ENGINEERING SERVICES REPORT

ELECTRICAL ENGINEERING SERVICES REPORT FOR
Doornhoek 318 LQ Portion 129, Thabazimbi

CLIENT

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REFERENCE NUMBER: VP0045-R01

ISSUE DATE: 01 June 2021

REV: 0

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DOCUMENT CONTROL

Document Title	Doornhoek 318 LQ Portion 129, Thabazimbi, Electrical Engineering Services Report
Document Number	VP0045-R01
Document Revision	0
Issue Date	01 June 2021

REVISION HISTORY			
Version	**Date**	**Author**	**Changes made**
0	01 June 2021	CJV	First issue

DOCUMENT APPROVAL			
Action	**Name/Designation**	**Signature**	**Date**
Prepared by	CJ Vermaak M.Eng, Pr.Eng		4 June 2021

No	**Issued to**
1	LEO Consulting (Pty) Ltd
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1. CONTENTS

2. INTRODUCTION

This report serves as the Engineering Services Report for the Electrical Engineering Services for the Doornhoek 318 LQ Portion 129 Development in Thabazimbi. The development will consist of 33 residential units. The design will be for an underground low voltage installation which will be fed from a new 400V Eskom connection. The Eskom connection will be via a dedicated 11000/400V Pole mounted transformer.

3. LOCATION OF THE PROJECT

The location of the project is next to the Warmbad (Bela Bela) road in Thabazimbi with coordinates 24°34'16.10"S and 27°25'14.52"E and is as follows:

Figure 1 Location of the project

Figure 2 Street View from Warmbad Road of the Location of the Development

4. TERMS OF REFERENCE AND SCOPE OF WORK

4.1 Terms of Reference

CJ Vermaak Consulting Engineer CC has been appointed for the Electrical Engineering Services Report for Doornhoek 318 LQ Portion 129 in Thabazimbi.

The following parties are the main parties of the contract:

- CJ Vermaak Consulting Engineer CC is the appointed consulting electrical engineer for the project for the inception stage of the project.
- The LEO Consulting (Pty) Ltd is the appointed consulting civil engineer for the project and will also be acting as the coordinator to which CJ Vermaak Consulting Engineer CC will correspond to.
- Bertie Joubert Eiendomme is the client for the project.

4.2 Proposed Scope of Work

The Scope of Work for the electrical engineering services will be as follows:

- Design and Installation of the internal underground low voltage electrical network, including metering kiosks.

- Design of internal street and area lighting (if required).

5. EXISTING ELECTRICAL INFRASTRUCTURE

An existing Eskom overhead 11kV line is running past the development. This the Eskom TS 11kV Line which is supplied from the Eskom Thabazimbi Combined Substation. This line also has a T-off and supplies properties next to the small access road on the South-eastern side of the proposed development. The T-off however is strung with a smaller overhead conductor and may have limited capacity. From a visual inspection and as per the Eskom standard the main backbone conductor on the main line should be Hare ACSR Conductor. The T-off conductor appears to be Fox ACSR Conductor (Worse case scenario). The Eskom conductor ratings at 11kV with a templating temperature is given in the table below:

Table 1 Existing Line Conductor Ratings

Eskom Conductor Ratings				
Conductor Name	**Templating Temperature (°C)**	**Maximum Current Rating (A)**	**Voltage (kV)**	**Power Transfer Capacity (kVA)**
Hare	50	280	11	5335
Fox	50	148	11	2820

There are two options or possible connection points to the existing Eskom TS 11kV line. The proposed connection points are either between TS 58 and TS 59 which are located next to the Warmbad Road (Hare Conductor) or from the TS 51 T-off in the small access road on the South-eastern side of the proposed development.

Figure 3 Poles TS 58 and TS 59 Respectively

The alternative position for the connection can be close to the TS 51/8A Pole as seen in the following image:

Figure 4 Pole TS 51/8A

The proposed electrical connections to the Eskom line are as per the following image:

Figure 5 Proposed Development with Possible Connection Points

6. MAXIMUM DEMAND LOAD ESTIMATE AND CONNECTION

6.1 Maximum Demand Calculation

The load and maximum demand estimate for the development are as follows:

Table 2 Estimated Maximum Demand

Maximum Demand Load Estimate				
Description	**Number of Units**	**ADMD per Unit (kVA)**	**Voltage (V)**	**Maximum Demand (kVA)**
Residential Units	33	4.7	400	178
Other (Auxiliaries)				14
Total				**192**

Note that the Maximum Demand is not a direct product of the number of units and the ADMD. The Maximum Demand is calculated using the Herman-Beta distribution as per NRS 034 and the Eskom standard. The ADMD for urban township complexes is 4.7kVA per unit. The Notified Maximum Demand (NMD) for which the application has to be made will be 200kVA. In terms of Table 1, it is anticipated that the additional load will not exceed 4% of the existing line capacity and that no major network upgrades are expected.

6.2 Eskom Connection

The bulk connection from Eskom, will be a low voltage connection at 400V. this will be supplied from a 11000/400V, 200kVA pole mounted transformer which will be installed on the stand boundary or as close as possible to the stand boundary. A Typical installation of the Eskom pole mounted transformer will be similar to the typical installations in the area and will be as per the following:

Figure 6 Typical Pole Mounted Transformer

The image above is the proposed solution (connection from the Warmbad Road side) as it has the advantage that the bulk supply kiosk (which will house the tariff meter as well as the main breaker) and main low voltage cable are located within the premises of the development and is thus much more secure. This is also a more reliable connection to the Eskom network as it will connect directly to the main Eskom TS line. The disadvantage however is that space needs to be allocated within the development for the structure as well as access to it.

An alternative connection can be as per the following image:

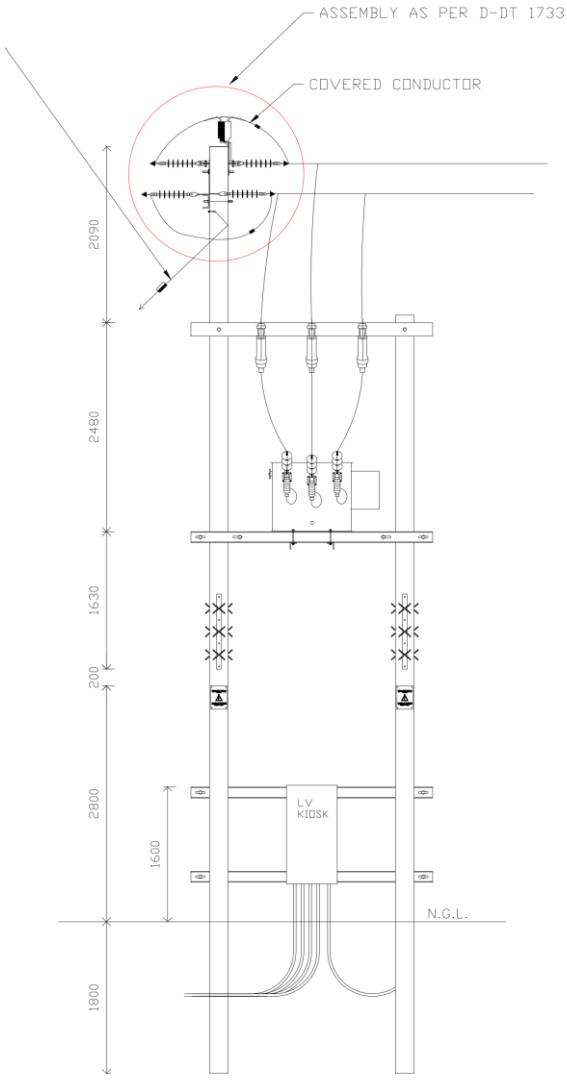

Figure 7 Alternative Transformer Structure

The image above would be the proposed solution should the supply be taken from the small access road at the South-eastern side of the proposed development. The advantage of this structure is that it will not occupy space within the development. The disadvantage of this structure is that the kiosk with the main breaker and meter as well as the main supply cable will not be secure and may be subject to theft and vandalism.

It must be noted however that the supply and installation of the transformer and transformer structure will be done by Eskom and the final configuration will be done by them. It is however conceivable that the structure of option 1 will be used by Eskom.

The proposed Single Line Diagram for the connection will be as follows:

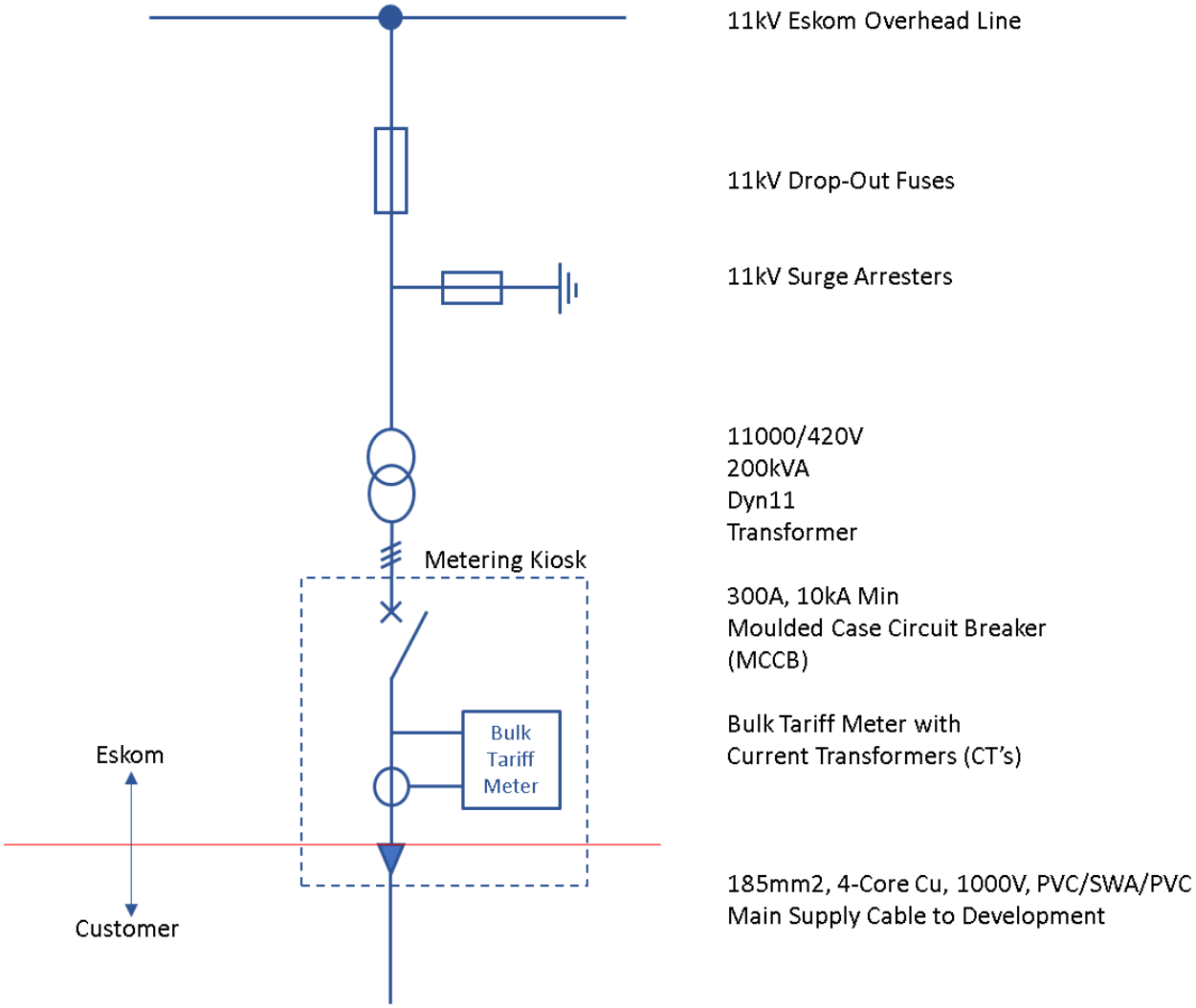

Figure 8 Eskom Connection Single Line Diagram

Provision will have to be made in the property for the Eskom supply point, including access to the bulk metering kiosk as well as a cable route from the bulk metering kiosk to the development, The proposed location for the Eskom supply point is as per the following image:

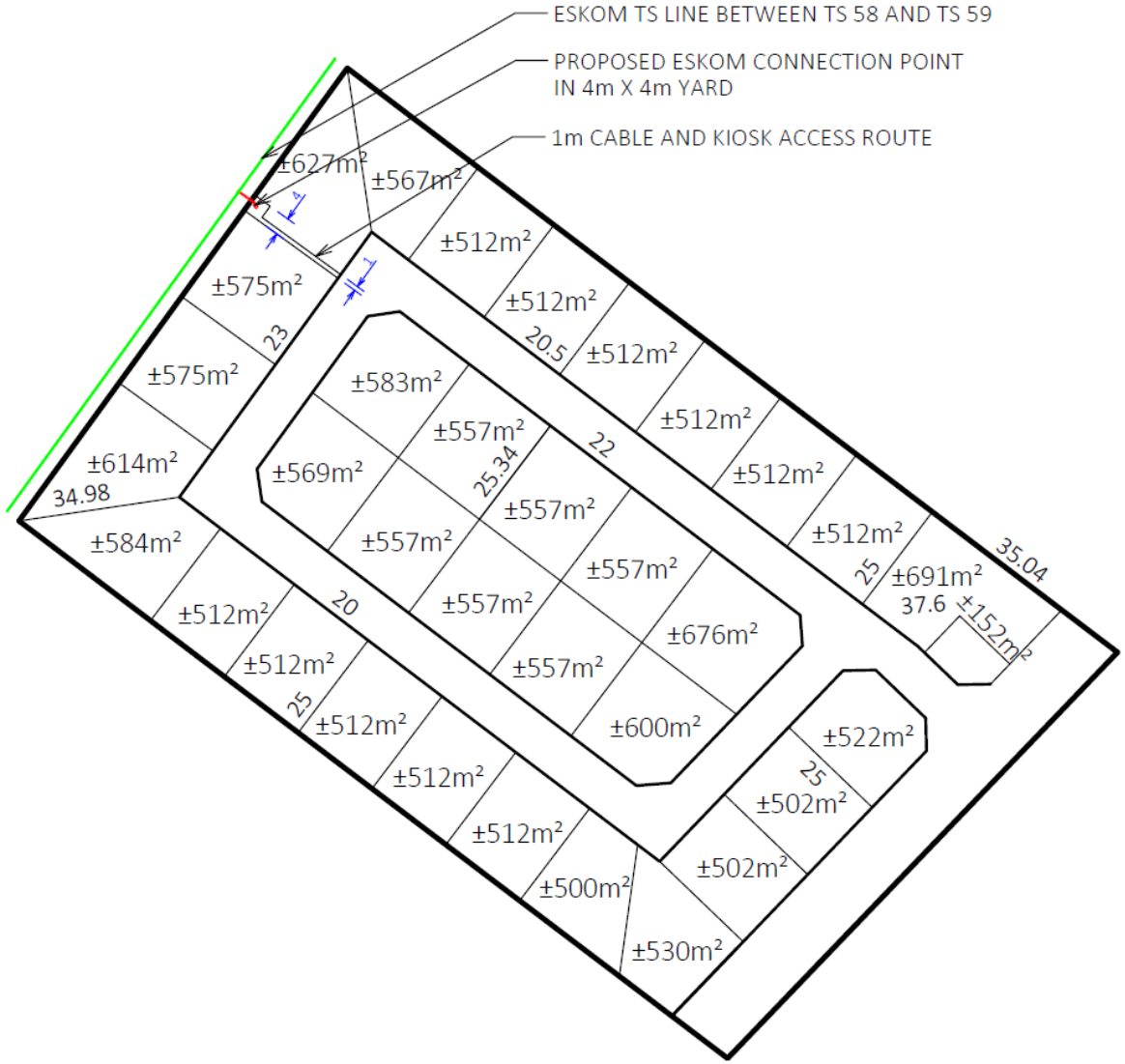

Figure 9 Proposed Location of the Eskom Connection Point

6.3 Eskom Connection Application

An application must be made with Eskom Customer Services for the new connection. The following information must be provided to Eskom upon application for the new connection:

- Physical location for the proposed transformer structure as well as the location relative to the existing Eskom poles (i.e., Between TS 58 and TS 59).
- Voltage - 400V, 3-Phase.
- Notified Maximum Demand – 200kVA.
- Details of the Applicant.

6.4 Internal Electrical Reticulation

The internal reticulation will only be a low voltage reticulation network and will be done with underground copper cables and ground mounted distribution kiosks which will supply power to the various units. The main supply cable from the bulk metering kiosk located at the pole mounted transformer will supply the secondary distribution kiosks directly. Each distribution kiosk will be equipped with house/unit connection low voltage circuit breakers (MCB's) as well as low voltage moulded case circuit breakers (MCCB's) where required.

Each unit will have a single phase 60A connection. The type of earthing system will either be a TN-C-S or a TN-C Earthing system depending on the detail design requirements.

Low voltage cables will be buried at a depth of 600mm minimum. Sleeves will be provided at road or other services crossings where necessary.

The internal low voltage electrical reticulation design must comply with SANS 10142-1:2017 and must be submitted to the local

6.5 Metering and Internal Network Management

It is proposed that prepaid meters be installed at each unit and that the internal reticulation network be a private network. It is therefore advised that a private utility management company be appointed for maintain and operating the internal electrical network and also be responsible for providing prepaid meters and the selling of power to the residents. The utility management company will also then be responsible for all interaction with Eskom after the network has been energized and taken over and shall make the payment for bulk energy usage to Eskom on a monthly basis.

7. SUMMARY OF TECHNICAL PARAMETERS

The main technical parameters for the proposed development can be summarised as per the following table:

Table 3 Summary of Technical Parameters

No	Description	Unit	Parameters
1	**Power System**		
1.1	Source		Eskom 200kVA Transformer
1.2	System Voltage	V	11000/400
1.3	Phase Rotation		R-W-B Anti clockwise
1.4	Frequency	Hz	50
1.5	3-Phase Fault Level @ 400V Terminal of Transformer	kA	6.4
2	**Design**		
2.1	Maximum Voltage Drop	%	5
2.2	After Diversity Maximum Demand (ADMD)	kVA	4.7
2.3	Notified Maximum Demand (NMD)	kVA	192
2.4	Cables	Type	1000V, 4-Core Copper, PVC/SWA/PVC
3	**Metering**		
3.1	At main supply point	Type	Bulk Tariff Metering
3.2	At residential units	Type	Prepaid
4	**Earthing**		
4.1	Earthing Conductor	Type	Bare Copper Earth Wire (BCEW)
4.2	At residential units	Type	TN-C-S / TN-C

8. CONCLUSION

The project entails the typical electrical network design for a new township development which will consist of a low voltage network. An 11kV connection to a pole mounted 200kVA transformer will be made to supply the customer with a 400V, 3-Phase metered supply. An application must be made with Eskom for this connection. It is not anticipated that Eskom will require any network upgrades for this application as it is considered small relative to the expected capacity of the 11kV line.

The internal network can be operated, maintained and managed by a private utility company. Prepaid metering is proposed for each unit.

- End of Report -