PART C3: SCOPE OF WORK

SCOPE OF WORK CONTENTS

SECTION 1

1 SCOPE OF WORKS

1.1 GENERAL

The Works consists of the supply of material, construction and commissioning of electrical infrastructure as part of Ntlangano Electrification Project. The total number of households expected to be electrified, as part of this scope is **102** households.

The scope of work consist of the supply of certain materials, construction and commissioning of the following electrical infrastructure.

Scope of Work	
Item	Qty
No of Connections	102
Medium Voltage Line	
MV 3 Phase ACSR Fox conductor (Route Length)	5 511.46m
Low Voltage	
ABC 35 insulated neutral Conductor (Route Length)	6 991.83m
Transfomers	
16kVA	3
32kVA	5
64kVA	2

Throughout the works the contractor is to allow for community and municipal liaison and involvement.

The project shall be tendered for on the basis of the technical specifications and layout drawings forming part of the Final Design Package for the Ntlangano Village Electrification.

1.1.1 The following will be required from the contractor:

- To sign a service level contract with the municipality.
- The contractor to supply all tools, transport and equipment. Transport shall be from the place of gathering, i.e. material store, to the place of work and back.
- The contractor to purchase, store, issue and control all material, tools and plant items.
- No list of preferred subcontractors provided – Contractor to note that any appointment of a subcontractor is to be approved by the Project Manager beforehand
- The contractor must co-ordinate the labour and material of all service connections including transporting of material to and from the workplace.
- The Main Contractor will supply the project with all the material Transformers, Poles, Conductor, X-Arms. Note that meters and seals will be supplied by the Municipality through Eskom and these will be split meters.
- The contractor must remunerate the Subcontractors forthnightly as quoted in bill of quantities **for accepted connections only**.
- The Contractor is to appoint a CLO approved by the PSC.

- To constantly liaise with the Consultants C.O.W and CLO.
- To implement and maintain conformance of the OHS act.
- To provide a professional level of Contracts Management.

1.1.2 The following does not form part of the Contractors responsibility:

- Macro programming of the contract i.e. which areas to be connected, etc.

1.1.3 The contractor should take note that:

The Employer appointed the Project Management office (Consultant) to monitor and supervise the project and the contractor will report to the appointed personal or his C.O.W. directly.

Conditions of contract will be as per this document and all invoices will have to be certified by the Engineer and Project manager.

No connections will be paid for unless a COC has been issued and the installation inspected and accepted by the Engineer as fault free.

The Engineer will issue inspection forms regarding the installation which shall be adhered to.

Ruling over technical issues shall be made by the Engineer and shall be finalized by the project manager.

This contract provides service connections of 20 A with 6 mm^2 Airdac with pilot wires.

Before any service connection can be inspected or handed over all tests must have been completed and the COC issued.

1.2 SITE ESTABLISHMENT

1.2.1 Clearing of terrain.

Land will be provided by the Employer on site where an office and stores can be established by the contractor. The whole area must be well fenced by the contractor, to a height of at least 2,5 meter with barbed wire overhang.

1.2.2 Erection of a Site Store

The Contractor shall provide a secure store such as lockable containers on site for the temporary storage of materials and equipment which is to be utilised in the execution of the Contract.

The site store shall be removed and the area cleared by the Contractor at completion of the Contract.

The Contractor shall employ a qualified storeman which shall be responsible for receipt and issuing of materials. The storeman shall maintain proper records of all materials received and issued during the duration of the Contract.

At the end of each week the C.O.W. shall compare material issued to material installed and at the end of calendar month the Contractor shall submit a comprehensive stock report to the C.O.W.

Payments will only be made for material certified by the C.O.W. as installed and taken over and his decision shall be final.

The Contractor shall accept full responsibility for any materials delivered by the Employer.

The following are the minimum requirements that this facility must adhere to:

(a) 2,5 Meter security fence with barbwire over-hang and lockable gates.

(b) Sufficient security lighting to fully illuminate the store area.

(c) At least one full time watchman with dogs.

Alternatively the Employer shall be approached to make avalible a fenced off storage area on site and the amount for P&G's shall be adjusted accordingly

1.2.3 Project board

The Contractor shall tender for the supply and erection of a project board. The Consultant office will supply the information that the board should display.

The board shall be erected at a position to be determined by the Consultant office.

1.2.4 Insurance

The Local Municipality is not providing/arranging for the contractor with all the risk insurance.

1.2.5 General Items

The Contractor must allow for any other costs of site establishment such as electricity, water, temporary toilet facilities, transport to and on site, etc.

At the end of the contract the Contractor shall remove all site facilities and clear the area of all rubble etc. to the satisfaction of the Project Manager.

1.2.6 Satisfaction and approval of the Employer

Approval by this body shall only be obtained through the Engineer/ Project Manager.

1.3 HEALTH AND SAFETY MANAGEMENT

The Contractor shall at all times adhere to the Health & Safety General Specification attached in the Annexure of the contract document.

Daily safety tailgate talks shall be held to discuss the safety aspects and risks involved in the day's work to ensure safe operation throughout the contract period. A health & safety risk analysis must be completed per outage area scope of work.

The Contractor shall not be allowed to work on any "live" structure, whether it is MV or LV.

Machinery that can encroach on the safe working clearances with regard to live lines, are not to be operated within nine metres of live reticulation lines, without the direct supervision of a qualified supervisor under the Employer 's HV Regulations and the OHS Act.

Precautions against Damage

The contractor shall take precautions for the protection of life and property on, or about, or in connection with the contract. The contractor shall be held liable for any damage arising from negligence on the part of himself and his employees. The contractor will ensure that excavations are done carefully as no plans of existing services are normally available of the rural areas. The damages occurring during any required excavations will be for the contractor's risk, and must therefore be repaired by the contractor.

Protection of the environment should at all times be adhered to

1.4 ENVIROMENTAL MANAGEMENT

The Contractor shall at all times adhere to the **Environmental Management Programme (EMP).**

The Contractor shall compy with the attached EMP document and DESD (Distribution Environemntal Screening Documet to be supplied by the surveyor as part of the construction drawings.

No fences, gates or locks may be damaged to obtain access onto a line route. Arrangements must be made in advance to obtain permission for access.

Use of private roads must be arranged in advance. Any damage to private roads must be repaired at the contractor's expense and to the satisfaction of the landowner.

No fires may be lit on private property. If fires are lit on Municipality property or in the construction camp, provision must be made that no accidental fires are started. No firewood may be collected in the veld.

No trees may be cut or removed without prior permission from the landowner. Permits shall be obtained for protected trees (protected trees shall be dealt with in special conditions)

1.5 QUALITY ASSURANCE

All construction methods are to comply with the Distribution standards & Technical Drawing requirements as per the FDP.

1.6 MATERIALS HANDLING

All materials to complete the Contract Works as described in this contract, will be provided by the Contractor, with the exception of the big five as oultlined above.

The contractor will be responsible to arrange for off-loading of material and equipment from the Municipality to stores to the site camp and must make provision shall include the costs thereof in his tender prices.

The Contractor will be responsible for ordering, expediting and arrange for off-loading of materials and equipment and shall include the cost thereof in his tender prices.

The contractor will have documentation on site to prove the origin of material. Material has to be presented to the Engineer/Contarct Manager, before commencement of the works, for approval. The contractor stays fully responsible for the quality of material he supplies to incorporate into the works. All materials supplied shall comply with the Standards.

The contractor shall make the necessary arrangements for safe storage on site, offering adequate protection against theft, damage, wind and weather. The responsibility for insurance of materials against any form of damage or theft after issue thereof also rests with the contractor.

A good record keeping system is essential to control the quantity of materials installed and all issues shall be recorded. It shall at any time be possible for the Engineer to establish from these records exactly what materials have been installed. These figures will regularly be compared to the actual quantities measured on site i.e. on a weekly and monthly basis.

It will at all times be the responsibility of the Contractor to ensure upon arrival of material that no visible damage has occurred and that quantities are correct. In the case of damaged material, acceptance shall be refused. Damaged material on site will be removed immediately.

The contractor is to ensure that the material is ordered timeously.

In cases where the contractor meets the required lead time for ordering and the material is not available, any resultant standing time or additional expenditure incurred will still be the responsibility of the contractor. The onus is thus on the contractor to chase orders and he will be required to submit proof thereof.

Written notification shall be given to the Contract Manager the moment that the Contractor suspects a possible late delivery. Should a late delivery occur, due to a problem of National

proportion then the Engineer/ Project Manager will determine the extent of lost time, however an extention of time shall only be considered if the delay is on the critical part as per the contractor program.

1.7 PROJECT MANAGEMENT

The Project Manager is responsible for the overall management of the project and as such will provide project management structure which will consist of a Clerk of Works which will be the Engineers authorized representative as well as the necessary supporting personnel such as Contrant manager, Quality Assurance to inspect of service connections to ensure that the quality of work is in accordance with the specification. Regular meetings of a general nature may be convened and charied by the Project Manage as follows:

Title and purpose	Approximate time & interval	Location	Attendance by:
Risk register and compensation events	Monthly : Date & Time to be advised.	At the site office	*Employer*, *Contractor*, *Supervisor*, *CPM* and *CPE*.
Overall contract progress and feedback	Monthly : Date & Time to be advised	At the site office	*Employer*, *Contractor*, *Supervisor*, *CPM* and *CPE*.
Technical meeting	Monthly : Date & Time to be advised	At the site office	*Contractor*, *Supervisor*, and *CPE*.
Health & Safety Meeting	Monthly : Date & Time to be advised	At the site office	*Contractor* with all his staff.

Under no circumstances will the Contractor or any of his personnel involve themselves in arguments with the Quality Assurance. Should there be a dispute then the Clerk of Works will be consulted. Should there still be a dispute then the Engineer will be called on, whose decision will be final.

The Engineer will make available the various forms and structures necessary for proper project Management. These structures will require input from the contractor, as such the Clerk of Works and the contractors Contract Manager will be in daily contact and the Contracts Manager will timeously supply the Clerk of Works with all the information which he requires.

1.8 CONTRACTS MANAGEMENT

The sole responsibility for managing the contract lies with the Contractor and as such he will supply an adequate computerized structure to fulfill his obligations and to ensure proper contract management regarding at least the following, materials ordering, handling and issuing, all personnel requirements, all financial issues, all political issues, all quality control requirements, all information required by the Employer and Project Manager.

The software to be used will be Microsoft Projects or Microsoft Excell Spreadsheet. The Contractor shall ensure that he supply personnel conversant with this package and adequate hardware.

It should clearly be understood that the structures put in place by project management, is not to replace the contract management required by the contractor to ensure that an installation, in accordance with this specification and standard practice, is being provided on time and within the prices as tendered.

Under no circumstances will project management thus take over the function of contract management.

All contractual documentation and communication will be in the form of properly compiled letters or forms attached to email.

Should the Contracts Manager prove to be incompetant then the Project Manager in consultantion with employer, will instruct the Contractor to replace him within 14 days. Sould the Contractor fail to satisfy the Engineers and Project manager needs in this regard then the Engineer shall give the Contractor 7 days notice after which the Engineer shall taken the steps which he deems necessary to rectify the situation at the contractors cost.

SECTION 2

2 DELIVERY, EXECUTION AND COMMISSIONING OF THE WORKS

2.1 DELIVERY AND EXECUTION

2.1.1 Time For Execution

The program shall be such that new connections will firstly be connected.

2.1.2 Co-Operation

Tenderers should note that co-operation between all parties is absolutely essential for the effective and speedy execution of the project. It is further a requirement of this contract, which for the full duration of the contract, close co-ordination between the Contractor and the Consultant must be ensured.

The Contractor shall make allowance in his tender prices for all such co-ordination and co-operation. Further, the tender amount shall include for the program compiled by the Contractor which shall at all times be adhered to.

The intricate problems involved with this type of work within an existing community are pertinently brought to the Contractor's attention as no monetary claims for delays or "standing time" by the Contractor resulting from factors beyond his control shall be allowed. The factors shall, from time to time, naturally have to be taken into account for the possible extension of the overall completion dates.

2.1.3 Program

A detailed program for the execution of the total Works must be presented by the Contractor within two weeks of acceptance of the tender. The program shall be in the format of a Bar Chart accompanied with a GHANT chart or similar project management program structure indicating the critical path items.

The Engineer shall provide an Excel Spreadsheet which shall be used to determine monthly progress. The contractor shall supply all input required to update this program on a daily basis.

Finally, it must be noted that notwithstanding any contrary requirement, the Engineer reserves the right to determine or change the sequence in which the works are to be completed. The approval of the Contractor's program shall, at all times, rest with the Engineer.

2.1.4 Site Meetings

The Contractor and his Contract Manager shall attend monthly site meetings with the Employer, the Engineer and the Clerk of Works. At these meetings, the progress of the contract will be discussed, and the Contractor shall provide all the required progress information. Cash flow schedules shall also be updated before each meeting.

2.1.5 Items For Approval

Where the specification refers to specific items and manufacture and where stipulated "or any other approved", written approval of such items must be obtained from the Engineer before any other equipment is used.

No equipment shall be installed before it is approved by the Engineer. The Contractor shall, upon request by the Engineer, submit samples of products for approval and if necessary, tests shall be carried out on the products in order to ascertain the quality thereof.

2.1.6 Quality Of Material

Only new and unused material of superior quality may be used. All materials shall, where applicable, comply with the applicable Standard and specification. It should be noted that all materials supplied under this contract as being IEC, BS or SABS approved shall be marked accordingly unless no such mark is applicable for a specific item.

2.1.7 Standard Of Workmanship

The electrical installation of this contract must be carried out by qualified electricians and cable jointers in accordance with the best modern methods.

The Engineer reserves the right to reject any work which, in his opinion, is not completed in a neat and orderly fashion and in accordance with accepted practice.

2.1.8 Trees

No trees shall be damaged, cut or pruned during the execution of the contract unless specifically authorised by the owner of the stand/s nearest to the tree. All work shall be carried out in strict accordance with The Environmental Conservation Act No. 73 of 1989, the Conservation of Agricultural Resources Act No. 43 of 1983, the Standard for the control and cutting of trees and bush within overhead line servitude's ESKASABG3 and Environmental Management Programme.

Should any trees have to be removed by the Contractor he shall arrange for the complete uprooting and trimming of tree trunks as well as the stacking of all trunks and branches. Holes caused by the uprooting shall be filled and consolidated. Rubble shall be removed to leave the site neat and tidy. The Contractor shall be held responsible for any damage which may occur during the felling of trees.

Where trees are to be pruned, this shall be done neatly to the satisfaction of the Engineer.

2.1.9 Interruption of Supply and Switching

All equipment supplied under this contract must be suitable for connection to these supplies.

During the final take-over tests, the Contractor shall be required to subject the systems to full electrical power. This may only be done after all tests and test results have been done to the Engineer satisfaction. After such approval, all switching shall fall under the jurisdiction of the supply authority. All interruptions shall be reduced to a minimum both during construction and after the system has been handed-over and during the maintenance period.

Arrangements for the switching off of power shall be made with the officials of municipality and two weeks prior application shall be required.

2.1.10 Labelling Of Switching Points

The numbering system shall be of such a nature as to reference switching points to the feeder and substation. The numbers will be black on a yellow background 50mm x 50mm. The text will be thick, 25mm high numbers nailed to the pole 3500mm above ground level facing the road. i.e 1.SEC.A.

In general these numbers shall be as indicated on the drawings but before manufacture thereof, confirmation of the final numbers must be obtained from the Engineer.

2.1.11 Labelling Of Transformers And Feeders

Each transformer shall be labelled according to a coding system which will be provided to the Contractor.

In addition to the label, the rating (in kVA) of the transformer and the phase rotation shall be indicated on the secondary side.

All LV feeders must be labelled according to Eskom ECOU labelling standard. These numbers shall be hung on to each LV feeder.

2.1.12 Working Drawings

Should the Contractor intent to deviate from the detail drawings or where detail drawings do not exist the Contractor shall submit full construction details and working drawings within 14 days of appointment for approval, unless otherwise agreed with the Engineer. The constructional details of all transformer pole supports, main line tee-off arrangements and isolating link structures shall in particular be approved by the Engineer prior to commencement of construction work.

2.1.13 Other Limitations

(a) No switching of the MV system by the Contractor will be allowed and **all switching requirements shall be applied for, at least seven (7) days in advance**.

(b) All excavations or openings shall conform to the conditions as stipulated in G.S.R.13 of the O.H.S. Act with special attention to sub-clause (h). Access routes to stands shall at all times be kept serviceable, or alternatives shall be provided. These include road entrances which may have to be keep closed overnight. All excavations to be done by hand if and where feasible.

(c) All stands shall be cleared after construction and be restored to their original condition. Excess excavated material shall be removed.

(d) Access for the contractor to individual stands may be restricted due to the fact that the stands are fully inhabited.

(e) Existing services, e.g. house structures, telephone lines, civil services, etc. may obstruct and delay construction work and may require changes to be made on site and close liaison with the Engineer as well as other parties is essential.

(f) Stand boudary pegs may not always be available, in such cases the Engineers confirmation shall be obtained, after which fence boudary poles might be used for setting out of the works. All pole positions determined in this manner shall be approved by the Engineer prior to commencing excavations.

(g) Local labour is available and **must** be used as much as possible. The contractor shall liaise closely with the local representatives in this regard. During the execution of the Contract, the Contractor shall provide proof of his efforts to secure local labour and shall provide an indication of his intended local labour content in his work teams with his tender submission.

(j) Theft of material can pose a major problem and it is therefore essential that secure stores be erected with fulltime security. During the erection of the works it is recommended that the network be energized as soon as possible and notice to this effect given to residents.

(k) Working on live MV structures is not allowed.

(l) Any existing site condition that may cause a delay shall, where ever possible, be brought timeously to the attention of the Engineer, in writing. However the onus is on the contractor to ensure that timeous action is taken to overcome the problem.

(m) Coordination meetins and inspections, as arranged by the Engineer shall be attended by the Contractor's site representatives as well as his contracts manager.

(n) The contractor shall be responsible for providing the necessary generating equipment and test instruments for the proper testing of the installation. All tests shall be performed in the presence of the Engineer and test results shall be recorded on the test reports provided by the Engineer.

(o) Tenderers should note that the design is such that the LV will be installed in the mid block position. Where ever Telkom lines are existing these Telkom poles will be utilized throughout. However before the LV conductor can be attached to the Telkom lines the existing screen wire has to be removed an the Telkom cable lowered. The contractor shall be responsible for liaison with the Telkom representative and shall arrange all meetings and shall obtain approval for his work on Telkom structures.

2.2 COMMISSIONING

2.2.1 Requirements

Prior to the commissioning and first hand-over of any work, the following requirements must be met (where applicable):

- A certificate must be provided in which the Contractor certifies that the maximum design load for overhead conductors has not been exceeded in any part of the installation.
- The earth resistance measurements of all earth points to prove that the maximum value is not exceeded.
- The isolation resistance reading between all cores and all cores to earth of all cables must be provided in accordance with the standards.
- The test results of the Megger-test of each transformer, after installation must be provided.
- A schedule of clearance distances from other services for all crossings must be provided (roads, telephone lines, etc.)
- Anti-climbing devices shall be in place.
- All labelling and notices required in terms of the specifications must be installed.
- As build drawings must be accepted by the Engineer.
- A C.O.C signed by Telkom must be obtained where Telkom structures are shared.
- A C.O.C. for each service connection is required.
- Certificate in which the contractor certifies that phasing of the M.V. network has been done.

2.2.2 Phase Distribution And Rotation

It is of utmost importance that all load is evenly distributed between the three phases. The Contractor must therefore ensure that pole top boxes are connected to the phases as indicated on the drawing.

The connections onto transformers shall comply to a uniform standard to ensure consistent phase rotation and phasing checks across open links shall also be done at the time of commissioning.

2.2.3 Handing over of completed work

The following handover documentation is required at handover. This is at the stage when the CNC is called for the final inspection of the new or upgraded network.

- Plant Handover Data Sheets with relevant data and earth readings
- Sag & Tensions recorded (MV & LV)
- Customer connection list
- As built drawings
- Application Forms
- Customer Safety declaration forms
- Meter Movement Forms
- SLD – Waybill No – reflecting SLD approved changes.
- COC's

SECTION 3

3 SCHEDULES OF PLANT AND MATERIAL

3.1 QUALITY

All materials shall be new and of the best quality and shall conform to the latest requirements of the Eskom Buyers Guide (Eskom Distribution Standard Part 9). With regards to the material supply chain, the approved materials manufacturer and marking requirements shall be set out on a schedule and approved before construction. The Contractor will be required to arrange a material sample inspection on site according to the requirements supplied by the CPE.

3.2 PLANT & MATERIAL PROVIDED "FREE ISSUE"BY THE EMPLOYER

The contractor shall supply all the plant and material as per the BoQ.

3.3 CONTRACTOR'S PROCUREMENT OF PLANT AND MATERIAL

All material is to comply with the latest Eskom Approved Suppliers List as published in the Eastern Cape Operating Unit by the Eskom T&Q Department. All conductors accept ABC and concentric conductor are to carry Eskom Holdings Limited's identification markings. Any non-standard material items are to be approved by Eskom Holdings Limited before use on the project. Acceptance sampling is to be carried out on receipt of material on site in order to inspect the outward condition of the material item.

In exceptional cases which require materials and/or techniques which are not contemplated in the various Distribution standards shall be approved by Engineer. The written approval shall be submitted together with the tender.

3.4 SITE MATERIAL

On completion of the site establishment, materials supplied by the contractor must be delivered to site, recorded in the material management system, and neatly and safely stacked and stored by the contractor. Once the material components are inspected and approved, and accepted by the Project Manager and Employer Design representatives, the material value can be certified for payment by the Employer. The Contractor claims for the material value and supply invoices as proof of the Contractors title to the materials in support of the claim.

3.5 TESTS AND INSPECTIONS BEFORE DELIVERY

The Contractor will be required to supply the following:

- Material Inspection & Approval by Engineer.
- Plant Data sheets per Transformer area.
- Transformer Earth Resistance Test
- Recloser Earth Resistance Tests
- Handovers for each transformer installation.
- Meter Movement form per house connection.

3.6 CONTRACTOR'S EQUIPMENT

The Contractor is to provide equipment necessary to complete the Works safely and by the completion date

SECTION 4

4 INSTALLATION SPECIFICATION

All section of the works must comply to the relevant Standards and Standard Specifications as listed in the FDP. In case of conflict in requirements between the Standards and Standard Specifications of the FDP and this Installation Specification Section, it shall timely be referred to the Engineer, in writing, whose ruling shall be final.

4.1 MV OVERHEAD SYSTEM

4.1.1 General

As shown on the drawings and schedules this item shall be the supply and delivery of all materials required for the erection and commissioning of the overhead MV distribution network.

This system shall consist of wood poles onto which the bare medium voltage conductor is attached (in Pole Top Delta configuration). This distribution system shall include pole mounted transformers which in turn shall connect onto the LV overhead system.

As shown on the drawings, in certain cases the same pole shall be shared to support both the LV and MV systems. In these cases the minimum vertical spacing should be maintained between the lower MV conductors and the upper LV conductor across the full span.

In all cases requirement for poles and supports shall be as detailed in this specification.

4.1.2 Wooden Poles

Wooden Poles shall be used throughout and shall be 11m pole type. Poles shall be planted 1800mm deep (in general 1/6 of the pole length) and shall be vertically installed.

4.1.3 Conductors and Fittings

Required conductors shall be as specified in the Schedule of Materials. All conductors shall be Eskom marked.

Tenderers should note that this section of the works is regarded as a critical section and unless the Contractor can satisfy the Engineer that he has adequate previous experience in the erection and commissioning of ACSR conductor systems the following requirements will apply:

(a) Written acceptance by the suppliers of both the conductor and the fittings of the Contractor's proposed methods of erection with specific reference to stringing, tensioning, sagging and terminating.

(b) During the erection and commissioning period an approved representative of the supplier of the fittings shall be present to approve the Contractor's procedures, if requested by the Engineer.

Tenderers shall note the requirements listed above and shall provide in their prices for any costs to be incurred in meeting these requirements.

4.1.4 Insulators

Three types of insulators namely line post, pin and strain insulators are required and in general these units shall be installed as detailed in the FDP. The units shall be suitable for a nominal voltage of 24 kV.

4.1.5 Drop Out fuses (DO's)

These units shall be installed where indicated on the drawings and as detailed in FDP.

Drop out fuses shall be rated as per Schedule of Material and shall be so installed to ensure that melting of the fuse elements leads to the cut out link being expelled from the line contacts, also ensuring easy operation by link stick.

4.1.6 Lightning arrestors

Lightning arrestors will be installed at the following places

- All transformers MV bushings and between neutral and tank.
- Incoming and outgoing side of a four pole structure.
- Both sides of sectionalisers.
- On poles both sides of auto reclosers and Tri-link structures.

The earthing of the surge arrestors will be by means of a 16mm² PVC insulated copper conductor terminating onto a 1,2m copper claded steel earth rod installed 500mm below ground level, or at a transformer installation, tied to the transformer MV earth conductor.

4.1.7 Line Disconnector

Three-phase line disconnector, of the solid link type, shall be provided at all points as shown on the drawings.

4.1.8 Erection

The Contractor shall ensure that the conductor is not damaged during installation and dragging of the conductor across the ground will not be allowed.

The Contractor should note that in all cases clearances as per the specification shall be applied to this installation and should be measured and the appropriate form completed.

Finally the Contractor should note that at road crossings no special arrangements will be required other than to ensure that structures on either sides of the crossings are strain structures, properly stayed and fitted with either pistol grips or arching horns.

After completion of the installation the necessary tests must be performed and results must be to the satisfaction of the Engineer.

a) Surveys, pegging and positioning

The contractor is not reposible for the survey of MV and LV line. The contractor will receive as-pegged drawing from the Engineer.

b) Excavating/drilling assembly and Erection of Structures

- Excavated/drilled holes for the planting of poles shall be taken down to the full depth specified or as indicated on the detail drawings. The Contractor is to note special requirements for leveling and allowance for cross slope. In all cases, specific measurements are required to ensure that the structure footings are at the correct levels.
- Excavated/drilled holes must be cleared of loose soil so that the butt end of the pole will be resting on undisturbed soil. After planting, the poles shall be plumbed vertically.
- All stay and pole holes shall be back-filled in layers of uncompacted thickness of 200mm and thoroughly compacted.
- Where so indicated, the soil shall be stabilised by the addition of a mixture of cement in the ratio of 1:10 by volume.
- All excavated/drilled holes for poles and stays shall be kept covered and/or barricaded in a manner acceptable for the Clerk of Works and also to prevent any possible injuries to people and/or live stock
- All excavated/drilled holes for poles and stays shall be kept covered and/or barricaded in a manner acceptable for the Clerk of Works and also to prevent any possible injuries to people and/or live stock

c) Attachment of Insulators and Hardware

- Insulators, strain and suspension hardware shall be secured to the structures in accordance with the manufacturer's instructions shown on the drawings.
- All split pins, security clips, locknuts or other locking devices shall be applied in their intended manner of use, so as to prevent uncoupling of the items in service.
- Poles will not be pre-drilled and insulator pin holes, etc., shall be drilled centrally disposed on the main diameter of the pole or cross-arm and drilled truly vertically in both the transverse and longitudinal directions of the line. All holes drilled on site in wood crossarms or poles shall be properly treated with creosote and unused holes shall be plugged.

d) Conductor Tensioning and Sagging

- The conductor types to be used on this project are ACSR conductor in the case of the MV reticulation, and ACSR conductors in the case of LV reticulation.
- All equivalent spans will be indicated on the drawing between MV and LV strain points and the sag & tension tables will be provided as part of the design package per task order issued. The Contractor shall record all the sag and tension values during the stringing and regulating activities and shall be submitted to and accepted by the Project Engineer.
- Auto joints can be used but should, as far as possible, be placed in the middle third of a span and no joint may be placed within 20m of a structure.
- The stringing of conductor shall be done carefully, using the correct tensioning and roller equipment to ensure no damage, kinks or birdcage effect is caused.
- Suitable temporary arrangements for the staying of structures wherever necessary, shall be made and such arrangements shall not impose overload conditions on any portion of such structures. The cost of the provision and labour of temporary stays shall be included in the tender price.
- Conductors shall be finally tensioned and sagged in accordance with the appropriate Sag Charts (which charts shall first be submitted to the Engineer for approval), and at the correct ambient temperature.

e) Conductor Joints and Terminations

- Where preformed helical armour rods, splices, dead-ends and stay make-offs are used, extreme care shall be exercised in the handling and storage of these items. It shall be stored in their original packing, under cover, until actually used. When being installed, care shall be taken that abrasive grit is not lost through mishandling.
- It is a specific requirement that midspan joints shall only be made by a person tested and certified as being competent to do such joints by either the Employer or the supplier of the joint.
- Where phases are to be interconnected double "P.G." clamps of a suitable size shall be used.

f) Structure & Stay assemby and planting

Transport to peg and layout of structures.

- The identification of pole/structure types and the loading thereof at bulk stockpile sites along the power line, the transport and off-loading thereof at the relevant peg positions.
- Poles shall be handled with appropriate slings and shall not be dropped from trucks, but shall be carefully off-loaded and stacked on wooden blocks.

Assembly of structures

- Tools and equipment used by the Contractor shall not damage the wood material or the protective coating on the steel components, and must be approved by the Project Manager, prior to the use thereof.
- The overall straightness of the pole shall be checked prior to the erection of the structures. Poles that do not meet the straightness criteria shall be rejected.
- The list of applicable MV & LV structures and assembly drawings are enclosed under the BoQ in this tender document.
- Holes must be drilled in a straight line at 90° to the centre axis of the pole to produce a satisfactorily assembled pole. All holes are to be treated with creosote by soaking a cloth in the creosote and pushing it through the holes.
- All MV threaded rods will have a double nut application rather than a single nut and Etchcoat paint.
- All LV threaded rods will have a single nut application with Etchcoat Paint on the thread after it has been tightened.
- All material items shall conform to the Approved Manufacturer listing of **May 2009** as issued by Eskom ECOU Region and is attached as an Annexure to this document.

4.2 POLE MOUNTED TRANSFORMERS

4.2.1 General

This item shall be the supply, delivery, erection, connecting and commissioning of pole mounted transformers as shown.

The transformer must be delivered filled with transformer oil.

4.2.2 Mounting

The transformer shall be mounted on and securely attached to the wood-pole structure using a steel bracket.

The major mounting details are shown on the detail drawing. It should be noted that the MV conductors will terminate as shown on the drawings and connections to bushings shall be by means of the correct lugs.

4.2.3 Protection

Dropout fuse protection shall be provided and fuses shall be mounted on a crossarm with the correct inclination to ensure correct operation of the units. Jumpers must be installed from the bottom of the fuses to the transformer MV bushings (and S.A.'s) and the Contractor should ensure that under all conditions the necessary clearances between phases and to earth are maintained. Furthermore minimum ground clearances to the bushings should be as indicated on the detail drawings.

Two metal oxide lightning arresters (33 kV - 10 kA) shall be supplied and installed on to the transformer so that the connections from the MV bushings to the lightning arresters are kept as short as possible.

The Contractor should ensure that the installation of equipment is such that the connections of the LV conductor as well as the MV conductors can be performed in an neat and workmanlike manner.

Barbed wire shall be fitted as shown on the drawings to achieve an anti climbing situation.

4.3 AUXILIARY EQUIPMENT

The type of transformer to be used for this project is as follows:

1. 16 kVA 22KV/240V single pole mounted as per D-DT-1860
2. 32 kVA 22kV/+/-240V single pole mounted as per D-DT-1860

3. 64 kVA 22kV/+/-240V single pole mounted as per D-DT-1860 and out-of line as per D-DT-1866 REV4 SHT7.

- All transformers shall comply with the coastal specification as per D-DT 3021
- The handling, transporting and installation of the transformer shall be done with extreme care to ensure no damage is caused to the bushings of the transformer.
- The contractor is to ensure that 2 x M20 threaded rods are installed through the transformer backstrap brackets and pole as per drawing D-DT0270 to prevent it from slipping down the pole.
- The upgrading of transformers is to be done during outage conditions. The work shall include the disconnection of all MV and LV connections, removal of the existing transformer, installation of new transformer and the re-connection of the MV, LV and earthing connections.
- For the new 16-100kVA transformers the MV and LV earthing installation shall be done as per drawing D-DT0627 Sheet 1. The LV 6kV surge arrestor to be installed and connected between the LV neutral bushing and the MV earth stud on the transformer as per drawing D-DT0628.
- MV surge arrestors to be installed on brackets on the transformer tank as per drawing D-DT0628.
- All MV and LV earth readings to be taken and recorded and shall not be more than 30 Ohm. If an earth reading is more than 30 Ohm, it is to be reported to the Engineer for further investigation and instruction.

4.4 HOUSE SERVICE CONNECTIONS

Marketing and community liaison

The Contractor shall indicate the nature and extent of his proposed strategy. Areas that shall be covered are listed above, but this list should not be taken as a limiting factor:

Contractor Involvement

Procedure per handling of blanket connections via upload;
Procedure per canvassing of application and data capture by a contractor;
Directive for the Implementation of Eskom Holdings Limited's Prepaid Supply Options

Application Phase

- Visit every potential customer
- Obtain completed application forms, as well completed Safety Tip Forms.
- Provide a sticker to mark the meter positions
- Advise Eskom Holdings Limited of schools, clinics, etc. and complete the necessary application forms.
- Keep customers informed of date of supply and project progress
- Foster close relationships with recognised community structures
- Establish JEWC (Joint Electricity Working Committee)
- Wear identification cards
- Treat all customers in a courteous, friendly and polite manner.
- Advise Eskom Holdings Limited of all 20 amp, 60 amp, single phase & 3 phase customers.

Connection Phase

- Keep all records and update maps
- Place toll free number and conditions of supply sticker on the meter
- Test and seal all meters
- Invite Project Manager to all community meetings
- Attend to customer complaints/queries and direct them to Project Manager when necessary
- Adhere to Eskom Holdings Limited's commitment to customers

- One meter per erf (any second meter to be approved by Project Manager).
- Connect all customers including approved 60 amp single phase and 3 phase customers

Education

- Advise customers of tariffs
- Safety
- Use of meter
- Economic use of electricity
- Toll-free number
- Advise customer of upgrade procedure
- Advise customer on basic operation of 20 amp meter

Municipality Involvement

- Attend community meetings
- Do customer safety and education meetings before commissioning.
- Regular audits of customer satisfaction
- Sign up 20 amp, 60 amp single & 3 phase customers
- Provide contractor with a stock of the relevant application forms, internal documents etc., stickers, Meter Movement Forms etc

Prepaid connections and revenue control

Customer Connections

The contractor will be required to capture all relevant customer information on a computer programme (approved Hardware to be supplied by the contractor). The meter is supplied with a "Free Issue" amount of 5 kWh. The contractor is to demonstrate to the customer as to how to operate the newly installer meter. The customer then will be in position to purchase his own electricity from one of the vending points in his township/area.

Additional Electrification Connections

- The contractor must notify the Project Manager of additional connections over and above those indicated on the drawing.
- Additional connections need to be verified by the design engineer and approved by the Project Manager.
-

Community Involvement

Customers must be treated with the greatest respect at all times and under all circumstances.

All "new" customers are to be visited by the contractor's staff immediately after connection or take-over of the area by contractor. An audit form confirming that the customer understands the installation is to be prepared by the contractor and retained by him for audit by Eskom Holdings Limited when required.

Enquiries and general complaints by customers are to be entered into a site book for this purpose. Complaints and enquiries must be handled by the contractor. Those that cannot be addressed by himself must be passed on to Eskom Holdings Limited by fax/telephone immediately. A copy of the log of complaints, enquiries and system faults must be forwarded to the Project Manager at monthly site meetings.

Contractor's Staff

Contractor's staff represent Eskom Holdings Limited and the Municipality as far as the community is concerned. It is imperative that the following is adhered to:

Contractor staff:

- Must be recruited by himself from the local areas and through the established JEWC.
- Must live in the area where they work.

- Must be accepted and respected by the community.
- Must always be respectable.
- Must be adequately trained.
- Must be mobile.
- Must be part of the customer care process
- Must be informed of what's expected of them.

Electronic Customer Data Capturing

- Customer Upload data fields as specified to be captured electronically.
- Customer Data fields are to be captured as specified under the Specifications.
- The co-ordinate to be captured is the position one meter in front of the entrance to the dwelling in which the ECU is installed. The accuracy of this co-ordinate is required to be < 3m RMS.
- Global Positioning System (GPS) coupled Data logging equipment to be used on site.
- Co-ordinates to be supplied as follows:
    - Speroid – 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.

  Customer data to be delivered in excel format – latest PCS44 file available from Eskom

  This encompasses the connection of the consumer to the Low Voltage Reticulation system and the issuing of a certificate of compliance for electrical installations.

4.5 HOUSE SUPPLY AND CONNECTION

- House connections will be done with 6mm² Airdac overhead conductor from the LV backbone pole to the house. The distance from the LV pole to the house shall not be more than 50m.
- Clearance not be less than 2.5m as per drawing D-DT0361 Sheet 1
- A kicker pole (5m or 7m) is to be installed if clearance problem occur. A kicker pole is to be installed at all Grass Thatch type roof houses and within 1m from the house so that the airdac can be terminated on the pole and taken into the underneath the thatch roof.
- A 10mm pigtail bolt assembly with an airdac strain clamp is to be installed either through the wall or roof rafter of the house at the highest point practical to ensure maximum clearance.
- The airdac entry must be through the wall of the house with a reasonable drip loop at the bottom and must be sealed afterwards with cement. Refer to drawing D-DT0361 sheet 1.
- The airdac is to be secured neatly to the wall with saddles.
- Contractor to ensure all connections and glands in the passive base unit is tightened.
- All house connection details, application details, GPS position and Safety clearance forms to be completed per installation and submitted in an electronic format to the Project Manager for upload to Eskom system.
- After commissioning all house installations should be tested and Certificate of Compliance issued by an authorised person. Minimum tests to be performed:
- Polarity test
- Earth Leakage test
- Voltage
- Loop Impedance where applicable..

4.6 SUPERVISION AND QUALITY CONTROL

The Tenderer shall allow in his tender prices for adequate and trained personnel, conversant with the nature of the Works described herein, to carry out the day to day construction activities.

The Contractor shall appoint, in writing, a responsible person who will assume responsibility for all safety aspects on the site and for the Works. A copy of this letter of appointment shall be forwarded to the Engineer.

The responsible person, so appointed, shall take responsibility for the inspection of the Works and the certification of all tests and test results as specified.

The Contractor shall tender for, and ensure that adequate quality control of the contract works is provided and maintained throughout the duration of the Contract.

It is an implicit requirement of tendering that the Contractor submits, with his tender, an organogram indicating the hierarchy and the number, as well as the functional responsibilities of persons named in the organogram.

This staff compliment shall be maintained for the total duration of the Contract.

The Contractor shall make provision for a dedicated steel containers for housing of meters.