Eskom National Transmission Company South Africa ™	Report	Substation Engineering

Title: **LM-Container Replacement Phase1 - Zandspruit RS**

Document Identifier: **Zand23P01-SE-D65**

Alternative Reference Number:

Area of Applicability: **National Transmission Company South Africa SOC Ltd**

Functional Area: **<e.g. Human Resources, Finance, Engineering, etc.>**

Revision: **0**

Total Pages: **11**

Next Review Date: **N/A**

Disclosure Classification: **Controlled Disclosure**

Compiled by	Functional Responsibility	Authorized by
NN Shandu	**Azhar Mayet**	**Andile Maneli**
Substation Engineering	**Substation Engineering**	**Substation Engineering**
Civil Technician	**Senior Engineer**	**Chief Engineer:**
Date: 28/01/2025	Date: 04/02/2025	Date: 05 - 02 - 2025

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1. INTRODUCTION

In 1994 Zandspruit RS was established in order to provide the telecommunications services in the Mogalakwena municipality area. The site was established with two Fiber glass container, erected on an uneven surface which has been a problem especially with heavy equipment like batteries sinking the floor of this containers. These containers have served their purpose for over twenty years, their condition has deteriorated, and they must urgently be replaced with a new equipment shelter that will meet ever increasing and evolving telecommunications requirements.

Network availability, dependability and service level agreement are compromised at this site, as suitable batteries for example cannot be installed to meet the standard standby time required during AC power failure. The new equipment shelter will enable other refurbishments onsite, thereby ensuring that the site complies with all standards and SLA. The existing 70m x 70m servitude is more than sufficient for the supply and construction of the new 6m x 3m x 3m container.

2. SUPPORTING CLAUSES

2.1 Scope

2.1.1 Purpose

This document is prepared to investigate the equipment shelter replacement at Zandspruit RS, as per the approved Northern Region 10-year plan project, LM – Container Replacement Phase 1. The project will replace the old, unsafe Fiber glass container with a proper container suitable for housing the Telecommunications equipment.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions/ National Transmission Company South Africa SOC Ltd Reg No 2021/539129/30.

2.1.3 Effective date

The document will be effective once approval has been granted by the Civil Technical Review (CTR) committee

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems

[2] 240-56576361 Telecommunication Transport Network Equipment Commissioning Standard

[3] 240-56362336 Standard for the Installation of a Telecoms Equipment Cabinet.

[4] 240-132190480 Telecommunications Equipment Installation Standard

[5] 240-73198174 SHE Specification

[6] 240-118870219 Standby Power Systems Topology and Autonomy for Eskom Sites

2.2.2 Informative

[7] 240-89498731 Equipment Container for AC-Powered Sites

[8] 240-138065940 Anti-Intrusion Measurements for Equipment Container at AC-Powered Sites.

[9] 240-56177186 Battery Room Standard

[10] 240-141785049 Technical Evaluation Criteria for Equipment Container for AC-Powered Sites.

[11] 240-56360034 Stationary Vented Lead Acid Batteries Standard.

[12] 240-53114248 Specification for Thyristor and switch mode chargers, AC/DC to DC/AC converters and inverter/uninterruptible power supplies.

[13] 240-56176168 DC Systems Settings Standard.

[14] 240-89797258 The Safe Handling, Transportation and Disposal of Cells, Batteries and Electrolyte.

[15] 240-75340750 Alarm Wiring Standard on EAS Unit.

[16] 240-56872119 Telecommunication Concrete Plinth.

2.3 Abbreviations

Abbreviation	Explanation
BB	Bus-bar
CT	Current transformer
CTR	Civil Technical Review
D_L	Dead load
kN	Kilo Newtons
kNm	Kilo Newton meter
kPa	Kilo Pascals
kV	Kilo Volts

Abbreviation	Explanation
MTS	Major Transmission Substation
SLS	Service Limit State
Trfr	Transformer
ULS	Ultimate Limit State
W_L	Wind Loading

2.4 Roles and Responsibilities

Mr Nelson Shandu is the Civil Engineering Technician responsible for this project.

2.5 Process for Monitoring

National Planning Application and Engineering (Limpopo) regional engineering is the custodian of document.

2.6 Related/Supporting Documents

ETFM 1846 ET Project Planning Book Rev 1

3. DETAIL DESIGN INFORMATION

3.1 Problem Scope

The scope will investigate the requirements for supply, deliver and construct the new equipment shelter which will be suitable for Telecommunication equipment's, and with sufficient DC system to handle existing load as well as the future growth.

3.2 Design Requirements

The container plinth design.

3.3 DESIGN OPTIONS CONSIDERED

A 150mm thick concrete plinth was considered, reinforced with 6mm steel rebar. However, the mesh reinforcement option allowed for easier constructability.

3.4 SITING

3.4.1 Site Characteristics

3.4.1.1 Geotechnical

A desktop study was carried out to determine relevant loading factors i.e., wind loading. A geotechnical investigation was not required for the project.

3.4.1.2 Topographical Survey

The Survey was carried out by Ripfumelo Valoyi and Samukelisiwe Mpungose (Both GITs) under supervision of Maipfi Nedzungani (Land Surveyor GPr LS1456) and Nomvelo Moagi (Land Survey Officer GTc ES 1963), on the 17th of October 2023.

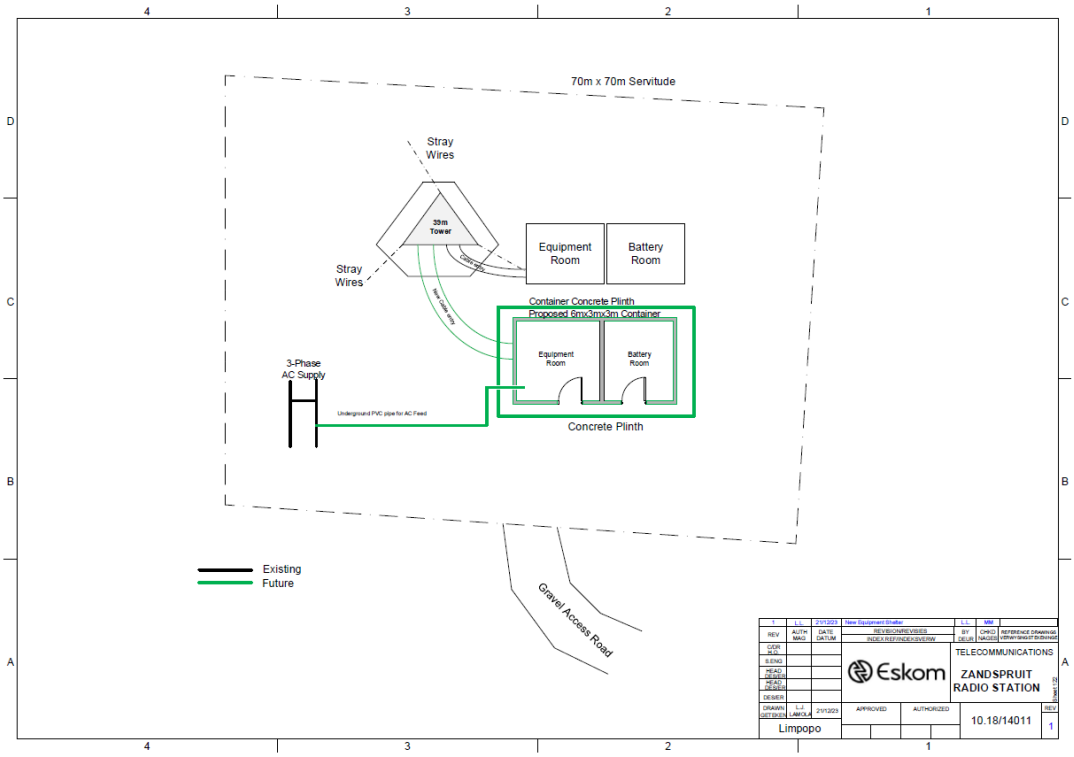
The following Equipment was used:

- Trimble R4 GPS Set

3.4.1.3 Hydrological Characteristics

Due to the small area of this project hydrological characteristics do not play a major part.

3.4.2 Site Layout



3.5 CIVIL AND STRUCTURAL DESIGN

3.5.1 Earthworks

The drawing number for the earthwork information is:

- Zand23P01-SE-D65

CLIENT:	Northern Grid	**DATE:**	12.06.2024
PROJECT	LM-Container Replacement Phase1 - Zandspruit RS		
OPERATOR:	Mr Nelson Shandu	**DATE TESTED:**	12.06.2024
TEST POSITION:	Zandspruit RS - (Test A)	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Sandy Materials	**INSTRUMENT USED:**	1 m DCP
CONSTRUCTION TYPE:	Structural	**NOTE:**	Started at GROUND LEVEL

DCP DATA

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	Structural	Road Construction	Estimate Bearing Ratio (kPa)	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0							
5	28	28mm	28mm	5.6	Dense	160	319	160	46	48	443
10	49	49mm	21mm	4.2	Very Dense	197	394	197	66	70	607
15	70	70mm	21mm	4.2	Very Dense	197	394	197	66	70	607
20	100	100mm	30mm	6.0	Dense	152	304	152	42	44	411
25	129	129mm	29mm	5.8	Dense	156	311	156	44	46	427
30	170	170mm	41mm	8.2	Dense	121	242	121	28	30	293
35	205	205mm	35mm	7.0	Dense	136	271	136	35	36	348
40	265	265mm	60mm	12.0	Dense	92	183	92	17	18	193
45	394	394mm	129mm	25.8	Medium Dense	52	105	52	7	7	84
50	399	399mm	5mm	1.0	Very Dense	>200	>400	>200	300	>110	2900
55	425	425mm	26mm	5.2	Dense	169	337	169	51	53	481
60	427	427mm	2mm	0.4	Very Dense	>200	>400	>200	442	>110	7873

The consistency of the soil is discovered to be Dense to very dense after the DCP test were conducted.

3.5.2 Foundation, plinths and trenches

The design for foundation and plinth was done as per SANS 10400 under the following condition.

Slab-on-the-ground foundations on class C, H, R and S sites

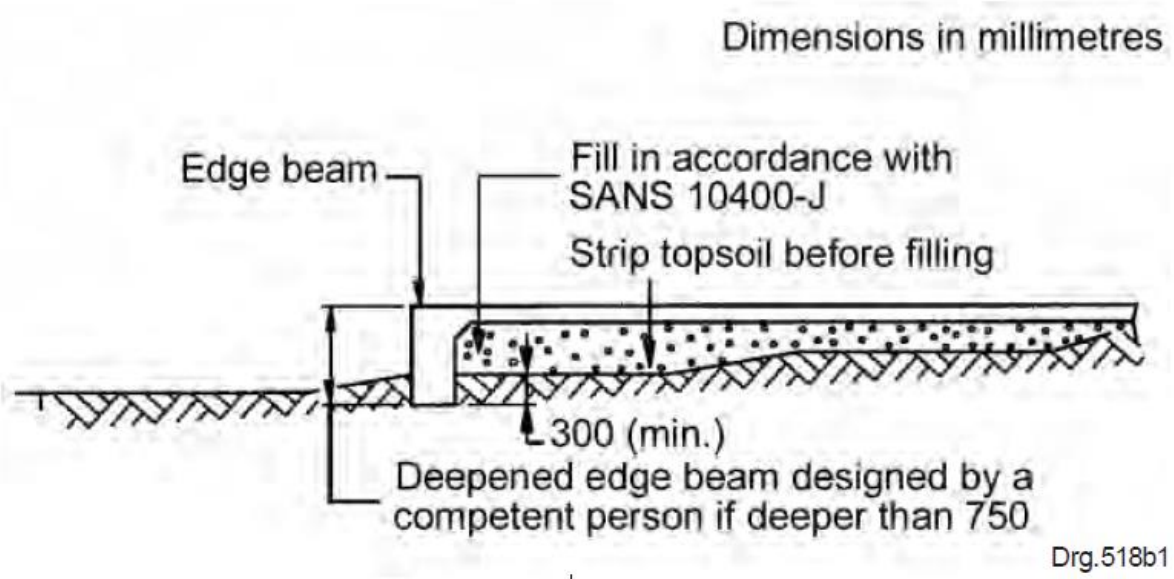
Slab-on-the-ground foundations for single-storey buildings on class C, H, R and S sites shall be in accordance where such foundations

a) have a surface area that does not exceed 200 m2,

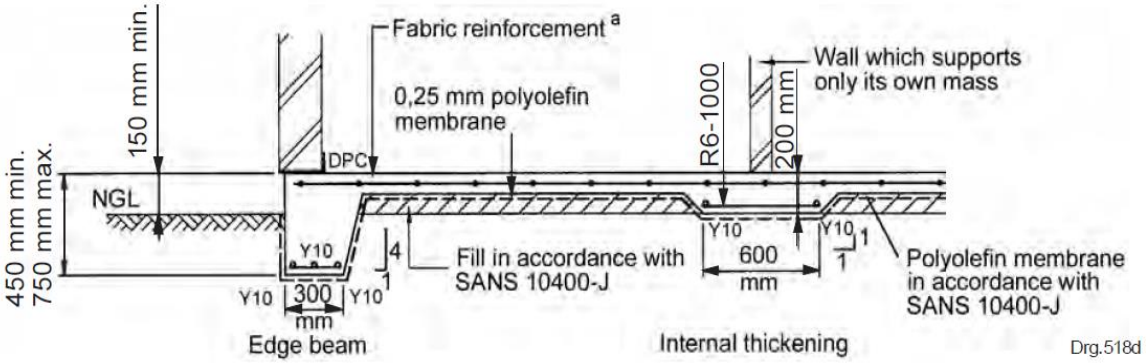
b) are free of joints,

c) do not contain any changes in surface levels with steps that exceed 400 mm, and

d) do not support any chimneys or walls which support concrete roofs.



a) Fill under slab-on-the-ground foundation



[a] Ref. 100 for slabs up to 50 m^2
Ref. 193 for slabs of 50,1 m^2 to 125 m^2
Ref. 245 for slabs of 125,1 m^2 to 200 m^2

a) Section through foundation

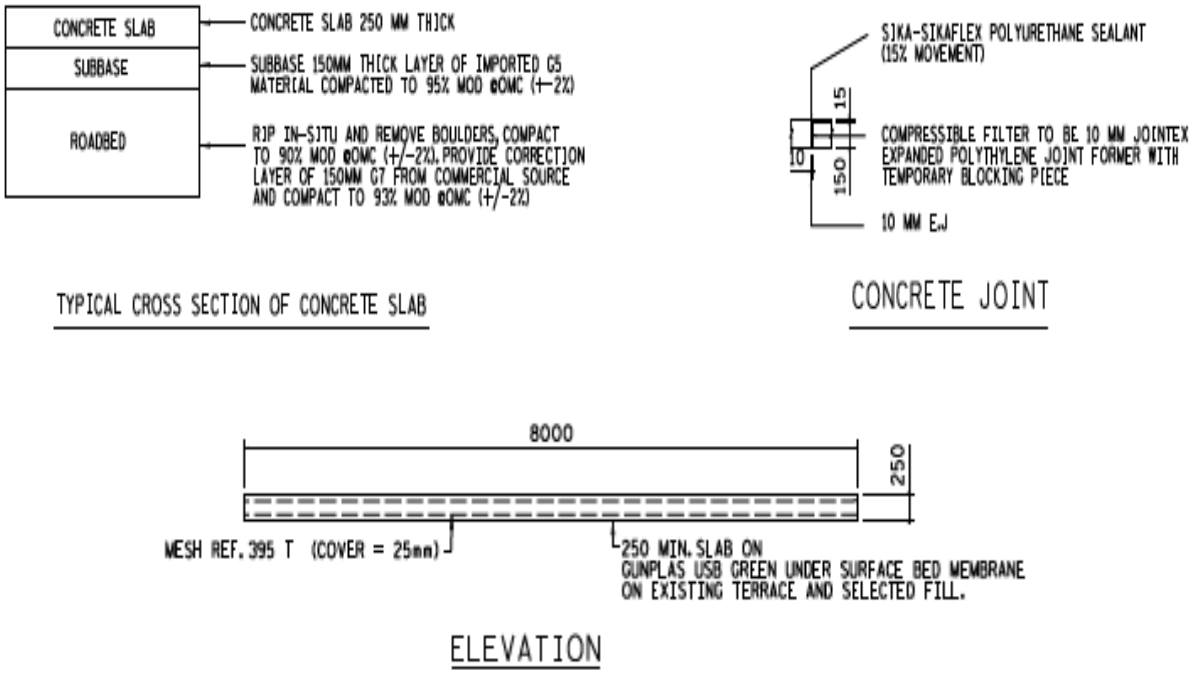
4. Design Description

4.1 Overview

This document is prepared to investigate the equipment shelter replacement at Zandspruit RS, as per the approved Northern Region 10-year plan project, LM – Container Replacement Phase 1. The project will replace the old, unsafe Fiber glass container with a proper container suitable for housing the Telecommunications equipment.

4.2 Detail Description

A 250mm thick concrete plinth was considered, reinforced with 6mm steel rebar. However, the mesh reinforcement option allowed for easier constructability.



4.3 Use

This has been designed to accommodate the new 500MVA transformer and upgrading associated bay equipment to current standards.

5. References

Refer to [3] to [8] in Section 2.2.2

6. Acceptance

This document has been seen and accepted by:

Name	Designation
Azhar Mayet	Chief Engineer
Andile Maneli	Civil Manager: Substation Engineering

7. Revisions

Date	Rev.	Compiler	Remarks
01/2025	1	Mr Nelson Shandu	First Issue

8. Development Team

The following people were involved in the development of this document:

- Mr Nelson Shandu
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9. Acknowledgements