PART 2

SPECIFICATION FOR ELECTRICAL WORK

PROJECT SPECIFICATIONS

2.1 CONTRACT WORK

The installation shall be carried out entirely by the Sub-Contractor's own staff and shall not in any way be sub-let. This part of the specification shall have preference to any other part of the specification.

2.2 CONTRACT PRICE ADJUSTMENT PROVISIONS (CPAP)

The tender price, tendered by the Contractor, shall be a fixed contract price free of any price adjustments.

Tenderers are referred to the Main Building Contract for details regarding the contract period and other applicable details.

2.3 SITE

The Tenderers must, before submitting their tenders, acquaint themselves with the local conditions, accessibility of the sites, soil conditions, availability of labour and labour conditions, transport, off loading store and custody conditions for materials and equipment necessary for the completion of the total contract. No claim based on ignorance in this regard shall be considered.

Permission must be obtained from the Engineer and or the Client’s Representative before any Tenderer visits the site, or the Contractor establishes himself on the site.

2.4 EXTENT OF WORK

The work covered by this contract comprises the complete electrical installation, in working order, as shown on the drawings and as per this specification, including the supply and installation of all fittings and the installation of such equipment supplied by the Client.

The work consists of the following items:

- MV Cable reticulation
- MV switch gears
- Installation of transformer
- LV cable reticulation
- Emergency power (generator) reticulation installation
- Electrical distribution boards
- Earthing and Lightning protection
- Small power

2.5 SUPPLY AND CONNECTION

The Electrical Sub-Contractor shall be responsible for the supply, installation and connection of all the specified MV and LV voltage cables including the supply cable to the supply point of the Local Authority.

2.6 INFORMATION

The tenderer's attention is drawn to the fact that if the schedules of this specification are not complete, this tender cannot be adjudicated and may be disqualified.

2.7 SPECIFICATION AND DRAWINGS

The specification and drawings generally show the character and extent of the proposed work, and shall not be held as showing every minute detail of the work to be executed.

Tenderers must ensure that their copy of the specification is complete and that all drawings as listed have been received.

Any discrepancy must immediately be brought to the attention of the Engineer and or the Client's Representative.

2.7.1 Contract Drawings

The layout and extent of the electrical installation will be shown on the construction drawings.

The positions of all power-, light- and switch outlets or routes which may be affected by other services must be confirmed by the Contractor with the Engineer and or the Client's Representative before placing such outlets.

2.7.2 As Built Drawings

The contractor is to prepare the As-Built paper prints in strict accordance with this specification. These drawings are to be kept in the site office. Retention monies normally due before commencement of the maintenance period will not be released until As-Built drawings have been prepared to the satisfaction of the Engineer and or the Client's Representative.

2.8 MAKING GOOD

The successful tenderer will be responsible for making good in all trades of any damage to buildings or other services which he or his employees may have incurred during the construction of the works.

The Contractor will be responsible for keeping the site clean and tidy and shall remove from the site all rubble and litter resulting from the construction work.

2.9. WORDING

The word "approve" means approval by the Engineer and or the Client's Representative.

2.10 SUPERVISION

Work must under all circumstances be supervised by a qualified and experienced representative of the Contractor who must be registered as an accredited person.

The representative must be authorized by the Contractor and must be able to receive instructions on behalf of the Contractor.

2.11 ELECTRICAL EQUIPMENT

All fittings, material and equipment and component parts thereof are to be in accordance with the attached quality specifications and must have the approval of Armscor. In addition all equipment shall be designed, manufactured and tested in accordance with the relevant

South African Bureau of Standards Specification or otherwise the relevant British Standard Specification.

All material and equipment must be suitable for the supply voltage 400/ 230V and the necessary precautions shall be taken against corrosion, i.e. exposed metal shall be anti-rust treated to approval and all metalwork to be galvanised or painted.

2.11.1 Equipment Standard Technical Specifications:

- Crabtree classic range plugs, light switches, and isolators
- SABS Circuit breakers for all distribution boards
- Energy saving equipment & globes
- SABS LED light fittings
- SABS cable trays and trucking
- SABS Transformers and generators
- SABS Bus bars and SANS 60439-1/IEC 60439-1 (SABS IEC 60439-1)

2.12 CONDUIT AND WIRING

The installation may be executed in SABS approved PVC or steel conduit. All conduits shall be concealed in the building work where possible. Steel conduit, black enameled and or galvanized steel conduit shall be screwed or plain end.

Should for some reason it not be possible to conceal conduit in the building work and the conduit installation must be surface mounted and if the installation could cause any danger in future, only steel conduit may be used.

Steel conduit exposed to damp or weather conditions shall be galvanised to SANS 763.

PVC conduit must comply with SANS 950.

PVC conduit must be supported at 1 000mm intervals maximum.

All conduits shall bear the stamp of approval by the SANS.

All conduits, regardless of the system employed, shall be installed strictly as described in the applicable paragraphs of Part 1 of this specification. Wiring of the installation shall be carried out as directed in Part 1 of this specification.

For geyser outlet circuits the wiring shall comprise 4,0mm? PVC insulated conductors and 2,5mm? Earth conductor in 20mm dia conduit and stove outlet circuits, 6,0mm? PVC insulated conductors and 4,0mm? Earth conductor in 25mm dia conduit.

Galvanised draw wires must be provided in all conduits provided for other services.

Flexible conduit shall be made of galvanised steel with rectangular cross-section corrugations to fit standard brass connectors and shall have a PVC sheath. Correct fittings and fixtures must be used. An earth continuity conductor must be installed with all flexible conduits.

All steel conduit joints in concrete slabs and all running joints must be painted.

No chasing by hammer and chisel will be accepted. Slots for conduits must be cut where necessary.

The metal conduit installation must provide a continuous earth.

Bushes on metal conduit shall be of brass only.

All outlet box cover plates must be metal and steel outlet boxes must be hot-dipped galvanized to SANS 763.

Where cavity walls or face brick walls are encountered deep back to back one end closed wall boxes must be used.

Blank cover plates on round outlet boxes must be fixed with flat head brass screws and a gasket to seal the box.

Blank cover plates on 100 x 100 mm outlet boxes must be fixed with two countersunk chrome screws.

Where outlet boxes or draw boxes are mounted on finished surfaces the Electrical Contractor shall take care that such outlets are mounted symmetrically. It will not be sufficient to scale the position of any outlet off the drawings. No extra payment will be allowed where the outlets are not mounted symmetrically and have to be changed.

Draw boxes on the lead in sleeves/conduit for the supply to stair blocks must be flush mounted and must be fitted with weatherproof lids which must have beveled edges. The lids must be fixed with tamper resistant screws to the boxes and must in general comply with the specification on distribution board doors. The draw boxes may not be smaller than 100 x 100mm. Standard factory made boxes as manufactured by GEM Industries, may be considered if submitted to the Department for approval.

2.13 SWITCHES AND SOCKET OUTLETS

All switches and socket outlets shall conform to the attached quality specifications and must be approved by the Engineer and or the Client's Representative.

The installation of switches and socket outlets shall be carried out in accordance with clause 10, Part 1 of this specification.

Light switches must be mounted 1400 mm a.f.f.l.

Switch socket circuits must be protected by 30mA earth leakage units. Light switch and switch sockets of one manufacturer only, will be accepted.

Switch sockets in the front of class rooms must be 300 mm a.f.f.l., where indicated.

Screws longer than 30mm to mount light switches or switch socket outlets will not be accepted.

2.14 DISTRIBUTION BOARDS

2.14.1 GENERAL

Supply and install the distribution boards as specified.

One spare 25mm dia and three spare 20mm dia conduits must be supplied from all distribution boards to roof spaces.

Three sets of factory drawings on all distribution boards must be submitted for inspection before manufacture of the distribution boards commence.

The Department must be notified at least two weeks in advance of the completion of the distribution boards in order that an inspection may be carried out before delivery.

2.14.2 Construction

The construction must be in accordance with Part 3 of this document.

All distribution boards must be flush mounted unless otherwise indicated and must have doors which must be pad lockable.

The current capacity of busbars may not exceed 1,6 A/mm².

Openings into distribution boards must tie up with the installation.

Cables must be terminated with cable glands or mounted with "K"-clamps to the distribution board tray where required. Earth rings and glands must be used to earth cable armouring inside distribution boards.

2.14.3 Installation

The distribution boards must be placed in such a way that the Builder can build them into the walls where required and or applicable. Special provision must be made that the distribution board tray is not damaged while being built in.

The distribution boards must be placed in the position shown on the drawings.

All distribution boards must be installed level.

Apparatus and requirements by the Supply Authority are not indicated on the distribution board diagrams and schedules. It is expected of the Electrical Contractor to install all such apparatus, accessories and systems as may be required by the Supply Authority, as part of the electrical contract price.

A neutral bar associated with each bank of mccb's must be positioned below each bank of mccb's and must be wired in the same sequence as the mccb's. Not more than one conductor per connector will be accepted.

Only hydraulic-magnetic operated mccb's must be used if the new micro ranges are not used.

Including any metering kiosk, only 5kA minimum fault level circuit breakers will be accepted in distribution boards.

The minimum conductor size between lightning arrestors and earth shall be 4mm².

Busbar stubs must be provided where more than one conductor terminates on equipment.

Earth conductors must be fastened with two screws and shoes to earth bars.

Two (2x) keyed alike locks with keys, padlocks must be provided with each distribution board.

2.15 LABELLING

Circuits which are removed from distribution boards must be marked "SPARE" on the distribution boards.

All outlets especially the terminal boxes associated with the intercom or telephone installation must be labeled as such.

Labels indicating the supply point and size of the supply cable must be provided on each distribution board.

Where switchboards are positioned behind doors of building structure i.e. build-in cupboards, a suitable approved electrical danger sign as well as the applicable distribution boards designate label must be supplied and fitted in a suitable position on the outside top section of one of the entrance doors at each such location.

2.16 POWER POINTS

The Contractor is to make allowance for the complete installation of all power points as indicated on the drawings and described hereunder-:

Luminaires

Above ceiling height. Note that the luminaires are not to be mounted under the roof overhang and that they must be mounted under the roof ridge on the end of buildings.

Wall mounted luminaires

Above door frame unless otherwise indicated on the drawings.

Photo Cells

Photo cells must be mounted away from area lighting at the same height as Type A luminaires.

2.17 BALANCING OF LOAD

The electrical contractor is required to balance the load as equally as possible over the multi-phase supply.

2.18 EARTHING OF INSTALLATIONS

Installations shall be effectively earthed in accordance with the "Standard Regulations" and to the requirements of the supply authority, as well as the Departments Representative, who may require additional earthing to meet test standards. Earthing must comply with S.A.N.S. 0142 – 2006.

All hot and cold water as well as waste pipes must be effectively bonded by 12,5 x 1,6 mm solid or perforated copper tape (not wire) clamped by means of brass bolts and nuts. The tape is to be fixed to walls by means of roundhead brass screws at intervals not exceeding 150 mm.

The earth connection from the main earth bar in the main board must be made to the cold water main and the incoming service earth conductor by means of 16 mm^2 stranded (not solid) bare copper earth wire or such conductor as the Department's Representative may direct. Where applicable all steel roof sheeting as well as steel walkways and stairs shall be suitably earthed.

Furthermore an earth electrode (earth spike) of at least 1,5 m long must be provided and driven into the ground at the centre of each gable-end wall of each individual block. This earth electrodes shall be installed at least 1 m from the building's perimeter and shall clear all aprons and water channels. These earth spikes must be driven into the ground to at least 300 mm below ground level and only after final bonding and tests have been carried out must proper backfilling and compacting of same be executed.

In each instance these earth spikes must be interconnected by means of a 16 mm^2 stranded bare copper earth conductor which must be installed in the inside of the ridging of the roof structure and encased in 20 mm flush conduits installed in the gable walls. This earth conductor must be bonded to the roof sheeting at intervals not exceeding 5 m, ensuring that roof sheeting on both sides of the ridging are properly bonded, as specified in Clause 14 of Part 1.

The overall earth resistance at the new electrical distribution board of the block shall not exceed 1 Ohm. The contractor shall assess the soil and site conditions at the time of tendering and allow for this to enable him to perform the proper earthing and bonding of all installations.

2.19 CABLES

2.19.1 General

Supply, install and connect all the low voltage cables specified in this document. The cables must comply with the requirements in Part 3 of this document. Bare hard drawn copper earth continuity conductors are to run with all four core underground cables constituting part of the low voltage distribution system. The earth conductors must be bound to the cables at intervals not exceeding 1 meter.

Conductor insulation which is colour coded by a line only, will not be accepted. The total insulation must have the phase colour.

All cables shall bear the stamp of approval by the SANS.

2.19.2 Installation

a) Testing

All low voltage cables must be tested on site, in the presence of a representative from the Department. All test results must be submitted to the Department.

On each completed section of the laid cable, the insulation resistance shall be tested to approval with an approved "testing" type instrument of not less than 1000 V for low voltage cables.

b) Depth of Trenches

All low voltage cables must be installed 600 mm below ground level to the top of the cable, below ground level.

c) Marking Tape

Yellow PVC marking tape, 150 mm wide must be supplied and installed 400 mm above all cables. The wording "Electric Cable Below - Caution" and "Elektriese Kabel Hieronder - Gevaar" must be provided on the marking tape.

d) Cable Lengths

Tenderers must base their tender price on the preliminary lengths specified in the Bills of Quantities. After installation the exact lengths shall be determined on site. Adjustments to the contract price shall then be calculated using tariffs in the Bill of Quantities.

It shall be the responsibility of the Electrical Contractor to establish the correct lengths of cable on site, before placing an order. The Contractor shall not be reimbursed for any surplus cable.

2.19.3 Cable Trenches

Tenderers must base their tariffs for cable trenches in soil, soft rock and hard rock on the quantities given in the Bill of Quantities. The actual quantities shall be determined on site. Adjustments to the Contract Price shall be calculated using the tariffs in the Bills of Quantities, after completion of the installation.

SOIL: Shall mean hand pickable soil and includes loose gravel, clay, backfilled soil, loose or soft shale, loose literati and rocks less than 75 mm diam.

SOFT ROCK: Shall mean rock which is hand pickable including hard shale, dense literati and rocks exceeding 75 mm in diam to 0,03 cubic meters volume.

HARD ROCK: Shall mean granite, quartz sandstone, slate and stone of similar hardness as well as rocks exceeding 0,03 cubic meter volume.

No guarantee can be given that explosives will not be necessary for excavations. However, should explosives be necessary and the Contractor receive permission to use explosives, the Electrical Contractor shall remain responsible for all work done with the explosives and shall comply to all conditions, regulations, requirements etc. imposed by the governing bodies.

Mechanical excavators may be used for trenching operations provided that they are not used in close proximity to other plant, services or other installations likely to be damaged by the use of such machinery. The use of mechanical excavators shall be subject to the approval of the Engineer and or the Client's Representative.

Should excavations be done in close proximity of existing services extreme care must be taken. Only labourers with experience of these conditions may be utilised.

The bottom and sides of trenches must be of smooth contour, and shall have no sharp dips or rises which may cause tensile forces in the cable during backfilling.

Backfilling of trenches may commence after the trenches have been approved and shall be compacted in layers of 150 mm. Sufficient allowance must be made for final settlement. For the first layer of 150 mm, sifted soil of which 75 mm must be below and 75 mm must be above the cable, must be used. Where no suitable soil is available on site, the Contractor shall import fill from elsewhere and make all the necessary arrangements to do so.

The Electrical Contractor shall be responsible to take the necessary precautions where excavations may be dangerous. Refer to the Occupational Health & Safety Act 1993, Reg. D13 of the General Safety Regulations. The Contractor must ensure that all buildings, sewer, etc, are protected against caging.

The cable trenches shall be excavated to a depth as specified in 2.19.2 above and shall be 300mm wide for one to three cables and the width shall be increased where more than three cables are laid together so that the cables may be placed at least two cable diameters apart throughout the run.

Payment will be made on a cubic excavation rate based on the basis of the given maximum dimensions or the actual dimensions, whichever is the lesser. The only exception shall be in cases of additional excavations caused by obstructions such as water pipes, drains, large rocks, etc., in which case the length of the additional excavation must be agreed upon on site by the Department.

2.19.4 Joints

Joints in cable runs shall not be allowed unless specified or authorised in writing, by the Department. Where cable joints are to be made, a joint hole must be excavated of sufficient size to enable the cable jointer to work efficiently and unimpeded.

Each cable end must be left in a loop of 0,9 m to prevent any tension on the joint.

During backfilling the section supporting the joint must be compacted to the extent that no movement will take place after the trenches have been backfilled.

All joints in underground cables and terminations shall be made either by means of compound filled boxes according to the best established practice by competent cable jointers using first class materials or by means of approved epoxy-resin pressure type jointing kits. Epoxyresin joints must be made entirely in accordance with the manufacturer's instructions

and with materials stipulated in such instructions. Low voltage PVCA cables are to be made off with sealing glands and materials designed for this purpose which must be of an approved make.

Where cables are cut and not immediately made off, the ends are to be sealed without delay.

2.19.5 Cable laying

Cables must be removed from the drums in such a manner that the cable is not subjected to mechanical damage, twisting or tension exceeding that stipulated by the cable manufacturer.

The laying of cables shall not commence until the trenches have been inspected and approved. The cables must be adequately supported at intervals during the whole operation. Particular care must be exercised where it is necessary to draw cables through pipes and ducts to avoid abrasion, elongation or distortion of any kind. The ends of such pipes and ducts shall be sealed to approval after drawing in of the cables.

2.19.6 Sleeves

All sleeves indicated on the drawings will be supplied and installed by the builder if not included in this Bills of Quantities. It shall be the responsibility of the Electrical Contractor to liaise with the builder to ensure that all the sleeves are correctly installed. Electrical cable sleeves and communication sleeves must be installed at least 600mm apart. All crossings of these sleeves must be at 90² with the communication sleeves on top.

Before backfilling the ends of all sleeves must be sealed with paper and a weak cement mixture.

2.19.7 Cable Markers

Cable markers must be provided on all cable runs at 50 m intervals on straight runs and at all bends. The position of cable markers must be confirmed on site.

Cable markers must consist of 150mm x 150mm x 300mm high concrete blocks with aluminium or other rust free metal plates marked with arrows to indicate the route.

The cable markers must protrude 25mm above ground level.

One cable marker must be placed at the site boundary where the telephone sleeve enters the site.

2.20 LUMINAIRES

Supply and install the luminaires schematically indicated on the drawings. (See clause 7). The luminaires must comply with the requirements in Part 3 and the particulars listed hereunder.

Verandah luminaires on multi storey buildings must be vertically in line.

The required luminaire types are specified on the drawings and tie up with the types indicated on the layouts. Samples of all luminaires must be approved by the Inspector of the Department before any order is placed.

All control gear within luminaires, shall bear the stamp of approval by the SANS.

The installation of luminaires must be done in accordance with the relevant clauses in parts 1 and 3 of this specification.

All luminaires must be complete with lamps and where necessary, control gear. In caretaker's residences (where applicable), B.C. lamp holders must be used. Starters of

fluorescent luminaires may not be accessible from outside the luminaire. Openings in the luminaire for starters must be covered to the approval of the Department. Lamp holders for GLS lamps must be porcelain or heavy duty brass.

The following luminaires are indicated on the respective drawings and must conform to the quality specifications Parts 1, 2 and 3 which forms part of this contract.

NOTE: All luminaires must be approved by the Engineer and or the Client's Representative prior to the installation of or any order being placed.

SYMBOL	TYPE	DESCRIPTION	PICTURE	AREA USED
	Type B2	46w-Led Colour Temperature 4000k Tridonic Led Module And Driver UV Stabilised, Self-Extinguishing Polycarbonate Diffuser With Photo-Engraved Interior And Smooth Outer Surface Anti-Tamper Polycarbonate Snap-Lock Latches Complete With Mounting Accessories		installation plant

Incandescent lamps and 16W 2D lamps are not acceptable to be used on this project and should be replaced with PL compact fluorescent lamps as an alternative.

2.25 PHOTO CELL

The area lighting must be switched direct by the photo cell. The photo cell must be mounted where indicated on the drawings in such a manner that the luminaires will not affect the operation of the photo cell.

The photo cell must be linked with the distribution board by 3 x 1.5 mm² PVC conductors drawn in conduit in the roof space.

The photo cell must comply to the following: -

i) Area lights must be switched ON when the illumination dropped to 50 lux.

ii) Area lights must be switched OFF when the illumination raised to 90 lux.

iii) It must be weatherproof and must have a built in time delay of approximately 40 seconds.

iv) Built in protection against voltage surges must be provided.

v) The photo cell must be mounted with an aluminium base.

vi) A sample of the proposed photo cell must be submitted to the Department for approval.

vii) 16A rating must be provided.

2.26 MANHOLES

All Manholes will be constructed and supplied by the building contractor.

2.27 SCHEDULE OF CABLE CONNECTIONS

See the schedule on the Site Layout Drawing.

2.28 LOW VOLTAGE DISTRIBUTION CUBICLES (KIOSKS)

Sheet steel canopies as specified in Part 3, must be provided.

2.29 TESTING AND INSPECTION

The Contractor shall test the entire installation in terms of Regulation 7 of the Electrical Installation Regulations 1992 of the Occupational Health & Safety Act 1993 and shall issue a Certificate of Compliance on the official form, Annexure 1, obtainable from the Electrical Contracting Board of South Africa. All tests shall be carried out in conjunction with and to the satisfaction of the Supply Authority and in the presence of the Department's Authorised Representative. The Contractor shall make all arrangements for testing and inspection, the costs thereof being included in the Tender Price.

All 220 V socket outlets shall be tested for polarity and the sensitivity of the earth leakage protection equipment shall be tested by means of an approved instrument.

Each length of cable shall be tested for insulation and polarity by means of a 1000 volt megger designed for that purpose. In the case of underground cables this shall be done before backfilling. In addition, the earth-loop impedance of each main and sub-main feed shall be measured. The earth resistance at each down conductor earth electrode shall be measured. The earth resistance shall be tested by means of an approved instrument.

If there is no power on the day of the test, the Contractor shall supply a 3 kW, 230 V generating plant for testing purposes.

"DANGER" notices shall be displayed at remote ends of cables under test.

The Engineer reserves the right to witness all tests. The Contractor shall advise the Engineer in writing of all results and furnish copies of all certificates.

Load balancing shall be undertaken by the Contractor in conjunction with the Engineer. Where conductors are altered to achieve satisfactory results they shall be re-laced by the Contractor.

The Contractor shall provide all the necessary instruments for the proper testing of the complete installation. If there is reason to doubt the accuracy of such instruments, the Contractor shall take the necessary action to prove their accuracy.

If the results of the first delivery tests are favourable and the installation is found in order, there will be no charge for the test. If the test is found unfavourable a levy of R2000, 00 will be charged to the Contractor for each subsequent test in the form of a variation order omitting such costs from his contract price.

The Contractor shall ensure that the installation is completed in every respect and that there are no major defects prior to notifying the Engineer (in writing) for a first delivery inspection. The Engineer will accept zero minor defects during the final inspection. Should this number of defects be exceeded at the final inspection then the Engineer will terminate that inspection and requests that an additional final inspection be arranged by the Contractor.

3. STEP-UP TRANSFORMER & STEP-UP TRANSFORMER

Technical Specifications: Data Sheet

Item 1: 3000kVA 11/0.400kV Distribution Transformer

Item 2: 3000kVA 0.400/11kV Distribution Transformer

TECHNICAL SPECIFICATION FOR TRANSFORMERS			
NO.	**DESCRIPTION**	**UNIT**	**GUARANTEED VALUE**
1	Manufacturer		**MATLAKSE (PTY) LTD**
2	South African Standard		Tested in Accordance with **SANS 780 Ed. 4**
3	International Standard		IEC60076
4	Type		Distribution Transformer
5	Installation		Outdoor
6	Maximum Ambient Temperature		-5 to 40℃
7	Altitude	m.a.s.l	≤1800m
8	Nominal Power	kVA	3000
9	Primary Voltage	kV	11
10	Secondary Voltage	kV	0.400
11	Rated Frequency	Hz	50
12	Cooling System		ONAN
13	Number of Windings Per Leg		2
14	Number of Phases		3
15	Tap Changer		NLTC
16	Tap Range		±2.5% & ±5.0%
17	Coolant		PCB Free Virgin Mineral Oil
18	No-Load Losses	kW	± 4.750
19	Load Losses	kW	± 22.000
20	Impedance	%	± 5.0 – 6.5
21	The temperature rise (at rated capacity and 30℃ambient temperature, maximum 40℃.)--Top Oil	°C	60
22	The temperature rise (at rated capacity and 30℃ambient temperature, maximum 40℃.)--Winding	°C	65
23	**Basic Insulation Level**		
a)	Primary	kV	75
b)	Secondary	kV	25
24	**Power Frequency Withstand Voltage**		
a)	Primary	kV	28
b)	Secondary	kV	2.5
25	Vector Group		YNd1 | Dyn11
26	Core Material		Grain Oriented Silicon Steel
27	Transformer Powder Coat Finish		C12 – Avocado Green
28	Winding Material (H.V & L.V)		**Aluminium Wound**
TRANSFORMER DIMENSIONS INCLUDING ALL FITTINGS AND WEIGHT			
1	**Overall dimensions**		
a)	Length	mm	As per Drawing
b)	Width	mm	As per Drawing
c)	Height	mm	As per Drawing
2	**Weights**		
a)	Active part	kg	As per Drawing
b)	Total	kg	As per Drawing

ACCESSORIES			
1	Bolted Hot Dip Galvanized Radiators	Yes/No	Yes
2	Oil Temperature Thermometer with Alarm and Trip	Yes/No	Yes
3	Pressure Relief Valve with Trip Contact	Yes/No	No
4	Oil Level Indicator	Yes/No	Yes
5	Conservator with Silica Gel Breather	Yes/No	Yes
6	Buchholz Relay with Alarm and Trip	Yes/No	Yes
7	M12 Earth Terminals	Yes/No	Yes
8	Auxiliary Terminal Box	Yes/No	Yes
9	Lifting Lugs	Yes/No	Yes
10	Skid Under Base	Yes/No	Yes
11	Filter and Drain Valve	Yes/No	Yes
12	Sealed Bolted Main Cover	Yes/No	Yes
13	H.V and L.V Cable Boxes	Yes/No	Yes
14	Stainless Steel Bolts and Nuts	Yes/No	Yes
ROUTINE TESTS			
1	Measurement of Insulation Resistance.	Yes/No	Yes
2	Voltage Ratio Measurement and Vector Group Verification Test.	Yes/No	Yes
3	No-Load Loss Test and Confirmation of No-LoadCurrent.	Yes/No	Yes
4	Measurement of DC Winding Resistance.	Yes/No	Yes
5	Load Loss Test and Confirmation of ImpedanceVoltage.	Yes/No	Yes
6	Induced Voltage Withstand.	Yes/No	Yes
7	Separate-Source Power-Frequency Voltage Withstand Test.	Yes/No	Yes
8	Sealing Test.	Yes/No	Yes

3.1 TRANSFORMER DRAWING

See drawing layout

3.2 MV VACUUM CIRCUIT BREAKER

- VD4-LMT 630A Vacuum Circuit Breaker.
- For Double Bus-bar Reyrolle Switchgear
- Rated current 630A
- Rate voltage 12kV
- Rated STC 31.5kA for 3 seconds
- Rated BIL 95kV
- Rated power frequency withstand voltage 28kV
- With Plug type secondary connection
- Fitted with (Per Unit)
- Motorized Spring Charging Mechanism
- Closing coil
- Trip coil
- Supplied with (Per Unit)
- Shutter Box
- Shutter operating mechanism
- Wired to standard drawings supplied by client