HESSEQUA MUNICIPALITY

BID No. HES-TECH 10 / 2223

ELECTRICAL RATES FOR A PERIOD OF THREE (3) YEARS

SCOPE OF WORK (Part C3)

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HESSEQUA MUNICIPALITY

BID No. HES-TECH 10 / 2223

ELECTRICAL RATES FOR A PERIOD OF THREE (3) YEARS

GENERAL PROJECT SPECIFICATION (Part C3.1)

1.0 GENERAL

The purpose of this tender is to procure the services of suitably qualified, capable and experienced service providers (also referred to as Supplier or Contractor) to provide the installation, maintenance and support services for the existing MV and LV electrical reticulation networks and associated infrastructure of Hessequa Municipality for a three year period.

As such the project may include for the supply, delivery and installation thereof of various materials and equipment associated with the afore-mentioned existing electrical reticulation and streetlighting networks, as required in order to expand, maintain or otherwise upgrade same.

Bidders shall take note of the requirements of all parts of the specification as far as they may be applicable and relevant to the various sections of work. No additional compensation or claims for any items that Tenderers have been made aware of during tender stage will be entertained.

2.0 LOCATION AND DESCRIPTION

The work included under this contract will be undertaken in numerous areas within the boundaries of the greater Hessequa Municipality and bidders must familiarise themselves with the prevailing site conditions to be encountered as per Part C3.4 hereof.

3.0 SCOPE OF WORK

3.1 General

This is a three (3) year multi-year contract with the exact scope of work to be determined on an ad hoc basis, subject to the availability of funding and as directed by the Municipality.

All work will therefore be defined on a per project basis at a later stage once funding has been secured in this regard.

3.2 Provisional Work

It is important to note that all items and quantities included in the Bill of Quantities are provisional only with the intention in this regard to obtain a schedule of rates for tender and comparative purposes.

These provisional quantities are therefore subject to adjustments and / or omissions, partly or in their entirety, depending on the availability of sufficient funding.

3.3 Extent of Work

The overall scope of the works includes for the supply, delivery, installation, testing, commissioning, maintenance and training of operators to the extent specified and / or shown on the drawings, but shall not be limited by the documentation.

It is therefore envisaged that the work required may thus include for the maintenance, expansion or otherwise upgrading of the following:

- Overhead MV (up to 22 000 volt) and LV (usually 400V, three phase) reticulation and associated equipment, including surveying of line routes, etc.
- MV and LV underground cable reticulation including trenching, excavation, etc.
- Procurement (in certain instances) and installation of MV and LV equipment such as miniature substations, switchgear, plinth / pole mounted transformers, distribution kiosks, etc.
- Work inside buildings, including such things as the installation of ready boards, distribution boards, wiring, etc.
- Inspection and report back on the condition of various equipment, components and / or infrastructure related to the MV / LV electrical networks and grid.
- Tracing, fault finding and other general troubleshooting measures required to determine the location and / or cause of faults, trips, etc on the system.
- Perform routine maintenance, servicing and testing on the existing MV / LV overhead and underground reticulation networks, and identify / advise the Municipality of any technical and / or operating conditions / issues encountered.
- Replacement of damaged or blown luminaire fittings or bulbs, ballasts, etc on existing highmast / streetlight installations, etc.
- Undertake emergency repairs to equipment and / or other electrical infrastructure as required, and upon the direction of the Municipality.
- Assisting the Municipality and / or others undertaking field investigations, studies, etc of the existing electrical network / infrastructure at the behest of the Municipality.
- Disposal and crushing of electrical waste at an approved E-Waste disposal facility.

4.0 ENGINEER'S DRAWINGS

Where available, drawings of the extent and connection of the existing electrical installations and the various reticulation networks will be provided to the successful Tenderer as required.

5.0 PROGRAMME / RESPONSE TIMES

The programme for major tasks during the contract period will be agreed with the Contractor before work commences, however in general the maximum response time required to a normal work instruction will be three (3) working days, i.e. within 72 hours of notification.

The maximum response time required to an emergency work instruction will be determined and indicated by the Municipality on a case by case basis.

The Municipality will in any event clearly communicate the nature of the instruction provided, and where deemed necessary the Contractor shall also provide a detailed construction programme for discussion and approval.

It must be noted that should the Contractor fail to respond within the time frames required above, or fail to complete a works instruction by the agreed practical completion date then penalties as stipulated under Item 5.13.1 of the Contract Data, Part C1.2 hereof may be applied in accordance with the seriousness of the transgression.

In severe instances such transgressions and / or repeated offences may also result in the Contractor being deemed to be in breach of contract and therefore grounds for the termination of same.

6.0 ELECTRICAL SUPPLY

The existing electrical supply voltages will differ in accordance with the installation in question, and may vary in kind between 22 000, 11 000 or 400 / 230 volt, 50 Hz. Actual voltages may deviate by up to 10% from these values and all equipment, jointing materials, etc., shall be suitably rated for these conditions. The phase rotation is to be checked and maintained through-out the network.

7.0 SWITCHING OF SUPPLIES

7.1 General

All switching of the supplies shall be arranged in advance with the Municipality.

The Contractor shall establish their requirements regarding advance notice, permits to work, etc., at the beginning of the contract and shall comply with these requirements as further detailed below.

If deemed necessary by the Municipality, the successful contractor shall agree to attend a compulsory training course on standard operating procedures to fully familiarise themselves with the various processes and communication channels.

7.2 Notices For Power Off

As a general rule Consumers must receive 2 days' written notice of interruptions of electricity supply for any work on the supply system.

The day immediately following the originally proposed date of work shall also be indicated as a possible alternate date should weather conditions prevent work from being executed on the proposed date.

The Contractor shall apply to the Employer at least 5 days before the date of the required interruption, so that the latter can prepare the necessary notices for distribution by the Contractor. The Contractor will be liable for all charges incurred by the Municipality relating to the notification of power interruption should the Contractor fail to arrive for work on the advertised days.

7.3 Safety Procedure

Any switching of existing power supplies shall be arranged 5 working days beforehand with the Electro-technical Department.

The Contractor shall not perform work on any portion of a network until such portion has been isolated and earthed.

The Contractor shall request a written "Work Permit" from the appointed Responsible Person, which shall be completed in duplicate. The original "Work Permit" shall be retained by the Contractor until completion of his work. Upon completion of the work, the Contractor shall sign a statement to this effect. He shall hand this statement, as well as the used "Work Permit" to the Responsible Person, to enable the latter to re-energise the relevant portion / portions of the network.

8.0 SEQUENCE OF WORK

Bidders must take cognisance of the fact that the existing electrical system is in constant operation, and therefore the various components cannot always be fully taken out of commission during the installation of new equipment or during maintenance.

All work shall be planned in advance and as much as possible of the work done beforehand to limit the disruption / downtime of the system to a minimum. Where required various shutdown work will need to be undertaken during off-peak times, i.e. after hours or on weekends and the Contractor shall make due allowance for same where necessary.

All existing services shall firstly be verified and exposed by means of inspection trenches, etc.

9.0 COORDINATION

Due allowance shall be made by the appointed Contractor for liaison between the Municipality, as well as any other role players or contractors as required to ensure the smooth running of the project and to ensure that the work is completed without any delays.

No claims for additional expenses will be paid should either party be uninformed of the other's work.

10.0 REGISTRATION OF CONTRACTOR

All Bidders must have a current and valid Electrical Contractor's registration with the Department of Labour, and the relevant registration number in this regard shall be provided as part of the tender requirements.

The Bidder shall furthermore maintain said registration throughout the duration of the contract in accordance with the prevailing legislation in this regard.

11.0 RATES

11.1 General

The rates provided by the Contractor in the Bill of Quantities shall be deemed to include the supply (where applicable) and delivery of all items of material to site, including incidentals necessary for the completion thereof, plus profit, but excluding VAT.

The Tenderer shall note that various quantities are for comparative purposes only and do not necessarily describe the extent of the work.

11.2 Free issue Items

The Municipality reserves the right to supply certain material or equipment that is available at the stage of a work instruction as a free issue item to the Contractor for installation only. The labour rate for the specific item / s in question shall in such instance still govern.

It is therefore important to note that all labour rates provided must include handling charges for the respective material.

12.0 RE-MEASUREMENT

All quantities in the Bills of Quantities are provisional and are subject to re-measurement on site.

When submitting claims for payment the Contractor must provide detailed job cards for each portion of work done listing the hours spent, travel, material required, etc as applicable.

As allowed for in the Bill of Quantities a fixed mark-up is also to be applied to the proven cost of unscheduled items of equipment and material, as well as other outside expertise required and the Contractor shall also furnish the necessary invoices with any claims in this regard.

No claims for payment for work done will be entertained should the Contractor fail to furnish the necessary supporting documentation as mentioned above.

13.0 SITE STAFF

The Contractor shall have a competent person / supervisor on site at all times to oversee the execution of the work required under this contract. Such supervisor shall be fully conversant with the equipment and materials being installed.

The site supervisor shall be familiar and have undergone the necessary training to meet all the health and safety requirements stipulated in the Occupational Health and Safety Act (OHS Act) and where relevant to meet the environmental procedures and the requirements of the Municipality.

The person in charge will also ensure that the necessary quality control is applied.

The Contractor shall not replace or change the previously approved Site Supervisor during the course of the contract without first timeously notifying the Municipality of his intention to do so, in order that said alternate Site Supervisor can be further evaluated and approved by the Municipality.

14.0 CLEARANCES WITH OTHER SERVICES

When relevant, it shall be the responsibility of the Contractor to obtain all necessary drawings and information of the existing and planned future underground services from the Municipality and Telkom to ensure that there are no damage to those services during the installation of electrical services and that all necessary clearances with their existing and future plant are allowed. Where necessary, the Contractor shall first locate existing underground services before commencing with the trenching for cables or the excavation of holes for poles.

Where and whenever tar, paving, concrete, grass and / or other existing road and pavement surfaces need to be lifted and removed for the installation of electrical services, the Municipality should be consulted in advance to inspect same before any work commences. On completion of the work, the existing road and pavement surfaces shall be re-instated to its original state and to the satisfaction of the Municipality.

15.0 PROOF OF ORDERS FOR MATERIALS / EQUIPMENT

Where required proof of orders for items with delivery periods in excess of 4 weeks shall be provided within two weeks after the Contractor has been instructed to proceed in this regard.

16.0 CAPACITY BUILDING AND TRAINING

As part of the contract the Contractor may be required to provide basic training and instruction of the municipal staff / operators in such things as familiarising personnel with new plant and equipment installed, and in the correct operation and maintenance thereof.

If required additional training may be requested and this shall be measured on a time basis with the exact number of hours in this regard agreed to with the Municipality beforehand.

17.0 LOCAL LABOUR

Optimum use shall be made of local labour and the Contractor shall as far as practically possible and economically viable make use of labour intensive methods to do the work.

The extent of local labour to be employed on a particular work instruction will be determined and agreed with the Municipality before any work commences.

17.1 Extended Public Works Program (EPWP)

Where required by the Municipality in order to meet its growth and development objectives, certain labour intensive aspects of the various projects may need to be included into the Municipality's overall EPWP program

This implies that Bidders should be aware of the EPWP requirements in order to implement and manage their operations accordingly.

No additional compensation or claims for any items that Bidders should have taken into account in this regard during tender stage will be entertained.

18.0 DAMAGE TO STRUCTURES

The Contractor shall be responsible for the making good of damage caused by his staff to any part of the structures. In the event of the occurrence of damage he shall arrange the repair of such damage to be carried out at his own expense to the satisfaction of the Municipality.

19.0 RESOURCES, TOOLS AND SPARE PARTS

The Contractor shall provide all the necessary manpower, tools and materials to perform all work required.

It is also expected that the Contractor will be able to rely on support from his workshop / factory whenever the need arises.

The tools needed to carry out the necessary work will be provided by the Contractor, and reliance shall not be made on the Municipality to supply, or lend the necessary tools to undertake any of the work. However, should the required expertise or resources be available in house the Municipality reserves the right to assist with certain aspects of the work in order to try limit costs.

The Contractor shall purchase the necessary spare parts, equipment and material through the contract if requested, however where superior quality and / or more favourable prices are available through other suppliers the Municipality reserves the right to supply the appointed Contractor with the necessary equipment / material.

The Contractor shall work closely with the Municipality, and where required advise its store personnel regarding the standard components of equipment / materials and other consumables that should be kept in stock to avoid future supply issues.

20.0 MAINTENANCE PERFORMANCE

20.1 General

The intention of the maintenance portion of this contract is to ensure that the electrical system be kept in a 100 % functional and reliable condition at all times.

Any replacement equipment offered shall be capable of seamlessly integrating with the existing system and equipment without adversely affecting any functioning of the existing system.

Whole scale replacement of existing equipment shall not be permitted where it is possible to restore the functionality of the system by the simple replacement of any faulty components of said equipment.

All repairs and parts supplied by the Contractor shall have a minimum 12 month warranty, and a record of all manhours, job cards, etc for each particular job / instruction must be kept for scrutiny upon request if so required.

20.2 Maintenance Program

Due to the unpredictable and reactionary nature of the project no formal programme of work is required in terms of maintenance, however the necessary response times indicated elsewhere above shall be adhered to at all times.

Where it is decided by the Municipality to proceed with various items of preventative maintenance work (i.e. non-critical items) said items will need to be attended to within a time period agreed to with the Municipality.

Cognisance must be taken of the fact that the existing electrical systems are in constant operation, and it is therefore imperative that as much preparation as possible be done before time in order to limit the disruption of service to a minimum.

Although it is envisaged that the majority works will be performed during normal office hours, the Contractor may also be required to work on weekends, public holidays and other Off-Peak hours as required.

20.3 Preventative Maintenance

Where instructed the successful Contractor shall undertake the necessary preventative maintenance on the existing electrical equipment / infrastructure and shall also draw the Municipality's designated representative attention to any items identified during the course of the project that it is felt may require pro-active servicing or replacement to prevent failure. The Contractor shall timeously provide the anticipated costs in this respect for formal approval before any work in this regard is undertaken.

The Contractor shall assist the Municipality when required with the drawing up of the various preventative maintenance schedules, and shall also attend any feedback sessions / meetings when requested by the Municipality. This work shall be measured be on a time basis with the exact number of hours in this regard agreed to with the Municipality beforehand.

20.4 Breakdown Maintenance

As a general rule the Municipality shall act as the first responder in terms of any emergency breakdown situation, however where necessary the Contractor may be requested to provide assistance and / or back-up as the case may be dependent on the severity of the situation.

The Contractor shall therefore ensure that key staff are contactable at all times in the event of an emergency breakdown situation.

The Contractor shall provide adequate support during the entire three year course of the contract with sufficient support staff to ensure that the existing electrical network is maintained and that it operates at optimum performance level, and the support offered must also include the following:

- Sufficient technical support to respond to any reported problems and to resolve any technical / equipment failures encountered.
- Response times in the order as indicated under Clause 5.0 above.
- General assistance and training to Municipal personnel on the ground dealing with any problems relating to the operation of the system.

20.5 Response Times

Refer to Clause 5.0 above.

21.0 GUARANTEE

The Contractor shall guarantee to the Employer the material, equipment and workmanship delivered by him / her, for a period of 12 months. The guarantee must be valid for a period starting on the date when the Works or portion thereof are accepted by the Engineer / Municipality as complete and in working condition.

The guarantee shall further comply with the relevant clauses of the standard specification as applicable.

22.0 "AS-BUILT" DRAWINGS AND MANUALS

Before the date of the issue of the Certificate of Completion, the Contractor shall hand-over to the Employers Representative marked-up hard copies of the "As-Builts" of the work undertaken.

These drawings shall clearly show, with measurement relative to the various structures where applicable, all cable routes and positions of cable markers, final details of all circuits, etc. These drawings shall be complete in all respects, together with operational and maintenance manuals, test certificates, commissioning report, etc, where relevant. The manual shall include a description

of the works, operating instructions, manufacturer's pamphlets and catalogues on all the equipment supplied and a spares list for the same equipment.

The Contract will not be considered complete until these drawings and manuals have been received.

23.0 SITE MEETINGS

If required regular site meetings will be convened soon after acceptance of tender at a time and place to be arranged.

Site meetings may be held at two week intervals, or longer or shorter as may be necessary, at a time and day of the week to be mutually agreed, for the duration of the Contract.

HESSEQUA MUNICIPALITY

BID No. HES-TECH 10 / 2223

ELECTRICAL RATES FOR A PERIOD OF THREE (3) YEARS

HEALTH AND SAFETY (Part C3.2)

1.0 GENERAL

The principal contractor and contractors are required to adhere to the provisions of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), as amended, and including the Construction Regulations (2014), as amended, forming part thereof. For the purposes of this part of the document, the terms principal contractor and contractor, and client, shall have the meanings as defined in the abovementioned Regulations.

The principal contractor, or contractor, as the case may be, shall undertake all the duties and activities required of him / her in terms of the abovementioned regulations. These may include but not necessarily be limited to the following:

- Notification of construction work
- Preparation, liason with and submission to the client, and implementation and maintenance of a suitable and sufficiently documented health and safety plan which must include and involve all contractors under a principal contractor's control.
- Liason and cooperation with all other contractors
- Supervision of construction work, including appointment of a construction supervisor in terms of the Regulations.
- Risk assessment
- Fall protection
- Structures, formwork and support work, excavation work, demolition work, scaffolding and suspended platforms, hoists of any type, and explosive powered tools
- Electrical installations and machinery on construction sites.
- Use and storage of flammable liquids, water hazards, general housekeeping and stacking and storage, as well as fire precautions.

2.0 HEALTH AND SAFETY INFORMATION

The design described in this document has taken into account the hazards to persons which may occur during construction, commissioning and subsequent use and maintenance. However, the nature of the work is such that certain hazards are unavoidable and will be prevalent during the above operations and these must be taken into account by the contractor when preparing and implementing the health and safety plan.

In order to assist the Contractor, certain hazards and aspects of health and safety are identified in this document and on the drawings and a Hazard Identification List is provided below to inform the contractor of any known or anticipated dangers or hazards relating to the design or construction work. The information is provided in order to assist the Contractor to analyse and evaluate the risks and does not, in any way, relieve the Contractor of his / her responsibilities in terms of health and safety.

3.0 HEALTH AND SAFETY PLAN

The Contractor shall be deemed to have read and fully understood the requirements of the above Act and Regulations and to have allowed for all costs in compliance therewith.

The Contractor shall prepare a Health and Safety Plan in respect of the Works in accordance with the Act and Regulations, which shall cover inter-alia the following details:

- Management Structure, Site Supervision and Responsible Persons including a succession plan.
- Contractor's induction training programme for employees, sub-contractors and visitors to the Site.
- Health and safety precautions and procedures to be adhered to in order to ensure compliance with the Act, Regulations and Safety Specifications.
- Regular monitoring procedures to be performed.
- Regular liaison, consultation and review meetings with all parties.

- Site security, welfare facilities and first aid.
- Site rules and fire and emergency procedures.

The Contractor is required to ensure that all sub-contractors or others engaged in the performance of the contract also comply with the above requirements.

4.0 HEALTH AND SAFETY CONDITIONS

The Chief Executive Officer of the Contractor shall assume the responsibility in terms of Section 16(1) of the Occupational Health and Safety Act (as amended). Should the Contractor assign any duty in terms of Section 16(2), a copy of such assignment shall immediately be provided to the representative of the Employer as defined in the Contract.

All work performed on the Employer's premises shall be performed under the supervision of the construction supervisor who understand the hazards associated with any work that the Contractor performs on the site in terms of Construction Regulations 2014.

The Contractor shall appoint a Competent Person who shall be trained on any occupational health and safety aspect pertaining to them or to the work that is to be performed.

The Contractor shall ensure that he familiarises himself / herself with the requirements of the Occupational Health and Safety Act and that he, his employees, and any sub-contractors, comply with them.

Discipline in the interests of occupational health and safety shall be strictly enforced.

Personal protective equipment shall be issued by the Contractor as required and shall be worn at all times where necessary.

Written safe work procedures and appropriate precautionary measures shall be available and enforced, and all employees shall be made conversant with the contents of these practices.

No substandard equipment/machinery/articles or substances shall be used on the site.

All incidents referred to in terms of Section 24 of the Occupational Health and Safety Act shall be reported by the Contractor to the Department of Labour and the Employer.

The Employer hereby obtains an interest in the issue of any formal inquiry conducted in terms of Section 32 of the Occupational Health and Safety Act and into any incident involving a Contractor and/or his employees and/or his sub-contractor/s.

No use shall be made of any of the Employer's machinery / plant / equipment / substance / personal protective equipment or any other article without prior arrangement and written approval.

No alcohol or any other intoxicating substance shall be allowed on the site. Any person suspected of being under the influence of alcohol or any other intoxicating substance shall not be permitted access to, or allowed to remain on the site.

Prior to commencement of any work, verified copies of all documents mentioned in the agreement, must be presented to the Employer.

5.0 HEALTH AND SAFETY HAZARD IDENTIFICATION LIST

The following list highlights items identified as presenting a hazard or danger to persons during construction and commissioning:

Item	Hazard Description	Applicable to the Project (Yes / No / N/A)	Hazard Rating (Low, Medium, High) *	Comment / Recommendation
5.1	Are there any specific client H&S requirements for the work?	Yes	High	Personal protective equipment shall be worn on site.
5.2	Have site archaeological issues been identified and evaluated (might be of historical importance)	N/A	N/A	N/A
5.3	Has a geotechnical survey been carried out, and if so do the results indicate hazards which require control measures?	N/A	N/A	N/A
5.4	Is the site adjacent to or over public transport (railways, taxi ranks, bus stops etc.)?	Yes	Medium	Work is to be carried out in the vicinity of moving vehicles and machinery which will be in operation. Necessary barricading and road signs to be allowed for.
5.5	Is the site adjacent to or over water (eg. rivers, dams, sea, canals)?	Yes	High	Contractor to take cognisance of any danger posed by proximity of water related hazards and adequate rescue equipment to be provided as required.
5.6	Is the site adjacent to, over or under any services or drains etc. (eg. high voltage cables, municipal sewer lines)?	Yes	High	Special care must be taken not to damage existing high / low voltage cables and overhead lines, as well as existing underground piped services.
5.7	Is the site adjacent to, over or under any public buildings such as schools and hospitals?	Yes	High	Work is to be carried out in residential areas and surrounding areas.
5.8	Are there any other local hazards such as overhead power cables?	Yes	High	Existing MV overhead lines and underground cables exist in the areas where work is to be done.
5.9	Will the ground contours present any construction problems?	Yes	Low	Sloped ground areas are present at certain sites.

Item	Hazard Description	Applicable to the Project (Yes / No / N/A)	Hazard Rating (Low, Medium, High) *	Comment / Recommendation
5.10	Is there any asbestos removal involved?	No	N/A	N/A
5.11	Will excavation be close to live electrical cables or pressure pipes?	Yes	High	Pressure pipes and electrical cables exist on site and must be taken note of.
5.12	Will any excavation works take place?	Yes	Medium	Where excavations and ground works are to be done adequate allowance shall be made for protection of excavations to prevent injury to humans or animals.
5.13	Will any work be carried out close to live electrical apparatus?	Yes	High	Contractor to take cognisance of danger presented by working inside live substation yard / building. Due care shall be exercised to ensure safety of workers at all times. Working area shall be physically isolated and demarcated from any live equipment.
5.14	Is there confined space or tank entry work involved?	Yes	High	Possible entry into confined roof and / or building spaces to be undertaken.
5.15	Will any steel erection works be taking place?	No	Medium	Possible steel support structures may be supplied and installed during the course of the project.
5.16	Will tower cranes be used or heavy lifting operations taking place?	Yes	High	Heavy lifting and rigging of equipment will be required for plant and machinery.
5.17	Will mobile work platforms, cradles or abseiling be necessary?	Yes	N/A	N/A
5.18	Is the access to the site adequate for vehicles and pedestrians? Are there any special arrangements and / or requirements?	Yes	Low	Existing gravel access roads are available for vehicular traffic for the majority of sites.
5.19	Will the public have access to the site?	Yes	High	Sites are located in rural, residential, commercial and industrial areas and access to site will not necessarily be limited to the Contractor's personnel only.
5.20	Have arrangements been made or co-ordinated for temporary electric supplies?	No	N/A	Arrange with Municipality if required.

Item	Hazard Description	Applicable to the Project (Yes / No / N/A)	Hazard Rating (Low, Medium, High) *	Comment / Recommendation
5.21	Have site lighting needs been identified for all stages of the work?	Yes	Medium	Certain emergency or off-peak work may need to be conducted after hours and at night and the Contractor must arrange for his own lighting in such instances.
5.22	Will any accommodation/ office units be located inside an existing structure?	No	N/A	Contractor must arrange for his own office.
5.23	Have arrangements been made or co-ordinated for temporary supplies such as water and sewage disposal?	No	N/A	Contractor must arrange for his own services.
5.24	What is the type of roof construction? Evaluate fall hazards.	No	Medium	Where work is to be undertaken at heights adequate fall protection must be provided.
5.25	Are there any 'Hot Works' to be undertaken?	Yes	High	Work is to be carried out on electrical equipment, and due care shall be exercised to ensure isolation of the supply when necessary.
5.26	Are electrical items to be installed?	Yes	High	Work is to be carried out on existing MV / LV electrical equipment, and due care shall be exercised to ensure isolation of the supply when necessary.
5.27	Will there be any lift installation works?	No	N/A	N/A
5.28	Will there be any escalators to install?	No	N/A	N/A
5.29	Is the project a fire risk?	No	N/A	N/A
5.30	Have all environmental issues been evaluated and controlled?	Yes	Low	Contractor to take adequate steps to prevent diesel / oil spills during construction.
5.31	Are there any specific fall protection hazards not already assessed?	Yes	High	Work may be undertaken at raised levels and slippery surfaces.
5.32	Are there any additional hazards which have been identified as being site specific and which are not covered by the foregoing? If YES, note here:	Yes	High	Certain sites lie in a semi-rural area and there is a possibility of potentially dangerous animals such as snakes being present.

Item	Hazard Description	Applicable to the Project (Yes / No / N/A)	Hazard Rating (Low, Medium, High) *	Comment / Recommendation
5.33	Are there any specific medical requirements necessary?	Yes	High	Medical fitness to work certificates signed off by a qualified Occupational Medical Practitioner must be provided for all staff / labourers to be employed on the project. Vaccination and other preventative measures against the spread Covid-19 as required by national legislation is highly encouraged / required.

* The hazard rating takes into account the likely level of consequence (injury / death) to which workers are exposed, the likely number of workers exposed to the hazard, and the probability of occurrence.

HESSEQUA MUNICIPALITY

BID No. HES-TECH 10 / 2223

ELECTRICAL RATES FOR A PERIOD OF THREE (3) YEARS

PROJECT TECHNICAL SPECIFICATION (Part C3.3)

1.0 GENERAL

This part of the specification deals with the main items of material and equipment which it will be the Contractor's responsibility to supply, install and / or maintain under the various portions of the work, as well as the responsibilities and duties expected from the Contractor in terms of the maintenance portion of the work.

Sufficient information is provided in this document to enable the tenderer to accurately price the work. Tenderers must allow for all items, whether specified in detail or not, required to complete the installation in a neat and workmanlike manner.

Tenderers shall take note of the requirements of all parts of the specification as far as they may be applicable and relevant to the various sections of work.

No additional compensation or claims for any items that Tenderers have been made aware of during tender stage will be entertained.

2.0 MAINTENANCE RESPONSIBILITY AND DUTIES

In terms of the maintenance portion of the work it is envisaged that the duties of same shall include for the following:

- Attend to call-outs when notified by the Municipality in order to attend to / diagnose faults on the system.

  The maximum response time to a normal / emergency work instruction after notification by the Municipality will be in the order as stipulated elsewhere in the specification.
- Servicing and general preventative maintenance on equipment as and when required.
- Breakdown maintenance and repair on plant and equipment as and when required.
- Supply and install new plant, equipment or material as required by the municipality during the course of the project, etc.
- Tracing, fault finding and other general troubleshooting measures required to determine the location and / or cause of faults, trips, etc on the system.
- Assisting the Municipality and / or others undertaking field investigations, studies, etc of the existing electrical network / infrastructure at the behest of the Municipality.
- Assisting the Municipality in drawing up a detailed annual maintenance program for all equipment and plants as and when required.
- Maintenance inspections and reports on the status of equipment and other associated infrastructure at the request of the Municipality. Such reports may include amongst other things a list of items that require attention and the cost of each item (as per the relevant tender rates as applicable), as well as any other preventative maintenance work identified.
- Monitoring of municipal stock levels of various critical items to ensure availability.
- Attend meetings (e.g. feedback sessions, etc) together with the Municipality when required.

3.0 MATERIAL / EQUIPMENT

3.1 Supply of Material

As a default it is anticipated that the bulk of the material required for the contract will be supplied directly by the Contractor.

In such instances Bidders are to note that all material and equipment supplied through the tender shall comply with the DTI requirements regarding local content as applicable, as well as the general specifications provided hereafter.

3.2 Free Issue

In certain instances the Municipality may at its discretion supply certain material or equipment that is available at the stage of a work instruction as a free issue item to the Contractor for installation only.

In such instances it will required from the successful Contractor to collect said free issue material from the Municipality's stores, and to undertake the final connection and commissioning of same.

Said Contractor shall take full responsibility for the satisfactory operation of all equipment and the connection, testing and commissioning thereof. The Contractor shall perform all the usual on site tests and calibration of ancillary equipment as required.

The issuing of material to the Contractor via the Municipality's stores shall be at fixed times to suit the Municipality, and said time, together with the quantities and type of material / equipment in question shall be confirmed timeously prior to collection to avoid unnecessary delays or confusion in this regard.

Bidders are to note that where equipment / material is to be supplied as a free issue item the labour rate as entered in the Bill of Quantities for the specific item / s in question shall in such instance shall govern. It is therefore important to note that all labour rates provided must include handling charges for the respective material.

4.0 REFURBISHMENT

Upon direction of the Municipality the successful Contractor may at times be requested to undertake various refurbishment measures on existing plant and equipment as deemed necessary in order to maintain same to an acceptable standard.

Should the necessary expertise in this regard not be available in house the Contractor shall engage the services of a specialist sub-contractor to perform the required servicing / maintenance of the equipment or plant in question. Such work shall be measured on a time / cost basis with the Contractor tendering a fixed mark-up on any outside expertise / equipment required to undertake the same.

No work shall proceed without prior approval being obtained from the Municipality regarding the anticipated scope and costs of the refurbishment work under consideration.

The afore-mentioned specialist sub-contractor shall test and verify the plant / equipment on completion of the refurbishment in accordance with the factory requirements of plant / equipment in question, and three sets of the necessary test reports in this regard shall be provided on handover.

5.0 TRANSFORMERS

5.1 Ground / Pole Mounted Transformers

Where transformers are to be supplied under the contract these shall generally meet with the minimum standards and requirements as indicated in the table below:

ITEM	DESCRIPTION	REQUIREMENT
1.0	Windings:	Double wound
2.0	Rating:	As indicated in the Bills of Quantities.
3.0	No. Of Phases:	Three (3)
4.0	Service Voltage Primary:	11 000 or 22 000 Volt as required.
5.0	Service Voltage Secondary:	420 / 240 Volt
6.0	Vector Group:	Dyn11
7.0	Transformer Winding Material:	Copper windings only. Windings shall be adequately clamped to be suitable for starting of large motor loads.
8.0	Type:	Pole / ground mounted transformer substations, hermetically sealed (welded cover) for outdoor use.
9.0	Cable Termination Arrangement	Pole Mounted - Outdoor porcelain bushings on both primary and secondary. Ground Mounted - Weather proof cable termination box over bushings suitable for heat shrink terminations.
10.0	Tap Changing:	Off-load fitted on 11 kV windings between ±5% in steps of 2,5%
11.0	Fittings:	Standard dial type thermometer.
12.0	Base:	Pole / ground mounted type as applicable.
13.0	Dimensions:	To be confirmed with, and approved by the Municipality prior to construction.
14.0	External Finish:	Zinc metal sprayed and painted in accordance with the requirements for Coastal conditions as laid down in SABS 780. The default finishing paint colour shall be avocado green unless indicated otherwise.

5.2 Power Transformers

Should it be required by the Municipality the successful Contractor appointed under the relevant section of the works shall undertake the final connection and commissioning of power transformers located inside substation yards previously supplied and delivered by others.

Said Contractor shall take full responsibility for the satisfactory operation of all equipment and the connection, testing and commissioning thereof, as well as perform all the usual on site tests and calibration of ancillary equipment.

Should the Contractor not have the necessary expertise in-house, the services of a specialist commissioning engineer shall be obtained to undertake the necessary work required. Such work shall include inter alia testing and commissioning of the entire new installation, primary and secondary injection testing on all CT's, VT testing, kWh / kVA meter programming and certification, determining relay co-ordination settings in conjunction with the Municipality and implementation of settings and checking an verifying all other control functions.

Three sets of the specialist's commissioning test report, containing all relay settings, etc. as well as test certificates and operating and maintenance manuals of all switchgear relays, etc shall be issued to the Engineer on handover.

Apart from new installations the services of the afore-mentioned specialist commissioning engineer may also be required to test, verify and / or fault find on existing installations as and when required. Such work shall be measured on a time basis with the exact number of hours in this regard agreed to with the Municipality beforehand.

6.0 MINIATURE SUBSTATIONS

6.1 General

Where called for miniature substations shall comply with the requirements in the table hereafter.

ITEM	DESCRIPTION	REQUIREMENT
1.0	**Enclosure**	
1.1	Class	SABS type B
1.2	Material and finish	3CR12 with a minimum thickness of 2.5mm as specified. Colour of paint for finishing coats shall be Avocado green.
2.0	**SF6 RMU Switchgear**	
2.1	Type	Similar or approved equal to the SF6 insulated ABB SafeRing / Safeplus non-extensible type with circuit breaker T-Off.
2.2	Cable terminations	All cable termination boxes shall be suitable for heatshrink cable terminations of the T-adapter / RICS insulation boot type, and the boxes shall be sized to ensure that sufficient space is available to accommodate the entire heatshrink termination kit, i.e. no cutting of the heatshrink kit will be permitted.

ITEM	DESCRIPTION	REQUIREMENT
	Cable terminations (Contd.)	All cable boxes must be easily accessible for the termination of cables from the doors provided on the substation enclosure, and suitable for the termination of up to 240mm² Al x 3 core belted PILCA cable. The circuit breaker shall be connected to the transformer bushings with 35mm² Cu XLPE insulated tails or an alternative cable of adequate rating and type.
2.3	Cable test facility	Test bushings shall be provided for ease of testing of cables terminated at the switches. A safety interlock mechanism shall be provided to ensure that access to test bushings is denied until the cable is earthed.
3.0	**Earth Fault Indicator**	
3.1	Type	ISO Tech GFD-50E or similar with current transformer.
3.2	Reset	Electrical self-reset (50-240V).
3.3	Labels	Engraved labels for switches and earth fault indicator to be provided.
4.0	**Transformer**	
4.1	Rated power	As indicated in the Bill of Quantities
4.2	No. of phases	3
4.3	Windings	Double wound
4.4	Material used for transformer winding	Copper only
4.5	Primary service voltage	11 000 or 22 000 Volt as required.
4.6	Secondary service voltage	420 / 240 V
4.7	Vector group	Dyn11
4.8	Fittings	Standard dial type thermometer with shunt trip switches.
5.0	**L.V. Compartment**	
5.1	MCB'S	Three phase - CBI type L20B, and single phase - CBI type QF unless indicated otherwise. Circuit breakers shall be fitted with phase barriers and busbar stubs to suit cable size to be connected.
5.2	CT's	3 off, Dual Class 3. 800 / 400 / 5A, to suit transformer current rating.

ITEM	DESCRIPTION	REQUIREMENT
5.3	Ammeters	3 off, 96mm x 96mm. Combined maximum demand, instantaneous, dual calibration indication ammeters.
5.4	Voltmeter	1 off, 96mm x 96mm. 0-500V voltmeter with selector switch.
5.5	Contactor	No bare electrical connections. Contactor to be mounted in sealed junction box.
5.6	Industrial plug outlet	As detailed on drawing.
5.7	Gland plates	2mm thick 316 stainless steel and sufficient for total number of cables required, incl. future cables. Pre-drilled for cable sizes required.
5.8	Busbars and earth bars	Note: All busbars shall be tin plated, including the earth bar.
5.9	Bulk LV Meter	To be supplied and installed inside the new miniature substation if required as further specified elsewhere.
6.0	**General**	
6.1	Labels	To comply with Standard Tech Spec and wording provided.
6.2	All bolts, nuts, washers, hinges, latches, handles, etc.	Brass or stainless steel.
6.3	Standard Technical Specification	The miniature substation shall comply with the relevant clauses of the Standard Technical Specification and George Municipality's specifications.

The substation shall be mounted on a brick-built plinth and the plinth cavity shall be filled with sand and a 100mm top layer of chip stone.

Two layers of five (5) ply malthoid shall be placed between the miniature substation base and the plinth, and cut flush with the substation cubicle.

Test certificates and operating manuals of the MV switchgear and the transformers shall be provided to the Municipality with copies to Engineer before switching on the substation.

The Substation shall be provided with a main earth as further described elsewhere in this specification.

Shop drawings of the miniature substation shall be submitted to the Engineer for written approval prior to the manufacturing thereof.

7.0 WITHDRAWABLE MV SWITCHGEAR AND COMPONENTS

7.1 Indoor MV Switchgear Panels

Where called for MV switchgear panels shall comply with the general requirements as given in the table hereafter as applicable.

ITEM	DESCRIPTION	REQUIREMENT
1.0	**General**	
1.1	Type	Extensible indoor, metal-clad MV switchgear with internal arc exhausting and withdrawable SF6 Gas or vacuum insulated (or a combination of the two) interruptors.
1.2	Make	Similar or approved equal to Actom SBV4E, or SBV24 type.
1.3	Finish	All metalwork shall be painted grey, to coastal finish.
1.4	Voltage rating	12kV, or 24kV rms as applicable
1.5	Current rating	630A to 1250A rms as applicable
1.6	Rated short-time withstand current and duration	21kA for 3 seconds
1.7	Rated impulse withstand voltage	125kVip
1.8	Busbars	1250A rated normal current single busbars.
1.9	Closing mechanism	110V DC Motor Charged spring closing mechanism.
1.10	Tripping	110V DC
1.11	Heaters	One or more black element heaters controlled by thermostats.
1.12	Loose equipment	Operating handle, racking handle, test spears, integral earth handle, carriage ramp and tool rack.
1.13	Incoming cable chambers	Rear / back cable entry. Gland plate with wooden cleat to accept heat shrink termination and three core PILCA cable of different sizes as required.
2.0	**Protection Relays**	
2.1	Type, etc.	As specified elsewhere.
3.0	**Other**	
3.1	Arc Flash Detection: a) Circuit breaker chamber b) Cable termination chamber c) Busbar chamber	 Point sensor Point sensor Bare Fibre sensor looped through busbar chamber of all new panels to inputs on protection relay in Bus-Section panel.
3.2	Internal Arc Classification	To fully comply with IEC 62271-100 and -200. Test certificate to be provided.
3.3	Potential indicators	Three neon lamps energised from capacitor bushings to indicate cable live.

ITEM	DESCRIPTION	REQUIREMENT
3.4	Instrumentation	Voltages and currents to be indicated on the protection relay.
4.0	**Telemetry**	
4.1	Telemetry I/O:	All inputs and outputs (I/O) for remote status indication and control to be wired and connected to relay inputs, where applicable. Should no relay inputs be available all I/O to be wired to terminal connectors at back of panel.
	Status inputs:	Circuit breaker (CB) closed CB open CB spring charged CB gas low CB in service position Bus fault trip CB fault trip CB supervisory CB in earth position CB in busbar earth position
	Analogue inputs: *(Analogue outputs from protection relay to be utilised in preference to additional transducers.)*	White phase amps A phase voltage B phase voltage C phase voltage
	Control outputs	CB open control CB close control

7.2 Protection Relays And Accessories

Where called for any protection relay and / or accessories supplied shall be of the SEL type as per the Municipality standard.

This equipment shall further comply with the requirements given in the table hereafter.

ITEM	DESCRIPTION	REQUIREMENT
1.0	**Incomer Protection Relay**	
1.1	Make and Type	SEL-751
1.2	Model Option Table Code (MOT)	751001DCD4D7081A230
1.3	Configuration: a) Firmware b) Chassis and Mounting c) User Interface d) Power Supply e) Front Panel Options f) Secondary Input Current g) Control Input Voltage h) I/O Board	 a) Standard b) Horizontal Panel mount c) English Language d) 110-250 V dc e) Front Panel Options; 5" Colour Touchscreen Display with 8 x Pushbuttons f) 1 Amp Phase, 1 Amp Neutral g) 110 V dc h) As per MOT Order Code in Item 1.2 above

ITEM	DESCRIPTION	REQUIREMENT
2.0	**Feeder Protection Relay**	
2.1	Make and Type	SEL-751
2.2	Model Option Table Code (MOT)	751201DCD4D7081A230
2.3	Configuration: Firmware Chassis and Mounting User Interface Power Supply Front Panel Options Secondary Input Current Control Input Voltage I/O Board	 a) Standard b) Horizontal Panel mount c) English Language d) 110-250 V dc e) Front Panel Options; 5" Colour Touchscreen Display with 8 x Pushbuttons f) 1 Amp Phase, 1 Amp Neutral g) 110 V dc h) As per MOT Order Code in Item 2.2 above
3.0	**Automation Controller**	
3.1	Make and Type	SEL 3530-4RTAC
3.2	Model Option Table Code (MOT)	
3.3	Configuration: Chassis and Mounting User Interface Power Supply Rear Communications Port Web HMI Client Protocols Server Protocols Peer-to-Peer Protocols Conformal coat	 a) Horizontal Panel mount b) English Language c) 110-250 V dc d) (1)10/100Base-T, (1)10/100Base-LX10 (single mode), 4 DB-9 EIA-232/EIA-485 e) Basic HMI Run-Time License f) SEL, DNP3, Modbus, IEC 61850 MMS g) SEL, DNP3, Modbus h) Mirrored Bits, IEC 61850 i) None
4.0	**Ethernet Switch**	
4.1	Make and Type	SEL-2730M
4.2	Model Option Table Code (MOT)	2730M0ARAX1111AAAAX0
4.3	Configuration: Chassis and Mounting User Interface Power Supply Ports Other	 a) Horizontal Panel mount b) English Language c) 110-250 V dc d) 24 e) As per MOT Order Code in Item 4.2 above
5.0	**Industrial Computer**	
5.1	Make and Type	SEL-3355

ITEM	DESCRIPTION	REQUIREMENT
5.2	Configuration: Chassis and Mounting User Interface Power Supply Other	a) Rack mount b) English Language c) 110-250 V dc d) Two (2) off Megabit Ethernet Dual-Fiber SFP Transceivers

Should it be required by the Municipality the successful Contractor appointed under the relevant section of the works shall also undertake the final connection, commissioning and programming of protection relay, substation automation and other peripheral data / communication equipment previously supplied and delivered by others as detailed elsewhere in this specification.

7.3 Installation, Connection and Programming

General

Where required the Contractor shall undertake the final connection and commissioning of the MV switchgear and / or other associated components (i.e. protection relays, substation automation equipment, etc) previously supplied either directly by the Contractor under this contract, or by others as the case may be.

The Contractor shall take full responsibility for the satisfactory operation of all equipment and the connection, testing and commissioning thereof, as well as perform all the usual on site tests and calibration of any ancillary equipment as applicable.

Should the Contractor not have the necessary expertise in-house, the services of a specialist commissioning engineer / service provider shall be obtained to undertake the necessary work required. Such work shall include inter alia testing and commissioning of the entire new installation, primary and secondary injection testing on all CT's, VT testing, kWh / kVA meter programming, retrofitting / programming of protection relays, substation automation and other peripheral data / communication equipment, and checking an verifying all other control functions.

Three sets of the specialist's commissioning test reports, containing all relay settings, etc. as well as test certificates and operating and maintenance manuals of all switchgear relays, etc shall be issued to the Engineer on handover.

Fault-finding

Apart from new installations the services of the Contractor, or his appointed specialist commissioning engineer / service provider may also be required to test, verify and / or fault find on existing installations as and when required. Such work shall be measured on a time basis with the exact number of hours in this regard agreed to with the Municipality beforehand.

8.0 SECONDARY DISTRIBUTION OUTDOOR SWITCHGEAR

8.1 General

Any outdoor distribution switchgear supplied shall be similar or approved equal to the SF6 insulated ABB SafeRing / Safeplus non-extensible modular type.

The switchgear shall be supplied as a completely sealed system and rated in accordance with operating voltage (i.e. 22 / 11 kV) required. The type and configuration of the various modules shall be confirmed and provided to suit the application required.

8.2 Bulk MV Metering Module

Any bulk metering unit supplied shall be fitted with a Landis & Gyr type ZMD 405 CT kWh meter, including LED indicator fuses, test block and cell phone modem for remote metering, and programmed in accordance with Municipal requirements as specified elsewhere.

The voltage transformer shall be 22 or 11kV (as required) / 110V, 3 phase, 100VA and Class 0,5.

The current transformers shall be 3 off, 100 / 50 / 5A, 10VA and Class 0,5.

The meter shall be tested, commissioned and programmed in accordance with the requirements of the municipality on site by a specialist contractor to be approved by the Engineer and the Municipality. The contractor shall also check the CT / VT wiring and provide a test certificate to the Municipality on completion to confirm that the meter has been tested in terms of their standard procedure and provide the test results required by them. Allowance must be made for this contractor to return to site one month after the supply has been energized to check and confirm in writing to the Engineer that the meter is operating correctly.

8.3 Enclosure

The enclosure housing the switchgear shall be manufactured from 3CR12 steel in accordance with the corrosive coastal conditions to be encountered. Colour of paint for finishing coats shall be Avocado Green.

All internal metal work shall be painted grey to coastal finish. Safety notices shall be provided as required in terms of the relevant legislation.

9.0 110V DC BATTERY TRIPPING UNIT (BTU)

The battery tripping unit shall comply with the South African National Standard SANS 1652:2008, Edition 1.5 as applicable, and the following minimum standards / requires as given in the table below:

ITEM	DESCRIPTION	REQUIREMENT
1.0	Service conditions a) ambient air temperature b) altitude up to m c) relative humidity Max.	 40°C (Max) / 0°C (Min) 1 800m 85%
2.0	AC Input:	230V (± 10%) @ 50 Hz (± 2,5 Hz)
3.0	Full Load Current:	20 A
4.0	Batteries: a) Type b) Nominal DC voltage c) Standby capacity d) Reverse battery protection	 a) Nickel Cadmium (low rate application). b) 110V c) 4h Standby time. Supplier to provide battery amp hour calculation. d) Required.
5.0	DC Load: a) Voltage b) Max Current c) Rated load current A	 a) 132V (Max) / 88V (Min) b) Standing load + 10A for 0.1 sec c) Approx 5A standing load.

ITEM	DESCRIPTION	REQUIREMENT
6.0	Alarms:	Audible and visual, with voltage free contacts for remote monitoring of: a) Charger fail b) Low DC volts c) High DC volts d) DC earth fault e) Charger on boost f) Charger on float
7.0	Locally mounted 96 x 96mm analogue meters for:	a) Voltmeter - DC output , 1 % accuracy b) Ammeter – DC Output, 1 % accuracy
8.0	Enclosure:	a) Floor / wall mounted as required. b) Front maintenance access. c) Naturally ventilated. d) IP2x rated e) Max noise level less than 80dB(A)
9.0	Paint Finish:	Epoxy powdered coated: - Grey, 29 (Externally) - White (Internally)

10.0 POLE MOUNTED EQUIPMENT

10.1 Auto-Reclosers

Where called for any auto-recloser equipment supplied shall be similar or equal approved to the following pole mounted types:

22kV – Cooper Power Systems Type NOVA 27, complete with hot dip galvanised steel mounting bracket.

11kV – Cooper Power Systems Type NOVA 15, complete with hot dip galvanised steel mounting bracket.

10.2 Sectionalizers

Where called for any sectionalizer equipment supplied shall be similar or equal approved to the following pole mounted types, complete with a hot dip galvanised steel bracket for mounting on a single pole:

22kV – Cooper Power Systems Type GW.

11kV – Cooper Power Systems Type GV.

10.3 Pole Mounted Transformer Combi Unit

Any pole mounted Transformer Combi Unit supplied shall be suitably rated for operational voltage in service, and shall be similar or approved equal to the Live Line Technology type.

The unit shall include all the required accessories, i.e. the LLT fuse carriers, live line arrestors, LLT fuses and LLT combi pole clamp, etc.

10.4 MV Expulsion Fuses

MV expulsion fuses shall be silicone cut-out suitable for the voltage operation as required and manufactured for severe corrosive coastal conditions, complete with hot dip galvanised steel mounted bracket.

10.5 Lightning Arrestors

MV lightning arrestors shall be silicone cut-out suitable for the voltage operation as required and manufactured for severe corrosive coastal conditions.

10.6 Tri-Switch / Disconnects

Where called tri-switch or set of disconnects it shall be similar or equal approved to the following pole mounted type, complete with a hot dip galvanised steel bracket for mounting on a single pole:

22kV – Linegear 2000 Type MK5 tri-switch, pull-to-open and pull-to-close, rated for 24kV, silicone 750.

11kV – Linegear 2000 Type MK5 tri-switch, pull-to-open and pull-to-close, rated for 12kV, Silicone 750.

11.0 PLINTHS

All items of MV equipment shall be mounted on concrete plinths complying with the requirements of the Municipality and the Standard Specification.

As a general rule where new plinths are to be supplied these shall be cast in situ and shall be 400 mm deep of which 200 mm shall be above ground level and shall be of appropriate dimensions to fully accommodate the relevant item of equipment to be installed on same. A 45° bevel shall be framed around the edge of the upper surface of each plinth and shall be between 30 and 50 mm in width. A 150 mm concrete border shall be left around the base of the equipment.

All plinths shall further comply with the following specifications as applicable:

(i) All concrete work to SANS 1200G-1982 as amended.
(ii) All reinforcing to SANS 920-1980 as amended.
(iii) Concrete strength at 28 days = 25MPa. (25/19).
(iv) Concrete cover to bases = 50mm, and to stub columns = 50mm.
(v) All new plinths shall exactly match the existing plinths of the same type.
(vi) All excavations, reinforcing, shuttering and the completed plinths shall be inspected and approved by the Engineer.

12.0 FENCING

Where fencing is to be supplied and / or installed this shall be similar or equal approved to the Betaview 3 type.

The fence height required shall generally be 2,4m high, with a continuous serrated saw tooth spike along the top edge as an anti-climb deterrent, and an underdig arrangement consisting of a continuous 450mm x 600mm flat mesh panel buried underground along the bottom rail of fence.

The final colour shall be confirmed before manufacture, but for the purposes of the tender same shall be Anthracite RAL 7021. All steelwork shall be PVC coated and shall carry a 10 Year corrosion proof warranty.

13.0 MV AND LV CABLING

13.1 MV Cables

(i) MV Cables shall be 3 core, PILCA, solid aluminium or stranded copper cored as specified in Table 18 for 11 kV cables and Table 20 for 22 kV cables.

(ii) All MV terminations shall be of the heatshrink T-adapter / RICS insulation boot type, and all MV through-joints shall be of the Powertech or Iso-tech type or similar equally approved.

(iii) Concrete slabs and PVC marker tape shall be placed over MV cables in trenches as further detailed below.

13.2 LV Cables

(i) LV Cables shall be 2, 3 or 4 cored as specified for each task, PVCAS, copper cored.

(ii) PVC marker tape shall be placed over LV cables in trenches as further detailed below.

(iii) All LV cable joints shall be by means of a "Scotch Cast" joint.

(iv) Locknuts on LV cable glands shall be brass.

13.3 Cables Laid In Trenches

(i) Unless specified otherwise for a specific task, LV cables shall be laid with a cover of 650 mm and MV cables with a cover of 850 mm.

(ii) Where two MV cables are run in same trench, they shall be laid a minimum of 300 mm apart with separate cable slabs over each cable.

(iii) Where MV and LV cables are laid in same trench, MV cables shall be located on road side and LV cables on the plot side of trench.

(iv) A horizontal distance of not less than 400 mm shall be maintained between cables of different voltage groups.

(v) Where a number of LV cables are run in same trench, they shall be laid with a minimum separation of 100 mm. This applies to feeder cables only and not streetlighting and service cables which shall be only 25 mm apart. Cables shall not cross each other unless approved by the Engineer.

(vi) Where cables run across erven parallel to lateral boundaries, they shall be located 1,0 m from the boundary at a depth of 1,0 m. If so specified they shall be run in sleeves, otherwise both MV and LV cables shall be protected by cable slabs and a PVC marker tape laid 300 mm above them.

(vii) Trench bottom shall be cleared of all sharp or protruding stones, and to be refilled with 150 mm of soft material and compacted bedding. A further layer of soft material shall be installed after cables are laid to provide 200 mm cover for cable when compacted. Protective cable slabs, a minimum of 50 mm thick x 230 mm wide, shall then be laid in case of MV cables, and PVC marker tape 300 mm wide with indelibly printed warnings every 150 mm along its length, in case of LV cables. In cases where MV and LV cables run in same trench, 100 mm of soft bedding for LV cables shall be situated above protective cable slabs. Where only LV service cables or streetlighting cables are installed, a clean trench bottom and soft material back-fill only is required.

(viii) Soft material described above may be either sand or backfill material sifted through a 3,0 mm mesh grid.

(ix) Balance of trench is to be back-filled with excavated material from which all stones, etc. greater than 100 mm in size have been extracted. All such material is to be removed from site.

(x) Cable route markers shall be provide for all MV and main LV feeder cables at road, culvert and Telkom cable crossings, at all changes of direction, at joints and at intervals not exceeding 60 metres along the straight.

(xi) Cable route markers shall comprise concrete blocks in shape of truncated pyramids 300 mm high, 150 mm x 150 mm at top and 225 mm x 225 mm at base. An aluminium plate 3,0 mm thick minimum, with four rods 75 mm minimum, welded to it on underside, shall be cast into top of concrete block, and plate shall have been stamped on its cable data and direction arrows, and at a crossing, crossing shall be indicated.

(xii) Cable route markers shall be placed over cable, in trench way, and shall protrude 25 mm above finished ground level but not where they are likely to cause an obstruction or be in way of moving traffic. Joint markers shall indicate as such. Contractor shall ensure that ground under and around cable marker is properly compacted.

13.4 Laying Of Cables With Other Services

(i) Where cables are laid in trenches containing water and other pipes, etc, electrical cables shall be laid along one edge of trench with other services occupying the other edge.

(ii) Cables shall be laid not less than 600 mm from such service unless otherwise approved by the Engineer.

(iii) At road and services crossings, sleeves shall be provided for each MV cable and a separate sleeve for other cables, unless required otherwise by the Engineer.

(iv) At Telkom cable crossings, power cables shall cross 300 mm below and at right angles to all such cables or sleeves for future cables. Power cables shall be enclosed in uPVC sleeves with cable slabs over, both of which shall extend 1,0 m either side of the crossing. No power cables running parallel with a Telkom cable shall be laid within a distance of 1,0 m measured horizontally from the Telkom cable. Wherever existing buried Telkom cables are encountered, strict precautions and care shall be taken and close supervision given. Any damage to or disturbance of Telkom cables whatsoever shall be immediately reported and confirmed in writing to the Engineer.

13.5 Labelling Of Cables

(i) All cables shall be clearly labelled with a durable, weatherproof type label.

(ii) Cables shall be labelled at both ends, stating clearly the cable designation (i.e. where they are supplied from / feeding), as well as the size and number of cores.

(iii) Labels shall be so installed that they are easily readable.

14.0 MV AND LV OVERHEAD LINES

(i) All steelwork on Overhead Line structures shall be Hot Dipped Galvanised.

(ii) Overhead Line conductors shall be of the following types and of the sizes specified for each task:

- MV Overhead Lines shall be either bare copper conductors, All Aluminium Alloy (AAAC) (Greased), Aluminium Conductor Steel Reinforced (ACSR) or Aerial Bundled Conductor (ABC) with supporting core system (French system).

- LV Overhead Lines shall be Aerial Bundled Conductors (ABC) for main lines and Airdac for service connection cables.

(iii) Insulators for MV bare conductor Overhead Lines shall be as follows and suitable for coastal conditions:

- 22 kV:
  Strain – Pure silicon rubber Long Rod 22kV, 70kN, 850mm creepage.
  Line Post – Capless brown glazed porcelain 22kV, 10kN, 750mm creepage.

- 11 kV:
  Strain – Pure silicon rubber Long Rod 11kV, 70kN, 590mm creepage.
  Line Post – Capless brown glazed porcelain 15kV, 10kN, 325mm creepage.

(iv) Wooden poles for Overhead Lines:

- Poles shall be machine peeled and inspected by the Engineer at the Suppliers premises before delivery to site and no excessively bent or ragged looking poles will be accepted. Poles must bear the SABS mark.

- Unless specified otherwise for a specific task, the minimum top diameter and diameter at theoretical ground level and depth pole to be planted shall be as follows for the following tarred wooden pole lengths:

Pole Length	Top diameter	Ground diameter	Plant depth
8 metres	140 mm	175 mm	1500 mm
9 metres	140 mm	180 mm	1500 mm
10 metres	160 mm	205 mm	1800 mm
11 metres	160 mm	215 mm	1800 mm
12 metres	160 mm	215 mm	1800 mm
13 metres	180 mm	245 mm	2000 mm
14 metres	200 mm	265 mm	2200 mm

- Unless specified otherwise for a specific task, the minimum diameter shall be as follows for the following wooden cross-arms:

Cross-Arm Length	Diameter
3,5 metres	140 mm
4,5 metres	140 mm
5,5 metres	160 mm
7 metres	160 mm

- Stays for Overhead Lines (unless specified otherwise for specific task) shall be galvanised, 7 strands of 4,0 mm, and adjustable. Similar or equally approved to RGS (Reticulation & General Specification), product code LSW 7 x 4,00.

  The base plates for all stays shall be galvanised steel plate of 600 x 600 x 600 mm square.

15.0 TRENCHING, EXCAVATION AND COMPACTION

Trenching for MV underground cable shall be minimum 1 000mm deep, and that for LV cables 700mm min.

The classification of excavated materials shall be in terms of SANS 192-5, as follows:

- Soft - Material which can be excavated by means of a suitable shovel, with the aid of a pick or other hand-swung tool, or with difficulty with the aid of a hand-swung tool.
- Intermediate - Material which is difficult to excavate by hand even with the aid of a crowbar and requires the assistance of pneumatic tools for economic removal.
- Rock - Material which cannot be economically fragmented and loosened by hand implements and pneumatic tools except by drilling and blasting or the use of rock-breaking equipment.

Disturbance to existing vegetation must be kept to a minimum at all times during construction. Where small trees, plants and shrubs located on the cable route need to be removed, it shall be replanted in its same position after installation of the cable.

Where existing tar, concrete and brick paved surfaces need to be cut or broken-up for trenching of underground cables, it shall be repaired to its original state after the installation of sleeves and cables. In the case of existing tar surfaces, all repairs shall be undertaken by a municipal approved sub-contractor and compaction tests shall be carried out in full compliance of the Municipality's associated standard specifications.

A 2% cement mixture shall be added to the backfilling for all poles and stays. Trenching, backfilling and compaction shall further comply with the Standard Technical Specification hereof.

1m High orange and yellow barricade safety netting, with wooden support pegs at min. 2m intervals, shall be installed for the entire length and on all sides of any open MV and/or LV cable trenches and holes for overhead line poles, stays and prop structures. This safety netting shall be installed when workers are not actively working in that specific area and also re-instated after close of business on a daily basis.

16.0 SLEEVES

Where possible the Contractor shall attempt to locate and re-use existing sleeves installed under roads. Any new sleeves required however, will be supplied and installed under this contract by the relevant Contractor / s.

Where required at major roads / intersections sleeves shall be installed using the directional drilling method. A minimum of two sleeves shall be installed for all road crossings.

All sleeve ends must be sealed with sista foam after the installation of the cables to prevent water penetration from the outside.

All sleeves must extend at least one metre beyond the entrance / road edge. The roads / paving must be repaired to its original state after the installation of the sleeves.

17.0 PREPAID kWh METERS

Any prepaid meter supplied (normal and split type) shall be of the smart prepaid electricity meter type with a User Interface Unit (UIU) and shall comply with the following requirements:

- It shall have a smart configuration, which supports remote disconnect and reconnect of the supply control switch. The meter shall be able to form part of an end to end Advanced Metering Infrastructure (AMI) system when Data Concentrators (DC) are installed. The meter shall communicate to the DC by means of open standard G3-PLC communications.
- It must support account configuration of Standard Transfer Specification (STS) prepayment and post-payment (credit metering).
- It shall be industry and Eskom's standard STS compliant – Certificate of Compliance (COC) to be provided.
- It shall be industry standard Device Language Message Specification (DLMS) compliant – COC to be provided.
- For operating and maintenance purposes, the meter shall support visual indications of load switch status and G3-PLC communications status.
- It shall support an IEC optical interface for field and service read-out and parameterization.
- Ancillary meter support tools, licenses and training for key municipality personnel.
- Full compliance with SABS 1524-1: 1994 and NRS 009.
- Current limiting from 1A to 60A adjustable in 1A steps.
- Maximum initial current limit manufacturer pre-set at 20A.
- Voltage surge protection to comply with SABS 171.
- Fitted with tamperproof protection.

The prepaid meters shall be compatible with the existing split prepaid meters in use by the Municipality, i.e. Landis & Gyr E460 type meter with P160 User interface, and shall be served from the existing System Master Station (SMS) and Credit Dispensing Unit (CDU) of the Municipality.

18.0 POLE MOUNTED CONSUMER SERVICES CONNECTION BOXES (CSCB)

Any CSCB supplied shall be similar or equal approved to the padlockable Polybox Polyethylene, GreenBro IP54 pole mounted box fitted with neutral and earth bars, and interconnecting conductors.

The box shall be fitted complete with 4 (four) min. 2,5m long min. 16mm² copper UV stable, black insulated, conductor tails for connection to the bundled conductor overhead line, and stainless steel brackets for strapping the box to the wooden pole. The interconnecting conductors shall be colour coded (Red, White and Blue stripe and Black for neutral).

The CSCB's shall typically each be fitted with a minimum of three (3) 63A single phase, CBI type QF-1(26), orange handle (Curve 1) circuit breakers and space allowance shall be made for three (3) split pre-payment kWh meter Measurement and Control Units (MCU's).

Three phases shall be connected to each CSCB, and the conductors / cables shall be installed as to create a "drip loop" to prevent water running down the conductors / cables into the connectors.

Stainless steel straps, 19mm wide, shall be used to strap the box to the pole. The conductors / cables shall be neatly tied together with cable ties and the neutral conductor fixed to the pole with a suitably sized u-nail.

The protection rating of the box shall be IP54. Stainless steel bolts and nuts to be used to lock doors of CSCB's.

All conductor/cable entries into the box shall be by means of suitably sized UV stable (grey) PVC compression glands.

19.0 READY BOARDS

Any ready board supplied shall be similar or equal approved to the CBI type NRBCON003 Ready Board type with a bulkhead light fitting and contain the following:

- 1 x Switched Bulkhead light fitting, fitted with 1 x 18W CFL lamp
- 3 x 16A Switched Sockets
- 1 x 6A Euro Socket
- Compatible with all the prepayment meters
- Warning labels
- Earth Leakage protection

The boards shall be suitable for a 230 volt single phase supply and comply with SABS 1619: 1995.

20.0 LV DISTRIBUTION KIOSKS

Where called for LV distribution kiosks shall be of polyethylene with a standard root, similar or approved equal to the Golnix / Greenbro Type.

The kiosks shall be of two door (i.e. front and back) polyethylene construction with standard root unless shown otherwise. The doors of the kiosk will be provided with an approved 3 point latching mechanism with padlocking facilities. The locking mechanisms and hinges shall be of heavy duty 316 stainless.

The kiosk shall be fitted with a heavy duty 316 stainless steel gland plate (min 2mm thick), pre-drilled for the cable sizes given. The kiosks shall be pre-wired for the circuit breakers, isolators, etc. as required and perspex cover sheets / shrouds shall be installed in the rear compartments of the kiosks protecting the exposed busbars. The afore-mentioned perspex shroud covers shall be labelled with a suitable danger warning sign.

The kiosks shall have a cloud grey finish, unless advised otherwise and shall further comply with the Standard Technical Specification.

21.0 EARTHING

The typical earthing requirements of standard equipment is as detailed below. Where due to the nature of the installation additional earthing measures are required these shall be indicated / confirmed with the Municipality in accordance with the applicable installation to be undertaken.

An earth test certificate for any equipment installed shall be provided to the Municipality before energizing of the supply to the afore-mentioned equipment occurs.

21.1 Ground / Pole Mounted Transformers

The earthing of the ground mounted transformer shall consist of 2 off 4,5 metre long earth spikes separated a minimum of 6m apart and linked via 70 mm² hard drawn bare copper wire to the earth stud of the transformer, and associated steel mounting frame, lighting arrestors, etc for pole mounted transformers as applicable.

The earth resistance shall not exceed 1 ohm.

21.2 Miniature Substation

The MV and LV earth bar of the miniature substation shall be earthed via two separate earth systems consisting of 2 off 4,5 metre long earth spikes and green PVC insulated 70 mm² PVC inter-connecting copper conductors.

The MV and LV earth bars shall be linked with a length of green 70 mm² PVC insulated conductor provided that the combined earth resistance of same does not exceed 1 ohm.

21.3 Kiosks

The earthing for LV distribution kiosks shall typically consist of a 30m length of bare hard drawn copper conductor of appropriate current carry capacity run in the same trench as the incoming supply cable.

A continuous earth system consisting of hard drawn copper earth conductor run together with the underground supply / feeder cable network may however be installed if required, and as directed by the Municipality.

21.4 Overhead Equipment / Cable Terminations

Earthing of overhead equipment (i.e. pole mounted combi units, lightning arrestors, etc) and cable terminations shall consist of 1 x 4,5 metre long earth spikes installed adjacent to the relevant poles and linked to the equipment / termination in question, as well as the frame, steel work, etc. of the overhead equipment / cable termination via 25mm² black PVC insulated copper conductor.

All earth down conductors against poles shall be fixed with stainless steel straps and shall be protected with 25mm diameter galvanised steel kicker pipe from 500mm below to 4 000mm above ground level. The pipe ends shall be sealed with "Denso" tape. The straps shall be minimum width 19mm and spaced at 1 metre intervals. Care shall be taken to ensure that the cable conductor is not damaged due to over tightening the straps.

21.5 General

All outdoor earth connections shall be covered with "Densal" paste and a double layer of "Denso" tape to prevent deterioration due to corrosion.

All earth conductors shall be terminated in compression type lugs and all connections shall be suitably labelled. Concrete cable markers labelled "Earth Spike" shall be installed above each earth spike.

Earth test certificates for the entire installation shall be provided to Engineer and Municipality before hand-over and energisation of the supply occurs.

The earthing shall further comply with relevant clauses of the Standard Technical Specification and the AMEU Code of Practice for the Application of Neutral Earthing on Low Voltage Distribution Systems.

22.0 STREET / HIGHMAST LIGHTING

Where requested by the Municipality the appointed Contractor shall undertake the servicing and maintenance of the existing street / highmast lighting installations as required.

Such work may include the service, maintainance and / or replacement of the existing luminaires with more energy efficient alternatives on a one for one basis as required.

22.1 Streetlight Maintenance

As a general rule faulty existing HPS / MV type streetlight fittings are to be replaced on a one for one basis with the more energy efficient modern LED type.

However where same is not financial viable, or only minor work is required to bring the existing HPS / MV back into operation (i.e. replace blown lamps) then this may be the required action by the Municipality.

22.2 Highmast Maintenance

Raising / Lowering Devices

Maintenance of high mast lighting consisting of both 18m and 30m masts of either the scissor or sectional type may be required under the project.

It shall be the Contractor's responsibility to determine the exact type of hoist operating device / equipment required to raise and lower each mast / carriage. Where required the Contractor shall liaise with the Municipality for the loaning of the necessary raising / lowering equipment and to pay same for their hiring / attendance costs (if any).

Carriage Modifications and Tests

Where existing luminaires are to be replaced with more modern LED alternatives it shall be the Contractor's responsibility to determine and undertake any modifications required to the existing carriage to accommodate same.

All new and and existing drilled holes shall be treated with cold galv to prevent future rust and all luminaire brackets shall be secured using galvanised steel bolts and nuts.

All new equipment, lamps cabling, etc must be tested and the correct operation of same verified before the carriage is raised back into position.

Allowance shall also be made to adjust, aim and focus all luminaires on site and to measure the horizontal illuminance in the presence of the Engineer and make such adjustments as are necessary to achieve an average lux level and uniformity ratio acceptable to the Engineer.

The luminaires shall be positioned so as to provide a minimum illuminance of 0,8 lux over a radius of 140m from the mast.

All equipment necessary for the testing and commissioning of the masts shall be provided by Contractor.

23.0 FIBRE OPTIC INSTALLATION

23.1 General

In certain instances it may be required for a fibre optic communication and / or backbone reticulation system to be installed between substations, etc to allow for a reliable communication medium for monitoring of equipment, protection co-ordination, etc.

It is envisaged that such a system shall largely be installed together with any supply cabling to be undertaken, and such fibre optic related work will be confirmed by the Municipality at a later date. Where same is required the Contractor shall install all specified manholes, managed dome joints, mini- and micro ducts, backbone and last mile single-mode and multimode fibre and all related termination equipment.

The tenderer shall allow for all patch panels, mid couplers and patch leads for all equipment as applicable, the exact details of which will be firmed up during the course of the project.

All equipment shall be installed in accordance with the manufacturer's recommendations and all materials used shall be protected against corrosion and shall be resistant to UV radiation.

Should the contractor not have the in-house expertise to install fibre cable, the services of a specialist in this field shall be employed.

23.2 Fibre Optic Cabling

The fibre optic backbone shall generally consist of 72 core single mode fibre run inside an underground reticulation system of ducts and manholes.

The tap-offs to the various positions shall be via an In-Line Closure type joint kit installed inside the manhole nearest the relevant camera. The tap-offs shall be terminated inside the relevant building, etc. using an appropriately sized fibre splice / patch type enclosure.

All single-mode optical fibre cable shall generally comply with and meet the latest relevant ITU recommendations and reports and in particular shall comply with Recommendation ITU-T G652.

All multimode optical fibre shall comply with Recommendation ITU-T G.651.1. The requirements of IEC Standards 793-2 and 794-1 shall also apply. The more stringent of these recommendations shall always apply.

Operating Wavelength

The fibre offered shall be optimised for operation at wavelengths in the 1550nm region, but shall also be capable of use at wavelengths in the 1310nm region. The contractor shall therefore submit full details of the expected performance of the fibres at these wavelengths.

The attenuation for single-mode fibre shall be measured using the cutback method specified in ITU-T Recommendation G652 Section I.1. The attenuation for multimode fibre shall be measured using the cutback method specified in ITU-T G.651.1 Section 6.1.

Attenuation

The average attenuation for single-mode fibre at the 1550nm wavelength region shall be less than 0.3 dB / km over any section of the route.

The average attenuation at the 1300nm wavelength region shall be less than 0.4 dB / km over any section of the route for single-mode fibre and less than 1 dB / km for multimode fibre.

The average attenuation for multimode fibre at the 850nm wavelength shall be less than 3.5 dB / km for any section of the route.

23.3 Fibre Installation

The compressed air method shall normally be used to install the cable in the duct in accordance with the requirements of the manufacturer's recommendations in this regard.

Cable lengths that are too long, and that are to be installed in one operation, shall be installed by using the back feed technique i.e. which is starting from the middle of the cable and installing towards both sides.

Where the cable cannot be blown in, cable friction during installation shall be reduced through using lubricants approved by the cable manufacturer.

All pulling data registered during installation shall form part of the cable acceptance procedures.

Joints are not encouraged, however where same are unavoidable, provision shall be made for a manhole as specified to house the joint. The tap-offs to the various equipment / building from the backbone fibre shall be undertaken using an In-Line Closure type joint kit installed inside the manhole nearest the relevant equipment / building.

Where more than one optical fibre cable is placed in the same run or at the same joining or termination box, a brightly coloured marker shall preferably be used to clearly tag or label each cable and joint to identify the cable or route.

23.4 Splicing and Termination

All splicing techniques to be used shall incorporate automatic core alignment by using local light injection and/or detection or the profile alignment system.

Enclosures

Splices and terminations shall be protected by re-enterable closures, preferably of a universal type, for duct and aerial application.

The enclosure shall be capable of housing a special splice holder for optical fibres - i.e. optical pack / light guide organiser - together with a spare length for every fibre. It shall include components for clamping of the cable and strength member to provide stress relief. The strength member shall not interfere with the fibre during splicing or organising of the fibre.

The enclosure shall be water and moisture tight without the use of an additional filling component, and shall provide protection against mechanical impact and shall come complete with a suitable splice tray to accommodate all splices required.

Pigtails and Connectors

Pigtails shall be installed at each fibre end. Pigtails shall have a LC / APC connector spliced to one end for single-mode fibre and a LC connector spliced to one end for multimode fibre, and shall be suitable for fusion splicing onto the fibres of the cable.

23.5 Installation Tests

Each section of fibre optic cable shall be OTDR tested and certified after installation. The tests for each fibre in each section shall include:

- Attenuation in the 850nm, 1310nm and 1550nm windows where applicable.
- Chromatic dispersion in the 850nm, 1310nm and 1550nm windows where applicable.
- Cut-off wavelength.

The contractor shall provide all test equipment and include all test results in the final manuals.

23.6 Fibre Backbone Manhole and Duct Reticulation

The Contractor shall install specified mini- and / or micro-ducts as required as part of the contract. The Contractor shall also be responsible for the installation of all required manholes to access and terminate the ducts along the route.

The mini-duct shall be of the 7 way (12 / 10mm), high density Polyethylene construction suitable for direct burial and shall have colour coded, 12 / 10mm inner tubes with permanent silicone lubricant. The ducts shall usually be installed in the same trench as the power cables in one complete run without any joints and shall be securely terminated inside the manholes.

Where joints are unavoidable such as at the end of a standard drum length a manhole shall be provided to house the joint. The duct shall be jointed inside the manhole using a 7 way, high density polyethylene mini-duct in-line jointing kit.

Where required the mini / micro-ducts may need to be installed using trenchless technology inside the Municipality's existing redundant water pipe network. A specialist Sub-Contractor shall be appointed to undertake this work should the Contractor not have the relevant expertise in house.

The tenderer shall install a new draw rope along with the mini- and/or micro-duct to enable future installation of more ducts into the existing pipe.

The manholes to be provided shall be similar or equal to the PVC poly hand held type with road way frame manufactured by 4EVRplastic. The manhole cover and frame shall be of the heavy duty polymer type, cloud grey in colour with a galvanized steel locking mechanism similar or equal to the Maverick Type 2A.

Duct Integrity Testing (DIT) shall be undertaken on all cores of all fibre ducts before and after closing of trenches to ensure that no issues (i.e. core damage, coupler seal leaks, etc) are present that may affect the final installation of the fibre.

24.0 BUSH CLEARANCE / TREE FELLING

Where bush clearing and tree felling is required the Contractor shall investigate the extent of same together with the Engineer / Municipality prior to undertaking any such work.

Under no circumstances are protected indigenous trees to be removed or lopped without the written permission of the Municipality's Agent / Representative, who is to be advised immediately once the existence of such trees becomes known.

The Contractor shall endeavour to limit the temporary disturbance area to as small as possible, and the forest canopy and vegetation cover must be retained where same will not pose an encroachment risk to overhead lines, or impact on any trenching operation to be undertaken.

All the necessary arrangements shall be made with the landowners on which the bush clearance is to be undertaken, and same shall be notified in advance when such work is to be undertaken.

The Contractor shall ensure that all the necessary controls and protocols are in place to ensure the safety of all persons and to avoid any damage to any property during the bush clearance / tree felling work. Any possible damage to existing fences, etc. shall be repaired to its original state.

Where required trees are to be cut at 100mm above the ground level, and tree stumps are to be treated to prevent re-sprouting. Tree trunks and large branches are to be cut up in small enough sections and removed from the property to an authorised disposal site. No heaps of tree litter and small branches which may become a fire hazard are to be left on site.

All material is to be removed from the Site although the Contractor shall not be deemed to have ownership of any such material.

25.0 OPERATION AND MAINTENANCE MANUALS

25.1 General

Three complete sets of operating manuals shall be supplied by the Contractor on handover of a project. The manuals shall be bound in suitable hardcover binders complete with all "As-Built" drawings and details, datasheets, specifications, etc of all equipment and software provided.

The manual shall be suited to both the instruction and reference use by maintenance staff at the technician / client level in the operation, trouble shooting and repair of the system. The manuals shall be user friendly and written in laymans terms where possible. Detailed illustrations and drawings shall be provided to aid in the description of various items such as network layouts / interconnections, system architecture, etc.

Draft copies shall be submitted to the Consultant for comments and approval prior to printing of the final manuals.

Delivery of the installation will not be accepted without the manuals

25.2 Operating Manuals

The operating manuals shall give a clear description of the purpose of the installation, and shall be a step by step guide to aiding the operating personnel in day to day operation of the system.

The operating manuals shall include the following as applicable:

- Detailed description of the different components used in the installation. Where illustrations are required to further assist in the understanding of various tasks or processes (i.e. functional block diagrams, etc) these shall be included.
- System set-up procedures, i.e. setting of different security levels, passwords, etc.
- First line maintenance procedures.
- Guide lines for routine-tests to be carried out by the Client inclusive of the periods in which tests are to be undertaken.
- Detailed instructions and troubleshooting guide for procedures to be followed in the event of equipment failure or malfunction.

25.3 Maintenance Manuals

The maintenance manual shall be a detailed technical instruction manual covering system maintenance and repair. The maintenance manual shall contain all technical documentation and literature required to give a clear description of the maintenance aspects of the system.

The manual shall be both comprehensive and concise, facilitating easy use by technical staff.

The following shall be included with the maintenance manuals as applicable:

- A general description of the entire system and its various components including functional block diagrams of the equipment, system architecture, etc.
- Schedule of all equipment, model numbers, serial numbers, optional extras, modifications, electrical power requirements, etc.
- Detailed weekly, monthly, quarterly, semi annually and annual preventative maintenance procedures.
- Manufacturer's catalogues and relevant literature.
- Complete list of all configuration and calibration parameters for all equipment in use.
- List of spare parts for all equipment.
- Fault tracing procedures.

26.0 LABELS AND NOTICES

Labels and safety notices shall be provided in compliance with the relevant clauses of the Standard Technical Specification.

27.0 INSPECTION, TESTING AND COMMISSIONING

The inspection, testing and commissioning procedures to be followed shall comply with the Standard Technical Specification.