provided on the MV side of the transformer and minisub earth bar by means of a 70mm^2 bare copper conductor.

4.2.2.8 All metalwork shall be bonded to earth.

4.2.2.9 The earth resistance after the cut-in of the MSS shall not exceed 1 Ω

Note: According to the Rustenburg Local Municipality's earthing philosophy, if the MV and LV earth electrodes are to be separated on site, the electrical bridge between the minisub earth bar and the LV neutral-earth bar would then be removed as required, and the neutral surge-arrester would become effective.

4.2.3 LV panel and main large frame MCCB's

4.2.3.1 The LV panel shall be constructed and designed for the use of large frame MCCB's and or connections.

4.2.3.2 A main LV large frame, MCCB, shall be installed in each miniature substation as main LV protection. If a thermal circuit is installed the MCCB shall be set to the specific transformer's full load secondary current.

The Main circuit breaker shall be mounted in the side panel on the LV side to enable the Main circuit breaker to be locked separately from the front metering panel. Two rails must be fixed for circuit breaker installation.

The connections from the transformer shall terminate on the top of the circuit breaker and the busbar connections shall terminate at the bottom of the circuit breaker.

Transformer size (kVA)	**Main MCCB Hydraulic-Magnetic Type As specified or similar**	
100	175 A (J25S)	15 kA (min)
200	350 A ((L20Y)	15 kA (min)
315	500A (L20Y)	15 kA (min)
500	830 A (M25B)	20 kA (min)
630	1000 A (N50DE)	35 kA (min.)
800	MANUFACTURER TO SPECIFY	

MAIN OFFER Table 2 – Main MCCB current ratings

The approval of ALTERNATIVE MCCB should take place prior to its installation.

Transformer size (kVA)	**Main MCCB – Thermal / Electronic Adjustability Range (A)**
100	100 – 200
200	200 – 400
315	400 – 800
500	400 – 800
630	800 – 1600
800	MANUFACTURER TO SPECIFY

ALTENATIVE Table 2A – Main MCCB current ratings – Electronic

NOTE: The main MCCB is usually located below the LV transformer bushings

4.2.3.3 The main LV large frame MCCB shall have flash barriers at both ends and shall be barricaded from inadvertent contact and tampering by a protective shield. The barrier shall not prevent operation of the main MCCB.

4.2.3.4 All other exposed live LV connections and components (e.g. the transformer LV bushings) shall be barricaded (protected) using non-flammable plastic (e.g. acrylic) material to prevent inadvertent contact by persons requiring access to the LV compartment.

NOTE: The term “barricaded” implies that each compartment containing live equipment shall have an IP2X rating.

4.2.3.5 All busbar holes intended for connection of cable conductors shall be 12mm clearance holes.

4.2.4 LV busbars

4.2.4.1 The LV phase busbars shall be positioned with 185mm fixing centers as shown in figure 1. The spacing between the lowest LV phase busbar and the LV neutral-earth busbar shall be 300mm. The spacing between the LV neutral-earth busbar and the Uni-strut clamping bar shall be 200mm.

4.2.4.2 The LV busbars shall be rated at 1,2 times the kVA capacity of the transformer (see table 2) and the current density shall not exceed 1,8A/mm^2.

Transformer rating (kVA)	LV busbar current rating (A)
200	335
315	525
500	835
630	1050
800	1350

Table 3 – LV Busbar current ratings

4.2.4.3 The rated short-time current withstand level (1 s) of the LV busbars shall be 25kA for up to 800kVA miniature substations.

4.2.4.4 The LV busbars shall be drilled (centrally located 12mm diameter holes evenly spaced) to accommodate the number of outgoing LV feeders/connections. The holes shall be horizontally spaced at intervals.

4.2.4.5 The LV neutral-earth busbar shall be dimensioned identically to the LV phase busbars and be made of tinned, hard-drawn copper in accordance with SANS 1029. The LV neutral-earth busbar shall be drilled (centrally located 12mm diameter holes evenly spaced) along the length of the busbar, so that the holes align vertically with the phase busbar holes.

4.2.4.6 Neutral isolating links are not required.

4.2.4.7 M12 set screws, nuts, washers and spring washers shall be provided for each 14mm hole drilled on the LV busbars.

4.2.6 LV metering compartment

4.2.6.1 A separate LV metering compartment, for metering a dedicated supply, shall be provided between the MV and LV compartment. This compartment shall open to the front of the minisub.

4.2.6.2 The LV metering compartment shall be independent from both the MV and LV compartments. Only a 50mm conduit pipe shall be used for internal metering wires between the LV compartment and the metering compartment. The LV metering compartment will be accessed by unskilled operators and the IP2X rating of the compartment is critically important.

4.2.6.3 The LV metering compartment shall be 400mm wide and 400mm deep.

4.2.6.4 The LV metering compartment shall make provision for an electronic maximum demand billing meter, which will be fitted by Rustenburg Local Municipality.

4.2.6.5 A metering test block and 3 fuse holders with 2A HRC fuses, shall be fitted in the LV metering compartment. All approved internal wiring shall be terminated in the left-hand side of the LV compartment in an adequate terminal strip.

4.2.6.6 As per table 4, the following busbars mounted class 2 LV metering ring CTs shall be installed in the middle of the LV busbars, to the left of any of the 7 outgoing LV feeders. It shall be possible to connect a dedicated LV cable/s to the left of these CT's.

MSS rating (kVA)	Recommended LV CT rating (A)
100	200 / 5
200	400 / 5
315	600 / 5
500	800 /5
630	1000 / 5
800	1200 / 5

Table 4: LV metering CT's

4.2.7 Additional equipment

4.2.7.1 Analogue LV ammeters shall be provided for all three phases. The ammeters shall be phase-identified, thermal maximum demand ammeters, integrating over a 15min period. The individual current transformers shall be busbar mounted and securely fitted
The ammeters shall be mounted below each other in the top left-hand corner of the panel on the small side of mini-sub. Size of bezel 96 x 96 mm. All needles to be on the same pivot. Pilot wires to the Amp meters must be long enough to remove the ammeters from the front of the panel for inspection purposes or replacement.

4.2.7.2 One voltmeter shall be provided with a selector switch to enable any one of the phase voltages to be read.

4.2.7.3 The meters shall be mounted as high as is practicable on the right-hand side of the LV compartment.

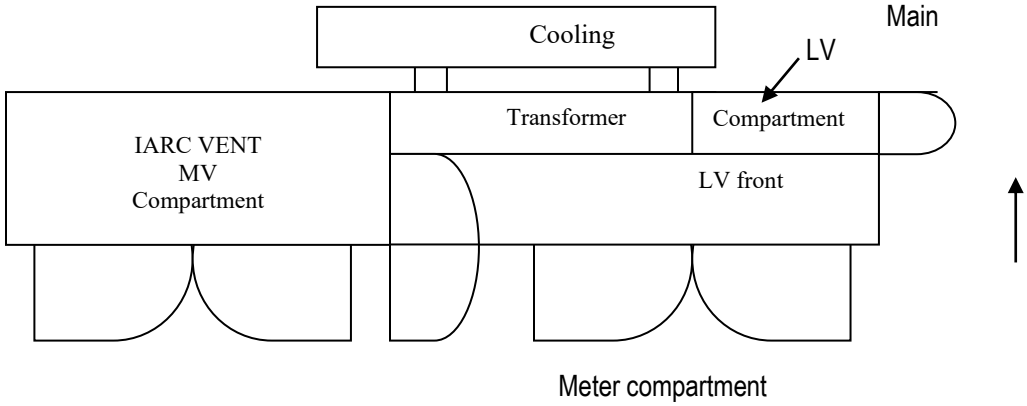
4.2.7.4 An earth-fault indicator (EFI) shall be provided and positioned on the right-hand side of the MV compartment. Sufficient slack shall be provided on the EFI CT cable, to enable it to reach the furthest MV cable termination. The indicator shall be mounted on the outside of the miniature substation enclosure in such a manner that it can be clearly viewed from the front of the miniature substation (street-front). The unit shall be connected to the LV supply of the miniature substation (see 4.2.6.2)

4.2.7.5 No provision shall be made for any street-lighting panels in the miniature substation. Provision shall be made for an MCCB protecting a possible street light circuit (see 4.2.3.5)

4.3 Construction requirements

4.3.1 Design

4.3.1.1 The general layout of the miniature substation shall be in accordance with the Type B (lateral) layout, as specified in figure C.2, annexure A, SANS 1029. Figure 3 is a specific illustration of Rustenburg Local Municipality requirements.



NOTE: Drawing not to scale.

Figure 3: Layout for Rustenburg Local Municipality Type B MSS

4.3.1.2 The miniature substation construction design shall be modular. Each of the enclosures shall form a separate module on its own and shall have an ingress protection rating of IP2X:

1. MV compartment
2. Metering compartment
3. Transformer compartment
4. LV front compartment housing outgoing circuit breakers and ancillary equipment: and
5. Main LV compartment housing main circuit breaker, tap changer and dual ratio changeover switch.

4.3.1.3 The base channel and sills of the doors shall be constructed with removable sections adjacent to the MV compartment door(s) to allow the MV cables to be moved into position. These sections shall be lap bolted with nuts on the inside of the base channel and housing. The base channel shall be designed to fit the type B concrete plinth

4.3.1.4 The three-point locking mechanism on each compartment door shall have an additional, captive, M10 Allen key cap screw. The cap screw shall be recessed i.e. the head shall be flush with the door surface and the screw shall lock the swivel mechanism of the three-point locking device when the mechanism is in the closed position. The door shall be secured even in the event of the padlock being removed.

4.3.1.5 All doors shall be flush with the body of the miniature substation and the stainless steel door hinges shall be the concealed type. A doorstop shall be provided to prevent the door from

swinging. The doorstop shall be strong enough to withstand the forces that might arise from wind on the open door.

4.3.1.6 Each door shall have a handle capable of being secured by means of a padlock with a shackle diameter of 8mm. A lock protection facility, complying with the general requirements detailed in Figure C.5 of SANS 1029, is required.

Note: 75mm from the pad lock to the minisub must be achieved.

4.3.1.7 The position of the lifting lugs shall take the centre of gravity of the entire minisub into consideration to ensure the minisub is evenly balanced when lifting without the roof being removed.

4.3.1.8 After disconnection of the cables and fastening it shall be possible to lift the entire miniature substation from its plinth. The transformer shall have lifting lugs by which it can be lifted after the disconnection of the cables and fastenings.

4.3.1.9 Ventilation louvers shall be provided on the miniature substation doors. Louvers shall not be provided on the roof section of the miniature. A 6mm mesh shall be provided on the inside of the louver.

4.3.1.10 The minisub enclosure shall be bonded to the miniature substation earth bar. All miniature substation housing sections (including the doors) shall be bonded to one another (i.e. inter-connected). The bonding conductors shall be tinned electrolytic copper braiding with a minimum cross-sectional area of 50mm^2.

4.3.2 Materials and corrosion protection

4.3.2.1 The miniature substation enclosure (roof, compartments and doors) and transformer tank shall be suitable for corrosive environments.

4.3.2.2 The unit shall be manufactured from mild steel which is 3mm (minimum) thick. Thinner wall thickness will only be considered if it is manufactured from 3CR12 stainless steel. COMPULORY TO INDICATE IN COVER LETTER.

4.3.2.3 The transformer cooling radiator shall be hot dip galvanized mild steel.

4.3.2.4 The copper busbars and minisub earth bar shall be tinned.

4.3.2.5 The miniature substation steel base shall be hot dip galvanized in accordance with the relevant requirements of SANS ISO 1461 and, in addition, shall be coated with black epoxy tar paint.

4.3.2.6 A 5mm thick cork packing shall be installed between the miniature substation end compartments and the transformer tank section, between the base and the end compartments, and between the base and the transformer tank section.

4.3.2.7 **The final colour shall be Avocado Green C12 in accordance with SANS 1091.**

4.4 Design

4.4.1 Layout

The type B miniature substation layout shall comprise of the following separate compartments:

a) MV compartment housing a metal-enclosed ring main unit (SF6 or Vacuum)
b) Transformer compartment housing the transformer
c) LV compartment for housing outgoing circuit breakers and ancillary equipment and
d) LV metering compartment with provision for mounting an electronic maximum demand billing meter
e) Main LV compartment housing main circuit breaker, rating plate, dual ratio changes over switch and tap changer

NOTE: Refer to figure 3 for diagram of layout.

4.4.2 Electrical requirements

4.4.2.1 MV ring main unit (RMU)

The non-extensible ring main unit shall comply with the requirements of the Rustenburg Ring-main unit Specification.

CABLE TESTING FACILITY - COMPULSORY

Cable test facilities that are independent of the cable end boxes and are accessible from the front of the Ring main are preferred.
For operator safety, the cable testing procedures shall be displayed on the front and inside of the cable testing facility covers.

4.4.2.2 Connections between ring main unit and transformer

4.4.2.2.1 For connections between RMU circuit breaker and transformer, MV, type C bushings shall be screened, Type B, 35mm^2, copper, single-core XLPE cables that comply with SANS 1339. The screens should be earthed on the RMU side only. Type 4 SSC terminations as per NRS 012 shall be supplied. Manufacturer to specify their standard connection for liability purposes

4.4.2.2.2 Fully screened separable connectors complying with NRS 053 shall be installed at both ends of the above screened tails.

4.4.2.3 Connections between outgoing LV MCCB and transformer busbars

4.4.2.3.1 These connections and the outgoing LV MCCB's shall only be provided if so, specified by Rustenburg Local Municipality or the consultant or developer providing the minisub for use on the Rustenburg Local Municipality network.

4.4.2.3.2 The connection between the top of the outgoing LV feeder MCCB and transformer LV busbars shall comprise 600/1000V, single core, PVC insulated flexible cables with stranded copper conductors that comply with SANS 1574. The cross-sectional area of each cable shall be 120mm^2.

4.4.2.3.3 The ends of these connections shall be terminated with a suitable crimped lug.

4.4.2.3.4 Acceptable allowance shall be made for short circuit effects such as thermal and electrodynamic forces.

4.4.2.3.5 The cabling shall be colour coded. A Coloured sleeve shall be fitted over the cable or lug barrel. The required colour shall be red, yellow and blue.

4.4.2.4 Transformer MV bushings

4.4.2.4.1 The transformer medium-voltage bushings shall comply with EN 50180 Type C (630A – tapered), bolted-type bushings with an M16 x 2 thread. These bushings have an internal screen which shall be earthed.

NOTE: All transformer bushing shall be subjected to a partial discharged test in accordance with SANS 60137.

4.4.2.4.2 The bushing-centre spacing and distance between the outer bushing-centers and the minisub metal enclosure shall be as specified in NRS 012 for use with type 4 connections:

a) 135mm between phase bushing-centers and
b) 90mm between phase bushing-centers and earth

4.4.2.4.3 The minimum creepage distance of the bushings shall be 31mm/kV

4.4.2.5 Transformer overload protection and shunt-trip facility

The transformer unit shall be fitted with a top-oil thermoelectric temperature-sensing element. This shall trip the main LV circuit breaker unit through a 230V shunt-trip facility when the transformer top-oil temperature exceeds 90°C. The relay used to prove the shunt-trip shall be housed in an enclosure and sealed with a stainless-steel meter sealing wire and a 12mm tinned copper ferrule. The thermoelectric should have a transparent front cover to view the temperature setting on the relay. The supply to the shunt trip facility shall be fitted with:

1. A 10A HRC fuse
2. A neutral fuse link.

NOTE: The pocket used to house the top-oil thermoelectric temperature-sensing element shall be filled with transformer oil and sealed to prevent oil from leaking during transit.

4.4.3 Construction requirements minisub and plinths

4.4.3.1 The general arrangement of the miniature substation shall be in accordance with the Type B (lateral) layout, specified in SANS 1029.

4.4.3.2 The maximum overall length and width of the miniature substation (including the cooling radiator) shall be 3000mm and 1650mm respectively. The miniature substation base length and width shall be 3000mm and 1200mm respectively. The height of the miniature substation is restricted to 2000mm. The base channel shall be designed to fit the standard Type B concrete plinth.

The plinth priced for shall be designed and manufactured for the Type B miniature substation for which the usual base length and width shall be 3000mm and 1200mm respectively.

4.4.3.3 A barrier shall separate the end of the LV compartment (located on the LV side of the transformer) from the front LV compartment.

4.4.3.4 The miniature substation earth busbar shall be accessible from the front of the Ring-main unit. The Ring-main unit shall be bonded to the miniature substation earth busbar by a 70mm^2 copper conductor.

4.4.3.5 Provision shall be made for the support (clamping) of two incoming (ring) cables in the MV compartment. Two adjustable cable clamps, each suitable for clamping cable ranging from 50 to 400mm^2 x 3 core, Aluminium XLPE shall be provided with the miniature substation. The minimum distance from the cable support point (clamp) to the RMU bushing centers shall be 800mm as per NRS 012.

4.4.3.6 The design and construction of the minisub shall complement the internal arc-test requirements of the RMU. The miniature substation shall be tested to assess the effects of arcing due to an internal fault inside the RMU. The minimum fault current inside the RMU shall be equal to the rated short time withstand current of the RMU. The minimum duration of the fault shall be 0,5 seconds. The miniature substation is intended to be installed in a site of unrestricted public accessibility and shall thus be tested with indicators placed in the front, lateral and rear sides (AB classification) of the miniature substation as per clause 6.106 and Annex A of SANS 62271-200.

4.5 Transformer losses and capitalization

4.5.1 The following capitalization formula will be used in the evaluation of any tender, to establish net present value of the total cost of the transformer:

Total cost = $A + C_iP_i + C_c P_c$

Were

A is the cost of purchasing and installing the transformer (capital cost), R.

P_i is the no-load (iron) losses, kW.
P_c is the load (copper) losses, kW.

C_i is the capitalized cost of no-load (iron) loss, R/kW; and

C_c is the capitalized cost of load (copper) loss, R/kW

4.5.2 The economic life of a transformer is assumed to be 30 years.

4.5.3 The values of parameters C_i and C_c are given in the technical schedules. These parameters will be revised as and when deemed necessary.

4.5.4 Regardless of the use of the capitalization formula, the losses shall not be greater than those given in table 5.

Rated power (kVA)	Component losses – No-load loss (W)	Load loss (W)
200	500	2530
315	792	4180
500	1210	5940
630	1430	7040
800	1600	8800

Table 5 – Maximum losses

4.5.5 Load and no-load losses, the percentage impedance and the X/R ratio of the transformer shall be stated in schedule B of the enquiry document. The load losses and the percentage impedance shall be stated at 75°C, in accordance with SANS 780.

4.5.6 Preference shall be given to low loss transformers.

4.6 Marking and labeling

4.6.1 Transformer rating plate information

4.6.1.1 **In addition to the relevant requirements of SANS 780, the following information shall be clearly shown on the transformer rating plate:**

a) The manufacturer's name and year of manufacture.
b) The serial number.
c) Rustenburg Local Municipality's order number.
d) Rustenburg Local Municipality's Store material number
e) The total mass of miniature substation.

4.6.1.2 The rating plate shall be permanently affixed in a prominent position at the LV transformer terminals so that it is clearly visible when the door to the LV compartment is open.

4.6.2 Signs

4.6.2.1 A sign depicting "Treatment and Full First Aid instructions" shall be permanently attached to the inside of the MV and LV compartment of the door that opens first.

4.6.2.2 External chromadek electrical safety notices, in accordance with design WW7 shall be securely mounted on the outside door of each compartment. If pop-rivets are used to attach the signs to the minisub doors, only aircraft pop-rivets will be acceptable. Normal pop-rivets are not acceptable.

4.6.2.3 The barrier used to barricade the LV bushings of the transformer shall have a sticker applied to it depicting an electrical symbolic warning sign (warning against "Unauthorized entry").

4.6.3 Labels

4.6.3.1 Phase labels shall be provided below all the bushings (primary and secondary) of the transformer and ring main unit.

4.6.3.2 The LV busbars shall be colour-coded in the colour of red, yellow, blue and black by a clearly visible painted-on spot at least 20mm diameter.

4.6.3.3 The MV and LV compartment doors shall be labeled with "MV" and "LV", respectively. Note that "MV" and not "HV" shall be used for the MV compartment doors. The labels shall be clearly and indelibly stenciled on both the inside and outside of all the compartment doors.

4.6.3.4 The LV metering compartment door shall be labeled with "METERING COMPARTMENT". The labels shall be clearly and indelibly stenciled on outside of the metering compartment door.

4.6.3.5 The manufacturer's name, primary voltage, secondary voltage, 'kVA' rating and vector group shall be marked on the right-hand side of the minisub, e.g. **"RLM MSS 11kV / 400V 500kVA Dyn11". The colour of the markings shall be black and the characters not less than 50mm high. The same information shall be displayed on the roof.**

The casing of the Minisub shall have the following embossed /sprayed:

i. **RLM PROPERTY - RLM MSS**
ii. **SIZE - 11kV / 400V 500kVA Dyn11**
iii. **Full WEIGHT - XXXkg**

4.6.3.6 The SF_6 /Vacuum RMU shall be provided with black on white sandwich board designation labels, permanently fixed on each circuit. **The labels shall be 150mm long by 30mm high.**

4.6.3.7 The LV outgoing circuits shall be provided with a 125mm long, 21mm high black on white sandwich board designation label, permanently fixed above each circuit breaker or on a mounting rail running the length of the LV circuits.

4.6.3.8 The LV auxiliary circuits shall be clearly labeled.

4.6.4 Safekeeping of documentation

4.6.4.1 Provision shall be made for the safe-keeping of all relevant documentation (i.e. the installation, operating and maintenance instructions for the ring main unit and all routine test certification) on the inside of the MV compartment door that opens first.

4.6.4.2 Provision shall be made for the safe keeping of Rustenburg Local Municipality's documentation (A4 size booklet, 20mm thick) on the inside of the LV compartment door that opens first.

4.7 Documentation

4.7.1 Technical schedules

The full Technical Schedule B and the Deviation Schedule shall be completed by the Bidder for each item offered and, together with Technical Schedule A, shall be submitted to Rustenburg Local Municipality for approval at the time of tendering.

4.7.2 Drawings

The following drawings shall be submitted to Rustenburg Local Municipality for approval at the time of technical evaluation:

4.7.2.1 Final design drawings (2 sets) reflecting the major dimensions (including the transformer and ring main unit dimensions) and layout of all components of the miniature substation. These drawings shall clearly indicate the following:

a) the general assembly (showing the actual positioning of the transformer, RMU, LV compartment, MV compartment and LV metering compartment. The position of the RMU bushings and cable support clamps shall be clearly shown)

b) the LV panel layout

c) the removable barrier that separates the end LV compartment from the front LV compartment

d) the removable barricading for the outgoing MCCB's

e) the removable sections adjacent to the cable entry positions (MV compartment base – see 4.3.1.3)

f) the design details of the interconnections between the ring main unit and the transformer MV bushings and

g) the internal arc complemented MV compartment details

4.7.2.2 Wiring circuit diagrams (2 sets). These drawings shall clearly indicate the following:

a) All auxiliary circuits and equipment
b) Ferrule numbers used for labeling auxiliary circuits

Any revision to drawings of units being manufactured for and supplied to Rustenburg Local Municipality shall clearly indicate the revision number and date and shall be submitted to Rustenburg Local Municipality for approval at the time of tendering.

4.7.3 Test certificates

4.7.3.1 All required type test certificates (see 5.2.1) shall be submitted to Rustenburg Local Municipality by the manufacturer at the time of tendering. Single copies of all type-test reports and certificates, in English, for the miniature substations offered shall be supplied to Rustenburg Local Municipality for approval at the tender stage. Certificates supplied for previous tenders shall be re-submitted.

4.7.3.2 Full routine test certificates (see 5.2.5) shall be provided with the miniature substations supplied. Original manufacturer's test certificates/reports for bought-out (out-sourced) equipment shall be provided with the equipment supplied.

4.7.3.3 Test certificates for each unit shall be traceable by reference to the manufacturer's serial reference number marked on the unit.

4.7.3.4 Any additional test certificates shall be marked "Additional tests" and kept separate from the required test certificates.

4.8 Transport

Each miniature substation shall be transported in a safe way. Damage to miniature substations will be for the cost of the supplier and payment approval shall be withheld for any damaged unit. **The supplier shall be responsible for safe off loading at RLM**

5. TESTS

5.1 General

5.1.1 The tests shall be performed to establish the design characteristics of the miniature substation and assure compliance with the requirements specified. The tests shall be conducted on new units in the same state as they are normally supplied.

5.1.2 Rustenburg Local Municipality reserves the right to witness any or all of these tests. The supplier or manufacturer shall demonstrate an ability to provide means to enable Rustenburg Local Municipality to witness such tests.

5.1.3 Suppliers are requested to indicate their compliance with the relevant standard at the tendering stage and shall submit all the required type tests and design drawings. If the units offered have been tested for compliance with an internationally accepted standard, Rustenburg Local Municipality may accept those test reports in place of the tests covered by this specification. The type test reports and alternative test standards shall be submitted with their tender, for Rustenburg Local Municipality's consideration.

5.1.4 The qualifying type tests need not be performed if they were successfully completed for a previous Rustenburg Local Municipality tender, provided that the design and material have not been changed or modified in any way. The type test certificates of completed successful type tests previously resubmitted shall be submitted with the current inquiry. Any change in the components shall be indicated at the time of tender. Reference to the appropriate inquiry for which the tests were successfully completed, shall be included in the current inquiry.

5.1.5 The transfer of test certificates between manufacturers will not be allowed.

5.1.6 Rustenburg Local Municipality reserves the right to view an existing miniature substation complying with this specification or if no such unit exists a prototype shall be built and made available for inspection by representatives of Rustenburg Local Municipality.

5.2 Qualifying tests

5.2.1 Type tests

5.2.1.1 Type tests are intended to establish design characteristics. They are normally made once and repeated only when the design, components or the material of the unit are changed. The results of the type tests are recorded as evidence of compliance with design requirements.

5.2.1.2 The following type tests specified in SANS 1029 are required. The supplier shall pay the cost of type testing and shall provide Rustenburg Local Municipality with the details of when and where these tests will be conducted.

5.2.2 Transformer unit

5.2.2.1 Type tests as specified in SANS 780 and SANS 60076-1 (temperature rise, voltage withstand dielectric) tank stiffness and, if applicable, corrugated tank fatigue type tests) shall be carried out on the transformer. The insulation levels of the transformer windings shall be tested in accordance with table 1.

5.2.2 The transformer temperature rise test shall be carried out on the complete minisub in accordance with SANS 61330 with the compartment doors closed.

5.2.2.3 In addition, the following special type tests shall be carried out:

a) Short-circuit withstand test in accordance with SANS 60076-5 and
b) The fully assembled miniature substation shall not exceed the specified maximum audio-sound levels specified in table 6 of this specification when tested in accordance with IEC 60551. This test shall be conducted with the compartment doors closed and the minisub standing on a solid level surface.

Rated power (kVA)	Maximum audio sound level dB(A)
200	50
315	50
500	52
630	54
800	54

Table 6 – Maximum limits of transformer audio sound levels

5.2.3 Ring Main Units

Type tests shall be carried out.

5.2.4 Minisub

The miniature substation shall be tested to assess the effects of arcing due to an internal fault inside the RMU. The minimum fault current inside the RMU shall be equal to the rated short time withstand current of the RMU. The minimum duration of the fault shall be 0,5 seconds. The MSS is intended to be installed outdoors in a site of unrestricted public accessibility (i.e. type B accessibility) and shall thus be tested with indicators placed in the front, lateral and rear sides of the MSS as per Annex A of SANS 61330. However, the test shall be carried out with the miniature substation MV compartment doors (front) open. The conditions stated in clause A.5.3.4 of SANS

61330 (i.e. applicable to the "Combined Test requirements") shall be fulfilled – giving the entire miniature substation the following internal arc classification (IAC):

Classification IAC AF-BFLR
Internal arc 20kA 0,5 s

The test setup shall thus be in accordance with the following conditions:

Front: restricted to operators (Type A test requirements) and
Rear and lateral: public accessibility (Type B test requirements)

The arc initiation shall be made in one of the main ring cable compartments (i.e. that which produces the highest stresses in the miniature substation) provided:

a) The air-filled compartment(s) and vacuum/SF_6 switchgear chamber(s) of the RMU have been previously internally arc tested in accordance with the requirements of SANS 62271-200 with a minimum classification IAC of "AF" for an internal arc o minimum current and duration as specified above; and

b) The gas flow coming from the other air-filled cable compartment(s) and SF_6 switchgear chamber(s) is like that from the tested cable compartment in accordance with clause A.3 of SANS 61330.

If the above conditions are met, then the miniature substation need not be tested for an arc initiated in the SF_6 switchgear chamber(s).

Venting of the internal arc emissions (i.e. gas flow) shall be directed upwards as miniature substations are normally installed on concrete plinths with the MV cable entry through the concrete plinth sealed with a sand-cement (10:1 mix) screed. Individual cable compartment and SF_6 switchgear chamber venting ducts are not required.

The designation of IAC classification shall be clearly shown on a label provided in the MV compartment of the MSS. The label shall be clearly visible to the operator.

5.2.5 Routine tests

Routine tests are intended to prove conformance of units to specific requirements and shall be made on every unit. These tests shall be non-destructive. The following routine tests, in addition to those specified in SANS 1029, are required.

5.2.5.1 Transformer unit

The following routine tests, as specified in SANS 780 and IEC 60076-1, shall be carried out on the transformer:

a) Measurement of winding resistance.
b) Measurement of voltage ratio and check of phase displacement.
c) Measurement of short-circuit impedance and load loss.
d) Measurement of no-load loss and current.
e) Dielectric routine tests

5.2.5.2 Ring main unit

Routine tests as specified.

The circuit breaker shall be tested in accordance with the following minimum requirements and a routine test certificate for the relay shall be produced and included with each miniature substation and stored in the documentation holder provided:

a) Primary current injection tests shall be carried out to confirm the correct operation of the relays.

b) A routine check shall be carried out to confirm that the relays are set according to relevant Rustenburg Local Municipality procedures

6. QUALITY MANAGEMENT

A quality management plan shall be set up in order to assure the proper quality management of the 11kV type B miniature substations with the rating not exceeding 800kVA during design, development, production, installation and servicing phases. Guidance on the requirements for a quality management plan may be found in the SANS ISO 9001. The details shall be subject to an agreement between Rustenburg Local Municipality and the Supplier.

7. ENVIRONMENTAL MANAGEMENT

An environmental management plan shall be set up in order to assure the proper environmental management of the 11kV type B miniature substation with the rating not exceeding 800kVA throughout their entire life cycles (i.e. during design, development, production, installation, operation and maintenance, decommissioning and disposal phases). Guidance on the requirements for an environmental management system may be found in SANS ISO 14001 standards. The details shall be subject to an agreement between Rustenburg Local Municipality and the Supplier. This is to ensure that the asset created conforms to environmental standards and Rustenburg Local Municipality's OHSACT Policy.

8. MAINTENANCE MANUAL

A maintenance manual or guideline as well as an operational manual, shall be submitted with a tender document for evaluation to ensure sound maintenance on products.

9. SUPPLIERS

If a bidder is a supplier and not the actual manufacturer and will be sourcing the product from another company, he must submit a letter from the other company/supplier at tender submission and must submit proof safe delivery and offloading and after sale service will be rendered to the supplier in Contract with RLM.

10 PRICING

Price schedules should be so drawn up and the covering letter so worded that the costs of all services such as tests and delivery and safe offload are declared and allowed for in the tender price.

11 TECHNICAL SCHEDULES A AND B AND DEVIATION SCHEDULE REQUIREMENT

The purchaser shall require the tenderer to fill in schedule B. By doing this, the tenderer will state compliance with this document and provide the information the purchaser has requested. Schedule B shall be completed in full by the supplier.

Deviations/modifications/alterations from the requirements specified in Schedule A or the rest of the specification shall be well documented in the deviation schedule.

Price schedules shall be drawn up and the covering letter so worded that the costs of all services such as tests and delivery are declared and allowed for in the tender.

RLM/DTIS/0114/2025/26 - APPOINTMENT OF ONE OR MORE SERVICE PROVIDERS (MAXIMUM OF 3 PER LINE ITEM) FOR THE SUPPLY AND DELIVERY OF MINITURE SUBSTATION, RINGMAIN UNITS, METERING UNIT, DISTRIBUTION TRANSFORMERS, PLINTHS AND TRANSFORMER OIL TO RUSTENBURG LOCAL MUNICIPALITY AS AND WHEN REQUIRED FOR A PERIOD OF 3 YEARS

STANDARD TECHNICAL SPECIFICATION:

MINI-SUBSTATIONS

ANNEXURE A – COMPULSORY TO COMPLETE

RATING kVA	VOLTAGE VOLTS	IMPEDANCE VOLTAGE %	LOSSES COPPER WATTS	LOSSES IRON WATTS	TEMP RISE WINDING °C	TEMP RISE TOP OIL °C
100	11000/230/400					
200	11000/230/400					
315	11000/230/400					
500	11000/230/400					
630	11000/230/400					
800	11000/230/400					

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ANNEXURE B

GENERAL INFORMATION ON MINISUB

	DESCRIPTION		A	B
	Nominal voltage of system	kV	11	
	Rated no-load secondary voltage	V	400/230	
	Rated output	kVA	100 200 315 500 630	
	Minimum high-voltage power frequency withstand test	kV	-----	
	Equipment in MV compartment		As per spec.	
	Top vent chimney		As per spec	
	Ring main unit (**2 x Isolators and 1 x Breaker tee-off switch to the transformer with Protection) WIP 45 or similar**	**NEIDI**	**As per spec.**	
	Cable test facilities that are independent of the cable end boxes and are accessible from the front		Yes	
	Incoming cable to be allowed for in termination		As per spec.	
	Construction		As per spec.	
	Layout		Type B	
	Material of housing		-----	
	Door fastening		Three-point locking	
	Lock protection facility		Yes	
	Compartment base – black epoxy tar		-----	
	Nameplates and notices		As per spec.	
	Documentation and drawings		As per spec.	
	Mini-substation base sizes: Length Width	mm mm	3000 1200	

ANNEXURE C

TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
1	**Standard operating conditions**		
1.1	a) Altitude m	1200	
1.2	b) Ambient air temperature °C	-5 to +40	
1.3	c) Lightning ground flash density Flashes/ km^2/year	>10	
1.4	d) Maximum solar radiation W/m^2	1000	
1.5	e) Ultraviolet radiation	High	
1.6	f) Relative humidity %	10 to 95	
1.7	g) Corrosive conditions (inland therefore non-corrosive)	Non-corrosive	
1.8	h) Wind pressure Pa	700	
2	**Ratings**		
2.1	Transformer power rating kVA	100/200/315/500/630	
2.2	Nominal voltage of system (Dual ratio)	11	
2.3	System of frequency Hz	50	
2.4	Number of phases	3	
2.5	Rated no-load secondary voltage V_{rms}	400	
2.6	Rated power-frequency voltage kV_{rms}	12	
2.7	Rated lightning impulse withstand voltage kV_{peak}	95	
2.8	Rated short-duration power frequency Withstand voltage [50Hz: 1 min] kV_{rms}	28	
2.9	Induced voltage withstand level	22	

	kV_{rms}		
2.10	Internal arc classification	AF-BFLR	
2.11	Internal arc current and duration	20KA/500 ms	

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TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
3	**Construction design**		
3.1	Layout	Type B	xxxxxxx
3.2	Construction	Modular	xxxxxxx
3.3	Removable base sections adjacent to MV compartment (sections to be lap bolted with nuts on the inside of the channel and housing)	Required	
3.4	Compartment fastening/locking (Pad lockable) three point locking with 1 additional 10mm sunken captive Allen cap screw	Required	
3.5	Compartment lock protection facility (with welded mesh top with inside visibility)	Required	
3.6	Total mass of miniature substation kg	xxxxxxxx	
3.7	Overall maximum dimensions		
3.8	a) MV compartment length mm		
	b) LV compartment length mm	xxxxxxxx	
	c) LV metering compartment mm	400 x 400	
	d) Overall length mm	3000	
	e) Overall width mm	1650	
	f) Overall height mm	2000	
	g) Base width mm	1200	
3.9	Provision for lifting of complete minisub onto a concrete plinth without need for dismantling	Required	
	Provision of lifting lugs on roof for ease of removal	Required	
3.10	MV switchgear, LV panel, LV metering and		

	transformer confined to separate compartments	Required	
3.11	Minisub housing sections and doors bonded	Required	

3.12	**Minisub plinth priced on to be designed and manufacture to house the Type B Miniature substation offered.**	Required	

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TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
4	**Transformer unit**		
4.1	Electrical requirements	As per SANS 780	
4.2	Vector group	Dyn 11	
4.3	MV system earthing	Effective	
4.4	LV transformer neutral earthing	Solid – connection to insulated LV neutral/earth bar	
4.5	MV system fault level kA	25	
4.6	Temperature rise limits	As per SANS 780 Table 6	
4.7	Secondary voltage regulation (Off-load on the 11Kv supply voltage windings) %	+6.0, +3. 0, -3.0, -6.0	
4.8	No-load losses W	xxxxxxxxx	
4.9	Load losses W	xxxxxxxxx	
4.10	Impedance %	SANS 780	
4.11	Cost/kW of no-load losses R/kW	13 900	
4.12	Cost/kW of load losses R/kW	1 800	
4.13	X/R	SANS 780	
4.14	Audio-sound level – maximum (see table 2) dB(A)	Table 2	
4.15	Sealed transformer unit	Required	

TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
4.16	Transformer MV bushings (NB internal screen to be earthed)	BS 7215-Type C with M16x2 thread	
4.17	MV bushing-center clearances (minimum) mm	135	
4.18	Clearances between outer bushing-centers and minisub metal enclosure (minimum) mm	90	
4.19	Transformer overload protection facility mm	Required	
4.20	Winding Material MV LV	 xxxxxxxx xxxxxxxx	
4.21	Manufacturer	xxxxxxxx	
5	**MV compartment**		
5.1	Equipment in MV compartment	Ring Main Unit Vacuum/SF6 2 X Isolators 1 x Circuit Breaker	
5.2	Ring Main Unit manufacturer	xxxxxxxxxx	
5.3	Incoming MV cable requirements:		
	a) 1 x 400mm^2 3 core Aluminium XLPE	Required	
	b) Cable support (clamping) required	Required	
	c) Minimum distance from cable clamp to centerline of RMU bushings mm	800	
	d) Type of connection	Screened (Type B)	
5.4	Minisub earth bar (accessible in front of RMU)	Required	

5.5	Interconnection arrangement between RMU and transformer MV bushings	xxxxxxxxx	
5.6	Unscreened interconnecting equipment and connections between ring main unit and transformer to be barricaded	Required	
5.7	Type of earth fault indicator	xxxxxxxxx	

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TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
6	**LV Compartment**		
6.1	Busbar rating (see Table 2) A	1,2 times the kVA capacity	
6.2	Busbar insulation	Air insulated	
6.3	Busbars Ø	3 + one identical neutral-earth busbar (insulated from frame)	
6.4	Current density of busbars A/mm^2	1,8 maximum	
6.5	Rated withstand current – 1 s (25kA for up to 630kVA)	As per rating kA$_{rms}$	
6.6	Min clearance to earth and between phases mm	20	
6.7	Provision of a LV neutral surge arrester fitted between minisub earth bar and LV neutral earth busbar	Required	
6.8	LV neutral-earth busbar to be earthed (via an electrical bridge to the minisub earth bar)	Required	
6.9	Neutral isolating links	Not Required	
6.10	Provision of LV main isolating switch	Not Required	
6.11	Number of outgoing LV feeders to be provided for (drill busbar Ø14mm holes)	2 - 160 mm apart	
	Spacing between holes (see Figure 1) mm	160mm	
6.12	LV panel designed for large frame MCCBs and connections	Required	
6.13	Spacing (vertical): Between phase busbars mm	185	
6.14	Between lowest LV busbar and LV neutral mm	300	
6.15	Minimum distance between LV neutral and mm	200	

	uni-strut		

TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
6.14	LV maximum demand ammeters	On all three phases	
6.15	Ammeter type	Thermal integrating over 15 min period	
6.16	LV indicating voltmeter with a selector switch	Required	
6.17	Ammeter and voltmeter size and display mm	96 x 96, 90°	
6.18	Ammeter and voltmeter position	Top right-hand side in LV compartment	
6.19	Analogue meter capable of reading current and voltage	Xxxxxxxx	
6.20	Provision of removable non-flammable barrier to separate LV end compartment and front LV compartment	Required	
6.21	Main MCCB manufacturer	xxxxxxxxx	
6.22	Catalogue/model code of main MCCB	xxxxxxxxxx	
6.23	Size of main MCCB A	As per table 2	

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TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
7	**LV Auxiliaries**		
	Provision of three point socket outlet in LV compartment (with instantaneous-trip earth leakage unit [20 A; 5kA rupturing capacity; 30mA sensitivity] and 20 A HRC fuse with neutral fuse link)	Required	
7.1	Numbering ferrules for auxiliary wiring	Required	
8	**Materials and corrosion protection**		
8.1	Minisub enclosure and transformer tank	Mild steel	
8.2	Radiator	Mild steel	
8.3	Tinned copper busbars	Required	
8.4	Minisub base material	Steel	
8.5	5mm cork packing (between ends and tank, base and ends, base and tank)	Required	
8.6	Final colour	Avocado Green (12)	

RLM/DTIS/0114/2025/26 - APPOINTMENT OF ONE OR MORE SERVICE PROVIDERS (MAXIMUM OF 3 PER LINE ITEM) FOR THE SUPPLY AND DELIVERY OF MINITURE SUBSTATION, RINGMAIN UNITS, METERING UNIT, DISTRIBUTION TRANSFORMERS, PLINTHS AND TRANSFORMER OIL TO RUSTENBURG LOCAL MUNICIPALITY AS AND WHEN REQUIRED FOR A PERIOD OF 3 YEARS

TECHNICAL SCHEDULES A AND B FOR MINIATURE SUBSTATIONS TYPE B

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Schedule A	Schedule B
9	**Notices, signs and labels**		
9.1	Transformer rating plate	Required	
9.2	Treatment and Full First Aid Instructions on inside of MV and LV compartment doors	Required	
9.3	Elec. Warning signs on all doors and barriers	Required	
9.4	Transformer phase labels below bushings	Required	
9.5	Colour-coded LV busbars	Required	
9.6	Stenciled labeling of MV and LV compartment doors (both inside and outside)	Required	
9.7	kVA, Prim V, Sec V & Corrosion Class	Required	
9.8	ID markings linking roof to body per batch	Required	
9.9	Provision for the safe keeping of documents	Required	
10	**Documentation**		
10.1	Type test certificates (provide ref. number of reports Sets	1	
10.2	Routine test certificates Sets	1	
10.3	Drawings	2	

	Sets		
10.4	Circuit diagrams (LV auxiliary wiring and equipment) Sets	2	

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TECHNICAL SCHEDULES A AND B DEVIATION SCHEDULE FOR MINIATURE SUBSTATIONS TYPE B

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by Rustenburg Local Municipality.

Item	Sub-clause	Proposed deviation

12 TECHNICAL DATA AND DRAWINGS

It is compulsory that full technical data and dimensional drawings must be included in the tender documents of all insulators offered. Items offered must also be clearly marked in the data sheets.

13 MAINTENANCE MANUAL

A maintenance manual or guideline if applicable must be submitted to ensure sound maintenance on products.

14 WARRANTY

The equipment offered shall be warranted free from defects in workmanship and materials for a period of at least twelve (12) months from the date of final commissioning or delivery. Any failures shall be repaired or replaced at the bidder's expense during the 12-month warranty period.

15 CERTIFICATES

Bidders must submit Eskom SANS, BS and IEC certificates of the equipment offered.

16 GENERAL

Only new manufactured equipment will be accepted.

17 SUPPLIERS

If the bidder is not the manufacturer, it is the responsibility of the bidder to ensure that he has a credit agreement as well as an after sales agreement with his supplier (Company) from which he will be sourcing the product.

18 AFTER SALE SERVICE

The bidder shall supply all details regarding their after-sale service on the equipment offered.

19 SAMPLES

No Samples are required. Delivery of substandard material or equipment will result in no approval of payment and the return of the product offered.

20 ALTERNATIVE OFFERS

No Alternative offers will be considered. Pricing on porcelain or other insulators is, however, required for evaluation purposes for market analysis.

21 LOCAL CONTENT

Local Content on material or products will be in accordance with the Department Trade and Industry where applicable.

No imported product will be excepted unless no manufacturing company exists in South Africa.

22 PRICE ESCALATION CLAUSE

The tender appointment prices shall be the ordering prices after adjudication and Contract Price Adjustment shall be clearly defined such as SEIFSA indices, CPI, ROE, Foreign Currency Components such as rates on which tender is based, Custom duties percentage, forward cover and the relevant clauses must find expression in the tender submitted.

SEIFSA indices, CPI, ROE, Foreign Currency Components such as rates on which tender is based, Custom duties percentage, forward cover and the relevant clauses shall be included then in the Service level agreement when the adjudication is successful.

All quantities will be verified after adjudication, Quantities may differ after adjudication on purchase orders.

23 CANCELATION CLAUSE

The delivery of substandard material or equipment or refrain from supplying it within the required timeframe will result in cancelation of the contract and the second highest scorer will be appointed.

END OF SPECIFICATION

CITY COUNCIL OF RUSTENBURG

DEPARTMENT OF THE CITY ELECTRICAL ENGINEER

STANDARD TECHNICAL SPECIFICATION: HV-014/0

1. 1. GENERAL INFORMATION

This specification is applicable to 33000/11000 volt distribution transformers.

1.1 System particulars:

No load line voltage	:	33/11 kV
Number of phases	:	3
Frequency	:	50 Hz
Cooling	:	ONAN

1.2 System earthing:

1.2.1 On 33 kV side through a neutral compensator;
1.2.2 On 11 kV side star point effectively earth

1.3 Service conditions:

		Maximum temperature: 40 C
Altitude	:	1200 m above sea level
Lightning conditions	:	Severe

1.4 Standards:

1.4.1	Transformers	:	SABS 780, 1979 as amended;
1.4.2	Transformer oil	:	SABS 555, 1985 as amended;
1.4.3	Hot dip galvanizing	:	SABS 763, 1977 as amended;
1.4.4	BS 171		

1.5 Compliance to Statuary Regulations:

All units must comply with the Occupational Health and Safety Act, (Act 85 of 1993).

2. 2. SABS CERTIFICATION

A copy of the transformer manufacturer's SABS issued certificate of quality assurance shall accompany the tender.

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RLM/DTIS/0114/2025/26 - APPOINTMENT OF ONE OR MORE SERVICE PROVIDERS (MAXIMUM OF 3 PER LINE ITEM) FOR THE SUPPLY AND DELIVERY OF MINITURE SUBSTATION, RINGMAIN UNITS, METERING UNIT, DISTRIBUTION TRANSFORMERS, PLINTHS AND TRANSFORMER OIL TO RUSTENBURG LOCAL MUNICIPALITY AS AND WHEN REQUIRED FOR A PERIOD OF 3 YEARS

TECHNICAL DATA SHEET

ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
1	**General Transformer Specification**		
1.1	**Ratings** Continuous rated power in MVA of main winding on any tapping with ONAN cooling Rated voltage ratio Rated current i) HV ii) LV No of phases Vector Group Manufacturer Type (Core or shell) Number of Limbs Transformer to comply with standard specification BS 171-1970 Type of cooling (to BS 171-1970) No load loss on principal tapping in kilowatts Flux density in core in tesla, at rated voltage and frequency on principle tapping i) Legs ii) Yoke Magnetizing current, at rated voltage and frequency, on principal tapping, in percent of rated current	20 MVA 33/11 kV 3 DY Yes ONAN	

TECHNICAL DATA SHEET

SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
	Current density in windings at rated MVA and rated voltage, in ampere per mm² i) HV Winding ii) LV Winding Load loss (I^2R and stray) at 75°C on principal tapping at rated power, in kilowatts Leakage reactance at 75°C and rated frequency based on max. Rated power in percent:- - On principal tapping - On extreme plus tapping (Hi tap 11 kV bucking) - On extreme minus tapping (Low tap 11 kV boosting) Limites, on any tapping, of the impedance at 75°C and rated frequency based on max. Rated power in percent:- Maximum Minimum Temperature rise at site altitude in °C:- Top oil Windings by resistance Approximate oil quantities, in litres: Transformer tank Coolers and conservator	10,0 % 55° 60°	

	Tap-changer Total		

SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
1.2	Windings Connection Connections brought out: 33 kV 11 kV Winding Insulation - HV - LV Min. 60-sec. separate source, withstand test voltage between winding under test and the remaining windings, core, frame and tank connected together and to earth, in kV r.m.s. Minimum induced over voltage withstand test between line terminals in kV	 Yes Yes Partially graded Partially graded HV LV HV LV	
1.3	Bushings Min. impulse withstands test voltage at sea level (1.2/50 micro-secs. full wave) in kV crest	 HV LV	

SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
	Plain Bushing provided with electro-tinned copper stem of:- - Min. diameter - Min. length Vertical orientation Oil filled condenser bushings provided Visual oil level indication Bushing manufacture HV - Type Manufacturer's name LV - Type (To fit 3 x 185mm², 11 kV XLPE 3-core cables) Manufacturer's name Neutral - Type Manufacturer's name	 Yes Yes Yes (Cable box) NA	
1.4	Mass Approximate mass, in kg: a) Core and windings kg b) Total mass without oil kg c) Total mass with oil kg d) Heaviest transportation weight e) Max. Dead weight of single unit (filled with oil where applicable) complete with all necessary attachments. Filling medium for transport.		

SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
1.5	Overall dimensions Complete unit a) Height b) Length c) Width Tank only (if separate cooler bank) a) Height b) Length c) Width Coolers only (If separate cooler bank) a) Height b) Length c) Width Height over HV bushings Distance through which core and windings must be hoisted to clear tank Tank and cooler material thickness, in mm a) Sides b) Bottom		

	c) Top d) Conservator e) Cooler tubes f) Pressed sheet radiators		
SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
1.6 1.7	Coolers: a) Number of cooler units b) Capacity of each cooler unit, in percent c) Safe withstand vacuum, in mm of Mercury, of (at sea level): On Load Tap Changer On load switching Tapping winding Tap changer control equipment suitable for: a) Local/remote control b) Auto/Manual control c) Parallel operation Ultimate no. of transformers for which parallel control scheme to be suitable Tap changer overcurrent protection blocking circuit monitoring contacts Time t1 t2 t3 Voltage sensing from VT on Transformer Panels Tap change pressure relief	 Yes HV On Tapchanger kiosk On Trf panel On Trf panel 2 seconds seconds seconds Yes	

	Out-of-step protection (Stop all further steps) Name of Manufacturer Type Voltage regulating relay Name of Manufacturer Type Voltage sensing from VT on 11 kV side of transformer panels Auxiliary Supplies to tap change motor drive Alarm circuits	Yes Trip CB Yes (alarm) Yes Yes 380V AC 110V DC	
SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantees and technical particulars (to be completed by Tenderer)
1.7a 1.8	Off laod tap changer Name of Manufacturer Type Tap ratios: Tap 1 Tap 2 Tap 3 Tap 4 Tap 5 Tap 6 Trip circuits HV/LV ratios provided by the tapping range, per unit of the ratio on the principal tapping: Minimum Minimum Number of approximately equal steps Approximate change per step % of the ratio on the principal tapping Type of tap-changer (resistor, reactor) Nominal voltage and current rating of tap changer: Contacts: Selector switch Diverter switch Resistor What is the maximum overcurrent which the tap-changer can handle without	 34 650 33 825 33 000 32 175 31 350 30 525 110V DC 105% 85% 16 1.25%	

	damage: Driving motor input, in kW Type of driving motor, i.e. three phase, split-phase Tap-changer overcurrent protection: Have overcurrent blocking facilities been provided. Type The monitoring contact Closes in advance of parting of the diverter switch contacts by (seconds) Diverter switch operating time, in seconds Time from "point of return" to parting of diverter switch contacts in seconds	 To stop tap-change drive	
SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantees and technical particulars (to be completed by Tenderer)
1.9	Transformer Fittings Required Conservator tank with plain oil gauge Dehydrating breather Bucholz relay Pocket for top-oil check thermometer Provision for dial-type top-oil thermometer with trip contacts Fan Control contacts Drain valve Oil filtration connections Rating and Diagram (Plate(s) Earthing terminal(s) (to be suitable for 50mm x 3mm flat copper strap Lifting lugs	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	

	Jacking pads Transformer base: skid underbase for movement in any direction Pressure relief device Winding temp. Indicator Oil sampling device Radiators a) Are separate radiators offered b) Separate radiators to be supported independently	Yes Yes Yes Yes Yes Yes	
1.10 10.1.1	Earthing HV Side Surge Diverters Polution	 Cl 1.2.1 Medium	
SECTION 5 ITEM	 DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
	Intensity of solar radiation Classification to IEC TC 37 WG 4 Type - Operating duty class - Diverter continuous operating voltage (line to line) - Diverter rated voltage (to IEC) (line to line) - Max. Continuous operating voltage (L-G) - Nominal Lightning discharge current (8/20µs) - Peak residual voltage for 8/20 µs for current impulse of the following magnitudes:	1,1 kW/m² Heavy duty Class 1 XAR.72,60kV or similar	

	10 kA 20 kA - Impulse spark-over voltage - Power frequency withstand Wet (10 sec) Dry (1 min) - Limit of: Radio influence voltage (RIV) at 1 MHz with noise limit 32 db Discharge current withstand (4/10μs² shots) Withstand voltage of assembled insulator (excluding internal portion) Creepage distance Energy absorption capability Zinc oxide or silicon carbide type		
SECTION 5 ITEM	DESCRIPTION	SCHEDULE A Requirements and site particulars	SCHEDULE B Equipment guarantee and technical particulars (to be completed by Tenderer)
     1.10.2	Insulating base Supporting structures to be provided Surge counter with each 3 Phase set Max. weight of single unit (kg) LV side:	Yes Yes (Volume 3) Yes Cl 1.2.2	

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RUSTENBURG LOCAL MUNICIPALITY

DIRECTORATE: INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

UNIT: ELECTRICAL ENGINEERING SERVICES

STANDARD TECHNICAL SPECIFICATION GUIDELINES: HV-016/1A

(SF6 / VACUUM)
RING MAIN UNITS (WITH METERING)
2021 RINGMAIN UNITS - AUGUST 2021
Guidelines.

This Guidelines can be used for the offering of SF6 / Vacuum ring-main units

Compulsory: Attach specifications and test certificates on all products offered

1. GENERAL INFORMATION

This specification is applicable to oil mini-substations.

1.1 System particulars:

Normal operating voltage	:	11 000 Volt
Normal operating voltage	:	230/400 Volt
Frequency	:	50 Hz
Number of phases	:	3
Neutral earthing	:	Solid

1.2 Service conditions:

Maximum temperature	:	40° C
Altitude	:	1200 m above sea level
Lightning conditions	:	Severe

2.1.1 NORMATIVE REFERENCES

Latest Edition:

SABS 1874 as amended
SABS IEC 61330 as amended
SANS 1872 as amended

2.1.2 SERVICE CONDITIONS

a. Unless otherwise specified in the Technical Schedules in the following sections of this document, all equipment offered shall be suitable for use under the following service conditions. Installation shall be in normal indoor conditions in accordance with IEC 60694.

Ambient temperature	-10°C to 50°C
Altitude	1000 to 1600m
Average humidity	Not exceeding 95%
Level of atmospheric pollution	High

Table 2.1 – Service Conditions

2.2 GENERAL MECHANICAL AND STRUCTURAL CONSTRUCTION

All Ring main units with or without metering shall be supplied in an outdoor ARC Proof metal enclosed cubicle with Top Vent. The cubicle shall be metal sprayed and painted **Avocado Green**

a. The RMU unit shall be of **the outdoor fully arc proof metal enclosed (Top Vent),** free standing, floor mounting, flush fronted type, consisting of modules assembled into one or more units. Each unit is to be made of a cubicle sealed for life with SF6 gas and contains all medium voltage components sealed off from the environment. If a system requires use of several units a separate extension of the busbar shall form a system with a common busbar.

b. The overall design of the switchgear shall be such that front access only is required. It shall be possible to erect the switchboard against a substation wall, with MV cables being terminated and accessible from the front.

c. The unit shall be constructed from at least 3 mm thick stainless steel sheets. The design of the units shall be such that no permanent or harmful distortion occurs either when being lifted by eyebolts or when moved into position by rollers.

d. The cubicle shall have a pressure relief device. In the case of an internal arc, the high pressure caused by the arc shall be released by the device. The hot gases shall be exhausted from the top of the cubicle. A controlled direction of flow of the hot gas shall be achieved in order to avoid injury to the operator.

e. The switchgear and control gear shall have the minimum degree of protection (in accordance with IEC 60529)
IP 67 for the tank with high voltage components

IP 2X for the front covers of the mechanism
IP 3X for the cable connection covers

f. The switchgear shall have an optional possibility to be extendable in either direction.

g. Each unit shall be supplied with an operating handle.

2.3 PANEL (MODULE) DESCRIPTION

2.3.1 Incoming cable module

a. The incoming cable module shall consist of an SF_6 cubicle housing an on-load switch disconnector and an earth switch.
b. The busbars and all electrical connections shall be located inside the tank.

c. The operating shafts for the switches shall have rotary seals where they enter the SF_6 . cubicle.

d. The operating mechanisms shall be located outside on the front of the SF_6 tank.

e. Cable bushings shall be located on the front of the SF_6 cubicle in a separate cable compartment.

f. Access to the cable bushings shall be in the lower part of each module.

g. Covers containing the mimic diagram and having a degree of protection IP2XC shall be used to close the front of the panels.

2.3.2 The Circuit Breaker Module (Transformer Feeder) (NEIDI Configuration)

a. It shall consist of a Vacuum / SF6 cubicle housing a circuit breaker unit and a disconnector earth switch.

b. The circuit breaker shall be of the type and rating as indicated in the technical schedules.

c. An integrated (self-powered) relay and associated CT's shall be used for tripping of the circuit breaker during fault conditions.

d. Busbars and all electrical connections shall be located inside the tank.

e. The operating shafts for the switching devices shall have rotary seals where they enter the SF_6 .cubicle.

f. The operating mechanisms shall be located outside on the front of the SF_6 tank.

g. Cable bushings shall be located on the front of the SF_6 cubicle in a separate cable compartment.

h. Access to the cable bushings shall be in the lower part of each module.

i. Covers containing the minimum diagram and having a degree of protection IP2XC shall be used to close the front of the panels.

2.4 CIRCUIT BREAKERS

a. Circuit breakers shall be of the vacuum/SF6 type.

b. Circuit breaker ratings shall be as specified in the Technical Schedules

c. The circuit breaker main circuit shall be connected in series with a three-position disconnector-earth switch.

d. The operation between circuit breaker and disconnector earth switch shall be mechanically interlocked.

2.5 BUSBARS

a. The busbars shall comprise of 3 single phase copper busbars and the connections to the on-load cable modules and the circuit breaker module

b. The busbar shall be fully integrated inside the SF_6 cubicle.

c. The busbars and the circuit connections to the busbars shall have normal current ratings suitable to the application and shall be calculated by the Contractor.

d. Busbars shall be rated to withstand all dynamic and thermal stresses for the full length of the switchgear.

e. The use of cabled sections in busbar runs (e.g. to provide connections to bus-couplers) is not acceptable without the written approval of the Electrical Engineer.

f. The temperature rise of busbars, busbar joints, busbar connections and breaker plug-in contact shall not exceed the figure laid down by BS 159 when carrying rated current, due account being taken of temperature rise correction for altitude.

2.6 RATING OF SWITCHGEAR

2.6.1 Voltage Rating

a. The MV switchgear shall be suitable for safe operation on the specified system for all operating conditions. The working voltage for the building substation is 11kV.

b. There shall be no audible corona discharge under working conditions. This requirement shall be taken to be complied with only if the audible corona extinction voltage, phase-to-earth, or phase-to-phase, is not less than 125% of nominal system voltage. Compliance

may be conceded if it can be shown that any discharge below the specified level takes place at points remote from all dielectric materials and cannot cause their deterioration.

2.6.2 Fault Capacity

a. The switchgear shall have the fault current ratings at nominal system voltage as specified in the Technical Schedules.

b. The contractor shall be required to verify the system fault level, and submit the details to the Electrical Engineer before commencing with manufacture.

c. Testing shall be done on an entire switch unit, complete with circuit breaker, potential transformer and condenser bushings where applicable, current transformers, busbars, shutters, cable boxes and if necessary, such parts of adjacent panels as are required to support the busbars and present a complete unit for testing.

2.6.3 Impulse Rating

a. The switchgear shall have an assigned impulse rating as specified in the Technical Schedules, supported by recent test certificates proving successful testing, using a standard 1/50 microsecond voltage wave, on identical units, manufactured in the factory from which an order would be executed.

b. The complete RMU shall withstand a one minute power frequency voltage, of 2.2 times the rated voltage.

c. Should reasonable doubt exist as to the validity of test certificates submitted, for example by virtue of modifications made to the switchgear, the Electrical Engineer may direct that a further certificate(s) be obtained on a sample unit(s) manufactured under the Contract at the expense of the Contractor. Such tests shall be carried out by a recognized testing institute and (at their discretion) in the presence of the Electrical Engineer.

2.7 ON-LOAD CABLE DISCONNECTOR

a. The on-load cable disconnector shall be a combination of a switch-disconnector and an earth switch.

b. The arc-quenching medium shall be SF_6 gas.

c. The on-load cable disconnector shall have three positions, namely:

Open
Closed
Earthed

2.8 EARTH SWITCH

a. Earth switches shall be rated equal to the switchgear rating.
b. Earth switches shall be of the quick-make type.

c. Earth switches shall be operated from the front of the cubicle by means of a removable handle.

2.9 CIRCUIT BREAKER MODULE

a. The circuit breaker module shall be a combination of a circuit breaker and an earth switch.
b. The circuit breaker and earth switches shall be mechanically interlocked.
c. The arc-quenching medium shall be SF_6 gas.
d. The circuit breaker shall have three positions, namely:

Open
Closed
Earthed

2.10 OPERATING MECHANISMS

a. All operating mechanisms shall be situated in the mechanism compartment behind the front covers outside the SF_6 tank.

b. The mechanism for the on-load cable disconnector and the earth switch shall operate both devices via one common shaft.

c. The mechanism shall provide independent manual operation for closing and opening of the disconnector, independent closing of the earth switch and dependent opening of the earth switch.

d. The mechanism for the vacuum circuit breaker (VCB) and disconnector-earth switch shall operate the VCB and the disconnector-earth switch via two separate shafts.

e. The mechanism for the VCB shall have stored spring (kinetic) energy and shall provide independent manual operation for closing and opening of the VCB.

f. The mechanism shall have a self-powered relay with associated CTs and/or remote tripping device.

g. The mechanism for the disconnector-earth switch shall provide independent manual operation for closing and opening of the disconnector, independent closing of the earth switch and dependent opening of the earth switch.

2.11 ELECTRICAL BUSHINGS

a. The bushings shall be made of cast resin with moulded electrical conductor in the centre.
b. A screen shall be moulded into the bushing. This screen shall act as the main capacitor supplying voltage indicators.
c. The bushings shall be sealed by O-rings and fixed to the cubicle by a common supporting bracket.

2.12 MECHANICAL BUSHINGS

a. The mechanical bushings are the interface between the switches inside the cubicle and the mechanism outside.
b. The mechanical bushing shall have a rotating shaft, which is connected to the shaft of the switch and to the corresponding shaft of the mechanism.
c. The rotating shaft shall be sealed by a double set of radial simmering gas seals.
d. O-rings shall provide the fixed sealing of the bushings.

2.13 FRONT COVERS

a. The front cover shall contain the mimic diagram of the main circuit with the position indicators for the switching devices

b. The voltage indicators shall be situated on the front covers.

2.14 POSITION INDICATORS

a. The position indication of the switching devices shall be visible through the front cover and be directly linked to the operating shaft of the respective switching devices.

b. Mechanical position indicated shall be used.

c. The following three positions shall be clearly visible for each of the different switching devices:

Open
Closed
Earthed

2.15 VOLTAGE INDICATION

2.15.1 Neon Lights

a. Where specified, three voltage-indicating neon lights – one for each phase – shall be provided to indicate whether the cable side of the circuit is energized.

b. The neon lights shall be energized from condenser bushings on the cable side.

c. It is the responsibility o the Contractor to ensure that the rating of the condenser bushings are sufficient to supply the imposed load on the bushings and to provide clear indication by the neon lights, even on the remote control boards, to the full approval of the RLM Representative / Electrical Engineer.

d. The Contractor shall state the make and type of condenser bushings used and the type of dielectric used for the manufacture of the bushings, and the certified 1/50 microsecond impulse strength of the bushings.

e. Each neon light shall be shunted by a suitable resistor or non-linear resistor located immediately adjacent to the condenser bushings to prevent dangerous potentials appearing in

the event of lamp failure and to protect the lamps against voltage surges.

2.15.2 On-load Cable Disconnector

a. A separate set of voltage indicators (neon lights) shall be situated on the front cover of the respective modules.

b. The voltage indicators shall be used to indicate the cable voltage of each incoming module.

c. Identification of t he phases shall be achieved by labels indicating L1, L2 and L3 on the front of the voltage indicators.

d. The voltage indicator shall satisfy the requirements of IEC61243 Annex F.

2.15.3 Circuit Breaker Module

a. A dedicated analogue voltmeter shall be situated on the front cover of the circuit breaker module to indicate the busbar voltage.

b. Voltmeters shall be of the suppressed zero type and scaled to the approval of the RLM Representative / Electrical Engineer with the normal operating voltage reading indicated in red.

c. A voltage selector switch shall be provided having four positions marked “OFF”, “R-B”, “Y-B” and “R-Y” so that the voltage across any two lines may be indicated or the voltmeter may be disconnected from the circuit.

d. The voltmeter shall be supplied via voltage transformers that shall be connected to the main busbars via primary fuses.

e. All voltage transformers shall comply with IEC 60186.

f. Voltage transformers shall be of dry type, with ratings and ratios as specified in the Technical Schedules.

g. Voltage transformers in cubicles shall have dimensions according to DIN 42600, Narrow type.

2.16 CABLE COMPARTMENT

a. It shall be possible to terminate a minimum of two single core MV cables per phase.

b. The access to the compartment shall be possible by removing the cable cover, bolted tot eh main frame.

c. Removable steel covers shall close the cable compartments.

d. Arc proof cable covers shall be available as an option.

e. Each module shall have a separate cable compartment that is segregated form each other by means of a partition wall. A partition wall shall be fitted to divide the cable compartment from the rear side of the switchgear.

f. In case of an arc inside the tank, followed by the opening of pressure relief device, the partition wall shall prevent the hot gases flowing out from the pressure relief to enter the cable compartments.

g. All covers shall be removable.

2.16.1 Power connection

a. The cables shall be installed below the mimic front cover.
b. The medium voltage cables shall be connected to the unit through electrical bushings
c. The bushings shall be fitted with a capacitor of approximately 15 pF. This capacitor shall be the primary capacitor used in the capacitive voltage divider, which shall form part of the permanent cable voltage indicator.
d. At the bottom of the cable compartment an earth bar system shall be fitted. This system shall be made of copper with a minimum cross sectional area of 120 mm²
e. In each compartment the earth bar shall be fitted
f. The main SF_6 tank shall be connected to the copper earth bar

2.17 INTERLOCKING

a. The mechanism for the on-load cable disconnector shall provide a built-in mechanical interlocking system to prevent the following operations:
Closing of disconnector switch when the earth switch is closed
Closing of the earth switch when the disconnector switch is in the closed position.

b. The mechanism for the circuit breaker unit shall provide a built-in mechanical interlocking system to prevent the following operations:
Closing of the circuit breaker when the earth switch is closed
Closing of the earth switch when the circuit breaker is in the closed position.
In addition an interlocking device that allows access to the fuses only when the earth switch is in the earthed position and opening of the earth switch is only possible when the fuse cover is closed and secured.

2.18 AUXILLIARY EQUIPMENT

2.18.1 Current transformers

a. Current transformers shall be of dry type, with ratings and ratios as specified in the Technical Schedules

b. All primary connections and all current transformers shall have a short time current rating corresponding to the rated breaking capacity of the switchboard.

c. No CT wires shall be joined under any circumstances.

d. The "Limits of Temperature Rise of Windings" specified in Table 1 of BS 3938 for the condition of rated current and burden, shall apply instead when the current transformer carries 150% of rated current and 225% of rated burden, continuously.

e. Magnetization characteristics (V_{kp} – 1_0 curves) and secondary winding resistance referred to 75°C shall be provided for all protection and metering current transformers. The following will specifically be required:
For Class TPS CT's, the excitation current shall be measured with V_k applied to the secondary winding.
For Class 5P and 10P C's, the excitation current corresponding to the rated accuracy limit factor
The secondary winding resistance referred to 75°C
For all metering CT's, tests for accuracies as specified in BS 3938, Clause 9.1 are required.

f. Current transformers used for metering purposes shall be of Class 0.5 accuracy and rated for a burden of 15 VA in accordance with BS 39378 (SABS IEC 60185)

g. The metering CTs shall be designed for early saturation and the Contractor shall state the saturation factor applicable.

h. Current transformers required for ammeter indication only, shall be Class 0.5 metering type for a burden of 15 VA.

i. All current transformer secondary connections shall be brought out to fully accessible terminal blocks and shall be clearly marked.

j. Duplicate rating plates to BS 3938 (SABS IEC 60185) for all CTs, shall be fitted in an accessible position on the relevant switchboard housing (e.g. where hinged doors are fitted to relay cubicles, the inside of such a door is an ideal position for mounting duplicate rating plates.)

2.18.2 Voltage Transformers

a. Where specified, three-phase voltage transformers shall be provided for connection to the main busbars.

b. The voltage transformer shall be oil-immersed, or totally encapsulated in epoxy resin, using recognized vacuum filling techniques.

c. The voltage transformer shall have an output of 50 VA per phase, be of Class 0.5 accuracy to BS 3941 (SABS IEC 60186) and shall be complete with fuses in the primary circuit and MCBs n the low-voltage circuit.

d. The medium voltage fuses shall be accessible only when the voltage transformer is fully isolated from the primary plug-in contacts.

e. The secondary voltage output shall be 110V between phases. The secondary wires of the VT outputs shall not be joined.

f. The primary and secondary windings of the VTs shall be connected such that there shall be no phase displacement between corresponding primary voltages and secondary voltages, expect for inherent phase angle errors.

g. Isolation of a VT shall be achieved by complete withdrawal of the VT assembly from its primary isolating contacts.

2.18.3 Low Voltage compartment

a. Necessary terminal blocks and wiring etc. shall be placed behind the front cover of each module.

b. Further additional low voltage equipment shall normally be contained in the low voltage compartment. In particular:

c. Terminal blocks

Wiring for interconnections between units connecting the auxiliary cables

Instruments
Protection relay
Metering devices
LV fuses etc

2.19 WIRING

a. Multi-stranded flexible copper conductor 300 / 500 V grade solid dielectric insulated single core wiring shall be used for all wiring.

b. All wiring shall be number feruled at both ends of each conductor. The numbering method employed shall conform to the system laid down in Annexure A of NRS 003-1.

c. All CT and VT circuit wiring shall have a cross sectional area of 2.5mm², with red, white, blue according to the relevant phases and black for the neutral.

d. All internal signal wiring and control wiring shall have a cross sectional area of 1.5mm² with grey wire for DC wiring and black wire for AC wiring.

e. All wires shall be provided with pre-insulated lugging, which shall be of the hooked flat blade (spade) type for terminal connections and ring ferrules for CT connections. For relay terminal connections ring type or hooked flat blade types shall be used, alternatively where space limitations are experienced, boot lace ferrules could be considered if approved in writing. Push-on lugs shall not be considered.

f. All wiring shall be placed in adequately supported trunking or looms with 20% spare capacity per wireway. Consideration should be given during the design stage to temperature rise within trunking or looms. The designed shall ensure that excessive temperature build-up does not occur within trunking or looms during normal operation of the system.

2.20 REVENUE METERING

a. A separate metering IED of the type specified in the Technical Schedules shall be installed for revenue metering purposes.

b. The meter shall have a minimum accuracy Class of 0.2 and shall be used for billing purposes.

c. The meter shall be housed in a separate metering kiosk that will be mall-mounted in the MV Chamber building with the RMU installation, unless it can be accommodated on a separate metering module that will form part of the overall switchgear installation.

d. The meter will be supplied from the metering CTs on the Circuit Breaker unit and will provide an indication of the total current being drawn by the installation.

e. The revenue meter shall have a RS485 communication module for interfacing with the MTN building management system.

2.21 CABLE TESTING FACILITY

2.21.1.1 Cable test facilities that are independent of the cable end boxes and are Accessible from the front of the RMU are preferred.

2.21.1.2 For operator safety, the cable testing procedures shall be displayed on the front and inside of the cable testing facility covers.

2.21.1.3 Cable test facilities shall only be accessible when the isolator / switch are earthed.

2.21.1.4 A substantial interlock must be fitted to prevent operation of the switch directly from the ON position to the EARTH AND TEST positions. Provision to be made for padlocking in any position.

2.21.1.5 Cable test terminals to be provided and these to be accessible only when the switch is in the EARTH AND TEST position. Interlocks are to be provided to ensure that the switch cannot be moved from the EARTH AND TEST position when the test terminal access cover is open.

2.21.1.6 The test terminals to be suitable for cable testing voltages up to 30 kV DC for 15 minutes

3 TECHNICAL DATA AND DRAWINGS

It is compulsory that full technical data and dimensional drawings must be included in the tender documents of all insulators offered. Items offered must also be clearly marked in the data sheets.

ANNEXURE A
(Informative)

The clauses listed below refer to the relevant sub clauses of specification SANS 1874

Schedule A: Purchaser's specific requirements
Schedule B: Particulars of equipment to be supplied (to be completed by tenderer)

Clause	Description	Schedule A	Schedule B
Note	Old Ringmains with metering units in use –Shneider RM6 NEIDI in Cubicle with WIP 300/400 protection. Please price and provide specs on similar type Ringmains offered		
	Current Ringmains in miniature substations in use – Shneider RM6 NEIDI with WIP 35/45 protection. Please price and provide specs on similar type Ringmains offered		

4.1.1	Rated voltage kV	12	
4.2.1.5	Is an indoor or outdoor unit required?	Outdoor	
4.2.2.1	Extensible or non-extensible unit	Non-extensible	
4.2.2.2	Is an extensible or non-extensible unit offered?	X	
4.2.3.2	Degree of protection of unit offered? i) 11kV live parts SF6 tank ii) Front cover mechanism iii) Cable covers iv) Vacuum	 IP67 IP2X IP3X IP67	
4.2.4	Required configuration **(NEIDI)** 2 X Isolators and 1 x Circuit Breaker with protection to Mini Sub Transformer or client substation. Protection WIP 45 / 400 or similar as per application.	**SD/CB/SD** SD/SD/SD (if Requested)	
4.2.5.1	Cable test facility requirements	Integral cable test facilities as stated in specifications	
4.2.5.2	Type of cable test facility offered?	X	
4.3.1.2	Rated normal current of a switch disconnector A	630	
4.3.2.1	The insulating and/or interrupting medium of switch disconnectors	SF6 /vacuum	
4.4.2.1	Transformer load to be protected: item 1 kVA	Up to 4000	
4.5.1.2	Circuit Breakers status indication	Direct on moving contact	
4.5.1.2	Interruption medium of circuit breakers	Vacuum/SF 6	
4.5.1.2	Method of providing reliable indication of the main circuit breaker contact position in the case of non-visible contacts?	X	
4.5.1.2	Does the circuit breaker panel include in-line off-load disconnectors?	X	
4.5.1.2	Is the circuit breaker (for the tee-off) connected in series with a three-position disconnector-earthing switch?	X	
4.5.1.2	Is the operation between the circuit breaker and disconnector-earthing switch interlocked?	X	
4.5.1.2	Rated normal current of the circuit breaker A	200	
4.5.2.1	Type of protection tripping of circuit breaker required	Self-powered relays	

ANNEXURE A
(Continued)

Clause	Description	Schedule A	Schedule B
4.6.2	Busbars extensible	Not required	
4.6.5	Insulation medium of the busbar chamber	SF 6 / Vacuum	
4.7.1.1	Cable boxes	Required	
4.7.1.2	Cable boxes required (NRS 012:2002)	Air-filled	
4.7.1.3	Cable type Maximum size(s)	XLPE TYPE B UNARMOURED	

		ALUMINIUM 400mm^2	
4.7.2.2	Termination type (Type 3-NRS 012)	Unscreened separable connector	
4.7.4.2	Type of bushing required	Type C, BS 7215	
4.7.5.1	Accessories for cable terminations requirements	Not required	
4.7.5.4	Required method of clamping the cables	Wood-clamp	
4.9.3	Pressure-checking device	Required for SF6	
4.9.5	Quality of SF_6 used in each compartment?	x	
4.10.1	Maximum earth fault current kA	10	
4.10.3	Size of clamping screw or nut offered?	X	
4.10.7	Size of hole on earthing bar? Mm	X	
4.11	Is live circuit indication required? Type of indicator offered: a) Voltage detection system (VDS)? b) Voltage presence indicating system (VPIS)?	Yes VDS VPIS	
4.11	Circuits for which indication is required.	SD and CB	
4.12.1	Earth fault indication	Required	
4.12.2	Type of earth fault indication offered?	X	
4.13.1	Enclosure and concrete plinth requirements **Compulsory -Attach specifications**	Required	
4.14.2	Recommended types of tools to install and maintain unit?	X	
4.15.1	Method used to attach rating plates?	X	
4.16.1.1	Method used to attach labels?	X	
4.17.7	Ring Main Unit environment	Non-corrosive	
5.1.3	Quantity already installed in South Africa?	X	
5.2(k)	Details of internal arc tests?	X	
6.1	List of recommended spares?	X	
7	**Compulsory manual:** Number of sets of manuals required, with tender submission	**1**	

5 MAINTENANCE MANUAL

A maintenance manual or guideline if applicable must be submitted to ensure sound maintenance on products.

6 WARRANTY

The equipment offered shall be warranted free from defects in workmanship and materials for a period of at least twelve (12) months from the date of final commissioning or delivery. Any failures shall be repaired or replaced at the bidder's expense during the 12-month warranty period.

7. TEST CERTIFICATES

All required test certificates shall be submitted to Rustenburg Local Municipality by the manufacturer at the time of tendering. Single copies of all type-test reports and certificates, in English, for the miniature substations offered shall be supplied to Rustenburg Local Municipality for approval at the tender stage.

8. GENERAL

Only new manufactured equipment will be accepted.

9. OFF LOADING

Each Ringmain Unit shall be transported in a safe way. Damage to Ringmain Units will be for the cost of the supplier and payment approval shall be withheld for any damaged unit. **The supplier shall be responsible for safe off loading at RLM**

10. SUPPLIERS

If the bidder is not the manufacturer, it is the responsibility of the bidder to ensure that he has a credit agreement as well as an after sales agreement with his supplier (Company) from which he will be sourcing the product.

11 AFTER SALE SERVICE

The bidder shall supply all details regarding their after-sale service on the equipment offered.

12 SAMPLES

No Samples are required. Delivery of substandard material or equipment will result in no approval of payment and the return of the product offered.

13 ALTERNATIVE OFFERS

No Alternative offers will be considered.

14 LOCAL CONTENT

Local Content on material or products will be in accordance with the Department Trade and Industry where applicable.

No imported product will be excepted unless no manufacturing company exists in South Africa.

15 PRICE ESCALATION CLAUSE

The tender appointment prices shall be the ordering prices after adjudication and Contract Price Adjustment shall be clearly defined such as SEIFSA indices, CPI, ROE, Foreign Currency Components such as rates on which tender is based, Custom duties percentage, forward cover and the relevant clauses must find expression in the tender submitted.

SEIFSA indices, CPI, ROE, Foreign Currency Components such as rates on which tender is based, Custom duties percentage, forward cover and the relevant clauses shall be included then in the Service level agreement when the adjudication is successful.

All quantities will be verified after adjudication, Quantities may differ after adjudication on purchase orders.

16 CANCELATION CLAUSE

The delivery of substandard material or equipment or refrain from supplying it within the required timeframe will result in cancelation of the contract and the second highest scorer will be appointed.

END OF SPECIFICATION

3B - RINGMAIN UNITS

RUSTENBURG MUNICIPALITY

STANDARD TECHNICAL SPECIFICATION:

HV POLE MOUNTED/ CUBICLE BASED 11KV METERING UNIT METERING UNITS

1. GENERAL

This specification is for Pole Mounted / Cubicle based High Voltage (11kV) Metering Units.

Service conditions:

Maximum temperature	:	40° C
Minimum temperature	:	-5° C

Altitude	:	1200 m above sea level
Lightning conditions	:	Severe

Compulsory Standards

All equipment offered must comply with the relevant provisions of the following specifications, standards as amended.

IEC60044-1:2003 Current Transformers.
IEC60044-2:2003 Voltage Transformers.
ESKOM SCSSCAAJ7 CT/VT Metering Units.
ESKOM SCSSCAAP9 Corrosion Protection.
BS3839 of 1973 and BS3941 of 1975

The equipment offered shall be constructed of materials suitable for robust use and shall be for inland outdoor application.

2. CT/VT METERING UNITS

The applications shall be as follows:

TYPE OF UNIT

All units SHALL be
3 Phase – 4 Wire

VOLTAGE TRANSFORMER

Supply Voltage = 11kV
Secondary Voltage = 110 Volt / 220 Volt
Accuracy Class = 0.2 /0.5 /1
Burden = 50 / 100 / 200 VA/Phase
VF (Voltage Factor) 1.2 continuous, 1.9 for 30 seconds.

Manufacturer to declare

CURRENT TRANSFORMER (METERING)

Supply Voltage = 11kV
CT's = 3
Multi tapped ratio =600/300 Amp/5A secondary
Burden =/15 VA
Accuracy Class = 0.2
STC (Short Time Current) = 20 kA for 1 second

CURRENT TRANSFORMER (PROTECTION)

Supply Voltage = 11kV

CT's = 3
Multi tapped ratio = 600/300 Amp/ 1A secondary
Burden = 15 VA
Accuracy Class = 10P10
STC (Short Time Current) = 20 kA for 1 second

Note!!
Secondary Ratio of Protection shall always be 1 Amp.
Secondary Ratio of Metering shall always be 5 Amp.

TERMINAL BOX

The unit shall be manufactured with a terminal box which contains the secondary terminals of the VT's and CT's.

METERING

The unit shall make provision for the mounting of an Electronic AMR Maximum Demand energy meter and the LV fuses in the cubicle.

LV fuses and wiring shall be installed by manufacturer.

PORCELAIN BUSHINGS FOR OVERHEAD UNITS

6 x porcelain bushings shall be included and provided

POLE MOUNTING BRACKETS FOR OVERHEAD UNITS

Pole mounting brackets shall be included and provided

EXTERIOR FINISHED – CUBICLE

All Ring main units with metering shall be supplied in an outdoor ARC Proof metal enclosed cubicle with Top Vent.

The cubicle shall be metal sprayed and painted **Avocado Green**

DRY TYPE - PREFERRED

The unit shall be of the Dry Type

WINDINGS

Windings - Aluminium

3 TECHNICAL DATA AND DRAWINGS

It is compulsory that full technical data and dimensional drawings must be included in the tender documents of all insulators offered. Items offered must also be clearly marked in the data sheets.

4 MAINTENANCE MANUAL

A maintenance manual or guideline if applicable must be submitted to ensure sound maintenance on products.

6 WARRANTY

The equipment offered shall be warranted free from defects in workmanship and materials for a period of at least twelve (12) months from the date of final commissioning or delivery. Any failures shall be repaired or replaced at the bidder's expense during the 12-month warranty period.

7. TEST CERTIFICATES

All required test certificates shall be submitted to Rustenburg Local Municipality by the manufacturer at the time of tendering. Single copies of all type-test reports and certificates, in English, for the miniature substations offered shall be supplied to Rustenburg Local Municipality for approval at the tender stage.

8. GENERAL

Only new manufactured equipment will be accepted.

9. TRANSPORT

Each 11kV Metering unit shall be transported in a safe way. Damage to 11kV Metering unit units will be for the cost of the supplier and payment approval shall be withheld for any damaged unit. **The supplier shall be responsible for safe off loading at RLM**

10. SUPPLIERS

If the bidder is not the manufacturer, it is the responsibility of the bidder to ensure that he has a credit agreement as well as an after sales agreement with his supplier (Company) from which he will be sourcing the product.

11 AFTER SALE SERVICE

The bidder shall supply all details regarding their after-sale service on the equipment offered.

12 SAMPLES

No Samples are required. Delivery of substandard material or equipment will result in no approval of payment and the return of the product offered.

13 ALTERNATIVE OFFERS

No Alternative offers will be considered.

14 LOCAL CONTENT

Local Content on material or products will be in accordance with the Department Trade and Industry where applicable.

No imported product will be excepted unless no manufacturing company exists in South Africa.

15 PRICE ESCALATION CLAUSE

The tender appointment prices shall be the ordering prices after adjudication and Contract Price Adjustment shall be clearly defined such as SEIFSA indices, CPI, ROE, Foreign Currency Components such as rates on which tender is based, Custom duties percentage, forward cover and the relevant clauses must find expression in the tender submitted.

SEIFSA indices, CPI, ROE, Foreign Currency Components such as rates on which tender is based, Custom duties percentage, forward cover and the relevant clauses shall be included then in the Service level agreement when the adjudication is successful.

All quantities will be verified after adjudication, Quantities may differ after adjudication on purchase orders.

16 CANCELATION CLAUSE

The delivery of substandard material or equipment or refrain from supplying it within the required timeframe will result in cancelation of the contract and the second highest scorer will be appointed.

END OF SPECIFICATION

RUSTENBURG LOCAL MUNICIPALITY

DIRECTORATE: TECHNICAL & INFRASTRUCTURAL SERVICES

UNIT: ELECTRICAL ENGINEERING SERVICES

STANDARD TECHNICAL SPECIFICATION: HV-015/1

TRANSFORMERS – OIL

1. GENERAL INFORMATION

This specification is applicable to transformers.

1.1 System particulars:

Normal operating voltage	:	11 000 Volt
Normal operating voltage	:	230/400 Volt
Frequency	:	50 Hz
Number of phases	:	3
Neutral earthing	:	Solid

1.2 Service conditions:

Maximum temperature	:	40° C
Altitude	:	1200 m above sea level
Lightning conditions	:	Severe

1.3 Standards:

1.3.1 All equipment manufactured and supplied must comply to NRS 004-1:1991.

1.3.2 The transformers to be manufactured and tested in accordance with SABS 780, as amended. Vector group Dyn 11.

1.4 Compliance to Statutory Regulations:

All units must comply with the Occupational Health and Safety Act (Act 85 of 1993).

2. GENERAL REQUIREMENTS

2.1 Breathing arrangements

All transformers above 100 kVA to be free-breathing and to be fitted with dehydrating breather.

2.2 Rated no-load voltages:

2.2.1 Three phase transformers

Primary : 11 000 V
Secondary : 400-230 V

2.2.2 Single phase transformers (for pole clamping)

Primary : 11 000 V
Secondary : 230 V

2.3 **NOTE**: Working voltage: 11 000/400 V (+- 10%).

The high voltage winding shall be arranged in delta connection and shall have taps of plus minus 5,0% in steps of 2,5% connected on an OFF-LOAD tap switch. Vector group Dyn 11. The LV-windings shall be arranged in the star- connection with the neutral brought out.

Type of windings – Aluminium.

2.3 Instruments for 500, 630, 800 and 1 250 kVA transformers

2.3.1 Dial thermometers shall be fitted

2.3.2 Adjustable thermometer for temperature alarm and trip facilities to be fitted.

2.3.3 Buchholz relay protection with auxiliary alarm and tripping contacts are required. Test button shall be provided.

The above thermometer and Buchholz relay shall be wired to a terminal box on the side of the transformer.

2.4 Terminals

Outdoor bush terminals to be provided on the primary and secondary side of the transformers suitable for cables with heat shrink terminations.

Provide suitable mounting bracket for 11 000 volt surge diverters.

2.5 Component Losses

Low loss transformers are required.

2.6 Outline drawings

Suppliers are to submit dimensioned outline drawings.

2.7 Data Sheet

Suppliers are to complete annexure “A” attached to this document.

5 TECHNICAL DATA AND DRAWINGS

It is compulsory that full technical data and dimensional drawings must be included in the tender documents of all insulators offered. Items offered must also be clearly marked in the data sheets.

6 MAINTENANCE MANUAL

A maintenance manual or guideline if applicable must be submitted to ensure sound maintenance on products.

6 WARRANTY

The equipment offered shall be warranted free from defects in workmanship and materials for a period of at least twelve (12) months from the date of final commission or delivery. Any failures shall be repaired or replaced at the bidder’s expense during the 12-month warranty period.

7. TEST CERTIFICATES

All required test certificates shall be submitted to Rustenburg Local Municipality by the manufacturer at the time of tendering. Single copies of all type-test reports and certificates, in English, for the miniature substations offered shall be supplied to Rustenburg Local Municipality for approval at the tender stage.

8. GENERAL

Only new manufactured equipment will be accepted. The Transformer shall be metal Sprayed and painted **Avocado Green**

9. TRANSPORT

Each Transformer shall be transported in a safe way. Damage to Transformers will be for the cost of the supplier and payment approval shall be withheld for any damaged unit. **The supplier shall be responsible for safe off loading at RLM**

10. SUPPLIERS

If the bidder is not the manufacturer, it is the responsibility of the bidder to ensure that he has a credit agreement as well as an after sales agreement with his supplier (Company) from which he will be sourcing the product.

11 AFTER SALE SERVICE

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14 CANCELATION CLAUSE

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END OF SPECIFICATION

RLM/DTIS/0114/2025/26 - APPOINTMENT OF ONE OR MORE SERVICE PROVIDERS (MAXIMUM OF 3 PER LINE ITEM) FOR THE SUPPLY AND DELIVERY OF MINITURE SUBSTATION, RINGMAIN UNITS, METERING UNIT, DISTRIBUTION TRANSFORMERS, PLINTHS AND TRANSFORMER OIL TO RUSTENBURG LOCAL MUNICIPALITY AS AND WHEN REQUIRED FOR A PERIOD OF 3 YEARS

STANDARD TECHNICAL SPECIFICATION: HV-016/1

TRANSFORMERS

ANNEXURE A

RATING kVA	VOLTAGE VOLTS	IMPEDANCE VOLTAGE %	LOSSES COPPER WATTS	LOSSES IRON WATTS	TEMP RISE WINDING °C	TEMP RISE TOP OIL °C
25	11000/230/400					
50	11000/230/400					
100	11000/230/400					
200	11000/230/400					
315	11000/230/400					
500	11000/230/400					
630	11000/230/400					
800	11000/230/400					
1250	11000/230/400					