

# PROJECT SPECIFICATION FOR TRANSFORMERS

## 1. QUALITY

All equipment, apparatus and materials shall comply with the following Specifications as per the latest amendments where applicable unless otherwise stated:

- **S.A.N.S 555 and BSS 149 – Insulating oils for transformers and switchgear.**
- **S.A.N.S 780 and NRS 005 – Power transformer, low loss type.**
- **S.A.N.S 60076 – Power Transformers**

## 2. ELECTRICAL SYSTEM:

The dual voltage rated transformers will be used on a system operating on either 11 000 or 6 600 Volt.

The low tensions system is 420/242 Volts, 3 phase, 4 wire. **Neutral must be solidly earthed at the transformer, to comply with S.A.N.S 1019.**

## 3. SITE CONDITIONS:

- **Altitude:** 1 738 meters above sea level.

### Temperature:

- **Max:** 35°C
- **Min:** -6°C

### Humidity:

- **During the night:** 100 % relative humidity
- **During the day:** 25 % relative humidity

### Lightning:

- Severe lightning storms prevail.

### Application:

- It is imperative that the units be as compact as possible with a neat and unobstructed appearance.
- The following unit shall be designed for erection onto a transformer bed in pole-mounted applications.....(200 kVA).

## 4. CONSTRUCTION, DESIGN AND TECHNICAL DETAILS:

### • General

The units are to be constructed of folded sheet steel minimum 14 SWG for erection onto a transformer bed in pole-mounted applications.

- **Ventilation, Vermin- and weatherproofing and painting.**

Particular attention shall be paid to the ventilation of transformers.

The units shall be adequately **vermin proofed**.

The enclosure shall be weatherproofed suitable for outdoor operation under all weather conditions.

External and internal metal surfaces shall be prepared for painting to S.A.B.S 064 code of practice, before applying three 0,0025 mm coats of "GAL ALLOY" and two final coats of enamel paint. **Beige Poly-Urethane paint (code F130) and Poly Urethane Thinners (code F130)** or equivalent paint on the outside and white enamel on the inside.

- **Technical Details:**

Each unit is to comprise of a distribution transformer as detailed below:

All electrical clearances are to comply with the British Standards Specification for a voltage of 11 /6,6 kV and 420 Volts respectively. All currently carrying parts will be of sufficient cross section to restrict temperature rise at full rated load to BSS limits.

All parts of the structure are to have adequate strength to withstand the mechanical stresses arising from through fault current at maximum level.

## **5. TRANSFORMER:**

### **5.1 Following award of this tender, the supplier will be expected to comply to the following Standards**

The transformer shall be designed and constructed in accordance with the latest S.A.N.S. 780 and NRS 005 for transformers intended for use in lighting areas.

The cores shall be built up of laminations of special sheet steel complying with the latest S.A.N.S. 780 and NRS 005. The transformers shall be insulated to withstand an impulse test voltage of 95 kV full wave 1,2/50 micro sec.

### **5.2 Type**

The transformer shall be of the double wound, fully insulated three phase outdoor hermetically sealed oil immersed natural cooling type having all the high and low voltage leads brought out of the tank to separate terminal insulators located either in the tank top or side. Details of how the hermetically sealed unit is constructed must be submitted. Units are to be of the **low losses** type as per the S.A.N.S. 780 and NRS 005 table.

**The transformer primary nominal voltage shall be 6.6kV and 11kV dual ratio or 11kV. The transformer primary and secondary windings shall be copper.**

### **5.3 Fittings**

The transformer shall be fitted with the following:

- Rating and diagram plates made of stainless steel suitable embossed or engraved.
- Earthing terminal
- Lifting lugs.
- Oil sight gauge.
- Oil drain plug
- Air relief vents, where necessary

#### **5.4 Rating:**

The transformer shall be designed for the maximum continuous rating specified. Maximum ambient temperatures shall be taken as 40° Celsius with an average value not exceeding 30° C over 24 hour periods and yearly average ambient air temperatures not more than 20° C.

The maximum oil temperature rise shall be 60 degrees C & the maximum winding temperature rise shall be 65 degrees C.

The transformers shall be designed for maximum efficiency at approximately 50% of their maximum continuous ratings.

#### **5.5 Overload Capacity**

The transformers shall be capable of carrying without injury-sustained overloads in accordance with the latest S.A.N.S. 780 and NRS 005.

#### **5.6 Tapping**

Tapping for +-5% voltage variations shall be provided on the high voltage and brought out to a suitably externally operated off-load tap changing switch of which the detail must be supplied. Tapping shall comprise of 5 steps of 2.5% variation between each tapping.

#### **5.7 Tests**

The successful company shall furnish copies of test certificates of tests carried out on the transformer in accordance with the latest S.A.N.S. 780 and NRS 030. Every transformer supplied will be dispatched with the routine test certificate. Similar or identical routine test certificate to be supplied with the tender.

#### **5.8 Special Tests and Type Testing**

Type Testing and special testing WILL be required at the discretion of the buyer. However, all transformers must be designed to withstand type and special testing as specified in the SANS 60076 guidelines. Verification for compliance can be done by calculation based on similar designed units.

Type and Special test certificates of identical or similar designed units must be supplied with the tender.

#### **5.9 Dispatch**

The transformers shall be dispatched, complete with the first fillings of oil in accordance with the latest S.A.N.S. 555

#### **5.10 Transformer Acceptance Criteria**

Transformers testing out of tolerance as specified in the SANS 780 WILL BE rejected. The right to accept or reject such a unit is at the discretion of Mogale City.

#### **5.11 Scope Of Offer:**

All parts and components of the min-substation transformer are to be guaranteed against defective materials for a period of twelve months after being put into service.

The tender price must be for complete construction and assembly of the units, testing, crating and delivery to the Municipality stores.

**5.12 Drawings:**

Dimensional drawings shall be submitted with the tender showing the proposed layout of equipment.

**5.13 Certification**

Transformers bearing the SABS / SANS certification mark shall be a requirement. A valid certificate or permit should be submitted with the tender.

**Annex A:**

**Schedule A: Purchaser's specific requirements (information required from tenderer in Schedule B)**

**Schedule B: Guarantees and technical particulars of equipment offered (to be completed by tenderer)**

Item	Sub clause	Description	Schedule A	Schedule B
1	1.1	kVA Rating	200/315/500/800	_____
		Continuous kVA Rating	200/315/500/800	_____
		Indoor or outdoor use	Indoor and outdoor	_____
		Nominal voltage	11/6,6 kV	_____
		Number of Phases	3	_____
		Frequency Hz	50	_____
		Method of earthing	Non-effective	_____
		Type of cooling	ONAN	_____
		Design Ambient Temperature	40	_____
		Maximum Altitude	1800m ASL	_____
		Type of Oil	Compliant to SANS	_____
		Oil Volume	SANS 555	_____
		Impedance Voltage	SANS 780	_____
		Tolerance	SANS 780	_____
		No-Load Losses (Guaranteed Value)	SANS 780	_____
		Tolerance	SANS 780	_____
		Load Losses	SANS 780	_____
		Tolerance	SANS 780	_____
		X/R Ratio	p.u	_____
		<u>Efficiency:</u>		
		100% load 0.8pf	--	_____
		75% load 0.8pf	--	_____
		50% load 0.8pf	--	_____
		<u>Regulation:</u>		
		100% load 0.8pf	--	_____
		75% load 0.8pf	--	_____
		50% load 0.8pf	--	_____
		Frequency	50Hz ±2.%	_____
		Maximum Flux Density	1.75 Tesla	_____
		Core Steel Type / Grade	---	_____
Over-load Capabilities	IEC 600354	_____		
Conductors:				
LV Winding	Cu	_____		
HV Winding	Cu	_____		
Insulation Type	Graded / Non-Graded	_____		
LV BIL	kV	_____		
HV BIL	kV	_____		
Temperature Rise (Oil / Winding)	60 / 65	_____		

Item	Sub clause	Description	Schedule A	Schedule B
	1.2	Type of transformer bushing (ENS0180- Type C)  Paint Colour  Transformer vector grouping required?	As Per SANS 60137  Beige Poly-Urethane (Code F130) and Poly-Urethane thinners (code F130)  DYN 11	_____  _____  _____
	1.3	Type of transformer bushings required  Type of corrosion environment for transformer	Porcelain  Non-Corrosive	_____  _____
2	2.1	System Nominal Voltage (kV)  Highest System Voltage (kV)  MV cable termination required  Size of MV cables mm <sup>2</sup>  Type of MV cables	11/6,6 Dual ratio  12 / 7.2  Gland plate  35-185  PILCDSTA	_____  _____  _____  _____  _____
3	3.1	Is a short circuit test required  Paint thickness to be verified to SANS ISO 2808	Yes  Yes	_____  _____
4	4.1	Overall Dimensions: Length Width excluding Radiators Width including Radiators Height  Type of radiator  Cover  Oil Gauge Fitted  PRV Fitted  Filler provision  Drain Valve Fitted	mm mm mm mm  Tubes / Corrugated  Bolted / Welded  Yes / No  Yes / No  Yes / No  Yes / No	_____  _____  _____  _____  _____  _____  _____  _____