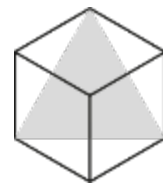




PROJECT: JDA ZOLA [EMDENI] PUBLIC TRANSPORT FACILITY

DOCUMENT NAME: ELECTRICAL PRELIMINARY DESIGN REPORT

DOCUMENT REFERENCE: EMDENI-ELEC-S2 RPT-01-02



POLYGON
PROJECT
ENGINEERS



The following signatories have approved the report:

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Revision History

Rev	Description	Author	Pages
A	Issued for Review	UP	All
B	Updated section 3: Electrical Power Supply	UP	4



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1. Introduction

The Johannesburg Development Agency is implementing a project for the construction of the Zola (Emdeni) Public Transport Facility and have appointed Polygon Project Engineers (Pty) Ltd as the mechanical and electrical engineers for the project.

The purpose of this report is to describe the Stage 2 design development (Conceptual Design) for the Electrical service to the Public Transport Facility located in Soweto, Gauteng. The Electrical service is defined as Electrical Power Supply, Power Reticulation, Building Services, and Electronic Systems.

2. Standards Used

Whilst not an exhaustive list, the following standards are used to guide the design of Electrical systems:

- *SANS 10142-1: 2009 The Wiring of LV Installations*
- *SANS 10114-1:2005 Interior Lighting Part1: Artificial Lighting of Interiors*
- *SANS 10389-1 Exterior Lighting – Part 1: Artificial Lighting of Exterior Areas*
- *SANS 204: Energy Efficiency in Buildings*
- *SANS 10400-XA Energy Usage in Buildings*
- *SANS 10313:2010 Protection against lightning*
- *SANS 60947-2 (2007) Low Voltage Switchgear and Controlgear, Part 2: Circuit Breakers*
- *SANS 1507-3 Electric Cables with Extruded Solid Dielectric Insulation for Fixed Installations*

3. Electrical Power Supply

The Electrical Power Supply application shall be submitted to City Power, requesting a dedicated 83KVA, 120 A, 400 V supply which will cater for whole facility. This was based on calculations for the various spaces within the project area. Provision has not been made for back-up power.

UPDATE 4 March 2021:

Enquiries were re-initiated with Eskom in 2021, with reference number 405198152. Indications are that power is available and a quotation will be sent through during the course of March 2021.



4. Building Services

The following areas will be deemed as buildings for this project, namely:

- Block A: Guardhouse
- Block B: B1-B8 Kiosks
- Block C: Refuse Areas
- Block D: Ablutions
- Block E: Ablutions
- Block F: Admin Offices
- Block G: Ablutions

The site also comprises of the driveways, a Ranking Area and a Recreational Area.

4.1. Power Reticulation

4.1.1. Cabling

- All cables are sized according to voltage drop over the length of the cable, electrical load requirement, estimated fault level and de-rating factors in accordance with SANS 10142-1 and SANS 1507-3.
- Distribution boards shall be manufactured according SANS 10142-1 and specified in the electrical drawings and Bill of Quantities
- Cables shall be routed either by burying in the ground or by running through walls and ceilings. At all times, all cables shall be protected by PVC conduits and sleeves.
- Electrical cables will have dedicated conduits and will not share conduits with data or telecommunications cabling to limit electronic interference and reduce the potential for damage caused by multiple contractors working in the same space.
- All cabling related to the Fire detection and suppression systems shall be distributed within steel bosal conduit.

4.1.2. Metering, Main Switchboard and Distribution Boards

The Main Switchboard shall be housed in an LV/Telkom room adjacent to the Guard house.



The Main switchboard will comprise of the following switchgear:

- The main incomer,
- A feed to each Kiosk,
- Admin Office sub DB,
- General areas.

The Admin Office sub DB will house switchgear to feed the following distribution boards;

- Block D,
- Block E,
- Block G,
- Recreational area,
- General Areas.

4.2. Lighting Design

- Energy efficient luminaires and fixtures shall be specified for both internal and external lighting. Only luminaires that are commonly available shall be specified to optimize spares availability and derive cost savings during both the construction and operational phases of the project.
- Consideration has been taken of the lighting requirements of critical task areas, such as office desks and emergency lighting.
- Internal lighting shall be controlled using conventional wall switches, except for refuse and ablution areas, where motion sensors shall be used.
- External lighting such as wall mounted lighting and parking area lighting shall be controlled by means of photocells.
- The driveways shall be lit using streetlights on GRP poles.
- Post top lamps shall be used to light up the general site areas.
- All luminaires shall bear a SABS stamp to ensure compliance with local standards and conditions.
- All switches shall be specified as the CRABTREE Classic range.
- All equipment shall bear an SABS stamp.



4.3. Small Power Design

- All socket outlets shall be specified as 3-pin, 16A, 220V deemed sufficient for small appliances, computers and other equipment utilizing 220V AC. All sockets shall include the now compulsory SANS 164-2 (ZA plug).
- All sockets shall be specified as the CRABTREE Classic range.
- Power skirting shall be used for the Admin Offices and the Guard-House buildings.

4.4. Earthing and Lightning Protection

Earthing and Lightning Protection will be required across the site.

- Earthing shall be achieved by means of interlinked earth mats located at various points around the development, arranged in such a manner to comply with SANS 10142-1.
- Lightning protection shall use the Rolling-Ball method of calculating the lightning rod coverage. A specialist contractor shall complete the installation according to SANS 10313 and provide the necessary compliance documentation.

4.5. Water Heating

- Hydroboils will be used for water heating in areas where required, typically at the kiosks and office block.
- The ablution blocks will not be equipped with water heating equipment.

4.6. Space Heating and Cooling

- Air conditioning will NOT be installed in the office areas.
- Ceiling fans will be provided in common areas where a roof or ceiling is available to provide cooling.

4.7. Electronics

4.7.1. Telecommunication

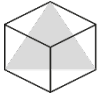
- A Telkom room shall be established next to the Guard house.



- Sleeving for telephone reticulation shall be provided for from the Telkom room to the guard house and the administrative offices.
- Telephone outlets shall be provided for in the Admin offices and the Guard-House.
- Fibre ducting shall be allowed for from the Telkom room to the guard house and the administrative offices.

4.7.2. Security Installation

- CCTV – a CCTV system shall be installed.
 - Low light, fixed-type, IP cameras shall be used to minimize wiring and installation costs.
 - Cameras shall be housed in tamper proof housings to mitigate the theft risk.
 - 22” Viewing screens shall be installed in the guard house, each display capable of monitoring eight (8) cameras shall be installed in the Guard House.
 - The DVR and related recording equipment shall be housed in the Telkom room.
- Access Control
 - The Guard House, Administrative offices and Telkom room shall be fitted with keypad type access control systems to limit entry to authorized personnel only. Other options such as key tags or biometric scanners may be used but required a dedicated person to manage the system. If / when this person leaves, the system becomes unusable and is usually bypassed, thereby defeating the original purpose.
 - The access control system shall be intelligently linked to the site security system to alert for intruder activity.
- Intruder Alarms
 - The Guard House, Administrative offices and Telkom room shall be fitted with intruder detection systems.
 - Control keypads will be installed in each area. Each space shall be operated independently.
 - All systems shall be linked to an emergency response centre.
 - At this stage of the design process, it is not known if the Guard house will be manned 24/7. It is envisaged that the guard house will be manned from 4AM to 9PM – typical travel hours for taxis.
 - Kiosks and ablution blocks will not be fitted with intruder detection systems.
 - Driveway gates shall not be automated but will be installed for security purposes.



4.7.3. Fire detection

- Fire detection equipment (smoke and heat detectors) shall be allowed for in the ablution blocks, Guard House, Telkom room and the administration offices.
- Control panels shall be installed in the Guard House.

4.7.4. IT Installation

- Provision shall be made for the installation of IT hardware.
- Two tier power skirting shall be used to allow for the reticulation of IT cabling.
- CAT-6 cabling shall be used.
- All power skirting lengths shall be linked to the server room (location to be determined) via 25mm diameter PVC conduit.
- Wifi hotspots shall be installed throughout the facility to provide internet connectivity for all commuters.

4.8. Solar PV System (Optional)

- The site has the advantage of a north facing roof, with ample available roof space of approximately 2360 m² to accommodate a solar PV system.
- A solar PV system to provide for the power across the whole site, of capacity 83 kVA will cost approximately R1.6 million.
- At full utilization, it would be possible to pay off this investment within 5 years. With current equipment life expectancy projections, the system would operate for at least 20 years.
- The proposed system would be grid-tied, thus drawing any shortfall in power from the Eskom grid.
- Rising electricity prices would mean reduced operational costs for this transport hub.
- The site is envisaged to enjoy good security thus adding to the attraction of this system.



5. Cost Estimate

The following cost estimate has been allowed for at this stage of the design. All costs are estimates and shall be firmed up with suppliers during further iterations of the design:

<i>Item</i>	<i>Description</i>	<i>Cost</i>
1	Electrical Installation	R 1,159,658.85
2	Electronic Installation	R 220,363.00
3	Electrical Supply (Eskom)	R 141,140.43
4	Total Cost (excl contingencies and VAT)	R 1,521,162.28
5	Contingencies at 10%	R 152,116.23
6	Total Cost (excl VAT)	R 1,673,278.51
7	VAT at 15%	R 250,991.78
8	Total	R 1,924,270.28