

**APPENDIX G3:  
ELECTRICAL SERVICES REPORT**

**JABULANI HEIGHTS DEVELOPMENT**

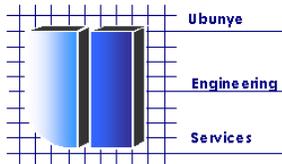
**PARCEL A**

**ELECTRICAL INSTALLATION**

**OUTLINE SCHEME REPORT**

Prepared by:

February 2011



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# ELECTRICAL INSTALLATION

## 1. INTRODUCTION

This report outlines the design philosophy of the electrical MV and LV installation for the proposed Jabulani Heights Development Parcel A in Jabulani, Soweto. The installation will be designed to ensure that the installation complies with the South African National Safety Standards while meeting the objective of the development.

The site consists of mixed residential development with multi floor blocks of between two and four floors. The residential blocks comprise of one, two and three bed room units.

## 2. DERIVATION OF THE BRIEF

The brief is to provide an electrical installation suitable for the proposed Jabulani Heights Development Parcel A. The contract covers the following electrical scope of works:

- The provision of the complete electrical installation, for the entire area which comprises this contract.
- Supply and installation of mini-substation including MV cabling.
- Supply and installation of street lighting.

## 3. DESIGN PHILISOPHY

### Main Power Supply

A site survey was conducted to determine the best and most economical means to provide power supply to site. There is an existing electrical infrastructure around the area and the connection point will be advised by Eskom and the upgrade of the substation should power capacity not be adequate.

Calculations were conducted to estimate the electrical load for the proposed development. The total load required for the development is estimated at 1.8MVA.

The electrical engineer has submitted an application with Eskom for the required power supply on behalf of the client, and is waiting for final feedback on the feasibility.

## **Reticulation**

### **HV Reticulation**

A sub-station will be constructed alongside the development boundary to connect from Eskom. The sub-station will comprise of incomer 11kV isolator to allow for connection to the new Eskom power supply through an underground cable. The sub-station will have 11kV incomer switch panel and two main Ring Unit (MRU) switch panels connecting the supply to the each parcel.

The MV cable will be of type XLPE 6.35kV/11kV 3-core type "A" cable in accordance with SANS 1339. The MV cable will be installed underground at a minimum depth of 1000mm below ground level. A trench of 1200mm deep will be excavated and bedding of 200mm river sand bedding laid under the cable and compacted to allow for cable cooling. The cable will terminate at each mini-substation via a T3 (Ring Main Unit) switch.

All H.V. equipment shall be suitable for an 11 000 Volt, 3-phase, 50 Hz, 1.8MVA at 11kV fault level system.

### **LV Reticulation**

LV cable will be buried at a minimum depth of 800mm below ground and will connect between the electrical distribution kiosks and the mini-substations. LV cables shall be installed a minimum of 400 mm apart from other 11kV cables.

### **Mini-Substation**

Mini-substations will be strategically positioned on site alongside the internal streets connected by an underground MV cable in a ring feed configuration. All mini-substations shall be as per Eskom approved specifications. The mini-subs will be mounted on top of a purpose made precast concrete base. The base will allow for cable access from underground.

### **Distribution Boards**

The main distribution panel will be located in the MV room which will house the main electrical meter for the parcel. The MV panels will connect power to the mini-subs on the site through a 11kV ring feeder. The mini-substations will distribute to the electrical kiosks. The kiosk will comprise of circuit breakers supplying individual residential blocks and street lighting. Each block will have a main distribution block comprising of circuit breakers for the number of units, general and passage lighting.

### **Cable Ladders and Electrical Sleeves**

Medium duty galvanized cable ladder will be installed in the sub-station to allow for the proper installation and routing of the MV cable.

Where cables cross under roadways, paved areas or other services, the cables shall be installed in uPVC sleeves (Kabelflex or equal & approved) in accordance with Eskom Electricity specification.

All cable sleeves shall be uPVC class 6, the nominal diameter shall be 160 mm for MV cabling and 110mm for LV cables installed at same level as the specified cable. Sleeves will be installed complete with draw-wire, plugs and marker blocks. One spare/unused sleeve will be allowed on a road crossing for future use.

### **Earthing & Lightning Protection System**

Sub-station, mini-substations and kiosks will be earthed. An earth mat will be installed at the mini-substations for earthing of the main power supply to protect the buildings from lightning. Overall earthing resistance required for the sub-station, mini-sub and kiosk will be 1ohm.

Earthing specialist will be required to perform earth resistivity tests and to determine the required earth resistance value and called upon to install an earthing system where required.

### **Cable Detector/Danger Tape**

Tapes will be installed in all 11kV cable trenches. The tape will have 150 mm wide x 0,075 mm thick yellow polyethylene tape with bright red skull and cross bones and the words "Electric cables – Danger/Gevaar" printed thereon in bold letters. The tape will be installed in compacted soil, directly above and 200 mm above all 11kV cable over the entire route. Where two 11kV cables are buried in one trench, a separate detector tape shall be installed over each cable.

### **Cable Route Markers**

Cable route markers for MV cable will be installed and will be prism shaped, of reinforced concrete construction, approximately 300mm high, with top approximately 150mm square and bottom approximately 250mm square, suitable for burying directly in ground. Indented into an aluminium plate imbedded into the top marked "11000V cable" and one or two arrows indicating cable route (one arrow for straight route and two for corner)

Cable detector tapes will be used where the MV and LV cable will be installed underground. The tape will be buried with the cable to mark the existence of the cable should excavation take place around that area. Concrete cable route marker blocks will be installed on ground level above the MV cable to mark the route of the cable installed underground.

## 4. TECHNICAL SPECIFICATIONS

### Electrical Load Estimate

The load estimate of the development was based on 5kW per unit. The calculated load for 472 units in Parcel A is 2360kW. The total load for the development is 1.77MVA maximum demand in total when a 60% diversity factor is considered.

It is therefore conclusive that the supply required for this development is 1.8MVA.

<b>Parcel A Load Calculation</b>			
<b>Estimated Number of Units</b>	<b>(kW) Per Unit</b>	<b>Total Load (kW)</b>	
472	5	2360	
Total calculated load		<b>2360 kW</b>	
80% pf		<b>2950 kVA</b>	
Diversified Load		<b>1770 kVA</b>	
<b>Estimated Load (kVA)</b>		<b>1770 kVA</b>	

### Outdoor Lighting

Pole light fittings will be positioned alongside the streets to give ambient lighting for parking area and security lighting. The lighting will be switched via timers or photo-cells for energy saving. Circuit breakers for the street lights will be installed in the kiosks.

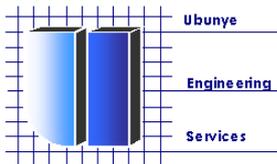
### Testing and Reports

All testing & reporting shall comply with and be carried out and reported on in accordance with SANS 10142 Part 2, 2009 for MV Installations.

**JABULANI HOUSING DEVELOPMENT**  
**PARCEL B AND C**  
**ELECTRICAL INSTALLATION**  
**OUTLINE SCHEME REPORT**

Prepared by:

March 2010



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## ELECTRICAL INSTALLATION

### 1. INTRODUCTION

This report outlines the design philosophy of the electrical MV and LV installation for the proposed Jabulani Housing Development in Jabulani, Soweto. The installation will be designed to ensure that the installation complies with the South African National Safety Standards while meeting the objective of the development.

The site consists of mixed residential development with multi floor blocks of between two and four floors. The development is divided over two sites i.e. Parcel B and Parcel C. The residential blocks comprise of one, two and three bed room units.

### 2. DERIVATION OF THE BRIEF

The brief is to provide an electrical installation suitable for the proposed Jabulani Housing Development Parcel B and C. The contract covers all work of an electrical nature and includes, but is not limited to the following:

- The provision of the complete electrical installation, for the entire area which comprises this contract.
- Supply and installation of mini-substation including MV cabling.
- Supply and installation of all distribution electrical kiosks, LV cabling including connection to distribution boards.
- Supply and installation of distribution boards for the residential blocks.
- Supply and installation of street lighting.

### 3. DESIGN PHILISOPHY

#### **Main Power Supply**

A site survey was conducted to determine the best and most economical means to provide power supply to site. There is an existing electrical infrastructure around the area and the connection point will be advised by local supply authority.

Calculations were conducted to estimate the electrical load for the proposed development. The total load required for the development is estimated at 4MVA.

The electrical engineer will make an application with the supply authority for the required power supply on behalf of the client.

### **Reticulation**

#### **HV Reticulation**

A new MV room will be constructed alongside the development boundary to connect from the local authority supply. The contractor shall liaise with the supply authority for the final position of the MV room. The MV room will comprise of incomer 11kV isolator to allow for connection to the new Eskom power supply through an underground cable. The MV room will have a 11kV incomer switch panel and two main Ring Unit (MRU) switch panels connecting the supply to the each parcel.

The MV cable will be of type XLPE 6.35kV/11kV 3-core type "A" cable in accordance with SANS 1339. The MV cable will be installed underground at a minimum depth of 1000mm below ground level. A trench of 1200mm deep will be excavated and bedding of 200mm river sand bedding laid under the cable and compacted to allow for cable cooling. The cable will terminate at each mini-substation via a T3 (Ring Main Unit) switch.

All H.V. equipment shall be suitable for an 11 000 Volt, 3-phase, 50 Hz, 4 MVA at 11kV fault level system.

#### **LV Reticulation**

LV cable will be buried at a minimum depth of 1000mm below ground and will connect between the electrical kiosks and the mini-substations. LV cables shall be installed a minimum of 300 mm apart from other 11kV cables.

#### **Mini-Substation**

Mini-substations will be strategically positioned on site alongside the internal streets connected by an underground MV cable in a ring feed configuration. All mini-substations shall be as per Eskom approved specifications. The mini-sub will be installed into a purpose made precast concrete base. The base will allow for cable access from underground. Details of the base will be supplied by the mini-sub supplier.

The mini-sub will allow for a hand operated ring main unit switch in the MV compartment. The mini-sub will be installed into positions to be indicated on the MV reticulation drawing and MV and LV cables connected as per the cable connection diagram.

### **Distribution Boards**

The main distribution panel will be located in the MV room which will house the main electrical meter for each parcel. The MV panels will connect power to the mini-sub on the site through a 11kV ring feeder. The mini-substations will distribute to the electrical kiosks. The kiosk will comprise of circuit breakers supplying individual residential blocks and street lighting. Each block will have a main distribution block comprising of circuit breakers for the number of units, general and passage lighting.

### **Cable Ladders and Electrical Sleeves**

Medium duty galvanized cable ladder will be installed in the MV room to allow for the proper installation and routing of the MV cable.

Where cables cross under roadways, paved areas or other services, the cables shall be installed in uPVC sleeves (Kabelflex or equal & approved) in accordance with Eskom Electricity specification.

All cable sleeves shall be uPVC class 6, the nominal diameter shall be 160 mm for MV cabling and 110mm for LV cables installed at same level as the specified cable. Sleeves will be installed complete with draw-wire, plugs and marker blocks. One spare/unused sleeve will be allowed on a road crossing for future use.

Cable ends shall be sealed with a non-hardening watertight resin compound after the installation of cables. All sleeves intended for future use shall likewise be sealed.

### **Earthing & Lightning Protection System**

MV room, mini-sub and kiosks will be earthed. An earth matt will be installed at the mini-substations for earthing of the main power supply to protect the buildings from lightning. Overall earthing resistance required for the MV room, mini-sub and kiosk will be 1ohm.

Earthing specialist will be required to perform earth resistivity tests and to determine the required earth resistance value and called upon to install an earthing system where required.

### **Cable Detector/Danger Tape**

Tapes will be installed in all 11kV cable trenches. The tape will have 150 mm wide x 0,075 mm thick yellow polyethylene tape with bright red skull and cross bones and the words “Electric cables – Danger/Gevaar” printed thereon in bold letters. The tape will be installed in compacted soil, directly above and 200 mm above all 11kV cable over the entire route. Where two 11kV cables are buried in one trench, a separate detector tape shall be installed over each cable.

### **Cable Route Markers**

Cable route markers for MV cable will be installed and will be prism shaped, of reinforced concrete construction, approximately 300mm high, with top approximately 150mm square and bottom approximately 250mm square, suitable for burying directly in ground. Indented into an aluminium plate imbedded into the top marked “11000V cable” and one or two arrows indicating cable route (one arrow for straight route and two for corner)

Cable detector tapes will be used where the MV and LV cable will be installed underground. The tape will be buried with the cable to mark the existence of the cable should excavation take place around that area. Concrete cable route marker blocks will be installed on ground level above the MV cable to mark the route of the cable installed underground.

## **4. TECHNICAL SPECIFICATIONS**

### **Electrical Load Estimate**

The load estimate of the development was based on 5kW per unit. The calculated load for Parcel B and Parcel C is 3390kW and 4820kW respectively. The total load for the development is therefore 8210kW and 5.2MVA maximum demand in total when a 60% diversity factor is considered.

It is therefore conclusive that the supply required for this development is 5MVA.

### **Design Criteria for Residential Blocks**

#### **Lighting and Small Power**

Each block will have a distribution board supplied from the electrical kiosk. The distribution board will have a circuit breaker for each unit and for general block lighting. The units will have individual conventional or pre-paid electrical meters as determined by the client.

The blocks will have general lighting for stairs and passages which will be controlled from the timer switch or the photo-cell.

The internal installation of the units will consist of general lighting, general power, telephone, and television points.

### **Outdoor Lighting**

Pole light fittings will be positioned alongside the streets to give ambient lighting for parking area and security lighting. The lighting will be switched via timers or photo-cells for energy saving. Circuit breakers for the street lights will be installed in the kiosks.

### **Testing and Reports**

All testing & reporting shall comply with and be carried out and reported on in accordance with SANS 10142 Part 2, 2009 for MV Installations.

## **5. EXCLUSIONS**

- 14% VAT
- Main contractor profit and mark-up
- Escalation based on current day rates
- Telecom and Electronic services
- Professional fees and disbursement
- Builders' works
- Kitchen equipment
- Public and private telephone system cables, wires, connections and instruments.
- Connection fees
- Telkom and intercom cabling