

SCOPE OF WORK (ENGINEERING & CADASTRAL SURVEYS CONTRACT)

The below scope specification covers all possible aspects of survey related work required for the construction of Electrification, Reticulation and System Improvement projects.

The scope is in accordance with Eskom's Overhead Power Line Design Manuals covering Terrain, Structure and Conductor aspects as well as the Survey Manuals Volume 1 & 2 for the Engineering Survey components. The scope also details the process followed in the Pre-Marketing of proposed Eskom customers and finally the cadastral survey component of the contract.

Any Task Order for Eskom survey work under this contract may comprise some or all of the following categories: Engineering Surveys, Pre-Marketing of Customers and or Cadastral Surveys.

1. SURVEYING OF RETICULATION LINES AND CABLES

1.1. ROUTE SELECTION

The objective of route selection is; taking into account obstacles and restrictions, to achieve the most long term cost effective, efficient and accessible route possible. The route should be mutually acceptable to Eskom and all interested and affected parties.

Accessibility has to be considered for construction and maintenance.

Aeroplane landing strips no part of the power line may protrude from a 3048m long & 768m wide approach surface measured at a slope of 1:50 at a distance of 60 from the end of any runway.

Building restrictions either side of centre line; Rural MV = 12m LV = 3m, Urban MV & LV = 3m and underground cables 1,5m.

Civil aviation spans higher than 60m above the ground need approval.

Crop Compensation Eskom has to reimburse owners for damages and the loss of trees and crops.

Explosive magazines dependent on span lengths, power lines must be more than 30 m away.

Flood lines try to locate structures above 50 year flood plains.

Graves and cemeteries can be crossed but should be avoided due to public objection.

Irrigated lands avoid crossing lands irrigated with pipes. Wheel move and centre pivot systems may not have structures placed where their operation would be limited.

Land usage impacts on the value of property and is a price factor in the route selection.

Landowners the route has to be mutually acceptable.

Other power line crossings lower voltages are built below higher voltage lines. Test clearance with higher conductor at hot design template 50 or 80°C and lower conductor at cold template design template -5°C. Crossings should be close to structures but further than overturning distance. Surveyors must be aware of blow out conditions and the proximity to stay wires.

Parallel power lines create induced currents; separation distances must be applied to maintain acceptable voltages.

Petronet pipe lines structures or parts thereof are not permitted within than 15m of pipelines.

Quarries only single shot blasting permitted within 500m of a power line.

Road crossings as per clearance chart conditions differ for National, District & Abnormal load routes.

Rocky areas can present clearance and access problems. Foundations are also more costly.

Servitude widths & building restrictions of power lines must be known before a route can be selected (as per Eskom clearance chart).

Shooting ranges no power lines within an 824m wide strip (wider if more than 12 targets) & 2500m behind range.

Side slope areas of excessive side slope are to be avoided.

Spoortnet crossings not less than 80 degrees to Eskom centre line. Clearances for each conductor type and structures as per clearance chart.

Structure dimensions of the particular power line must be known before a route can be selected this will indicate the expected 'foot print' area of towers and the conductor spacing for side slope considerations.

Sub-tropical fruit trees require special clearances.

Sugar cane lands must be avoided where possible as fires interfere with the performance of power lines.

Telkom separation distance is to be applied when paralleling with power lines. Optic fibre lines are not affected by interference or induced currents. Crossings as per specified crossing angles and the clearance of a structure on which a man can stand unsupported is to be applied over telephone poles.

Township developments existing and proposed have to be considered and routes planned in accordance with the cadastral layout.

Tree plantations allow 25m overturning distance to pine and gum or similar trees.

Orchids allow additional clearance of 3m above estimated height of fruit trees.

Trust land must be identified as wayleaves for all properties traversed are required from the occupants (e.g. Ngonyama Trust land) as well as servitude from the trustees.

Water features normal ground clearance is applied but over navigable waters a 15m mast height plus 2,5m plus minimum safety clearance is above the high watermark.

Wetlands and adjacent areas should be avoided as they are environmentally sensitive.

Windmills, bore holes & overhead water tanks over turning distance.

2. ENVIRONMENTAL ASSESSMENT

DESD – Distribution Environmental Screening Document. The documented findings of an environmental screening conducted by in-house or contracted expertise to determine the environmental impact significance of projects not listed in terms of GNR 982, listing Notice 1 GNR983, Listing Notice 2 GNR324 and Listing Notice 3. The findings of the screening will determine whether a formal application for environmental authorisation should be submitted to the competent authority and/or whether there are any other legislative requirements that need be complied with.

Completion of the DESD form and escalating it to the relevant Area Surveyor highlighting ALL possible environmental sensitivities by the proposed powerline. Eskom to continue providing DESD Training to Survey Contractors annually or as when required.

The Area Surveyor together with Eskom Environmental officer will appoint a Botanist to investigate and apply for the necessary permits.

NB: It however remains the contract surveyor's responsibility to follow up and to ensure that the necessary permits are applied for and obtained before any construction takes place.

Should it be necessary to clear trace lines through trees for survey purposes, the survey contractor shall give prior notification to the property owner. Application is made to the Department of Environmental Affairs for approval. The owner has to give his consent to cut or trim indigenous trees and a permit must be granted by KZN Wildlife before proceeding with the survey. Supplier to also act in an advisory capacity regarding clearances and restrictions to produce an EIA if required. Investigate any alternative corridors to finalise route selection with the environmentalist.

3. ROUTE APPROVAL AND OBTAINING SIGNED WAYLEAVE.

Two types of rights of servitude;

In "**general terms**" – Wayleave / Agreement and General Deed.

In "**Specific terms**" – servitude diagram and Title Deed endorsement and involves consideration payment.

Customer relations It is essential that good relations with Eskom's customers be maintained. Every reasonable consideration to Property Owner's requests must be given by the contractor and his staff. The contractor shall ensure that the Property Owner and other interested persons are aware of the activities to take place. When Property Owner and Eskom agree on final route a wayleave must be completed and signed by the Registered Property Owner as confirmed by a Deeds Search. If property is occupied by someone other than the Registered Property Owner then this person is also required to sign the Wayleave. Surveyors shall also ensure that all gates are kept closed and particular care shall be taken to avoid damage to livestock, crops, fences or farm roads. Environmental awareness shall be maintained at all times. Care shall also be given to avoid littering and the causing of fires. It is an express part of this contract that the contractor shall be held liable for all damage arising from negligence on the part of himself and/or his employees.

4. RECORDING OF LINE ROUTES

All bend, tee-off and terminal points must be co-ordinated by use of GPS in 2 – 5 centimetre accuracy,

These points must be loaded on to plan with Topographic or photographic background for printing and attaching to Wayleave with printed Co-ordinate list.

5. PROFILING OF LINE ROUTE

MV Line route is to be profiled as per Eskom Overhead Power Line Design manual. All detail is to be recorded to allow for correct placing of structures when doing the line design. LV Line route is to be profiled **only** where services are crossed.

6. LINE DESIGN

Line design is to be done as per Eskom Overhead Power Line Design Manual and Survey Guide Manual Volume 1 & 2. Line design is to be done using Modelmaker Software package and a printed final profile to be submitted with package.

7. PEGGING OF STRUCTURES

All structures are to be pegged in field as per Survey Guide Manual Volume 1 & 2. All Structure positions, Stay/Strut positions and centre line of H-poles are to be pegged. All bends, RMU and Mini sub positions on Underground Cable Routes are to be pegged.

8. BILL OF STRUCTURES

All structures details are to be shown on the Survey CAD drawing by use to CAD Codes as per Survey Guide Manual Volume 1 & 2.

9. CROSSING CLEARANCE PROFILES

All work to be done as per Eskom Overhead Power Line Design Manual and Survey Guide Manual Volume 1 & 2. Detail Service Crossing drawings to be produced as per Eskom Drawing standard.

10. CLEARANCE CHECKS

Clearance checks to be done using Total Station and standard survey methods and compared to Eskom Clearance Chart in Survey Guide Manual Volume 2.

OTHER SURVEY TASKS/CATEGORIES

1. TOPOGRAPHIC SURVEYS

Site Identification, selection and detail survey by Standard Survey Methods as per Eskom requirements and Sub Station Design.

2. DATA CAPTURE

Capture of data for various requirements by use of GPS to obtain co-ordinates and detail of point.

3. CAD WORK

Produce CAD drawings to Eskom Drawing Standard contained within Survey Guide Manual Vol 1. Only Legally Licensed MicroStation Software Packages to be used for producing CAD Drawings

4. PRE-MARKETING

MARKETING DATA CAPTURING

Prior every project design, there is an endeavour by Eskom to document customer information through data collection, processing, and analysis within Eskom Distribution standards (Land Development Procedures). This includes the capturing of proposed connections and attributes through house-to-house count and taking GPS co-ordinates for all the houses counted. Liaison with Electrification Planning Manager/Co-ordinator and Area Counsellors/Traditional Leaders in all local municipal areas is part of pre-marketing process. Notification of all above-mentioned stakeholders of intension to do premarketing and attach polygon to letter on the day of the

marketing. Primary attributes associated with a Pre-Marketing project include details such as full names & surname, ID Numbers, Latitude/Longitude Co-ordinates and physical address of the potential customer. The PCS File spreadsheet must be completed in full and form part of the submission pack.

Meetings with Councilors/Induna: In line with municipal plans for the electrification of the Polygon

Community Liaison & Education: In line with Eskom Planning Department & Municipality programs

Specific requirements for the pre-marketing exercise are as follows:

- The collection of electrical network related data including coordinates and corrected diagrams of structure numbers, transformer names, meter numbers, etc. but not limited to these by:
 - Field verification of Network Operating Diagrams;
 - Coordinating points with use of GPS;
 - Sketching and/or photographing of problematic situations.
- Coordinating and verification of house positions for electrification projects using GPS.
- Attend applicable meetings, workshops and training interventions as required by or requested by Eskom.
- Any plant defects / data inaccuracies observed must be noted and referred back to the Area Surveyor.
- Kilometers travelled will only be claimed from Base Offices (New Germany, Empangeni, Pietermaritzburg, Newcastle, Shelly Beach & Bloemfontein Eskom Centre) to site, and back to the (Base Office) on completion of project.
- Suppliers that are based within the area of works; kilometers will be calculated from their base.

One connection required per stand.

- Supplier to liaise with Eskom's Area Surveyor & Electrification Planning Co-ordinators to confirm mapping, villages, boundaries, Municipal contacts and Ward Councillors.
- Area visits must be preceded by a community meeting with the Ward Councillor in attendance. The objective and scope of work will again be outlined.
- GPS Process:
 - The head of the settlement / cluster must be approached to obtain information on the number and details of occupants per dwelling
 - Capture as mandatory fields i.e. I.D number and customers name etc. (refer to detailed scope, detailed scope is per task order issued)
 - Only those living as a family unit will be considered for a point of supply. There must be cooking facilities.
 - GPS customer at entrance to the dwelling in WGS 84 (DMS) format

- Co-ordinates to be supplied as follows:
 - Spheroid – WGS84
 - Projection – Geographical
 - Datum – Hartebeeshoek
 - Format – DMS. A suffix “S” to be added as the last character of the Latitude, and a suffix “E” to be added as the last character of the Longitude.

The following do not qualify as a Point of Supply:

- Rooms that are used solely for storage, prayer, entertainment, meetings, eating, sleeping, and ablution.
- Un-occupied rooms
- Rooms that are used on weekends by family members working away from home
- Rooms used for livestock or poultry
- Vandalised, partly built and damaged rooms
- Customer's premises need to be identified with a sticker after completion of the GPS work, in order to avoid duplication or missing out of customers.
- Where there is an existing MV and LV or one of the two the data capture has to identify and indicate it on his/her report with details.

5. CADASTRAL SURVEYS

The need for provision of Cadastral Survey Services originates from Distribution Division Land Development Department and is as a result of Eskom's requirement to acquire assets such as servitudes and land which are necessary for the transmission of electricity and maintenance of electrical networks. Servitudes are necessary to accommodate power line routes and some substation/switching station sites. Land is therefore regularly acquired for powerline routes, substations and TSC sites.

The process of acquiring land involves; identification, negotiation and agreement to purchase from the land owner. Thereafter, it is necessary to demarcate and define this piece of acquired land. Demarcation involves physically beaconing the piece of acquired land while definition involves the representation of that land on an approved Surveyor General's diagram. Demarcation and definition is the end product of a Cadastral Survey in respect of land acquisition and can only be undertaken by a registered Professional Land Surveyor. This Surveyor General diagram is now attached to a Deed of Transfer which gets registered in the Register of Deeds Office thereby completing the transfer of land to Eskom.

Similarly, the process of acquiring servitudes involve: identification, negotiation an agreement to purchase from the land owner. Initially Eskom registers a General Deed of Servitude against the affected properties. This gives Eskom the right to enter the property and construct the

power line along a negotiated route. The entire property is burdened by this servitude. The final route of the power line can only be ascertained after construction. As per agreement with the land owners, the final route has to be surveyed and defined on a Surveyor General's diagram. The General Deed of Servitude is replaced by a Specific Deed which confines Eskom's servitude rights to this route. This survey and representation of the power line route on an approved Surveyor General's diagram is the end product of a Cadastral Survey in respect of servitude acquisition and can only be undertaken by a registered Professional Land Surveyor

Scope under this contract is the provision of supervision, materials, labour and transport required to undertake cadastral survey work in terms of the Land Survey Act No. 8 of 1997 undertaken by qualified professionals.

Approved Surveyor General Diagrams are necessary for the registration of servitudes or acquisition of land, together with other relevant servitude plans showing overall property schedules for servitudes being registered.

Specific activity List:

Acquisition of all necessary plans and data necessary to undertake cadastral survey
The provision of supervision, materials, labour and transport needed to undertake cadastral survey work
Obtaining necessary statutory approvals required for cadastral surveys
Drafting of all necessary statutory approval requirements associated with cadastral surveys
Demarcation and pointing out of necessary cadastral boundaries or servitude footprint.

All following cadastral work categories shall comply with the requirements of the Land Survey Act No. 8 of 1997 as well as the latest Eskom directives, standards and procedures.

- Registration Surveys of Linear Infrastructure servitudes (e.g. Power lines, Cable routes and access roads).
- Registration surveys of site servitudes (e.g. Substation, CNC and Radio Repeater sites)
- Consolidation, Sub-divisions and Amendments survey and registration.
- Relocation and verification of Cadastral Boundaries and Beacons.
- Demarcation of Servitude boundaries.
- Cadastral Compilations.
- Servitude Property Schedules
- Surveyor General Diagram Auditing.
- Professional Consultation.
- SPLUMA Applications.

Main Deliverables:

Approved Surveyor General Diagrams necessary for the registration of servitudes and or acquisition of land, together with other relevant plans.

Where necessary, the placing and pointing out of Cadastral boundaries and servitude extent.