

 <b>Eskom</b>	<b>Report</b>	<b>Technology</b>
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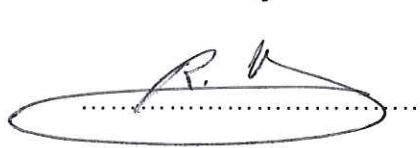


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## Foreword

This document was compiled to list the requirements to lift the 1 Apollo Kendal line between towers 225 and 226 to maintain clearances of min 12m under full load from the road to the conductor. Due to the loopin's at Kusile, this line was renamed 1 Kendal Kusile.

This activity of raising the span was done on the same location on the Duvha Kendal line in early 2015, which was very successful.

## Revision history

Date	Rev.	Compiled by	Clause	Remarks
20 August 2015	1	S Mushabe	all	New document

## Acceptance

This document has been seen and accepted by:

Name	Designation
Bharat Haridass	Senior Consultant
Riaz Vajeth	Senior Manager

## Development team

Bharat Haridass

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## 1. Executive Summary

With the construction of the new Kusile Access road between the existing N12 and D686 roads, it was found that the vertical clearances of the 1 Apollo Kendal 400kV line between towers 225 and 226 did not satisfy the 12m requirement stipulated for roads which will be used for heavy/ abnormal loads. The normal OSHACT requirement for 400kV lines over major roads is 9.3m, under full load of the line, but due to the fact that this road is an access road to Kusile and alternative route for the other industries in the area, a 12m vertical clearance is requested which will be used for heavy/ abnormal loads.


In order to achieve the desired 12m clearance at full load of the line, a new 518H tower of conductor attachment height of 26m will be installed to replace existing tower 225. The new tower will be placed 30m away from the existing tower 225, towards tower 226.

By installing this new 518H tower, we raise the clearance above the 12m level.

Existing triple Dinosaur conductor and existing 2x19/2.65 earthwire will be maintained. No new joints or conductor will be required.

The new tower will be equipped with new phase and earthwire hardware and new glass insulators.

The existing tower 225, will be removed in stages as the new 518H (new 225) will be erected.

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## **2. Supporting Clauses**

### **2.1 Scope**

#### **2.1.1 Purpose**

This document was compiled to detail the solution to lift the existing 1 Apollo Kendal 400kV line between towers 225 and 226.

#### **2.1.2 Applicability**

This document shall apply throughout Eskom Holdings Limited, its divisions, subsidiaries and entities wherein Eskom has a controlling interest.

## **2.2 References**

Parties using this document shall apply the most recent edition of the following documents:

### **2.2.1 Normative References**

- [1] SANS 10280-1:2013 – Overhead power lines for conditions prevailing in South Africa
- [2] 240-47172520 – The Standard for the Construction of Overhead Powerlines (TRMSCAAC 5)

### **2.2.2 Informative references**

- [1] Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
- [2] Electrical Machinery Regulations, 2011. Government Notice No. 250 of 25 March 2011
- [3] Construction Regulations, 2014. Government Notice No. 37305 of 7 February 2014
- [4] 240-53458961 – Process Control Manual (PCM) for Perform Line Engineering
- [5] 240-71380115 – Routine Inspection and Maintenance of Transmission lines


## **2.3 Definitions and abbreviations**

### **2.3.1 Definitions**

N/A

### **2.3.2 Abbreviations**

CAH            Conductor Attachment Height

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### 3. Document Content

#### 3.1 Scope of work

In order to rectify the clearance issue under the 1 Apollo Kendal 400kV line between towers 225 and 226, it is recommended to install a new 518H tower of CAH 26m, 30m away from existing tower 225 towards 226, and remove existing tower 225. This addition of a new higher suspension tower will pick up the conductor to above 12m clearance over the road at full load.

Below table lists the basic scope of work developed by LES, but will be discussed with the appointed contractor for acceptance and changes that will be required by them to execute the work safely.

Item no	Basic description of steps to follow (not limited to these).
1	Site establishment by contractor
2	Setting out of new tower foundations
3	Soil excavation and soil nomination.
4	Installation of new 518H foundations
5	Build tower up to safe level depending on the clearances (waist level)
6	Pre-assembly new tower in sections near new position.
7	Get outage on line
8	Install mitigation between road and new tower on tower 225 side, to prevent conductor and earthwires from touching the road.
9	Place conductor and earthwires of existing tower 225 in running blocks. May require to place existing towers 224 and 223 in running blocks as well.
10	Build new tower 225 in sections around phase and earthwires.
11	Attach phase and earthwires to new tower 225 with running blocks
12	Dismantle old tower 225 in sections.
13	Regulate and clamp in phases and earthwires on new tower 225. Remove running blocks from other towers.
14	Remove existing tower 225 foundations.

#### NOTE:

1. Care must be taken by the contractor to safe guard all free issue materials and tower steelwork, as the area can be prone to theft.
2. Eskom will provide the contractor with method statements for the construction work, which must be used to develop their specific project method statements for the activities they will be executing.
3. Contractor is to adhere to specific steps stipulated in their method statements when doing activities like clamping in of the conductors, etc, to avoid any fatalities.

## 3.1.1 Details of existing tower 225

Existing tower 225 is a self- supporting suspension tower 512 series. This tower will be completely removed after the new tower is installed.



FIGURE 1- PICTURE OF EXISTING TOWER 225.



FIGURE 2- PICTURE OF EXISTING TOWER 226-REMAINS

## 3.1.2 BASIC DRAWING OF EXISTING AND NEW LAYOUT.

The diagrams below show the existing layout and new layout of the spans between towers 225 and 226.

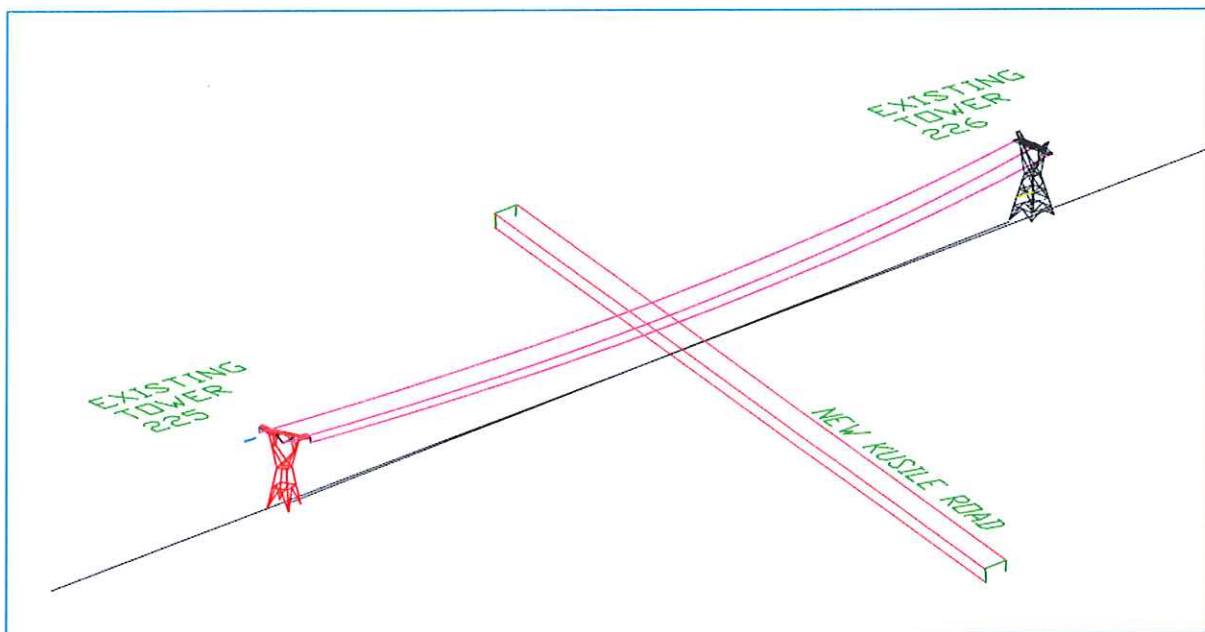


FIGURE 3- LAYOUT CURRENTLY

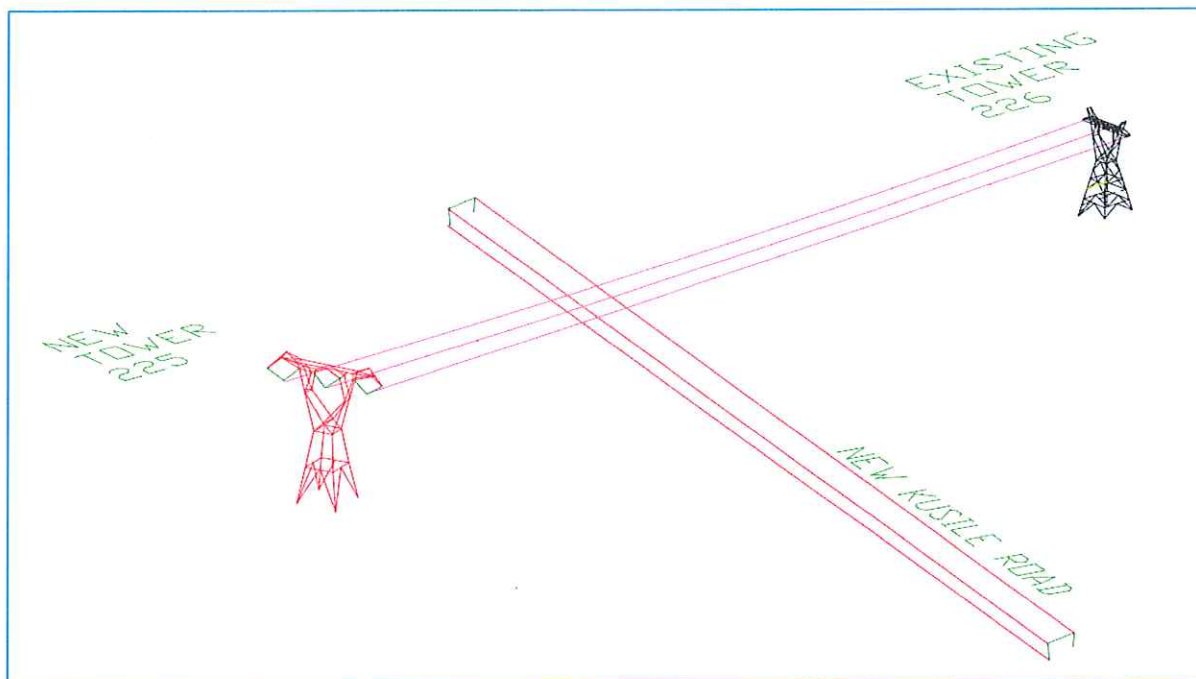
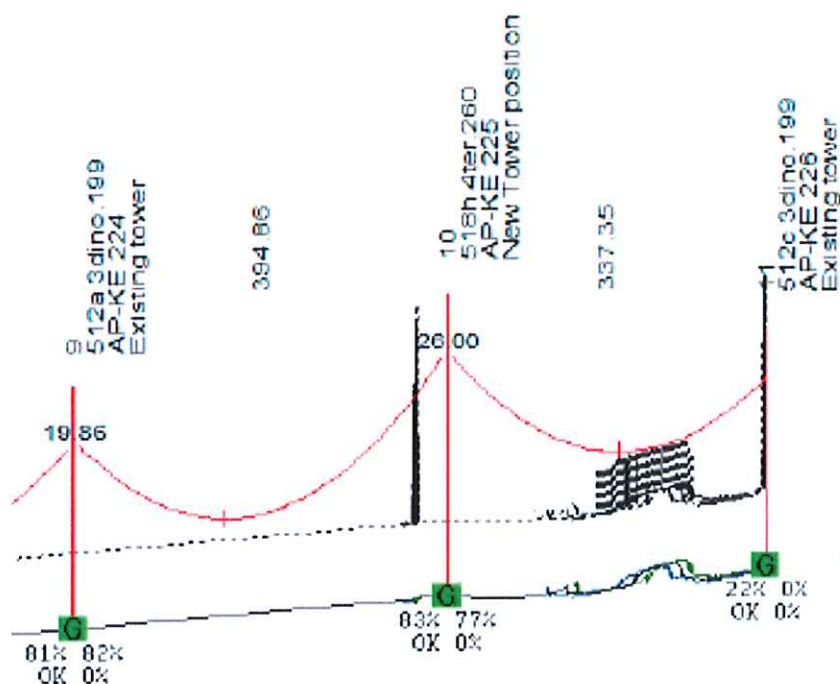



FIGURE 4- LAYOUT AFTER NEW TOWER

### 3.1.3 New profile and tower positions

The new profile is attached below as well as the new tower positions.



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**Staking Table**

Structure Number	Station (m)	X Easting (m)	Y Northing (m)	Centerline Z Elevation (m)	TIN Z Elevation (m)	Ahead Span (m)	Line Angle (deg)	Transverse Axis Azimuth (deg)	Structure Name	Structure Description	Struct. Height (m)	Tower Number
10	3238.482	-10276.4	-2874002	1518.558	0	337.347	0	264.8136	518h 4ter.260	518H Self Supporting tower	32.14	AP-KE 225

**FIGURE 5 and 6- Tower positions.**

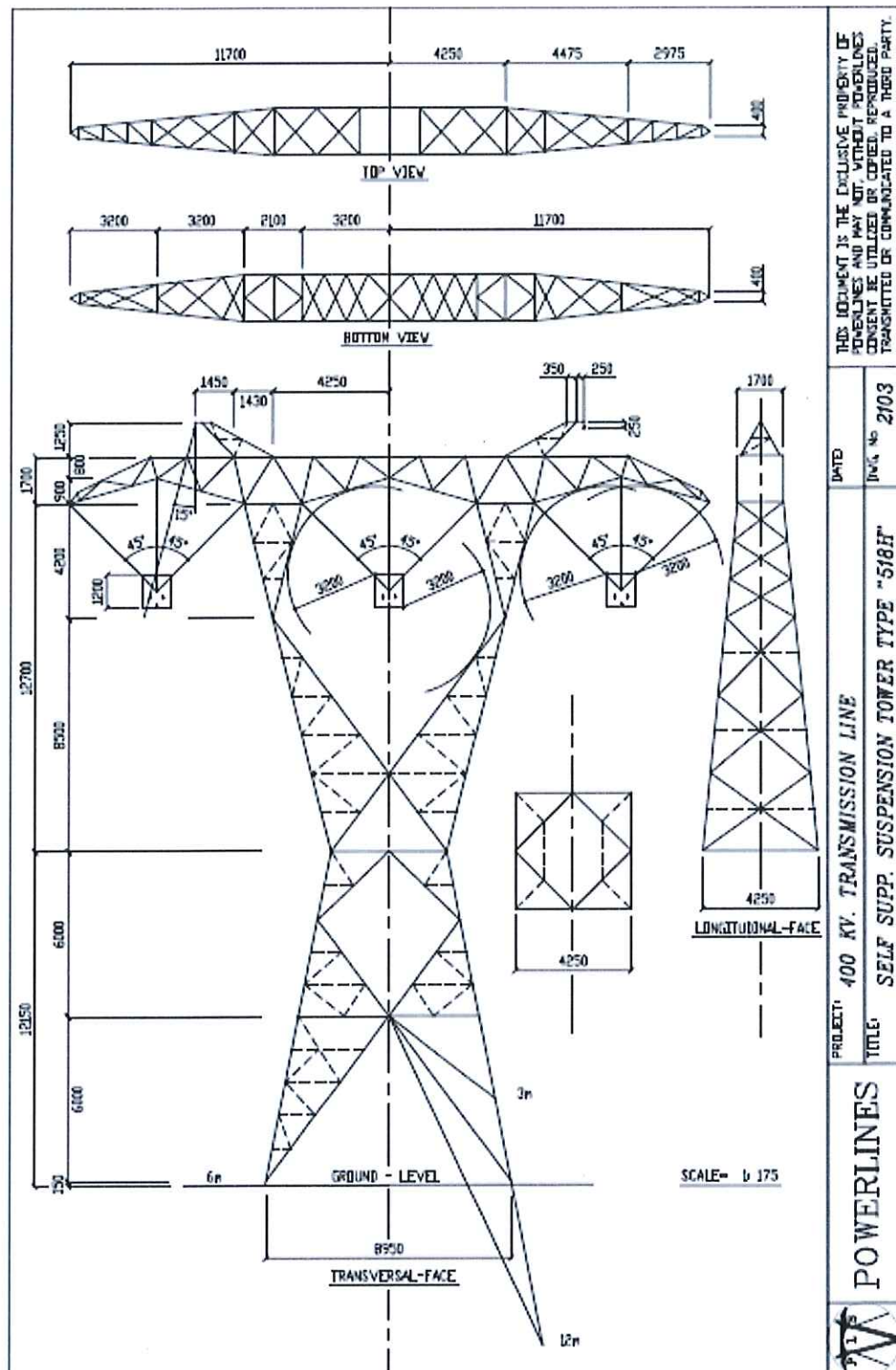
### 3.1.4 Free issue material


Eskom will provide the contractor with all new hardware for the new 518H structure. The existing 3x Dinosaur and 2x 19/2.65 earthwire will remain. New glass discs will also be supplied.

No	Item description	Quantity
1	V-assembly for triple Dinosaur configuration	3
2	Suspension Earthwire assemblies for 19/2.65	2
3	210kN standard glass discs	140.

### 3.1.5 Details for new tower.

The new tower is a 518H, of CAH 26m.



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### 3.1.6 Details for 518H foundations

For the new tower, it is recommended that standard pad and chimney foundations be utilised. Eskom will supply the contractor with standard designs for this tower, which the contractor can use or design new foundations. Basic details for this tower loading are depicted below, to which the foundation designer must apply additional factors to increase the strength and performance of the foundations.

<b>SELF-SUPPORTING TOWERS (ALL LOADS IN kN)</b>
<b>TOWER TYPE</b>
<b>518H</b>
<b>COMPRESSION</b>
<b>C = 754</b>
<b>X = 30</b>
<b>Y = 25</b>
<b>UPLIFT</b>
<b>U = 592</b>

## 4. Conclusions

Based on the outage time, importance of maintaining the statutory requirements for lines over roads and the actual constructability, the introduction of a new 518H tower to replace the existing tower 225, is the recommended way to increase the clearance to min 12m at full load. This current recommendation is based on a similar exercise done on the Duvha Kendal line running parallel to the 1 Apollo Kendal line, which was executed successfully in early 2015.

## 5. APPENDICES

