

 Eskom	Standard	Technology
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Title: **STANDARD FOR SUBSTATION SURVEYS**

Unique Identifier:

240-102384426

Alternative Reference Number: **<n/a>**

Area of Applicability:

Engineering

Documentation Type:

Standard

Revision:

1

Total Pages:

6

Next Review Date:

June 2021

Disclosure Classification:

Controlled Disclosure

Compiled by

DJ Angove

Derrick Angove

Senior Technician

Date: *17-3-2016*

Approved by

Dawie Senekal

Dawie Senekal

Senior Technologist –
Substation Engineering

Date: *18-03-2016*

Authorized by

Phineas Tlhatlhetji

Phineas Tlhatlhetji

Senior Manager –
Substation Engineering

Date: *03/06/2016*

Supported by SCOT/SC

Phineas Tlhatlhetji

Phineas Tlhatlhetji

Substation/SC Chairperson

Date: *03/06/2016*

PCM Reference: **240-53459042**

SCOT Study Committee Number/Name: **STANDARD & DESIGN PROCEDURES-CIVL (Tx)**

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1. Introduction

The quality and accurate survey data Substation Design receives is an integral part of the design and construction of new and extending existing Substations and Access roads.

2. Supporting Clauses

2.1 Scope

This document standardises the survey requirements for Substation Design.

2.1.1 Purpose

The purpose of this document is to assist Substation Designers to request the minimum survey requirements for designing Substations for our Survey Department to perform or to appoint a Professional Land Surveyor to produce an accurate and quality product.

2.1.2 Applicability

This document shall apply to Substation Engineering Department within Group Technology in Eskom.

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] Occupation Health and Safety Act. 1993 (No 85 of 1993)

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

Definition	Description
Approved by	The accountability of the Approver of the document is equivalent to the specified role of Functional Responsible/Owner as identified in 240-53114186 and 32-6 for Documents and Records Management.

2.3.2 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
A.M.S.L.	Above Mean Sea Level
DTM	Digital Terrain Model

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Abbreviation	Description
I.L.	Invert Level
PDE	Power Delivery Engineering
T.L.	Terrace Level
T.O.C.	Top Of Concrete
WGS	World Global System

2.5 Roles and Responsibilities

Substation Designers to ensure all survey requirements are indicated clearly before commencement of project.

2.6 Process for monitoring

Survey Data received on agreed time frame.

2.7 Related/Supporting Documents

Not Applicable.

3. Survey requirements for substations

This document outlines the different survey data required at different stages of Substation designs or revisions.

3.1 Site Selection

The minimum survey requirements at site selection stage, is to request for Digital Elevation Model Data (DTM) and a 1: 50 000 Geographical maps from PDE Planning and GIS Department.

This DTM is ascii data (xyz co-ordinates) that can be used to produce contours. These contours can be superimposed on the 1 : 50 000 Geographical Map to determine the location of the sites in relationship to Town/Access roads and Power lines. Preliminary cut/fill volumes are also obtained to assist in the geotechnical investigation to select the preferred site.

FOOTNOTE – The accuracy of the data is very poor and can only be used for planning purposes.

3.2 Concept design

A request to PDE Planning and GIS Department should be made to obtain whether a Lidar Survey is available.

The Lidar survey consist of CAD files in DGN and DXF format

- Imagery files in ECW format
- Laser points in Ascii format

With these files the Substation can be orientated to the correct position, access road routes can be determined and preliminary geometric designs can be carried out.

If a Lidar survey is not available a full topographical survey is required as described in the final design stage.

3.3 Final design

A request to PDE Planning and GIS Department should be made to appoint a qualified Professional Land Surveyor to produce a detailed Topographical/Engineering survey of the selected site.

The area to be surveyed should be indicated on a 1: 50 000 map or the property boundary/Substation servitude co-ordinates negotiated by the Lands and Rights Department.

The scope must cover the following:

- The survey to be in WGS 84 ellipsoid.
- All topographical features to be shown on the survey in DGN or DFX format –
 - Farm boundaries, trees, bush and vegetation, rock outcrops, rivers, dry water courses, soil erosion,
 - Poorly drained areas, roads, power lines telephone lines, existing structures/buildings,
 - grave yards and archaeological sites. Existing culverts, manholes, pipelines, (top and invert levels).
- Labelled contours A.M.S.L. at 0.5m intervals.
- Nearest national/district road with road number and kilometre marker.
- A 50m wide strip either side of T-junction if access road connects directly to a national/district road.
- Existing registered servitudes.
- Bench marks with co-ordinates and descriptions.
- The accuracy of the survey to Real Time GPS = $\pm 30\text{mm}$

Electronic survey data required from the survey must be in Acsii format (x,y and z co-ordinates values in columns).

A survey report consisting of equipment and personnel used, control beacon/trig stations, methodology on how the survey was compiled and results and general findings.

3.4 Substation extensions

The Substation Designers are required to mark up an existing Key Plan/Sketch indicating the area where the extension is required and existing column foundations. The marked up drawing is then sent to PDE Planning and GIS Department who will appoint a professional Land Surveyor to produce a detailed Topographical/Engineering survey of the marked extension

- The scope must cover the following:
- The survey to be in WGS 84 ellipsoid.
 - All topographical features to be shown on the survey in DGN or DFX format –
 - All marked column foundations with T.O.C. and existing T.L., Existing structures/buildings,
 - Pylons, yard and security fences, top and bottom of cut/fill embankments, existing culverts
 - And manholes top and invert levels, drainage channels and outlets, any visible services.
- Labelled contours A.M.S.L. at 0.5m intervals.
- Bench marks or existing setting out beacons with co-ordinates and descriptions.
- The accuracy of the survey to Real Time GPS = $\pm 30\text{mm}$

Electronic survey data required from the survey must be in Acsii format (x,y and z co-ordinates values in columns).

A survey report consisting of equipment and personnel used, control beacon/trig stations, methodology on how the survey was compiled and results and general findings.

4. Authorisation

This document has been seen and accepted by:

Name and surname	Designation
Phineas Tlhatlhetji	Senior Manager - Substation Engineering
Dawie Senekal	Senior Technologist - Substation Engineering
Dawie Naude	Senior Technologist - Substation Engineering
Nkosazana Leseka	Geologist - Substation Engineering
Peter Greybe	Senior Technologist - Substation Engineering
Phenyo Montshioa	Engineer - Substation Engineering
Thato Seatlholo	Senior Technician - Substation Engineering

5. Revisions

Date	Rev	Compiler	Remarks
June 2016	1	D. J. Angove	New document required

6. Development team

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

- Derrick Angove
- Dawie Senekal

7. Acknowledgements

Not applicable.